

SprintRay: Kick-Starting Growth

“So where do we go from here?” asked Amir Mansouri. As their car crawled through the Shanghai traffic, Mansouri and his co-founding partner, Jing Zhang, were discussing the future of their 3D printing start-up—SprintRay—which sold high-resolution desktop 3D printers, software and materials to dentists and dental labs in the United States and beyond. This was Mansouri’s first trip to China to visit the SprintRay production facility and the talented engineers at the research and development (R&D) facility, since starting their venture in 2014.



As they made their way through the slow-moving traffic, the founders reminisced on the company’s growth and challenges they had successfully navigated since its birth. SprintRay had just closed the first quarter (Q1) of 2018 with \$1.9 million in revenue, which exceeded its entire revenue for 2017. The company had projected to achieve \$6 million in revenues by the end of 2018 and it was on its way to achieving those numbers. Additional funding was required to fuel the company’s growth, but Mansouri’s efforts to raise a \$5 million Series A funding in Q1 had failed.

As their car threaded the narrow lanes, the founders discussed the critical decisions and dilemmas facing their start-up—some as complex and twisted as the Shanghai traffic surrounding their car.

SprintRay had witnessed phenomenal growth and the two founders had overcome many financial, production, sales, and people challenges. However, additional funding was desperately needed. SprintRay’s future success or failure would be a function of a series of choices Mansouri and Zhang faced that day.

The Founders’ Paths to Entrepreneurship

Growing up in Iran, Mansouri always dreamt of living overseas and exploring bigger opportunities. After completing his undergraduate degree in Mechanical Engineering at Iran’s Elm-o-Sanat (Science and Technology) University in 2008, Mansouri joined a two-year research program at the National University of Malaysia (also known as UKM). Even though his parents were educators and had no entrepreneurial background, Mansouri had begun to chase ambitious entrepreneurial dreams from an early age.

Although his research focus at UKM was the fabrication of titanium foam, his first brush with entrepreneurship was a lot less scientific—flipping cellular phones. Mansouri explored the local Malaysian stores to buy cellular phones which he later upgraded with new software and sold on the internet for a profit. The profits helped him cover his housing expenses. As Mansouri continued his research and unusual entrepreneurial pursuits, he started chasing his next dream. “I applied to universities in the US. My objective was to use my technical capabilities to get to the US, knowing that I would be able to discover the rest of my future then,” he said. He was accepted to the University of Southern California’s (USC) Manufacturing Engineering master’s program and brought his dreams to Los Angeles.

While at USC, Mansouri kept his entrepreneurial spirit alive. “I accidentally broke my cell phone screen and repaired it myself. After doing some online research, I realized that there was a good market for selling a cell phone repair kit on eBay. I sold about 4,000 kits in one-and-half years and made over \$100,000 in revenue. But as volumes increased, shipping and operations became a hassle. I learned a lot, but I had to keep my focus on the bigger opportunities,” he explained.

Mansouri’s fascination with 3D printing could be traced to his first robotics class at USC where he learned about the technology. “The first spark in my mind was a class discussion about the origin of 3D printing and how it was the opportune time to innovate and create new products,” he remembered. He joined the rapid prototyping lab—focused on 3D printing—and simultaneously enrolled in the Manufacturing Engineering Ph.D. program at USC, as he completed his masters.

Unlike Mansouri, his co-founding partner Zhang grew up in an entrepreneurial family. Captivated by 3D printing opportunities, Zhang also worked at the rapid prototyping lab at USC prior to receiving his Ph.D. in 2009—a few years before he met Amir. After earning his Ph.D., he joined a prominent mutual fund company in China, only to realize that it wasn’t his true calling. “It was just numbers and I didn’t build anything concrete. You couldn’t see it or touch it,” Zhang said. After leaving his cushy analyst job, Zhang started a construction material trading company, to piggyback on the huge demand for road construction in China. The business, however, proved to be complicated. “We faced a lot of challenges in building a sales force and maneuvering through corporate and government bureaucracies. I slowly shut down the company,” he explained. After two unsatisfying stints, Zhang went back to his passion—3D printing. Along with a Chinese friend, Zhang started a 3D printing company in China in 2012 and developed a prototype which later became the first prototype for SprintRay in 2014. While Zhang enjoyed the research work, he was unsure about the commercial viability and future of the business. The uncertainty dissipated when he met Mansouri at USC.

Mansouri and Zhang met in 2014 at USC’s rapid prototyping lab. “Zhang seemed to be very entrepreneurial and had ambitious plans in the 3D printing area. He had also created some prototypes in China, which got me excited,” remembered Mansouri. Zhang also quickly felt a connection between him and Mansouri. “Mansouri had a good sense of business and he was aggressive. He complemented my strength—which was research and engineering,” explained Zhang. As the two exchanged their thoughts and passion for 3D printing, they laid the groundwork for SprintRay (see **Exhibit 1** for Mansouri and Zhang at SprintRay).

The First Steps Together: Jumping into Kickstarter

While Mansouri and Zhang had an idea, they had to test the market and raise the capital to build a company. The early success of Formlabs—a Massachusetts-based 3D printing technology developer and manufacturer founded two years before SprintRay—caught their attention. Formlabs was launched in September 2012 through Kickstarter—a platform for designers and entrepreneurs to raise funds for their creative projects—and had raised \$3 million¹ through the campaign. Following Formlabs’ footsteps and leveraging the first 3D prototype developed by Zhang in China, the founders decided to launch a Kickstarter campaign to gauge the market demand and finance SprintRay into existence.

At this point, Mansouri and Zhang only had a prototype. The idea of SprintRay didn’t stem from market research, but rather two eager entrepreneurs who thought they could bring a better product to the market. “It was a pure engineering approach. We were so ignorant about the market that we didn’t conduct any research or had any understanding of what was needed. We wanted to make a good-looking and technologically-better product that could sell itself,” laughed Mansouri as he recalled the early rush into launching SprintRay.

Professor Sid Mohasseb, Adjunct Professor of Data Sciences & Operations, and Case Fellow Divya Sathyanarayanan prepared this case. This case was developed from field research and published sources. Cases are developed solely as the basis for class discussion and are not intended to serve as endorsements, sources of primary data or illustrations of effective or ineffective management.

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As one of his first executive decisions, Mansouri reached out to his friend Hossein Bassir, an industrial engineer who later became the third co-founder, to help them refine the prototype and turn it into an appealing and sellable product.

Getting Ready to Kickstart

While Bassir worked on designing the product in the US, Zhang—in parallel—established a separate entity in China and received government grants which funded the company's early research. The early version of SprintRay's product was intended to be an all-purpose consumer focused 3D printer that could print different characters in animation, games and movies. "The research funding and Zhang's early efforts to find production and manufacturing partners were key to our later success—we got a little lucky," recalled Mansouri, who took charge of planning the Kickstarter campaign. Mansouri's research suggested that the key to a successful Kickstarter campaign was conducting pre-campaign awareness activities by participating in trade shows. With this idea, the SprintRay founding team participated in the 'Inside 3D Printing' trade show in Santa Clarita in October 2014 (see **Exhibit 2** for SprintRay at tradeshow). Mansouri recalled:

None of us had ever organized a trade show and we were naive on every front. We even randomly quoted prices between \$1,500 - \$2,000, without having any knowledge of our production costs. Our initial and rather shallow competitive analysis showed that we were placed between high resolution expensive (over \$20,000) product companies and low resolution inexpensive (below \$2,000) providers. Jing pushed us to be lower in order to compete with the Chinese products, while Hossein wanted our machines to be the best looking and priced a notch lower than the most expensive providers; but more premium and expensive than Formlabs.

Over time, the team managed to collect around 1,000 e-mail contacts through trade shows alone. Simultaneously, the SprintRay team also worked with a USC alumnus to create a professional Kickstarter video which—according to Zhang—helped them successfully position the company. After all the initial research and awareness, SprintRay was launched on Kickstarter in April 2015 (see **Exhibit 3** for Kickstarter campaign).

The product was priced at \$2,500 per machine for Kickstarter supporters, with a slight hike to \$3,100 for late comers. The initial Kickstarter pricing was below the actual manufacturing cost. In response to mounting financial losses, the company raised the product price by three-fold a few months later—a decision that negatively impacted the company's ability to generate revenue.

Time to Deliver

Through Kickstarter, SprintRay got 270 backers and raised \$422,830. The orders were in and it was time to deliver the products. Zhang started manufacturing the product—even before the Kickstarter campaign ended—which gave them a lead time for delivery (see **Exhibit 4** for SprintRay manufacturing facility in China). However, production challenges, vendor issues in delivery, and disagreements in design delayed the production process. "The beginning was very slow and painful," Zhang recalled. The company took more than eight months—a delay of four months—to deliver the first tier of Kickstarter products, which were shipped in batches of 40. "We shipped in small batches to see if there were any issues which could be rectified in the next batch. We were not concerned about mass production," said Zhang.

As Zhang sorted out the kinks in production in China, Mansouri—back in the US—was worried about his lack of knowledge on growing and running a business. While waiting for the products to be manufactured, Mansouri completed a technology commercialization graduate certificate program at USC's Marshall School of Business. Simultaneously, he also searched for a mentor who could guide him in making the appropriate business decisions.

Erick Kreidler—Mansouri's former professor and a part-time lecturer of Industrial and Systems Engineering at USC, as well as the managing partner at KRE Consulting Firm—came to Mansouri's aid. "Mansouri and Zhang had good knowledge about the technology and what they wanted to build. But they needed someone to guide them on making the right business decisions. Mansouri approached me

with an insightful question: ‘I don’t know what the right questions to ask are?’ It was his diligence and ability to listen that made me take special interest in the company,” said Kreidler, who was one of the first members to join the SprintRay board. Under Kreidler’s guidance, Mansouri charted the growth for the venture: researched the right market, grew the customer base, improved manufacturing efficiency and re-examined pricing.

Dynamics of the Booming 3D Printing Industry

3D printing is considered a critical component of the Fourth Industrial Revolution—where advanced production and operations techniques come together with smart digital technologies. Over the last three decades, with advancements in technology, materials and services, 3D printing—also known as additive manufacturing—witnessed adoption in most major industries, including automobile, aerospace, defense, logistics, art and design. (see **Exhibit 5** for current application and future potential of 3D printing by industry).

In 2014, the 3D printing industry had registered revenues of \$2 billion, up from \$1 billion in 2009.² 2009 witnessed two major events in the 3D printing industry: 1) several fundamental 3D printing patents expired² and 2) the first home 3D printer—RepRap—was introduced.³ RepRap (Replicating Rapid Prototypers) was initially conceived in 2005 by England-based mechanical engineering professor Adrian Bowyer and made 3D printing much more accessible to the average person. The industry was abuzz with speculation that RepRap could give traditional manufacturers and printing companies a run for their money. However, the hype failed to create a major impact and the industry continued to witness single-digit growth between 2014 and 2016.² “3D printing companies were behaving like Internet companies during the dotcom era. The industry was super-hyped but not mature,” noted Mansouri.

2017 brought a new optimism within the industry due to three key reasons: availability of a wide range of printing materials, improvement in printing speeds, and larger build volume (ability to print larger objects).⁴ This led to the quick expansion of this technology across multiple industries.⁴ The number of materials that could be used in 3D printing had almost doubled since 2014²—ABS plastic, PLA, polyamide (nylon), glass filled polyamide, stereolithography (epoxy resins), silver, titanium, steel, wax, photopolymers and polycarbonate were all commonly used. In 2016, 25% of top global companies had already employed 3D printing in their business and further growth was anticipated as the technology use was gradually shifting from areas in addition to just rapid prototyping.⁴ Another advantage of 3D printing was the ability to experiment and adjust designs and revise product quickly. By tweaking the software, the printer could be used to develop different products every time, negating expensive cutting, drilling, assembling or tooling of machines.

3D printing revenues among global public companies were estimated to grow by a little over 12% between 2017 and 2020². The number of companies selling various types (different material types) of industrial 3D printing systems grew from 97 in 2016 to 135 in 2017⁵. Moreover, the number of desktop 3D printers—under the \$5,000 price range—nearly doubled to 528,952 in 2017 as compared to 2015.⁵ According to a 2018 report by consultancy major Deloitte, “Large companies entering the 3D printing market validates the space and pushes the industry to innovate faster.” In parallel, smaller, venture-backed innovative companies were being formed around the globe in search of new applications for 3D printing, using wider products at a faster speed with more accuracy.

3D Printing: Game Changer for Dentistry

3D printing coupled with digital scanning enabled dental labs to produce dental crowns, implants, bridges and other dental appliances more efficiently (faster and cheaper)⁹. With the introduction of lean methodologies (minimizing waste without compromising productivity) in prototyping, 3D printing found prominence in the dental industry across fields such as restorative dentistry, implantology, orthodontics and prosthodontics, among others⁶. Dental 3D printers used light or lasers to polymerize the printing materials—liquid/resin or powder—through computer-guided precision to develop models and parts with complex details (see **Exhibit 6** for 3D printing process in dental labs).

Dentists and dental labs started investing in this technology (see **Exhibit 7** for projected digital dental production system sales) to offer a convenient, customized and accurate service for their patients. After the 2015-2016 timeframe, demand for 3D printers had witnessed strong growth as quality of

printed products improved and the printers could be used across labs of different sizes.⁷ Additionally, the printers not only saved time and money for the dentists and dental labs, but also helped them specialize in a wide range of dental implants and products such as denture frameworks, surgical guides, crowns, night guards, bridges, retainers, splints, etc. (see **Exhibit 8** for comparison of traditional and digital dentistry workflows). As the technology's business values became more observable, several new 3D printing-related industry events were born and witnessed significant attendance, building on participation in established conferences. In addition, new 3D manufacturers and machines appeared frequently on sites such as Kickstarter, Indiegogo, and eBay.

Some of the top players developing 3D printers for the dental industry, at the time, included Stratasys, Formlabs and EnvisionTec. According to Mansouri, Formlabs has been one of the main competitors of SprintRay in the desktop 3D printing dental industry. As 3D printing technology and dental applications continued to penetrate the dental industry, revenues were projected to exceed \$3.1 billion by 2020.⁸ "Dental industry revenues will exceed \$7 billion by 2027, as the diversity of material and product printing size expands," estimated Mansouri.

Kickstarter Ends, Financial Distress Begins

All was not well post-Kickstarter for SprintRay. The company faced a severe financial crisis in 2016. Mansouri and Zhang had spent all the money raised from Kickstarter on manufacturing the products. While Kickstarter helped SprintRay generate initial awareness, financing, and orders, Mansouri realized that their planning for the campaign itself was inadequate. Mansouri explained:

We spent all the money and didn't know what to do next. At the same time, our competitor—Formlabs—used Kickstarter as a proof of traction and reportedly raised \$10 million in Series A funds immediately after that. They did it right from day one, and we did not. That put us behind the competitive curve. At the time, we had no clear value proposition, business structure, delivery channels, predictable revenue stream, streamlined operations, or customer support.

In dire straits, Zhang came to the company's rescue. Mansouri received \$10,000-\$50,000 every month from Zhang and his family to cover the operating expenses, while the team was busy finding new customers and ways to grow their revenues in the US. In the meantime, Zhang was building a full-fledged R&D team in China. "I felt establishing an R&D team in China and having real capabilities in 3D printing technologies would give us an edge over our competitors," explained Zhang.

In two short years, Zhang built a team of forty focused on software programming, electro-mechanical and optical design. His research efforts allowed him to raise capital for his company, established in 2012 in China. The 3D printing intellectual property generation was in full swing. However, after a short period, Zhang felt that the R&D team had more members than required. "I either had to fire about one-third of the people or put them on other non-SprintRay related projects. We decided to keep going and started building different 3D printing products, apart from SprintRay's branded and proprietary 3D printers," he explained.

Finding Focus: The Real Birth of SprintRay

By mid-2016, a year after the Kickstarter ended, the two founders had realized that SprintRay needed a solid organizational structure, well-defined market, strong sales model and additional capital in order to survive and grow.

The "Sweet Spot"

The company was focused on delivering the promised products as opposed to planning for growth. While looking for a market focus and conducting research about 3D printing, Mansouri recalled a Kickstarter client's request which pointed to the dental market. After digging deeper, he discovered that 3D printing in the dental market was gaining momentum with more than \$4 billion in prosthetic, orthodontic, and other dental parts being made each year.⁹ In a bid to transition from traditional labor-intensive fabrication techniques to digital dentistry, dental laboratories, orthodontists and dentists were rapidly adopting 3D technologies. The key benefits of adopting 3D technologies were its abilities to make dentistry more affordable, customized, and convenient for the patients as well as dentists.

While 3D printing in the dental industry was gaining traction, the main bottlenecks were process efficiency and appropriateness of material used to make the parts.

3D printing in the dental industry mainly involved scanning technologies which could create digital scans of the mouth and/or teeth. Digital scans were then utilized by the dentists to create dental prosthetics, appliances and digital restorations, replacing the traditional fabrication processes such as casting.

Around the same time, California-based Glidewell Dental Labs expressed interest in purchasing SprintRay 3D printers—another indication of the demand for 3D printers in the dental industry. “During the Kickstarter, they had purchased one of our printers. They suggested that we should consider going after the dental industry because our 3D printer was accurate enough. But they said there were changes that needed to be incorporated before the product could become ready for the dental market,” said Mansouri. As Glidewell conversations became serious and they (Glidewell) appeared more committed, SprintRay began investing time and effort to fulfill all their requirements. “Since we had a good lead customer, we just grabbed the bull by the horns and did whatever we could,” noted Mansouri. SprintRay was investing large sums in supporting Glidewell and losing money doing so. Custom programs were developed, and substantial changes were made to the printers to make them capable of operating on shared and wireless networked computers. Glidewell ordered six more printers from SprintRay. “That, to me, was the signal that dental was the right market for us,” noted Mansouri. However, although the Glidewell guidance was critical in understanding and focusing on the dental market, it proved to be costly for the company as massive customizations caused significant delays in production. It took around eighteen months to introduce the next version of the product to the market.

Cost advantages—ranging from 2x to 10x—on account of digital scanning and 3D printing fabrication drove the exponential adoption of this technology in the dental market. Following SprintRay’s initial footsteps in the dental market, Formlabs also set their sights on the industry and started dedicated marketing efforts in mid-2016. “Formlabs was our only serious competitor, their focus on Dental was another signal for us that we were headed in the right direction,” added Mansouri.

“If you could meet the market needs with faster and cheaper products, you would positively influence the customer’s margins and get their attention and purchase orders. That became our sweet spot and that was also what attracted Glidewell towards our product and offering,” Mansouri stated. “We wanted to be the low-cost version of the industrial Digital Light Processing (DLP) 3D printers—high performing but less expensive. The goal was to focus 70% of our resources and efforts on the dental market and still keep 30% focus on the consumer market,” he added.

While studying the dental market, Mansouri found that almost all sales were made through distributors. “I was initially obsessed about selling directly to the customers (dental labs and dentists). I couldn’t wrap my head around giving 30-40% of our profit margin to resellers. Going through resellers also put you far from customers, making it difficult to hear their feedback and offer them support,” Mansouri said. “However, going directly and approaching buyers in the dental market looked like suicide to us as dentists bought equipment and supplies from their trusted distributor whom they had many years of relationship with,” he noted. The team created a list of top twenty distributors and targeted the local ones initially. With a printer in the back of his car, nicely strapped with a seat belt, Mansouri visited the distributors to strike a partnership to re-sell SprintRay products. While many liked the product and agreed to partner, several demanded exclusive distributorships. “Luckily, our board members joined our conversations with the distributors and helped us get past the exclusivity demands,” noted Mansouri. The first deal with a local distributor was signed in December 2016.

2016 ended on a positive note on a few fronts: the promised Kickstarter products were finally shipped out and customers were happy, SprintRay had found a market focus with the first distributor signed, and the company generated \$200,000 in revenue organically post Kickstarter. However, cash was still very low—around \$10,000 in the bank— and production was almost fully supported by Zhang in China. Payroll for SprintRay’s US workforce was being funded by the two or three product units sold organically every month.

Seeing Eye to Eye with Investors

As the focus shifted to the dental market, SprintRay needed money to fuel growth. Based on their experience and knowledge of the dental market, SprintRay formed a new business plan with a fine-tuned message, revised pricing and marketing strategies. The revenues did not support the company and to grow market share, margins had to be compromised further and external investor funding was essential. Mansouri approached angel investors in Los Angeles with a \$5 million ask at a \$40 million valuation. The ask was deemed unreasonably high and was shot down by investors. “My board and advisers were good at late stage manufacturing and not early stage. So, we didn’t have anyone to gauge our story and financials internally. Getting an advisor who had experience working with early stage companies would have definitely helped,” Mansouri noted.

As Mansouri and Zhang dealt with funding challenges, they simultaneously worked to fix one of their early mistakes in establishing the company. To support the Kickstarter customers with a legal entity to contract with, the founders rushed to register an LLC (Limited Liability Corporation) with 100% ownership allocated to Zhang’s wife. This decision caused a structural problem when foreign loans received from China had to be settled and equity had to be allocated to founders, advisors and later investors. “With so many different moving pieces, the company needed to re-structure and also establish a formal board to move things ahead,” recalled Kreidler. Ultimately, Kreidler became the lead board member and his network of investor friends wrote the first few investment checks at a considerably lower valuation. The company received \$850,000 through angel investors which was used for further expansion of the customer care team, retiring old loans, maintaining inventory and supporting manufacturing.

“January to July 2017 were tough months for SprintRay. We maxed personal and company credit cards and Bassir and I stopped taking salaries. We were behind on rent, on our payments to manufacturers, and everyone else. Relief arrived on July 11, 2017 when the angel investor’s money was deposited into our account,” Mansouri remembered.

Fine-tuning for Growth

SprintRay now had the money and market to grow. However, the company had no real sales force and was still grappling with issues in production, people and pricing. Mansouri and Zhang had to fine-tune almost every aspect of SprintRay’s operations to position it for its next stage of growth.

Balancing Product, Price and Market

The product feedback from Glidewell Dental Lab, right after the company’s Kickstarter purchase, became an early blueprint for SprintRay’s second and more advanced version of the product which primarily targeted the dental market. The product was introduced, with considerable delay, under a different name and distinct look. The company started to differentiate the products based on functionality—mainly on speed and accuracy. MoonRay was the original lower priced product. MoonRay-S was the second and enhanced version priced at \$6000. A more industrialized version of the product, MoonRay-D, was introduced at a \$9,000 price point. While Model S targeted the broader general market, Model D—offering higher resolution—was designed for the dental-lab market.

MoonRay-D did not find many takers as it was only designed to meet Glidewell’s needs. “We tried to sell D but failed. No one wanted model D because the platform was too small and resolution benefits were not an advantage,” explained Mansouri. MoonRay-S, however, received a lot of interest and went on to become SprintRay’s flagship product in the dental market. “Understanding market needs is really important but responding to one person’s or company’s narrow need didn’t mean the concept was scalable,” he pointed.

Time to Commit

While SprintRay focused on enhancing its products, its competitor—Formlabs—was gaining market traction. Despite heavy outbound calling and tradeshow participation, real sales for SprintRay were poor. Mansouri started experimenting with the market positioning and pricing to find the right mix. “I believe the decision to commit to dental was a key one for the company. At the time, we had two landing pages positioning MoonRay-S for non-dental and MoonRay-D for dental. But the dual personality was

hurting us. We then changed the website to focus on dental applications, with content that would educate users on what they could accomplish with our printers,” Mansouri said.

By the Q2 of 2017, SprintRay had hired one sales representative and was selling seven to eight units per month to the dental market. “It was great, but it wasn’t enough. I started talking to a few of our customers and influencers in the dental market, who pointed that our sweet spot for the price was around \$4,000. We then decided to sacrifice margins for faster growth. This was another key decision for the company,” said Mansouri. After testing and trying several combinations, the pricing for MoonRay-S, which was repositioned to target the dental market, was dropped by 33% to \$4,000. Finally, the market reacted positively.

Sell, Baby, Sell

Initially, SprintRay participated in non-dental and dental trade shows. However, the focus soon shifted to dental trade shows only. The company also invested in influencer marketing as it learned its importance in the dental market. SprintRay received a lot of business leads—courtesy of their new focus—but the lack of a solid sales team made it difficult to close the opportunities and turn them into real cash flow. To steer sales, SprintRay hired John Fernandez, who had previously led the sales division for Atlanta-based Carestream Dental. Fernandez was experienced and knowledgeable about the dental market. “The 3D printing industry had always excited me. After leaving Carestream Dental, I started my own dental distribution entity and one of the products I wanted to carry was a 3D printer. That’s how I met Mansouri. It felt right seeing his energy, passion, enthusiasm and the openness to trying new things,” remembered Fernandez. After joining SprintRay in early July 2017, Fernandez spent a couple of months validating the sales process and developed a compensation plan that allowed them to maintain margins and recruit talent. “We had brochures and samples, but if somebody wanted to buy our product, we didn’t have an order form,” he chuckled.

Searching for the right value proposition, Fernandez defined SprintRay products’ unique selling points (USP). “Having a 3D printer in the office with the ability to develop a wide range of dental products; that was the value proposition,” he said. Moreover, Fernandez felt the additional applications offered by the product, through a range of materials (resins), made it competitive compared to other products in the market. “We could show our product had a lower cost of ownership, with more applications, and it performed faster and better,” explained Fernandez.

SprintRay studied the 3D printing market and learned that their competitors had a limitation. They could only work with their own printing material, which locked them into their pace of development. “We discovered that a Dutch dental material company, NextDent, had developed a wide portfolio of dental resins. These were FDA classified resins that could be used in a patient’s mouth. Our own resins were only used to print teeth models but NextDent resins could open up many other possibilities for doctors,” explained Fernandez. With these resins, SprintRay printers could print night guards, surgical guides, and dentures on demand in the dental office. The value proposition evolved to “print dental appliances in office on-demand.” The team quickly calibrated their printer to different dental materials and increased the number of applications it could support. “Doctors started to prefer SprintRay’s printer over our competitor Formlabs’, as our printer could work with ten different dental resins, while Formlabs only had two branded resins,” said Fernandez. With the new pricing and a clear value proposition, sales quickly increased from about six units a month to more than forty units a month.

With the aim of increasing its business through partnerships with leading distributors in the dental industry, SprintRay approached Minnesota-based Patterson Dental—a major dental distributor with over 30% share in the dental market. A deal was inked, and Patterson started buying SprintRay printers. “Getting Patterson on board as a principle distributor in the dental industry got us credibility and made it clear that SprintRay was capable of meeting market demand in high volume,” noted Kreidler. The deal with Patterson required Fernandez to rethink the company’s direct-to-market sales focus where the company’s sales team directly approached buyers and sold its product. “SprintRay’s pretty much non-existent sales force was challenged to quickly support Patterson’s 1,200 sales personnel,” said Fernandez. This prompted Fernandez to develop a hybrid sales model that allowed sales representatives to play a dual role of selling the product directly to the doctors who were not a part of the Patterson community of customers, while serving the needs of Patterson sales representatives as a manufacturer’s support team.

However, the hybrid sales model didn't work as planned and turned out to be a challenge. Conflicts between the company sales people and Patterson representatives impacted sales and effectiveness; opportunities were compromised. Compensation and commission imbalances between direct and indirect (through Patterson) opportunities impacted the salespeople's behaviors and decisions negatively. To this end, Fernandez focused on repositioning the sales team as 'regional additive manufacturing specialists' with a mission to be valuable sales, support and functional resources for the clients. He prioritized training to enhance the sales team's ability to answer customer and distributor questions. He believed that the company's competitive advantage would stem from solving each customer's problem. "It took a while for us to get the balance between compensation, service, support and direct/indirect sales. But when we cracked the code, it worked well," noted Mansouri. By January 2018, SprintRay had a salesforce of six regional representatives following the hybrid model.

More People...More Challenges

As business grew, SprintRay hired new talent and its workforce grew from five people to 20 people in the US in 2017. The company also set up a full-fledged quality control system locally in the US. As the workforce and the operations expanded, the company needed more processes and systems to manage its business. It established human resource infrastructure such as payroll, health insurance, time reporting, employee overtime policies, etc. "Bassir and I had a passion for 3D printing and we wanted that culture within our US workforce. We tried to hire people who demonstrated love for this field," recalled Mansouri. However, even with the policies and systems in place, SprintRay's attrition rate fluctuated between 25% and 30%. "Anyone we hired too fast, ended up not being good. I learnt that when in doubt don't hire at all. Just keep looking for the right talent," Mansouri noted.

Although the company was focused on the dental market, it took almost six months for the leadership team to instill this mentality within its employees. "They (employees) didn't sign up to join a dental company. So, I had to push them to learn the dental lingo, push the designer to design a website for the dental company, create our mission and vision around dental," recalled Mansouri. Everyone at SprintRay had to learn how to use its 3D printing machine and the company even created a tradition that every new hire had to print a piece using the company's own 3D printer and upload its image on their social media accounts.

Mansouri and Zhang not only faced the challenge of finding the right talent, but they faced communication and cultural differences between their US and Chinese workforce. Zhang and his team in China had difficulty understanding the US operating standards. Zhang explained:

The mindset of the Chinese people is different. They are not as professional or technical as the people in the US. It's easy to do something in China that's like 60 percent ready. Although, it's very difficult to build something that's 95 percent ready. In the US, people are more concerned with intellectual property (IP) and more user-oriented features. Whereas in China, people are concerned with cost and efficiency, while making quick financial returns.

Bassir and Mansouri were not always satisfied with the machines and the quality of production in China. Mansouri admitted, "It was very hard to educate the team in China about the requirements and customer expectations in the US. So, there was a lot of back and forth."

The founders discovered that the problems were mostly related to communication gaps and perspective differences between the teams and not related to supply chain or capability shortcomings. "When people are willing to listen, understand and accept that the other person is right, things move much faster," noted Zhang. So Bassir began to communicate directly with the engineers in China using Chinese messaging platform WeChat which could translate English messages into Chinese language and vice-versa. "This proved to be a real turning point in improving the product quality and communication between the US and China team," recalled Zhang. As they sorted the communication and cultural kinks in their US and China operations, Mansouri and Zhang realized that the company needed a solid plan for the next level of growth. They had to find the path to the next version of themselves—SprintRay 2.0.

Shaping the Future Through Venture Capital

By the end of 2017—compared to 2016—SprintRay had experienced six times revenue growth, moved to a bigger office, hired a strong workforce and was faced with considerably higher expenses (see **Exhibit 9** for SprintRay's new office). The 2017 revenue of close to \$1.8 million was projected to increase to over \$6 million in 2018 and financial needs to support the growth had increased rapidly.

It was time to raise more money. The deal with Patterson Dental had put the company in a strong position to approach institutional investors. A new business plan with a 100% focus on the U.S. dental market was developed. The plan called for more sales representatives, marketing investments and additional operating and customer support staff in order to maximize growth opportunity. The plan required a \$5 to \$7 million raise. SprintRay's efforts to raise series A funding started in January 2018. Mansouri engaged a consultant, put together an investor presentation and assembled a list of over 300 Venture Capital (VC) firms. "We created a list of US-based VCs who invested in hardware companies and had recently raised a big fund (had money to invest). It was one week before the International Consumer Electronics Show (CES) in Las Vegas in 2018," recalled Mansouri.

The Immediate Success

Mansouri lined up three meetings at CES in Las Vegas. 3M—a materials company at its core with a strong presence in the oral care market—expressed interest but refused to be the lead investor. They asked SprintRay to find a lead investor and come back to them. Likewise, HP Tech Ventures—the VC arm of HP Inc.—also showed interest but laid the same condition as 3M. Los Angeles-based VC firm Calibrate Ventures also expressed interest in funding SprintRay. "Meetings went well and some even asked us to raise a couple of million more than our target. They asked us for financials, competitive matrix and customer lists to be interviewed. Some even scheduled follow-up meetings at our office. Everything looked rosy and promising; at least in the beginning," Mansouri stated, with a hint of sarcasm.

The Eventual Failure

More investors were approached in the next couple of months. Mansouri provided potential investors with their requested information through early March 2018, only to hear nothing from them. "Many weeks passed in silence. I regularly followed up, until I got a rejection from all approached," he said. For SprintRay, that Spring was filled with investor calls, more requests for information and more rejections and disappointments.

"Investors did not provide any specific feedback for rejecting the proposal, except that hardware was not their cup of tea. Only one investor offered a couple reasons for passing on the deal. He said our margins were too low. While we had purposefully lowered the margins to get market traction, our mistake was to offer a forecast based on the same scenario. We did not acknowledge a need to increase margins over time. Moreover, the investor felt our market focus was very small as we had failed to articulate the market size effectively," explained Mansouri. "Investors argued that there are 190,000 dentists and multiplied by \$4,000 (our product price), the market size was around \$790M and the additional recurring material revenue potential did not excite them," he added. Even though the investor rejections were painful, their feedback helped Mansouri plan for future investor discussion. With each passing day, it became harder to manage the working capital requirements of the company and map the growth organically without any capital infusion."

Finding Real Direction

As mid-2018 approached, SprintRay's growth dynamics clearly pointed to significant additional capital needs and the funding efforts had proved fruitless. The company's target customer base of digital dentists—a niche segment of 40,000 dentists—was growing by 15% every year, according to Mansouri. This constituted roughly over 20% of the total dentist population of 195,722¹⁰ in the US. The larger 3D printing dental lab market—estimated to reach \$7 billion by 2027¹¹—was also growing rapidly and SprintRay was well poised to attack the market with a portfolio of three products (the existing MoonRay product family plus two new products addressing customer needs for the larger sized more industrialize applications plus more advanced uses with ceramic as the base material. While strategic venture investors as well as domestic and global distributors of medical devices were knocking on its doors,

SprintRay was still looking for a lead investor and its path forward was not clear. Faced with tremendous opportunities and challenges, the team was at a crossroads and decisions had to be made.

Zhang, Mansouri, and their board had to explore the alternative paths forward and weigh the options:

1. **Raise funds through VC:** With a renewed pitch, the company could leverage the 2018 expected revenue results and its year-over-year performance to re-position itself for a \$7 million capital raise from VC's and shoot for a minimum of \$125 million revenue target over the next five years (20x growth). The team had to consider how to re-open conversations with the VC's and get a second bite at the apple. In order to win big, realize more aggressive sales forecasts and quickly grab market share against well-funded competitors, higher level funding was critical.
2. **Consider acquisition by a strategic investor or merge with a larger dental industry player:** SprintRay could get acquired (an exit that paid real cash/payoff to investors) by a strategic investor. While the founders would compromise their payoff, they would shield themselves and the company against market risks ranging from well-funded competitors, stringent tariffs by the US government on Chinese imports, economic realities of potential down turns and the risk of execution. They would have to learn to be a part of a potentially larger bureaucratic organization and exchange their entrepreneurial dreams for corporate safety. SprintRay could also consider merging (an equity swap without any cash distribution to investors) with distributors and/or other dental market players in order to enhance their collective offering. In this case, they would not be able to sell their equity position for cash or adequately satisfy the investors. However, they may find themselves in a better position for growth and a bigger exit (acquisition), potentially even an IPO either in the US or China.
3. **Slow capital raise from angel investors:** SprintRay could continue to raise smaller amounts from angel investors and avoid being caught up in the intense efforts of raising VC capital or finding the right buyer or partner. This path involved much less equity dilution. It would allow the company to finance its way to a better position before accepting VC money—at a higher valuation—and preserve the founder's equity more effectively. However, the team would have to constantly stay in fundraising mode, potentially compromising focus on day-to-day execution. The pace of growth and market penetration might also be slowed due to a smaller reserve of financial resources.

Mansouri and Zhang had to consider all possible alternatives and consider the perspectives of their existing investors who had supported SprintRay in its growth so far. Mansouri's visit to Shanghai, to meet Zhang, couldn't have been timed better as they charted their venture's future.

Exhibit 1: Mansouri and Zhang at SprintRay

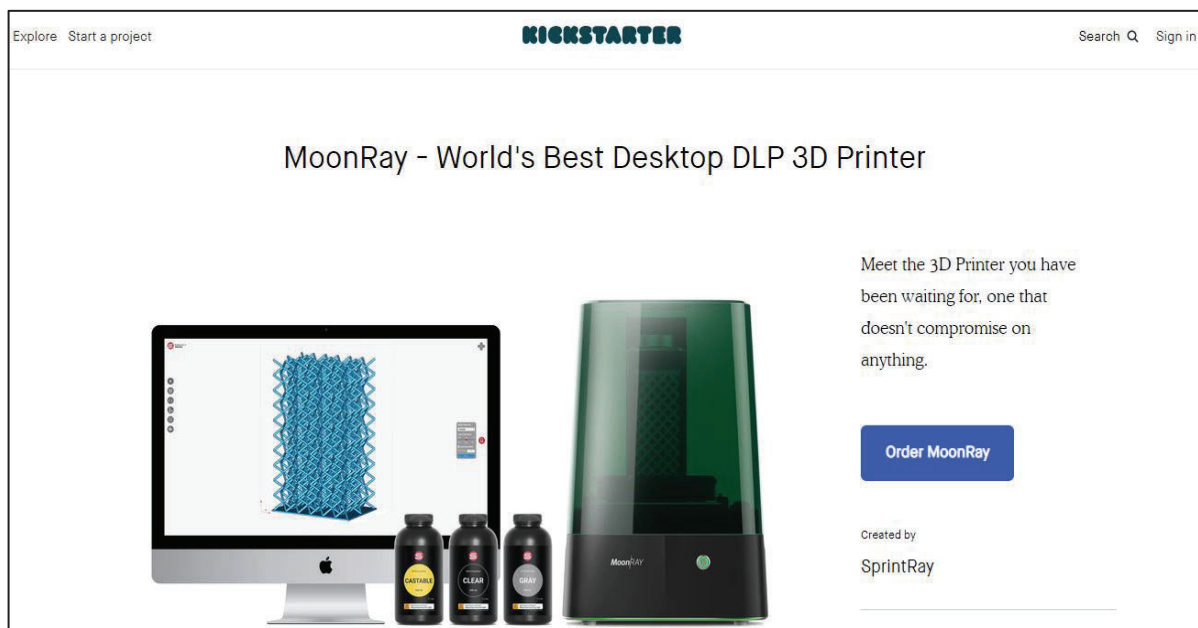
Source: SprintRay

Exhibit 2: SprintRay at Tradeshows



Source: SprintRay

Exhibit 3: Kickstarter Campaign



Link to Kickstarter: <https://www.kickstarter.com/projects/sprintray/moonray-worlds-best-desktop-3d-printer>

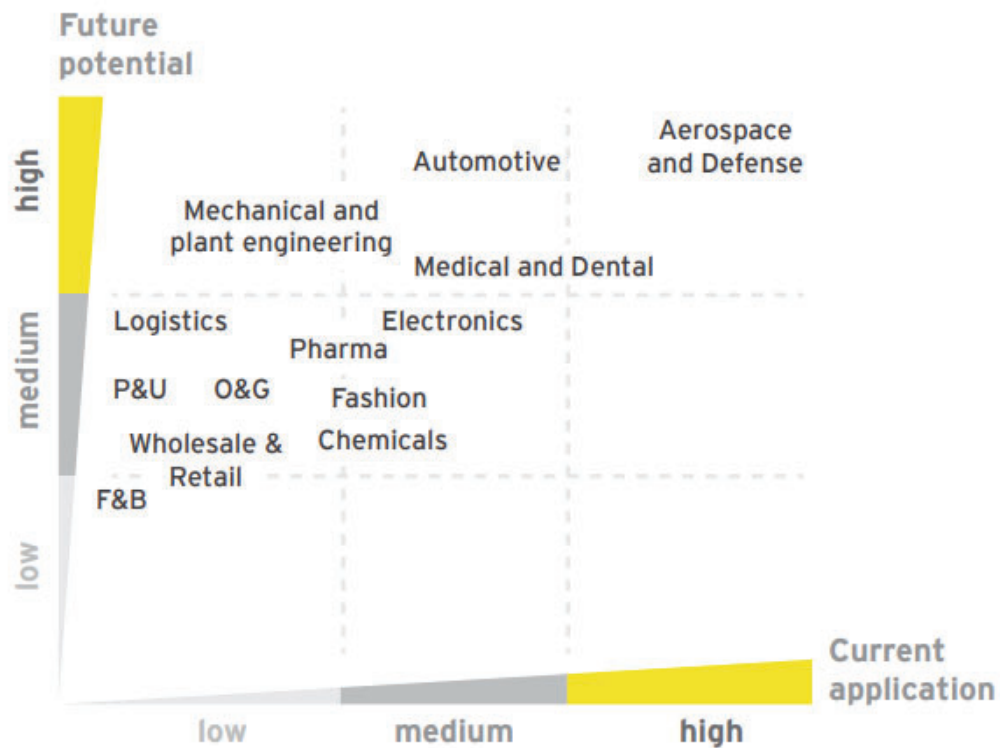
Source: SprintRay

Exhibit 4: SprintRay Manufacturing Facility in China



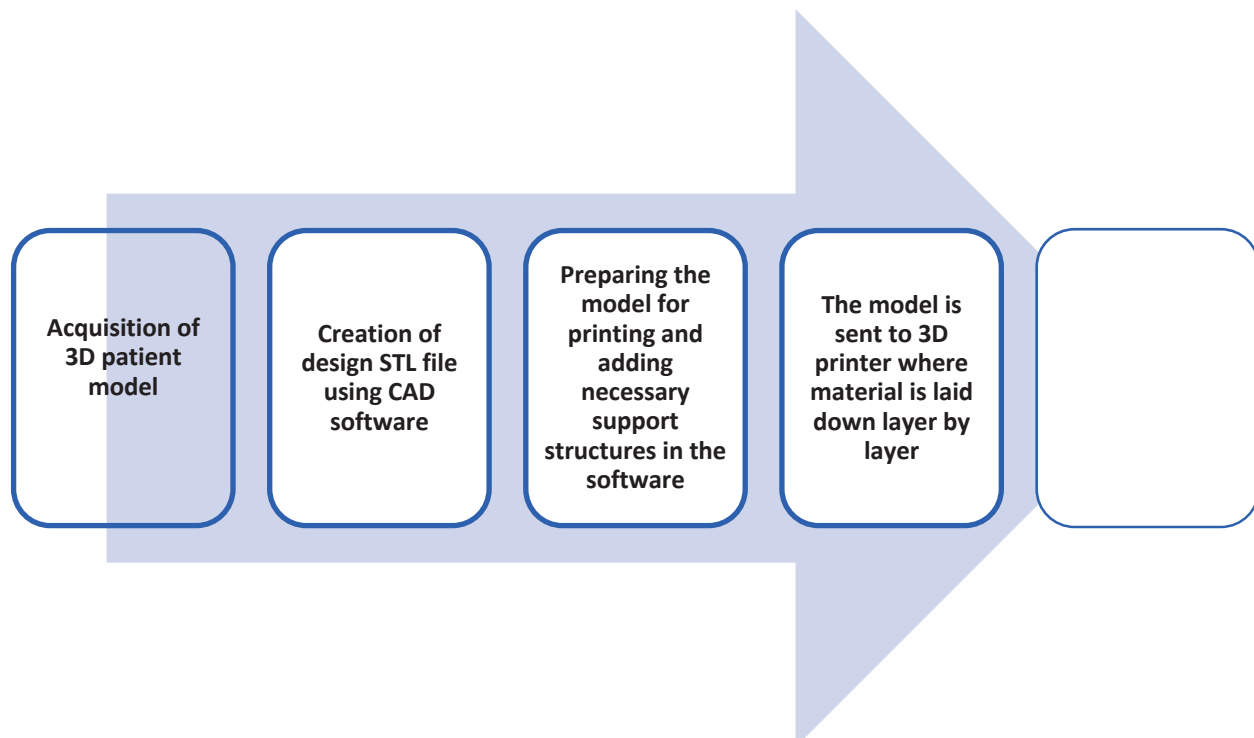
Source: SprintRay

Exhibit 5: Current Application and Future Potential of 3D Printing by Industry

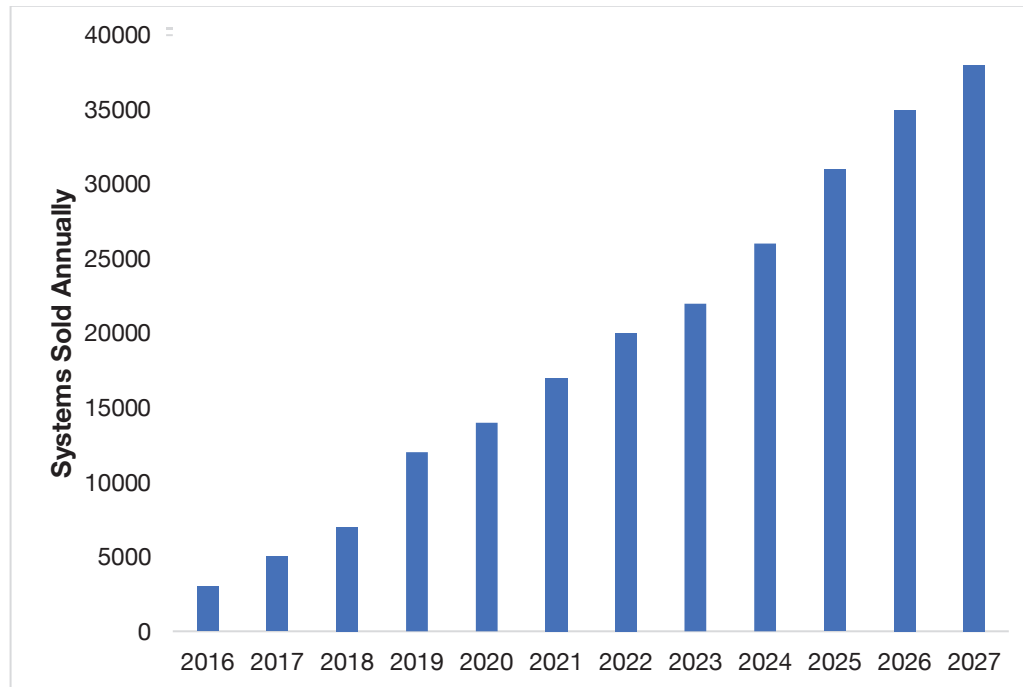
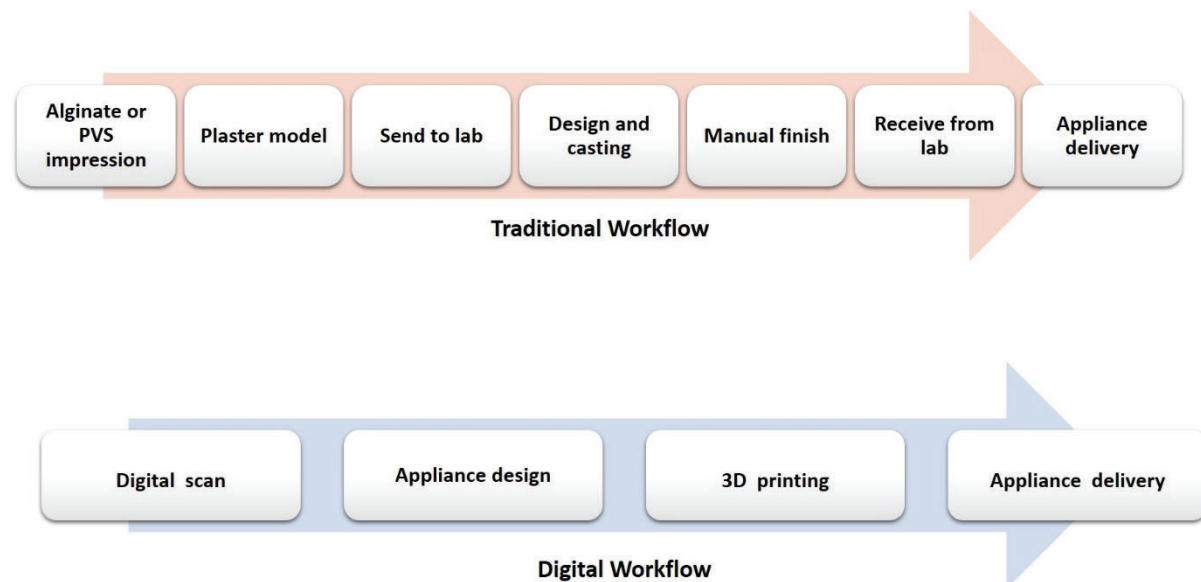


Source: EY Analysis based on 2016 EY global 3D printing survey

Exhibit 6: 3D Printing Process in Dental Labs



Source: 3D printing in Dentistry by Andrew Dawood, Begona Marti and V. Sauret-Jackson¹²

Exhibit 7: Projected Digital Dental Production System SalesSource: SmarTech Publishing¹³**Exhibit 8: Comparison of Traditional and Digital Dentistry Workflows**

Source: SprintRay

Exhibit 9: SprintRay's New Office



Source: SprintRay

ENDNOTES

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