Carbon®

Considerations When Choosing a 3D Printer for Your Lab

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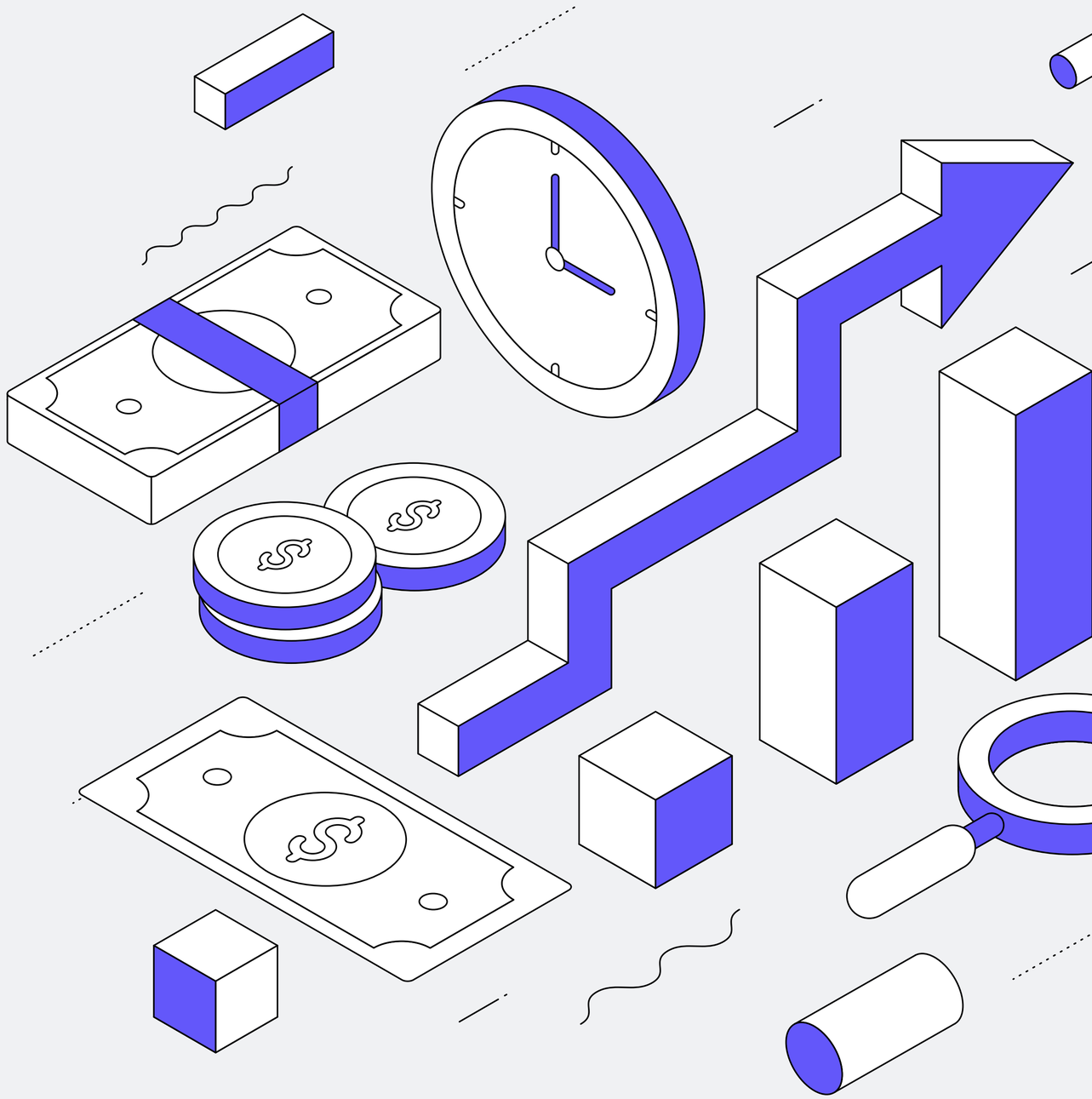

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Introduction

Mass customization at scale is one of the most challenging business models for a host of reasons. Unlike with traditional manufacturing, finished goods inventory cannot be stored and serve as a buffer to the many disruptions that can occur in production. When producing custom products, there is no room for error in your operations, and even small disruptions can lead to production output coming to a standstill.

The dental lab industry has consistently remained at the forefront of digital manufacturing innovation, and excels at mass producing custom products that improve people's lives. The industry's ability to adopt 3D printing has been highly impressive, and arguably remains one of the most impactful uses of the technology to date.

Carbon provides dental labs not just with a reliable 3D printing solution that consistently delivers high-quality, accurate parts, but also with the support needed to get the most out of their investment. With efficient workflows, premium materials, and best-in-class service and support, Carbon helps labs implement digital workflows that increase productivity and throughput—significantly minimizing labor costs and maximizing cost-effective high-volume production.

Dental labs consistently rank Carbon the most preferred, most reliable, and most used 3D printing solution, and Carbon leads by a wide margin for high-volume labs using 3D printing in more than 30 cases per day.[1]

Why is Carbon the best choice for high-volume dental labs?

1. 3D Printing Continues to Grow: Findings from the NADL Dental Technology Survey, NADL, January 2022

Why a lease option makes sense for capital equipment

Unlike an outright purchase model, a subscription model aligns our success with yours, and requires us to continue to earn your business. This incentivizes us to build great products that continually perform and improve, and help you be highly successful with them.

RELIABILITY

You can expect us to build the most reliable printers possible, because a subscription includes printer service. Customers have rated us most reliable in the industry;[1] however, if you ever have any issues with a printer that requires service, we take care of it, and remove the hassle or cost that customers have to endure with other printer brands. To minimize unplanned downtime, we remotely monitor your printer health with predictive maintenance software, which often allows issues to be resolved before they can cause disruptions to your lab business. As we continually find ways to make your printer more reliable and efficient, we install those updates, whether they be through over-the-air software improvements or hardware retrofits.

FAST RESPONSE

Since we are so dedicated to your success, you can expect us to respond faster to your needs. Instead of waiting days or weeks to hear back from your 3D printer vendor, our experienced technical support team targets responding to you within 15 minutes. When you get started with a new application, rather than having to adopt it completely on your own, you can expect Carbon to provide exceptional support and training as you learn and implement the workflow. Carbon also consistently releases software updates, new materials, and workflow improvements to increase your success with the platform.

INCLUSIVE SERVICE

Most other 3D printing platforms don't integrate service and support into their solutions, requiring customers to purchase expensive service packages or pay out of pocket for repairs, and customers can only expect reactive support versus proactive engagement. By including service in a subscription, Carbon removes risk for your lab and provides you with a platform having top-rated reliability.[1]

In summary, a subscription model incentivizes Carbon in unique ways that drive radically different and improved customer experiences. A Carbon subscription means partnering with a technology company dedicated to your success, which maximizes your ROI and business impact with 3D printing.

1. 3D Printing Continues to Grow: Findings from the NADL Dental Technology Survey, NADL, January 2022

“When we were first approached by Carbon, we didn’t think we needed another 3D printer. However, the benefits of Carbon go beyond quality and speed. The Carbon team’s willingness to be available at the drop of a dime embodies the same values we hold towards our customer relationships.”

BEN TOPAZ,
Owner, Golden Ceramic Labs

How to get the best ROI from your 3D printing technology

With Carbon you can:

- Save hundreds of thousands of dollars in labor and material costs per year. Connect with us to understand the savings based on your current volumes and production breakdown.
- Reduce your cost per part when operating at scale due to the use of production-grade hardware that does not require consumables and costly repairs that are the owner's responsibility.
- Significantly increase your volumes, without increasing the size of your workforce or lab space, providing your lab with operating leverage that was previously not possible.
    - Digital night guards, for example, can be produced with one-third the amount of labor (or 3X more units per day with the same amount of labor) as analog production methods, increasing the profit per unit by 60%.

Choosing the right partner as your volume and number of 3D printing applications scale is paramount for actually realizing these business impacts. Selecting a printer strictly based on sticker price from a vendor who is not dedicated to your success can often lead to results that fall far short of expectations. And, the costs of operating other 3D printers are often far more than originally expected. For these reasons, Carbon remains the best investment for labs.

Understanding your total cost of ownership

Unlike other printers, there are no high, ongoing, variable costs of operation with a Carbon subscription. This makes your production costs highly transparent and predictable, making it easier to run your business. In addition, lower variable costs create more attractive economics when operating at scale, leading to improved profitability.

Competitor printer manufacturers are often not transparent with the many costs that contribute to the total cost of ownership. While advertised initial printer costs may appear attractive, these costs don't include service and support, calibration labor, and costly short-lasting hardware consumables. Resin pricing is another large variable in your total costs that should be taken into account, and is typically much higher when initial printer costs are kept low.

In addition to the direct costs associated with owning and operating different printers, the cost of downtime can be significant. Even just 10% downtime can cost a small lab $5,000+ per year in outsourcing fees. As digital production volume grows and dental labs rely more on 3D printers for the production of end-use appliances, the cost of downtime becomes significantly more expensive. In addition to being ranked the #1 most preferred 3D printer by NADL, Carbon was ranked the most reliable printer brand, helping customers significantly reduce costs incurred due to 3D printer downtime.[1]

After factoring all of this in, it is often surprising how much more attractive a Carbon subscription looks. With a Carbon subscription, you know exactly what you will spend on your printer, providing you with unmatched predictability and transparency. In addition, our subscriptions include far more than any other manufacturer provides: remote monitoring and service of your hardware, application support from our team of experts, dedicated account managers and technical support, over the air software updates, and more.

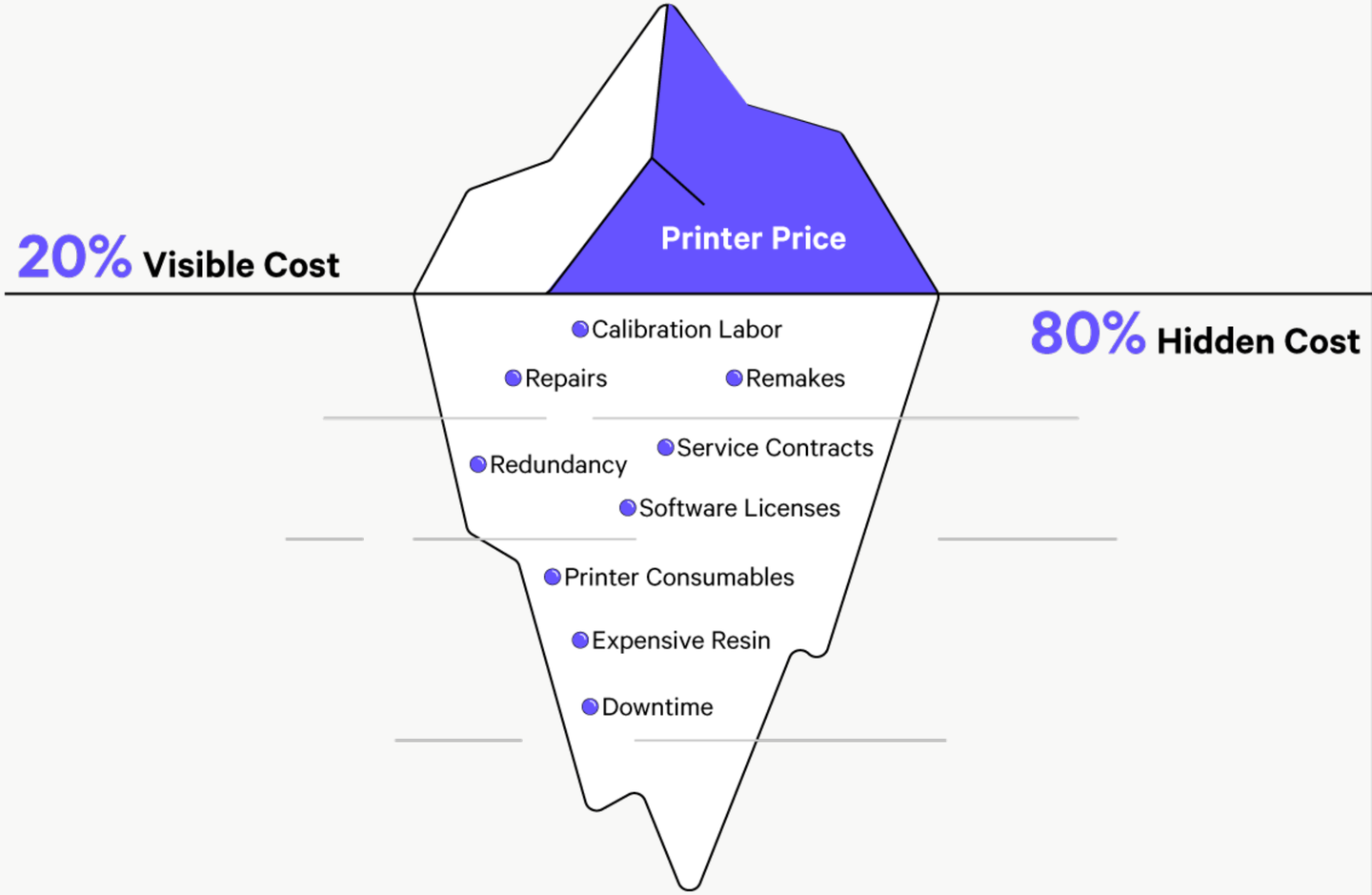
“Our other printers were down 30–40% of the time and would take weeks to get back up. The only time our Carbon went down, it was back up in 24 hours. I’ve never worked with a more service oriented and responsive company than Carbon. Other printer companies make promises, but Carbon is the only one that delivers.”

MEGAN NAKANISHI,
Director of Operations, Nakanishi Dental Lab

Competitor printer manufacturers are not transparent with the many costs that contribute to the total cost of ownership. Often forgotten costs under the surface can make up 80% of the cost of operating different systems. A Carbon subscription results in highly transparent and predictable production costs, making it easier to run your business.

- The cost of competing printer hardware can be less than 1/4 of the total cost to operate the machine. Do not be fooled by a low printer price.
- Competitor resins are often significantly more expensive than Carbon's resins, sometimes by up to $200 per liter.
- Hardware consumable costs such as replacement windows can add $30 or more per printed liter of resin due to their short lifetimes. Carbon printers do not incorporate consumables. Instead, all parts are built to last, giving you the peace of mind that your 1,000th part will match your first part.
- Competitor service contracts do not cover 100% of repair costs once 12-month warranties expire.
- It's not a matter of if competing printers go down, it's a matter of when. This downtime can cost even a small lab $5,000 per year through outsourcing production.
- In summary, with competing printers, you may pay less for the base printer, but the very expensive consumables and service costs often drive the total cost of operating the machine to be higher than the costs of using a Carbon printer.

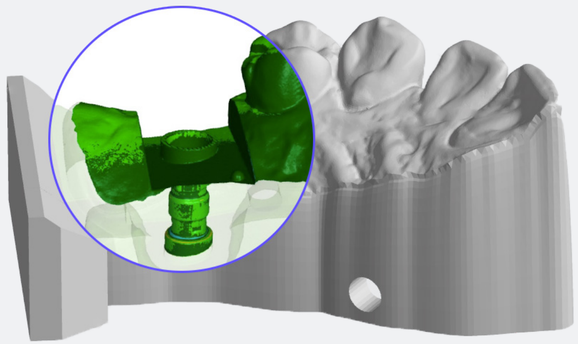
With competitors, printer price is only the tip of the iceberg.



Why accuracy matters and how it should be evaluated

The only 3d printer company confident enough to validate their accuracy through BU

www.carbon3d.com/bu-model-study-download-idt/



Get the Abstract

The average accuracy of dies, quadrant models, and full arch models, when the critical areas are analyzed, is 94% of points within ±50 µm

Consistent accuracy is the most crucial factor to consider when adopting 3D printing in a dental lab for applications from crown and bridge models to digital dentures. In the highly competitive dental lab industry, inaccurate printed models and other restorative products can lead to fit failures, costly remakes, unhappy patients, and unsatisfied dentists.

In an effort to determine the true accuracy that can be obtained in production, Boston University conducted a study on Carbon model accuracy using conditions that mimic a dental lab's production. Nine models, consisting of implant models, full arches, and dies, were printed in different locations across the full build platform each week for 8 weeks. The models were designed in 3Shape with Carbon's recommended settings, printed in 50µm slice thickness, and post processed in accordance with Carbon's SOP's. The printer was not calibrated before or during the study, and regular production of dental models and appliances continued during the study's duration. Model accuracy was measured using an optical scanner and CT scanner, which is required to analyze the accuracy within small analog sockets in implant models. Researchers at the university concluded that Carbon's model accuracy averaged 94% of the surface within ±50 µm. This level of accuracy and consistency is essential for delivering the highest quality restorations consistently.

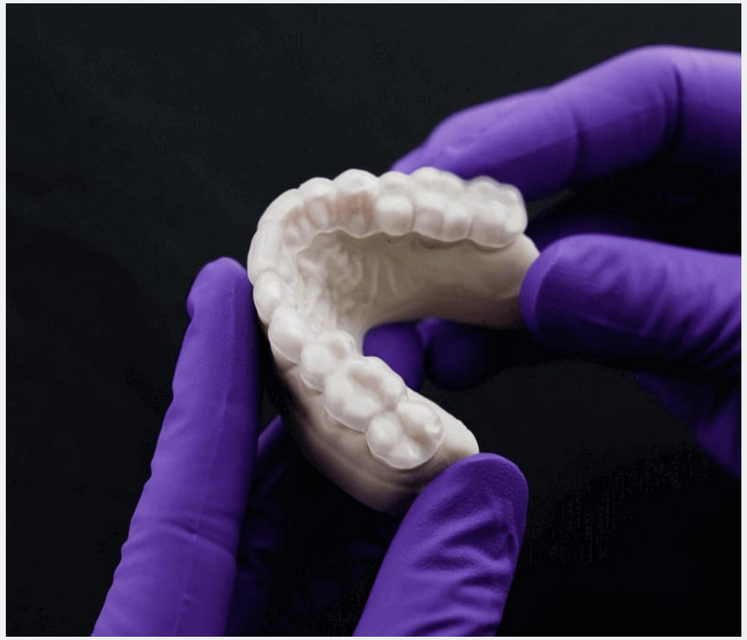
Other printer manufacturers make claims regarding their accuracy, and may present a few accurate scans, but Carbon is the only 3D printer manufacturer confident enough to validate their accuracy and long-term consistency through a third-party university study.

“With Carbon, you don’t have inconsistency issues that a lot of other labs struggle with. Also, with the accuracy that the Carbon DLS™ process provides, we know exactly how long it’s going to take to produce a part.”

KURTIS HELM,
Helm dental labs

Not all 3D printing technologies are created equally

With more and more parts being 3D printed for end use dental appliances such as night guards and dentures, the integrity of the final part is more important than ever. A common misconception is that the same third party dental resin printed on any 3D printer will give the same final product. In reality, the 3D printer used has a large effect on the final microstructure and accuracy, and therefore properties and performance of the printed part. Carbon's groundbreaking Digital Light Synthesis™ (Carbon DLS™) 3D printing process incorporates a highly optimized dead zone which results in layerless parts, strong in all directions. In addition, our printing parameters are highly validated to yield exceptional accuracy. Compare this to printing processes in which the parts stick to a consumable window after each layer is cured, on printers with less thorough validation processes. These printers yield parts weak or brittle in certain directions that are less accurate and consistent.



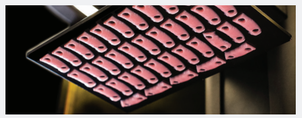
What indications can you 3D print


Surgical Guide


Denture Base


Denture Teeth


Impression Tray


Gingiva Mask


Models and Dies


Castable


Indirect Bonding Tray


Soft and Hard Splint

Carbon delivers a broad range of 3D printed applications for dental labs, and is continuously researching and validating new materials. We have strong relationships with the top resin brands in the world, and a proven validation and support strategy that ensures success with these materials.

The first step in bringing a new resin to the Carbon platform always starts with our customers. We work closely with them when evaluating any new material, and prioritize their feedback and requirements above all else. This enables us to truly identify the materials that labs believe will be most impactful to their business, and then dedicate significant resources toward bringing forward a fully validated solution.

When a resin is validated for a Carbon printer, it has undergone a comprehensive process that ensures it works for you from day 1. This means you can expect outstanding results, along with great training protocols and support for third-party materials on our platform. All of this lowers the barriers to adoption associated with successfully implementing new printing applications.

Other manufacturers may tout hundreds of available materials, but minimal evaluation is done alongside customers to vet a material's desirability and effectiveness, and less work is completed to call a resin "validated." This can result in subpar results, and little to no support when challenges inevitably arise in your production.

If you are a lab that values consistency, reliability, and effective support for the materials used in your lab, the level of validation that comes with resins on the Carbon platform is a must have. If you desire getting earlier access to new materials, and enjoy development work, providing feedback, and being at the forefront, Carbon offers early access programs and actively seeks participants when evaluating new product offerings.

What production volumes make 3D printing a sound investment

For information on manufacturing clear aligner models at scale, scan the QR code to learn more about Carbon's L1 Production Solution for Clear Aligner Models.

www.carbon3d.com/industries/clear-aligners/

Carbon's solutions are used by labs having a wide range of production volumes, from a few parts to thousands of parts per day. The Carbon M-Series printers and the Carbon Dental Production Partner Network allow dental labs of every size to create any dental application using the Carbon DLS process.

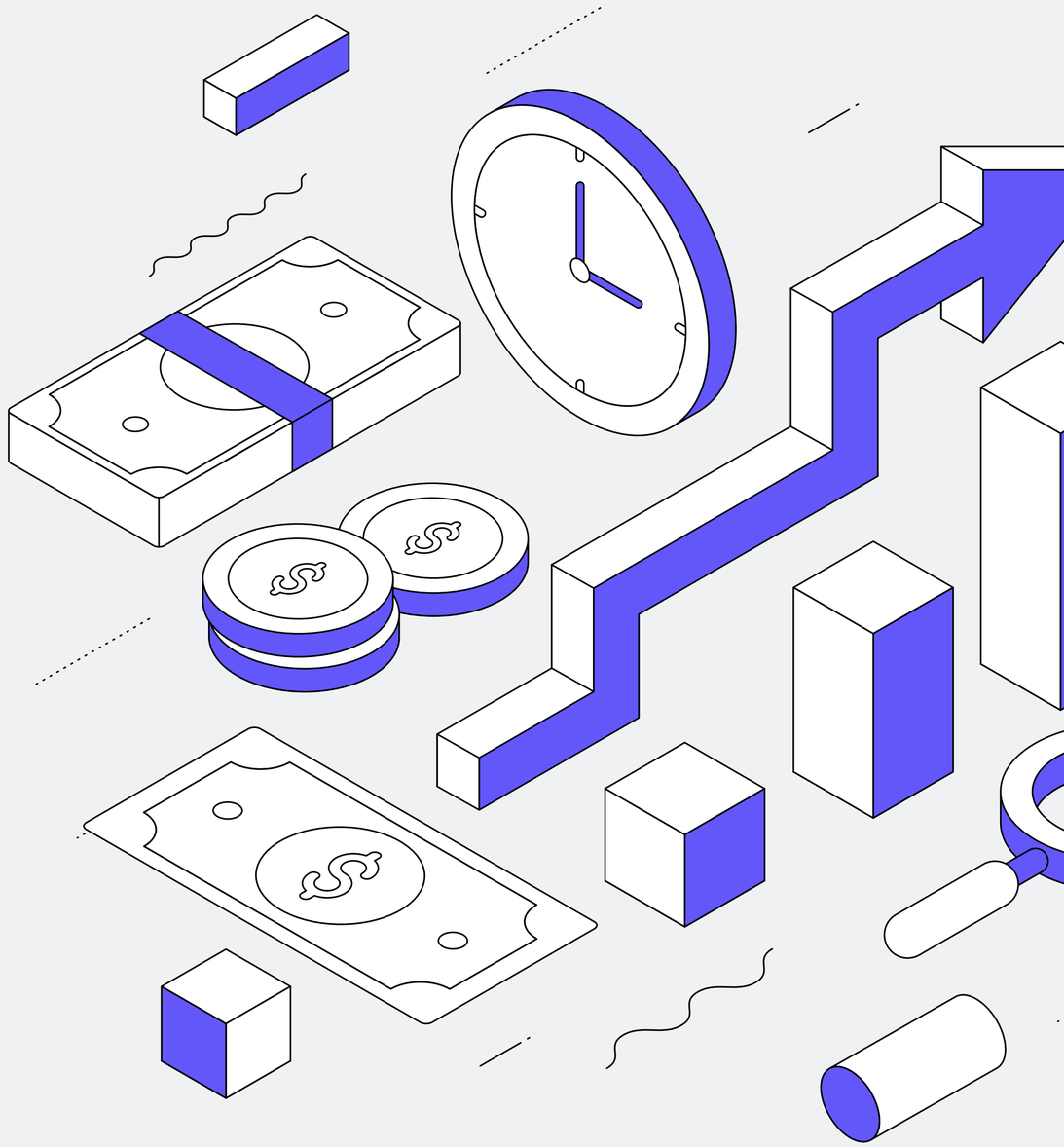
Even moving a low volume of parts to a Carbon printer can result in an attractive ROI. Transitioning just 5 dentures per day from analog production to a Carbon printer can equate to an ROI of approximately $60,000 per year after deducting the cost of an M1 printer subscription from your annual labor and material savings. Moving 10 dentures per day to a Carbon printer can lead to an ROI of approximately $140,000 per year. These volumes still leave plenty of print capacity left over, so your ROI can be even greater if that capacity is used to print other applications.

Splints are another highly profitable application to print. Moving 5 splints from analog production to Carbon equates to an annual ROI of approximately $20,000, and moving 10 yields an ROI close to $40,000. Again, these volumes still leave plenty of print capacity to print other applications and drive an even higher ROI. An M2, for example, can print up to 12 splints in just 90 minutes.

If your 3D printing production only consists of parts that are not end-use appliances, such as models, higher volumes are typically needed to justify an investment in a Carbon printer. Approximately 15 or more printed models are recommended to achieve a competitive cost per model on an M1 printer, and 25 printed models are recommended for an M2. For higher volumes, Carbon becomes the clear and most preferred choice, given the high ongoing variables costs and reliability challenges with alternative solutions.

To learn more about Carbon and how to determine the right digital production solution for your dental lab, reach out to us at dental@carbon3d.com.

INTRODUCING OUR NEW
MONEY SAVING TOOL



Carbon's interactive business impact tool allows you to quantify the impact of moving your applications to the Carbon 3D printing platform. Simply enter estimates of your daily denture, splint, and/or model production volumes, then view a summary of the potential cost and labor savings you could experience with a Carbon 3D printer. Find out how much you could save now!

To receive a fully detailed and customizable analysis that includes additional printable applications and identifies the right printer for your lab, reach out to us at dental@carbon3d.com

www.carbon3d.com/industries/dental/

Carbon®