Dental

Additive Manufacturing Opportunities in 2018–23

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Dental AM Insights to Chew On

No other year in the history of the dental industry has seen as great a push towards global adoption of digital dentistry than 2017 and, as a result of this, attention from dental professionals on 3D printing technologies is at an all-time high.

This, of course, is a net positive for the dental 3D printing industry, which remains one of the key vertical markets for 3D printing solutions by stakeholders developing such products. However, with the great push to digitize dental workflows and fabrication processes, the dental industry overall remains in a great state of change, one that 3D printing technologies may ultimately capitalize on for future growth opportunities, but also one in which the path forward is not clear. Certainly, 3D printing technologies as a whole are now firmly planted in the spotlight of the dental industry as it collectively seeks to integrate cutting-edge technologies.

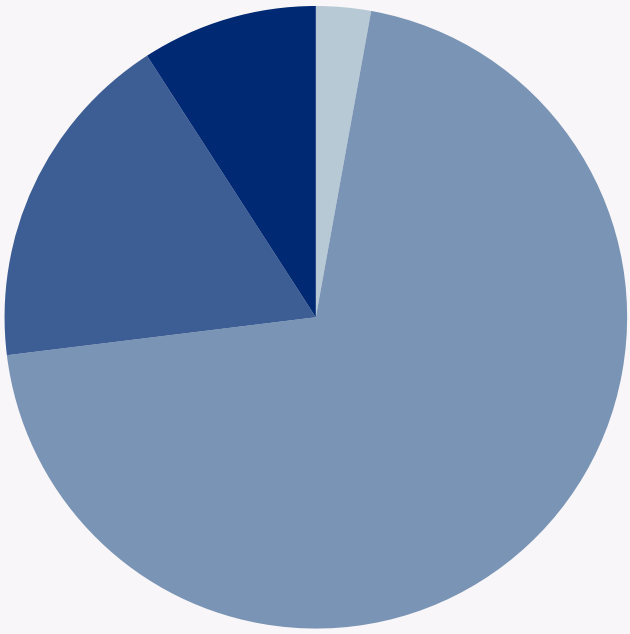
Total revenues for dental 3D printing including revenues associated with service-based printing by laboratories and specialist production centers reached **$2.5B in 2018**, up from $1.8B in 2017. The global dental 3D printing market is estimated to have generated around $750M in 2018 in dental AM hardware, material, and software sales.

Perhaps most notable has been the response of global dental solutions powerhouses in the direct integration of 3D print-related products. Companies like **Henry Schein**, **Dental Wings**, **BEGO**, **Roland DG**, **Whip Mix**, and more have now become invested in the sale of printers or the development of dental 3D printing technologies.

Where 3D printing has made huge inroads over the last year, however, has been in the use of low cost, desktop photopolymerization systems used in small and large laboratories alike, as well

Dental AM Market Share by Segment

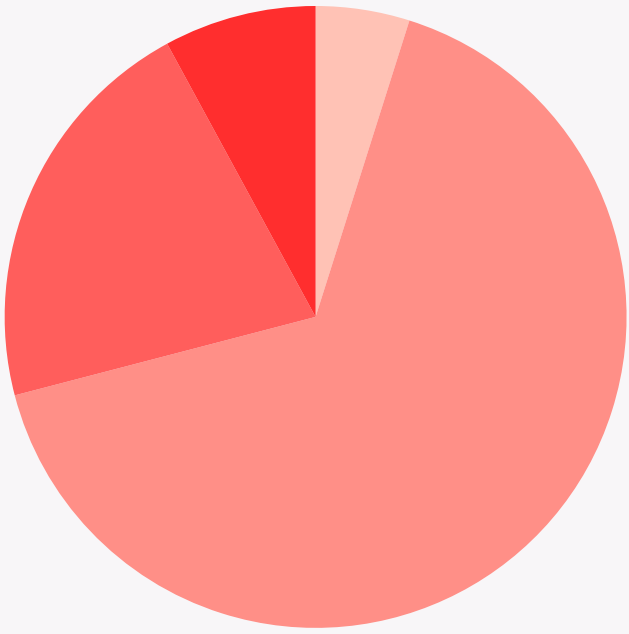
9% Hardware
18% Materials
70% Services
3% Software



2018

Source: Smartech Publishing

8% Hardware
21% Materials
66% Services
5% Software



2023

Source: Smartech Publishing

"The ultimate goal of additive fabrication of directly produced dental restorations also continues to move forward, though the end goal continues to largely elude the AM industry's grasp—for now"

as directly in clinics themselves. These sub-$5,000 printers are being easily converted to dental printers through the development of special biocompatible dental resin materials used in the printing of value-add dental devices like clear surgical guides, aligner forming tools, try-on trays, and models.

Low cost printers finally being coupled with certified dental printing resins and a halfway decent supply chain and support network.

There are a number of 3D printing companies chasing this these days but **Formlabs** can pretty much take the credit here. Companies like **EnvisionTEC** and **DWS**, which have been selling some dental printers at just under $10,000 for years will probably see bigger demand for those product lines. The potential impact for 3D printing in the office is truly massive.

Some of the things being printed today in high volumes probably won't last if the ultimate goal of the industry is to go digital. The original dental printing application, which is casting patterns for various metallic dental devices and restorations, is probably eventually going to begin to decline. Printed casting patterns continue to survive and thrive today mostly because there are many dental professionals out there who just aren't entirely sold on the capabilities of milling, but still want to introduce greater efficiency into their analog workflow.

Other items that are going to thrive are found in the clear aligner market, which is inherently tied to printing. The amount of growth that the leaders in clear aligners have seen in the past five years is really impressive. And now there's quite a few more startups in this area trying to come in.

If **Align Technologies** is providing a clear aligner solution to a few hundred thousand patients, that translates to tens of millions of 3D printed components because essentially everybody in this market prints a forming tool which is then vacuum formed to make the aligner. Each patient needs somewhere between 20 and 40 individualized aligners to correct their teeth during a treatment cycle.

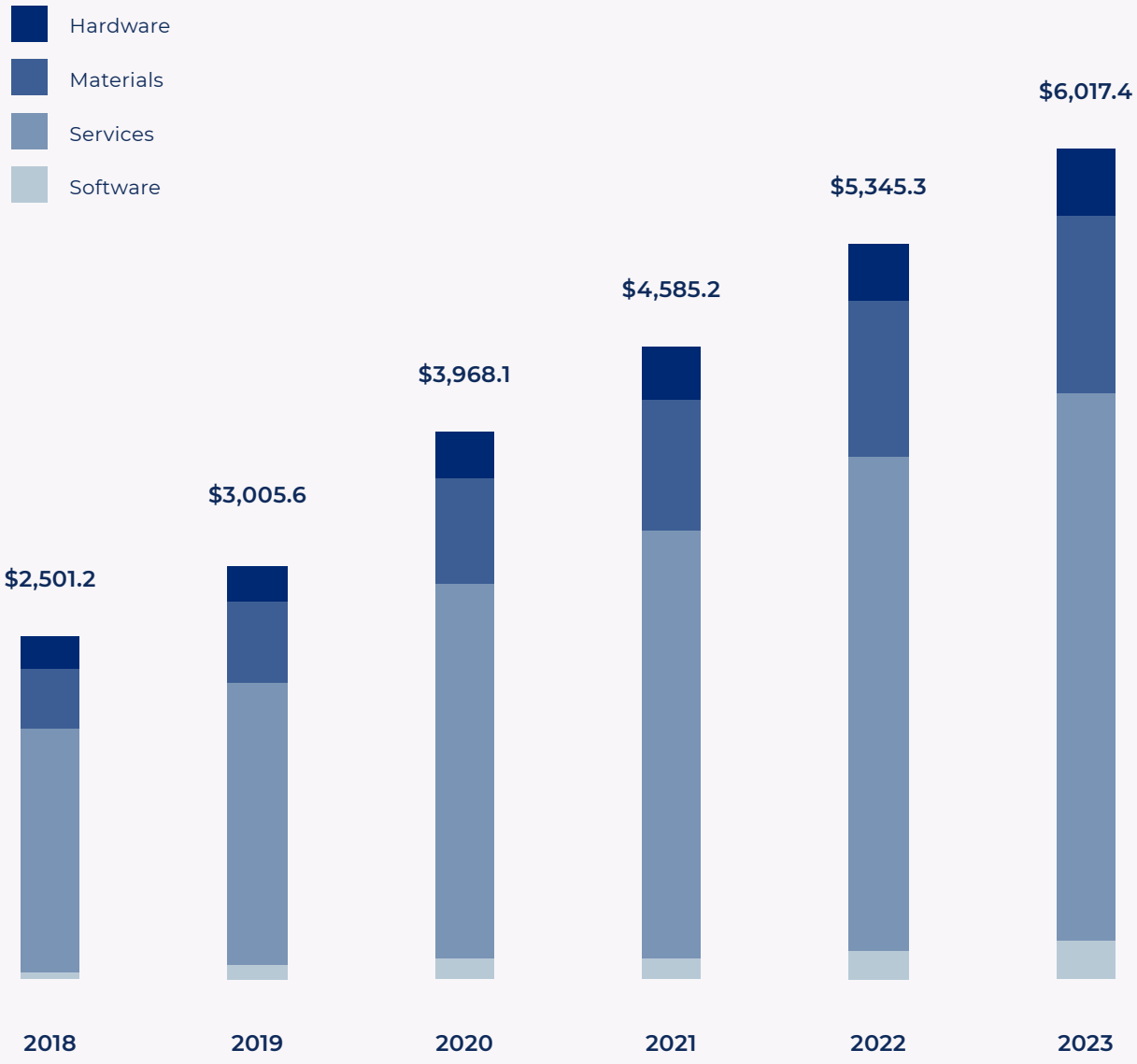
Finally, the ultimate goal of additive fabrication of directly produced dental restorations also continues to move forward, though the end goal continues to largely elude the printing industry's grasp—for now. Metal additive manufacturing systems are now being turned to for the production of dental implant hardware, offering a major opportunity for the future as North American dental markets in particular have embraced implantology compared to traditional porcelain-fused-to-metal crown and bridge solutions.

Printing direct restorations to compete with milled zirconia continues to be developed, and is a possible area of future industry disruption which many dental professionals will become a reality within five years' time.

Overall, dental 3D printing continues to drive growth in the broader print industry during its phase of transition to manufacturing, by providing a high value solution which is being utilized both in serial volumes and for end-use long-term part production. Leaders in the area of 3D printing have all nearly unanimously shifted their strategy to develop vertically-targeted solutions as the global desire for high-end, general rapid prototyping solutions has slowed. A telling sign for the future of 3D printing in dentistry shows that major stakeholders in 3D printer development such as **Stratasys**, **3D Systems**, **EnvisionTEC**, **DWS** and **EOS** have included a specific focus on the dental industry among other much more industrial targets such as aerospace, automotive, and orthopedics.

This, combined with the receptiveness of traditional dental suppliers and solutions companies to embrace printing as part of the digital revolution in dentistry clearly shows that the best in dental 3D printing is yet to come.

Total AM in Dental Market Value 2018-23 ($US M)



Source: Smartech Publishing

Full Report

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In 2017, 3D printing went mainstream in the dental industry. A number of high profile business ventures and acquisitions have continued to propel dental applications utilizing 3D printing technologies firmly into the sights of the largest dental services and solutions providers in the world.

As the additive industry continues to transition, as a whole, towards manufacturing applications, the growth path for most existing polymer print technologies has faltered somewhat by historical comparison. This has allowed for well established, high value applications in healthcare to really shine and earn major focus of stakeholders in the industry. Dentists worldwide continue to leverage digital workflows and manufacturing processes, having long since identified that digital dentistry represents the future of the industry. Indeed, 3D printing is well positioned to become the leading digital process in dental fabrication worldwide given its flexibility in efficient and accurate production of everything from dental models, to orthodontic aligners, to PFM restorations, to denture frameworks and beyond.

This third dedicated study expands coverage to consider the greater transformative potential of 3D printing in dentistry, which is in better enabling dental treatment by bringing personalized device fabrication closer to the point of care -in the dentist's office.

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