# 3D Systems: Empowering Our Customers to Manufacture the Future

3D Systems has revolutionized the way companies design, present, prototype, and manufacture new products, empowering leagues of artists, hobbyists, and consumers to create previously impossible designs.
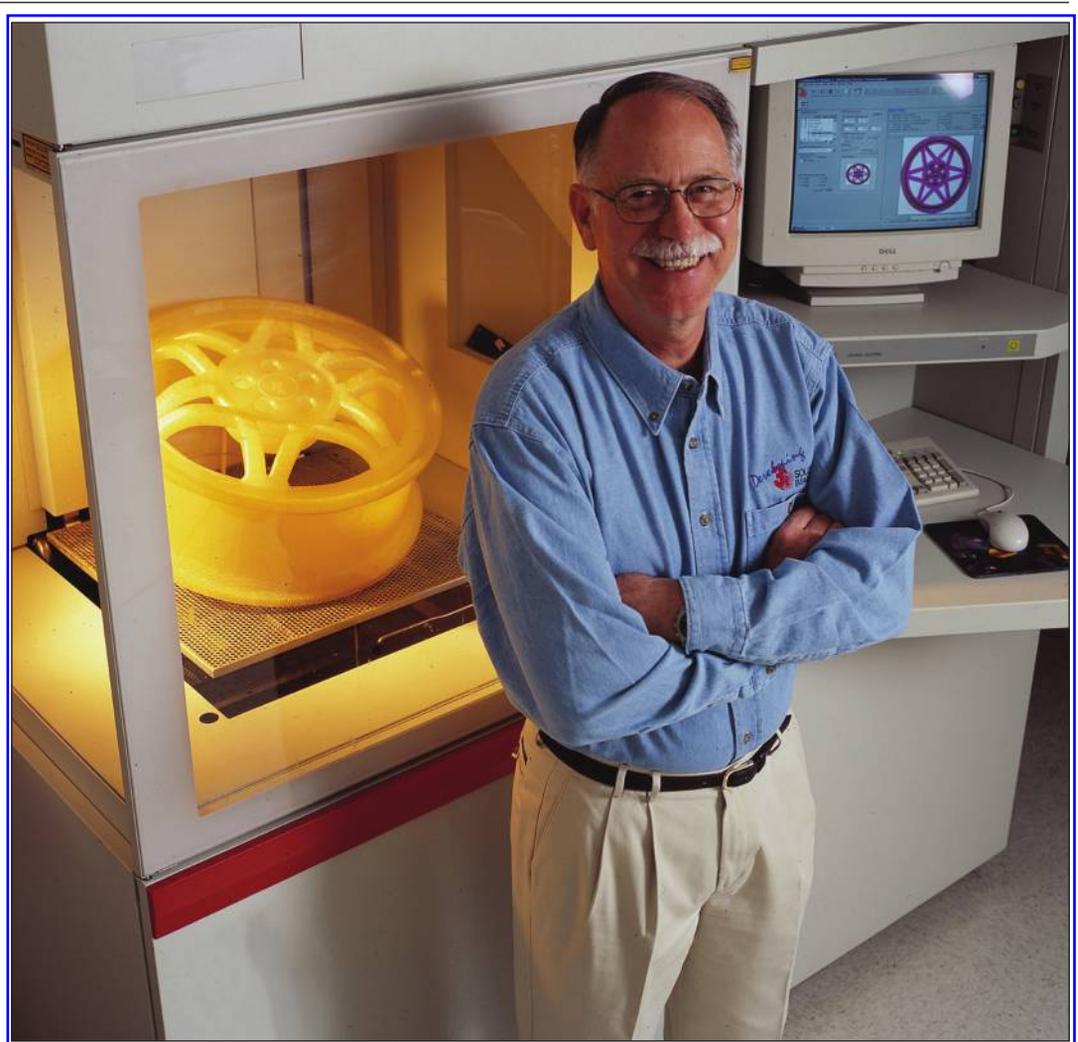
Chuck Hull with an SLA® 3D printer from 3D Systems.

On March 9, 1983, Chuck Hull, now cofounder, executive vice president, and chief technology officer of **3D Systems**, created a small teacup by shooting a laser into a vat of UV-curable photopolymer. It was one of many attempts he made over a number of years. But this time it worked—and Dr. Hull built the first successfully produced 3D-printed object. Dr. Hull went on to file patents for Stereolithography (SLA) and then to develop the .STL file format so that computer-aided design (CAD) systems could communicate with these new 3D printers. In 1986, he founded **3D Systems**, and 27 years later, the business has revolutionized the way companies design, present, prototype, and manufacture new products, empowering leagues of artists, hobbyists, and consumers to create previously impossible designs.

3D Systems is the leading global provider of 3D content-to-print solutions, including professional and consumer design-to-manufacturing products, tools, and services. Our portfolio includes the most comprehensive family of personal to production 3D printers; materials from thermoplastic to fully dense precious metals; intuitive and powerful content development and design tools; and global, on-demand rapid manufacturing of production- and consumer-grade parts.

At **3D Systems**, we believe in expanding possibilities. We are disrupting product design and manufacturing, changing health care, altering the way we archive, enabling distributed and localized production, empowering entrepreneurs to level the playing field with traditional powerhouses, and giving large companies the power to manufacture products faster and customize their product offering. Through all of this, we are shaping a tomorrow characterized by less waste, dwindling ecological footprints, and a sustainable economy. We are *manufacturing the future*.

What makes us different?

In short, we are differentiating ourselves with a strategy based on innovation, focused growth initiatives, and convergence of exponential technology. Concurrently, a number of other factors separate us from the pack.

- **Dedication to innovation and development**—We are expanding our 3D print technology and our second-to-none print materials portfolio. As our business grows, we continue to invest in dazzling new technologies and grow our leading print engine portfolio through in-house research and development. The high performance and precision that result are the reasons why many of the leading aerospace, health care, metal casting, and jewelry manufacturers continue to deploy and integrate our systems into their manufacturing operations.
- **Reimagining the engineer's desktop**—We are quickly expanding our solution toolbox, identifying partners and technologies that will help us create a differentiated, interoperable, content-to-print system. Our goal is to develop and deliver a complete platform that will connect desktops, mobile devices, cloud computing, and manufacturing devices for the ultimate in productivity and fidelity. To fulfill this commitment, we've invested more than $100 million to bring together an unparalleled suite of 3D scanning, volumetric CAD, quality verification, and content-authoring software. In addition, we're making it easy to order on-demand parts from the cloud with our QuickParts® service and Bespoke Innovations® health-care services.
- **Disrupt, transform, and impact**—We are focused on changing entire industries and poised to disrupt how we create, what we make, and where we manufacture. This innovation-focused strategy and our growth initiatives position us at the heart of some $30 billion of the 3D design-to-manufacture value chain opportunities, which we expect could allow us to outpace projected marketplace growth for the foreseeable future.

The confluence of our unmatched portfolio, unparalleled technology, and financial strength—in addition to our first-mover advantage in key verticals like patient-specific medical devices, advanced manufacturing, and consumer opportunities—provides us with greater flexibility to pursue even more open-ended growth opportunities as we disrupt and transform the design-to-manufacturing workflow.

What's driving 3D printing adoption?

A number of trends are contributing to the adoption of 3D printing capabilities. First, compressed product life cycles and competitive pressure are forcing users to reduce new product time-to-market and innovation timelines. **3D Systems'** 3D printers are key to shrinking the design-to-manufacture window. Second, a rise in part complexity and part count has given rise to 3D printing adoption. 3D printing can create geometries that are quite simply not possible with traditional manufacturing methods and can do so without increased costs. Thirdly, the push for companies across the board to reduce waste and energy consumption makes 3D printing an attractive option. In fact, many 3D printers allow users to recycle material after each use, cutting both waste and cost. Finally, a recent Engineering.com survey reveals that 66% of engineers do not use professional 3D printers and 3D printing technologies, revealing a huge untapped market. Through our efforts to democratize access to 3D printing and lower price points, and our strides to make 3D printers easier to use, we can drive this new industrial revolution forward.

This is one major way that we create value, ultimately expanding our clients' capabilities by providing the opportunity to design and manufacture faster, better, and more economically.

A full-color shoe concept model printed with 3D Systems' ColorJet technology.

Our health-care services give doctors and dentists the ability to create 3D models from DICOM data; create 3D-printed, full-color models on demand; and make customized, artistic medical braces and prosthetic fairings.

Creating value by expanding possibilities

By accelerating 3D printer adoption through new products, ongoing channel expansion, and continuous technology, we are creating new opportunities and possibilities for a wide variety of clients. This is one major way that we create value, ultimately expanding our clients' capabilities by providing the opportunity to design and manufacture faster, better, and more economically.

Allowing clients more capabilities is our main goal in democratizing 3D printing and 3D printing technologies. The larger the audience we reach, the faster we can transform and eliminate outdated methods. We continue to introduce improved, efficient, easy-to-use products at lower price points. In fact, over the past several years we decreased the cost of a 3D printer to $1,300 USD while expanding our state-of-the-art 3D design and scanning technology—for users in the living room, classroom, garage, shop, or office. We expect this trend to accelerate and anticipate all users, regardless of level, to evolve with 3D printing in the years to come.

Additionally, we create new possibilities via our enhanced portfolio of hardware, software, and services, as we provide one-stop shopping for ideation-to-production needs. For professional design, engineering, and manufacturing industries, some specific capability-enhancing features of our portfolio include:

- **Unmatched and growing materials selection**—Our portfolio of some 100 proprietary print materials for professional

and production 3D printers includes the best-performing thermoplastics, composite, and metal materials, as well as special-purpose biocompatible, conformal structural, and castable materials. This materials portfolio

A car headlamp part printed in Accura® ClearVue material.

allows us to cover the widest array of customer applications, providing high-performance materials for aerospace and automotive, high-impact durable plastic for functional testing, cast-friendly wax for rapid foundry production, materials with injection molded-like properties and specialized materials for jewelry, dental models, medical implants, and more.

- **On-demand, cloud-based services**— QuickParts is rapidly becoming a leading choice for quick-turn, on-demand manufacturing services. This innovative technology allows us unfiltered and direct access to end users and will provide them with the latest ideation-to-production solutions. This access will shape our customers' brand expectations, and

3D Systems' large array of 3D printers includes the ProJet® 3500 HD*Max* (left) and the brand new ProX™ 950 SLA production 3D printer (right).

QuickParts is our best cross-selling and upselling customer acquisitions portal. Additionally, our health-care services give doctors and dentists the ability to create 3D models from Digital Imaging and Communications in Medicine (DICOM) data; create 3D-printed, full-color models on demand; and make customized, artistic medical braces and prosthetic fairings.

- **Production-grade capabilities**—We are the recognized 3D printability leader in overall part performance, quality, accuracy, affordability, and sustainability. It goes without saying that our 3D printers can fulfill the production requirements typically only achievable from traditional manufacturing, but they do it more efficiently and often at a lower cost. Our depth and breadth of performance, differentiation, utility, and scalability means we can provide accuracy for fit and function, print quality for part detail definition, edge sharpness, and wall smoothness. In terms of size, our professional printers are capable of printing up to a full-size car dashboard with the finest feature details.

As mentioned earlier, we are expanding the possibilities in the consumer market as well.

- **Reinventing retail**—**Staples, Inc.,** became the first major U.S. retailer to announce the availability of 3D printers, and the company is expanding its in-store 3D printer availability. **Yamada Denki, Office Depot, Inc.,** and more are also attracted to our customer initiatives. Additionally, 3D content creation has become simpler and easier with digital photography or sensor improvements. 3D printing and personalization also enable entertainment companies and retailers to monetize their products in new, interactive, immersive, and customized ways.
- **Better consumer access**—Cubify.com provides a unique ecosystem for all things 3D printing, with apps for gamified content creation; Cubify® authoring software; and download, hosting, publishing, and production services. With Cubify.com, creators, designers, and developers can share and monetize their creations and apps as well.
- **Reimagining education**—We have taken the lead to bring affordable 3D content-to-print packages to schools. In doing so, we are unleashing creativity through curriculum developments, community projects, educator partnerships and sponsorships, and seamless student/teacher experience integration.

3D Systems is growing

Guided by our experienced, dynamic, global management team, we are in the midst of an unprecedented growth period, and we expect that trend to continue in light of a number of factors and initiatives, including:

- **Global reach**—With more than 30 locations around the world, serving well over 500 channel partners, our local presence delivers quality service and support to all key marketplaces that we currently serve and those we hope to penetrate.
- **Manufacturing drives growth**—For the past several years, we sold about half of our professional-grade systems outright to
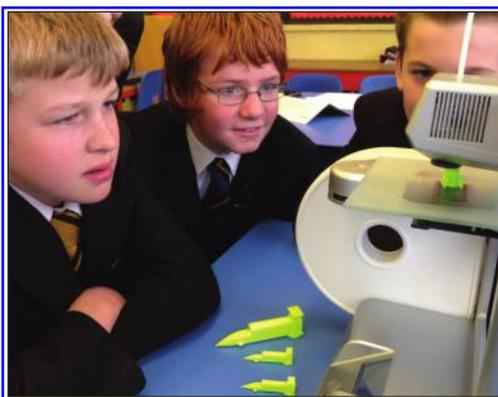

Students print their designs on the Cube® 3D printer.

3D printing and personalization also enable entertainment companies and retailers to monetize their products in new, interactive, immersive, and customized ways.

3D Systems' Cube 3D printer.
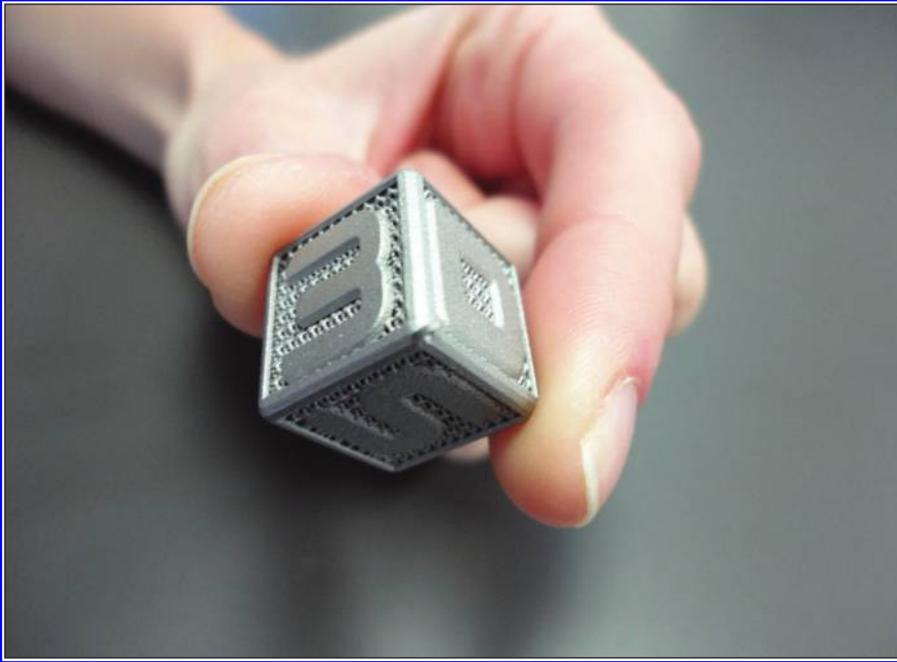
A 3D-printed metal cube.

> The level of inbound interest in adopting our products is unprecedented across both the consumer and advanced manufacturing sectors.

manufacturing operations. Our growing base of installation clients is a testament to our success and to the resulting recurring revenue growth and margin expansion we enjoy.

- **Accelerating adoption of 3D printing**—Our continued and sustainable growth is driven by our unique sales channels. Some 150 direct sales and sales support professionals manage our channels and oversee 500 resellers. Through those channels we boost the awareness and adoption of 3D printing.
- **Expanding products and service offering**—We continue to seek more game-changing, disruptive technologies to integrate with our suite of products and services. The recent acquisition of Phenix Systems, for example, brings clients new manufacturing capabilities with the only selective metal laser sintering systems that can print chemically pure, fully dense metal and ceramic parts.

- **Leading advanced manufacturing installations**—We believe that advanced manufacturing applications will drive growth; we benefit because a vast number of our production-grade systems are already in use. The cost savings that follow from reduced machining operations, compressed lead times, and lower part counts—coupled with enhanced designs for manufacturing—will lead to even more demand. We are already working with several leading aerospace companies and the Department of Defense, for example, on ways to bring aircraft parts into production using 3D printing.

Concluding thoughts

Two major events associated with growth strategies and value creation validate our position in the industry: 1) the rapid expansion of our Cube consumer 3D printer at **Staples, Inc.; Amazon; Office Depot, Inc.;** and similar international corporations and 2) the significant commitment that companies such as **GE** are making to embed 3D printing into their advanced manufacturing roadmap.

The level of inbound interest in adopting our products is unprecedented across both the consumer and advanced manufacturing sectors, and we believe that our products, tools, and services are on the cusp of enjoying much broader adoption across more upstream production and consumer applications. As awareness of our capabilities evolves, we believe that demand for prints, materials, and software design tools like Geomagic® Solutions and QuickParts will accelerate. We also expect to see increased utilization of recently shipped and installed existing systems as customers start to extend their use cases.

Acknowledgment