



# PatSnap Analytical Report

3D Printing

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## New Entrants

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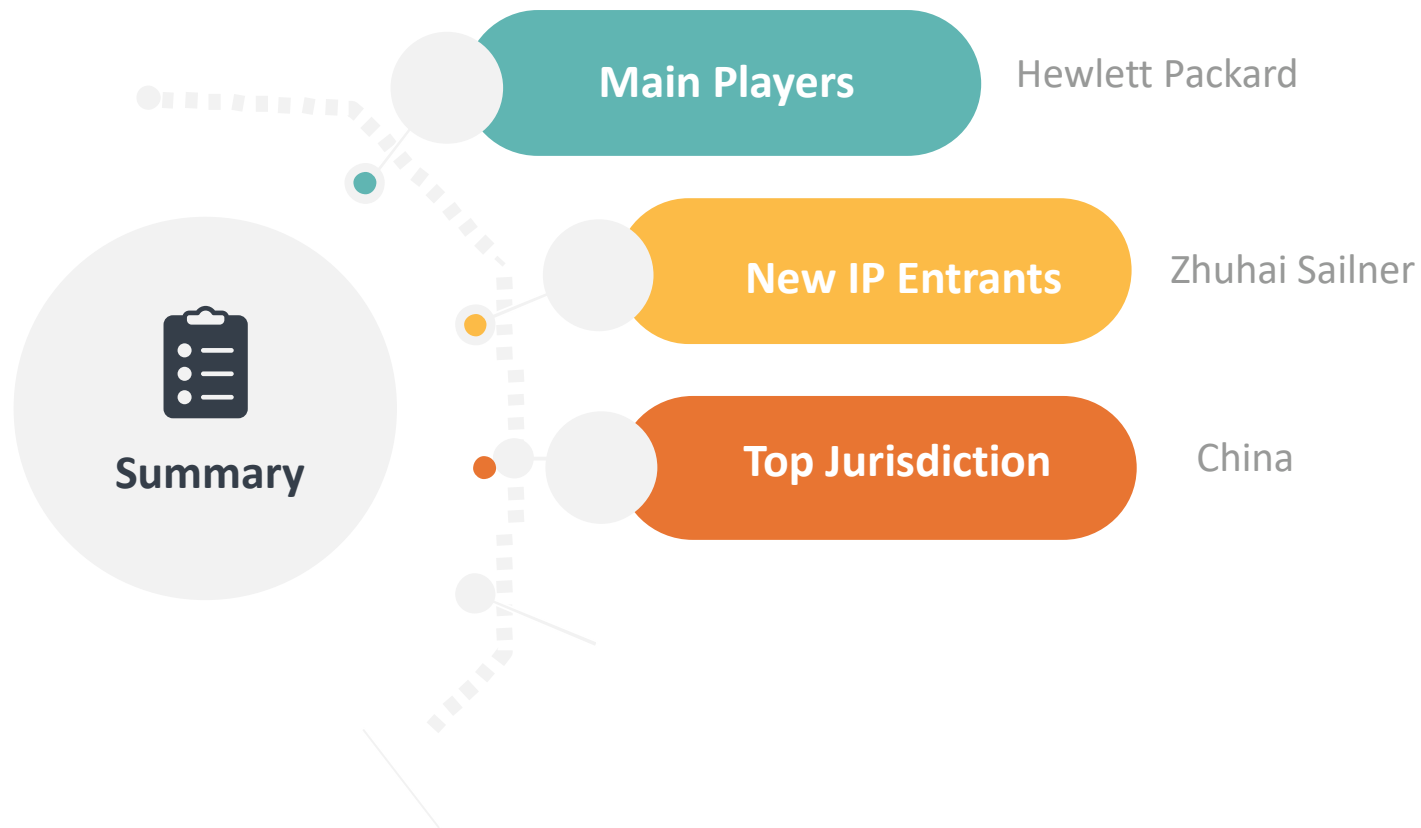
USA Venture Capital Investment



## M&A Activity

3D Systems Corp.

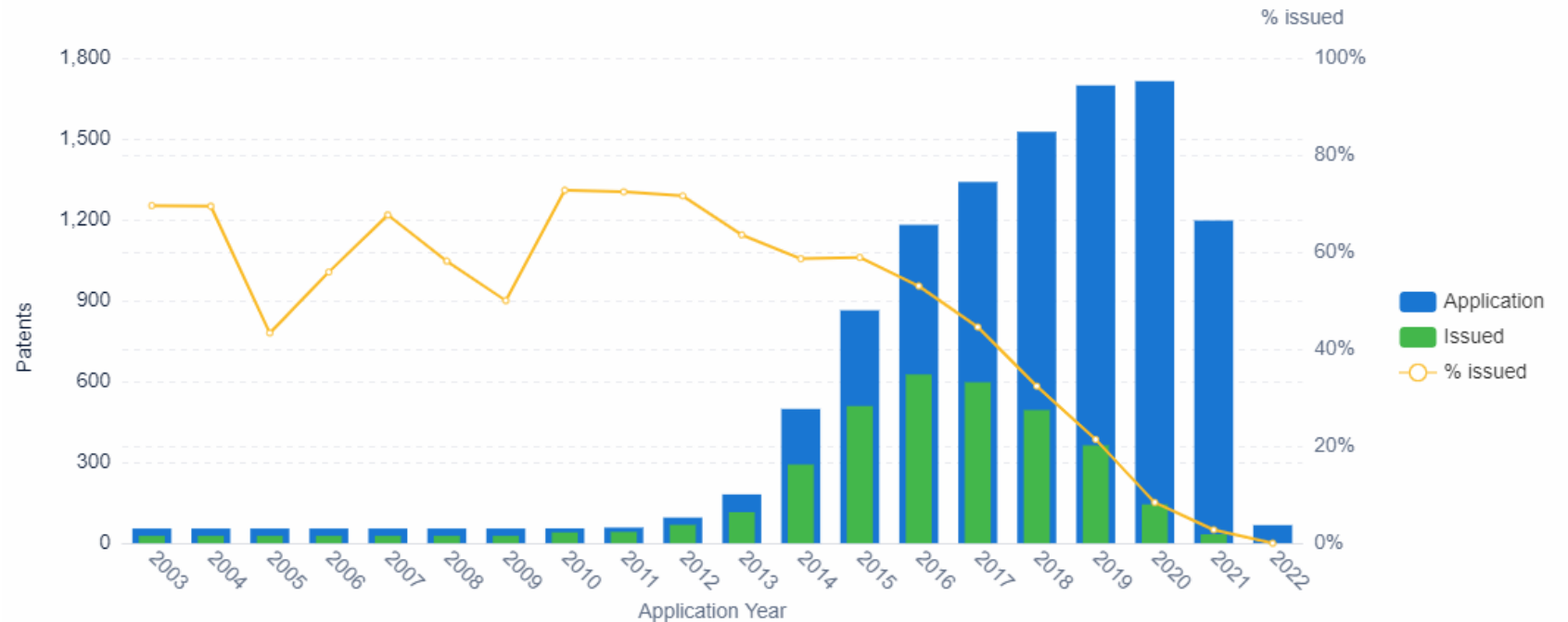
# Summary



# Application Trend

Figure 1 displays the annual application trend for patents. The blue bars illustrate applications, whereas the green bars represent issued patents. When a **patent is issued**, it's displayed on the **column based on the year the application was filed**.

From 2014 onwards, the number of **applications related to 3D printing increased rapidly**.



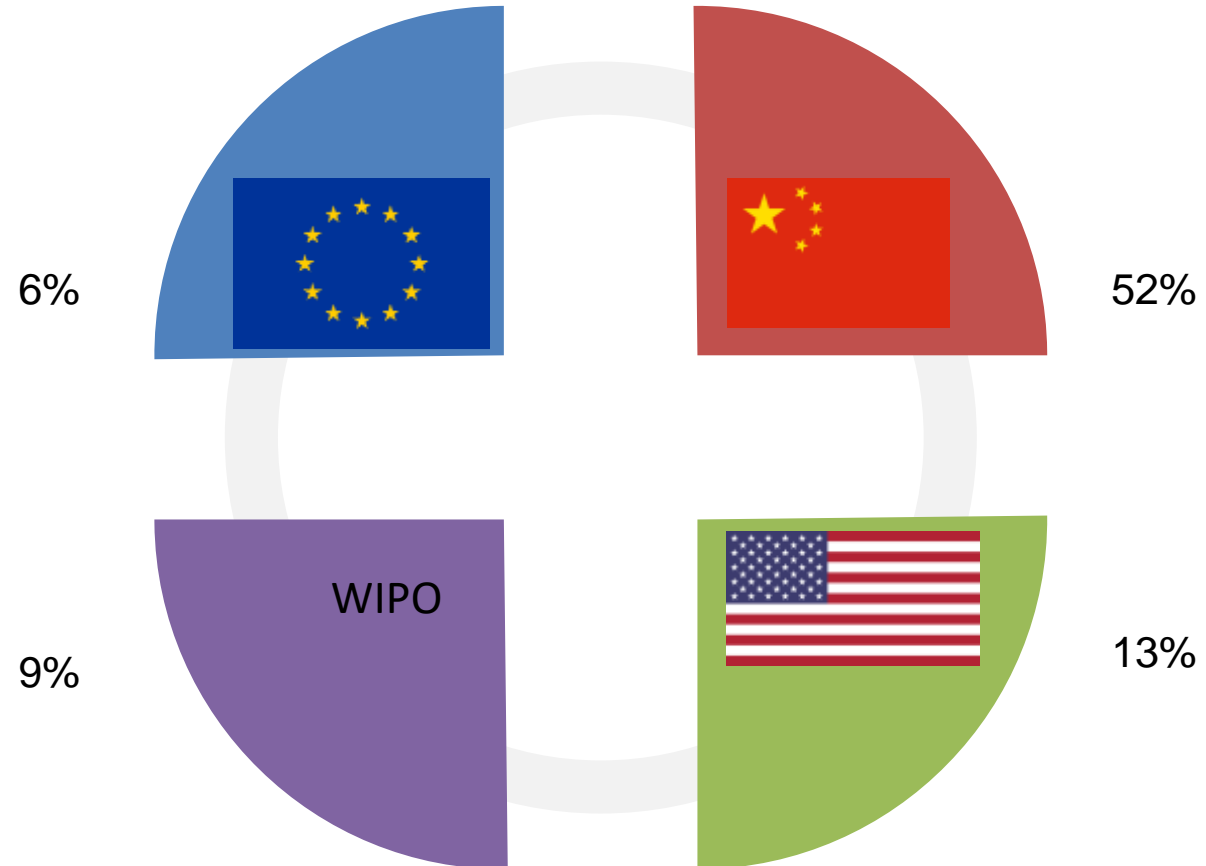
**Figure 1 Application and Issued Trend for 3D Printing**

A year over year increase of approximately **200 to 300 more patent applications** is noted during this period. This increase is synonymous with industry and consumer interest in 3D printing, and 3D printing innovations. Examples include **Adidas' first pair of 3D printed shoes, made from plastic**, as well as the fashion industry seeing garments being produced.

This can also be seen by some of the applications that were made, such as [EP3911283B1](#): *Process of designing and manufacturing a prosthetic socket*. This granted patent was made in published in 2022, which was providing a more customised approach to prosthetics based on the person using it.

Other examples of 3D printing can be seen in recent applications such as [US20220212407A1](#): *Three-dimensional printed organs, devices, and matrices*, applied for in March 2022. This patent focusses on Bio-Printing of organs for generation and the assessment of immunological products and immune responses.

# Jurisdiction Overview



# Countries of Origin

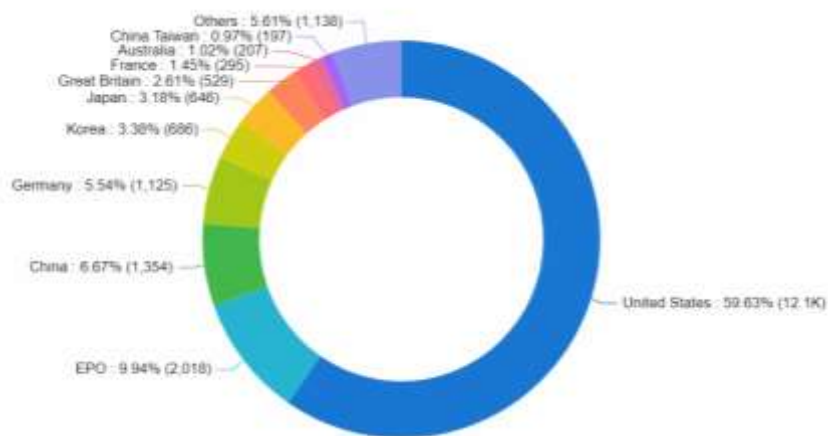


Figure 2 Countries Of Origin

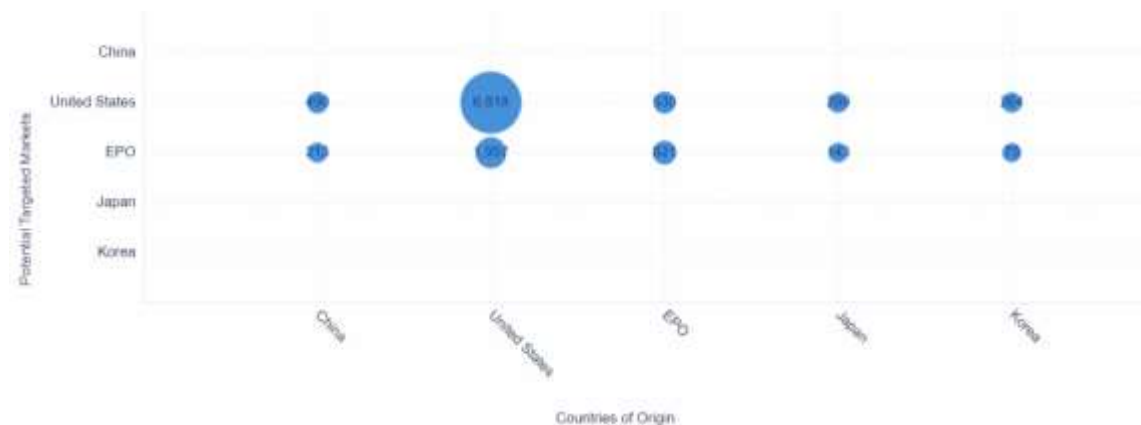


Figure 3 Trend in Top Countries of Origin and targeted market

Figure 2 shows which countries the **first application** of the patent was filed. It provides an indicator of where the idea relating to the technology first originated. **Most simple family applications filed in the US, EPO, and WO authority originate in the US.** China (CN) is the country with the third largest number of filings, after the EPO and US. CN filed more patents in US than in EPO (485 simple family applications in the US compared to 219 in the EPO), showing that **companies in CN prefer to file patents in the US than in EP.**

Diving deeper, we see that the most frequently used IPC code for simple family applications filed in CN is **B33Y30/00** (*apparatus for additive manufacturing*), whereas the patents filed in the US originating from the US is IPC code **B33Y10/00** (*processes of additive manufacturing*). This indicates **innovation from the US is focused on processes, methods, and systems related to 3D printing**, whereas **innovations originating in CN are focused on the devices used in and for 3D printing.**

The most valuable patents originating from the US and CN jurisdictions are [US9470911B2](#) (*method and system to create products*), valued at \$12.4M and cited 538 times, and [US11224680B2](#) (*Compositions for cell-based three-dimensional printing*) valued at \$5.8M cited 63 times.

# New Entrants Overview



- Sailner 3D, affiliated with Seine Group, a global leader dedicated to printing and imaging products, output solutions and managed print service (MPS), develops and sells 3D printers for industrial use. Its 3D products are used in full-color multi-material model for medical education training, surgery planning, jewelry precision model and customized full-color multi-material



- Mighty Buildings offers developers the construction technology and design services they need to democratize modern home design and build resilient communities of sustainable homes. Their 3D-printed panel system and automated near zero-waste production allow prefab home kits move seamlessly from factory floor to foundation — reducing construction project



- Jabil is a product solutions company providing comprehensive design, manufacturing, supply chain and product management services.  
[US20210284854A1](#) : Precipitation of polyether block amide and thermoplastic polyethylene to enhance operational window for three-dimensional printing is their most valuable patent (\$85K)

# New Entrants

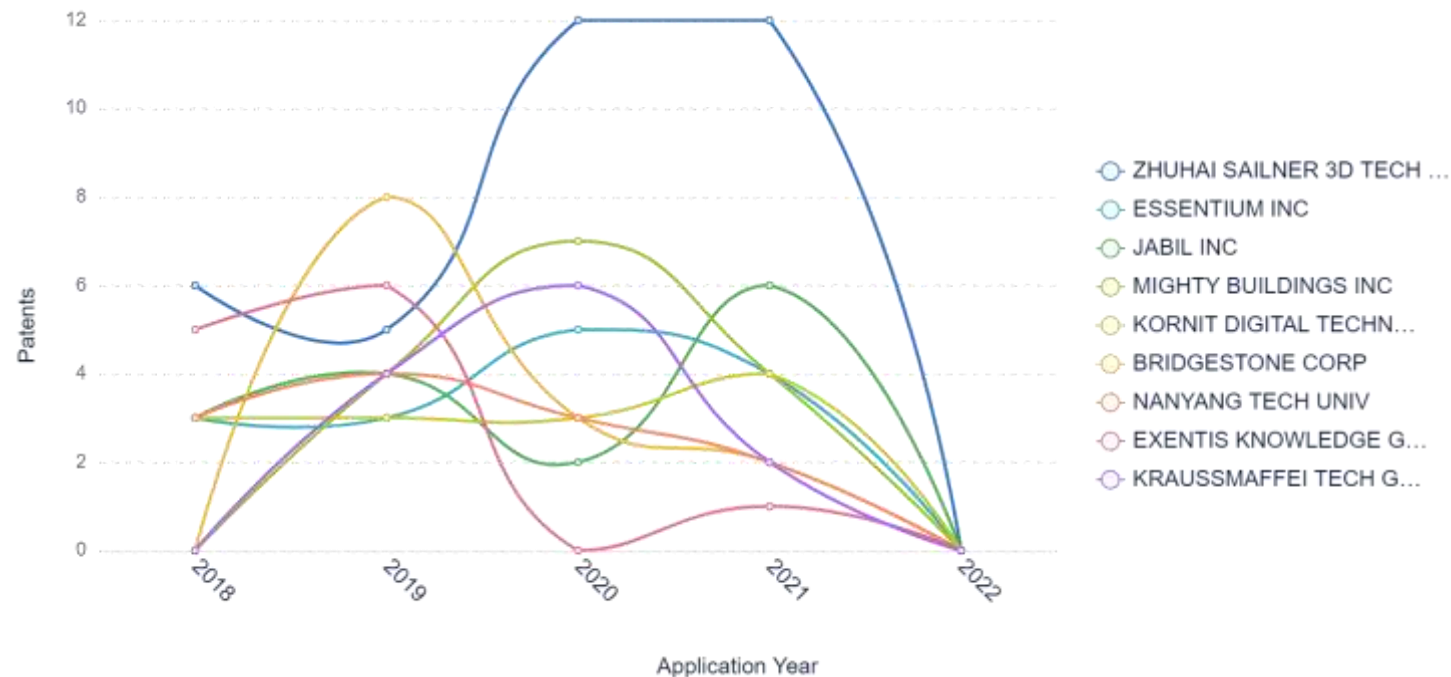


Figure 4 New Entrants

**Mighty Buildings Inc. (USA)** and **Jabil Inc. (USA)** hold the next highest number of filings in 2020 and 2021, with **Mighty Building Inc. holding two published patents** and the company's **most valuable patent application since their entry into the market being [US20200338828A1](#)** (system for obtaining a Photopolymerized Prepolymer) holding a value of \$19,000. Much like Zhuhai, **Jabil Inc. holds no published patents** within this technology area, however its most valuable patent application since its entry into the market is patent [US20210284854A1](#) (precipitation of polyether block amide and thermoplastic polyethylene to enhance operational window for three-dimensional printing) with a value of \$80,000.

Despite the specifics of the overall technology space, new entrants are looking to innovate in new and different ways within this space.

Figure 4 shows the impact of several new entrants in the area, with **Zhuhai Sailner (HK) leading with the highest number of filings from 2020** – a year in which four of these new entrants filed their highest number of patent applications to date. Of the 24 patent applications filed by Zhuhai Sailner between 2020 and 2021, **19 are either active, pending, or in the PCT designated stage** – however **none of these have been granted**. At a value of **\$140,000**, [US2020061928A1](#) (3D printing method and device), is Zhuhai Sailner's most valuable patent since its entry into the market, filed under the US Patent Authority and currently undergoing examination.



# Top Companies

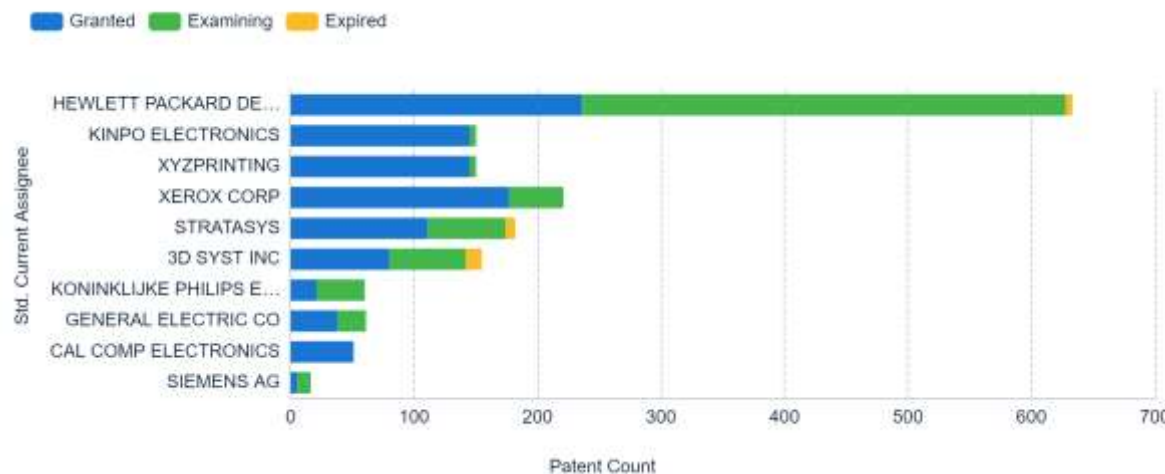


Figure 5 Top Assignees by Portfolio Size

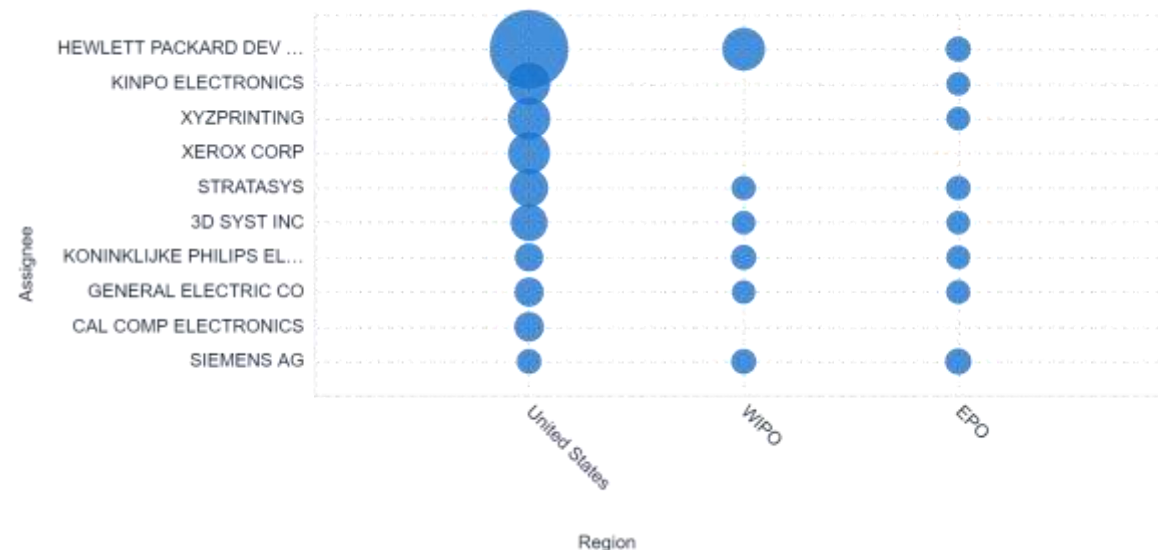
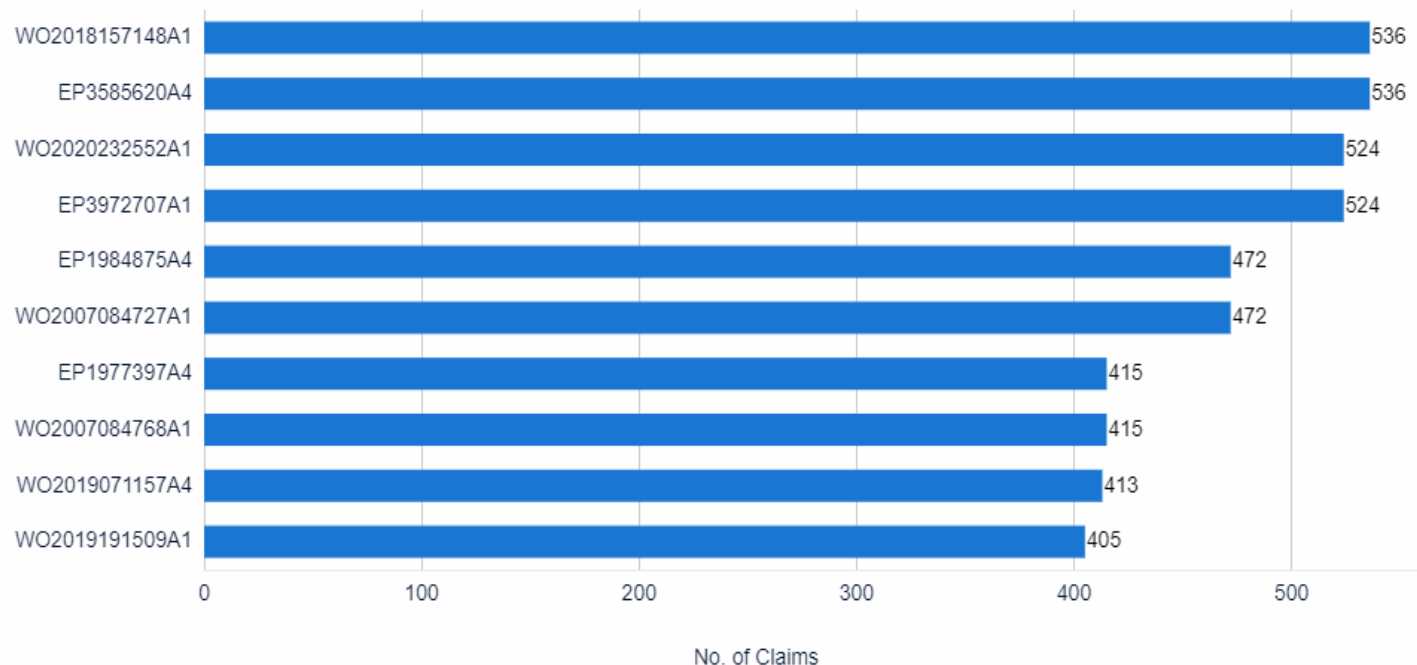


Figure 6 Top 10 Assignees by Filing Jurisdiction

Figure 5 shows the 10 companies with the largest portfolios within the 3D printing technology field. **38% of Hewlett Packard's (HP) (US) granted, examining, and expired publications, have been granted.** Within the same legal status categories, **97% of Kinpo's (CN-TW) publications have been granted.** Figure 6 shows that, **with respect to the US, WIPO, and EPO filing regions, 99% of Kinpo's applications have been made in the US,** with 1% of total applications being made in the EPO. Comparatively 72% of **Hewlett Packard's** applications have been in the US, with 28% of total applications being made in WIPO and EPO combined.

**HP's** highest valued patent is [US10471698B2](#): *Computational model and three-dimensional (3D) printing methods*, valued at \$4.36M while **Kinpo's** highest valued patent is [US10071524B2](#): *Printing method for printing multi-material 3D model*, valued at \$2.05M – both filed in the US and with the former due to expire in November 2035, and the latter due to expire in October 2036.

# Valuable Patents: Claim Volume



**Figure 7 Top Patents with Largest Volume of Claims**

Figure 7 identifies the patents that hold the largest number of both dependent and independent claims. The records above are inventions that are more complex and have the highest level of financial and time investment involved in filing. The patent applications [WO2018157148A1](#) and [EP3585620A4](#) (3D printing devices including mixing nozzles) **contain the highest number of claims, at 536**. A deeper dive into this patent indicates it's **focused on microfluidic printing nozzles devices and the methods of the printing of articles (e.g., of footwear) using 3D printing**.

Containing a high number of claims can provide a greater chance of success in an application when a patent is facing adversity with legal action; by holding more claims, there is a larger probability that at least one or two of the claims can survive the eventual challenges in a litigation context, and therefore provide protection for the patent.

# Valuable Patents: Top Cited

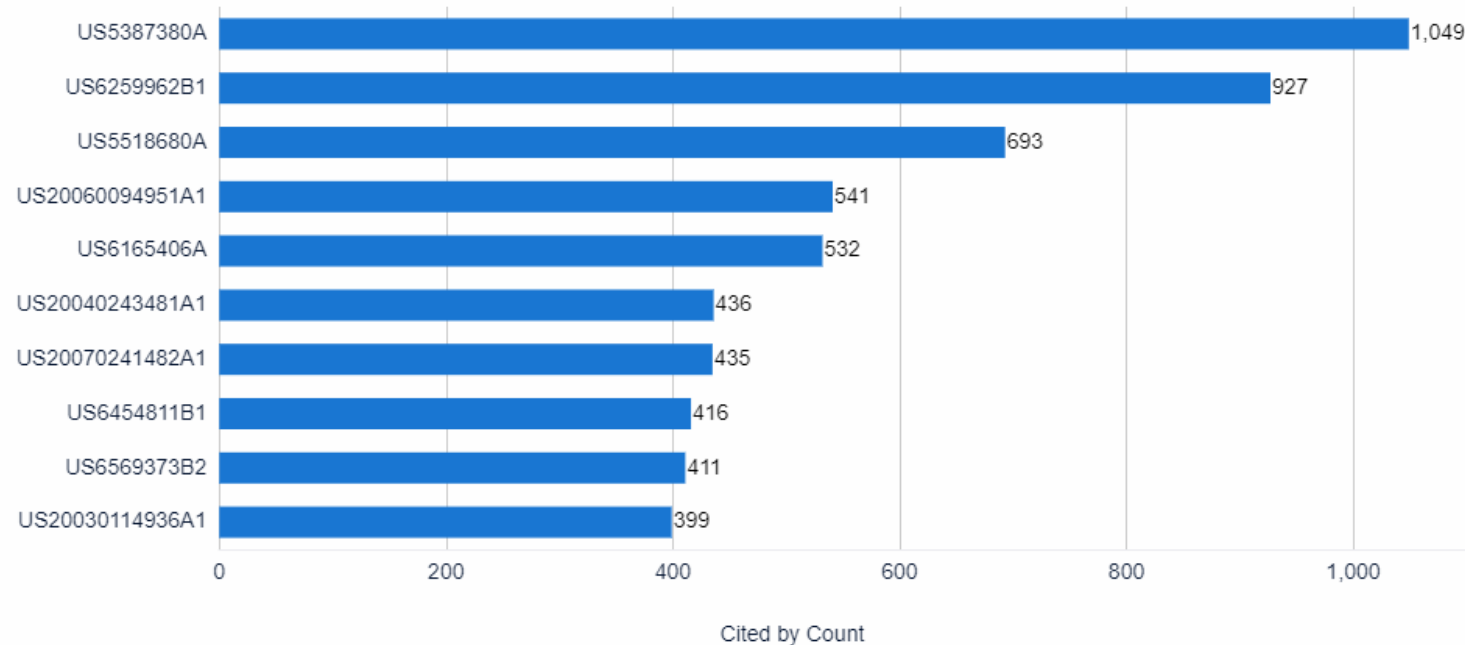


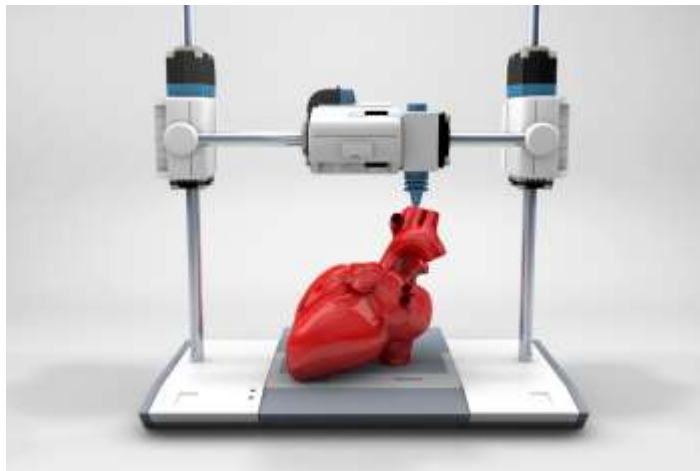
Figure 8 Top Cited Patents

Figure 8 shows the top ten cited patents within the dataset retrieved. **The forward citations of a patent are typically a measure of the social value of inventions, as well as an indicator of innovation in a particular technology space.** It is widely regarded that patents that receive more citations are more likely to be renewed in the future. A notable application within the list is [US5387380A:Three-dimensional printing techniques](#), with the coassignees being MIT and Merck & Co, receiving 1049 forward citations to highlight its importance in the 3D printing domain. Notable companies, such as **General Electric, Hewlett Packard and 3D Systems Inc** feature among the top citers for this individual patent application alone, emphasizing the impact and the wide acceptance that the invention has had for further innovation. It's worth noting that half of the top 10 cited patents below were published over 20 years ago, demonstrating that early innovations within the space had contributed to building the foundation for where the industry is currently.

# Investment Overview

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Company Name	Investor	Date	Amount
Toybox Labs	Gaingels LLC	07 Jul 2022	\$72K USD
Perris Biologics, Inc.	Anonymous	06 Jul 2022	\$17M USD
MeaTech	Anonymous	30 Jun 2022	\$6.5M USD
Glowforge Inc	DFJ Growth Management & 3 others	22 Jun 2022	\$43M USD
Desktop Metal Operating	Anonymous	10 May 2022	\$100M USD



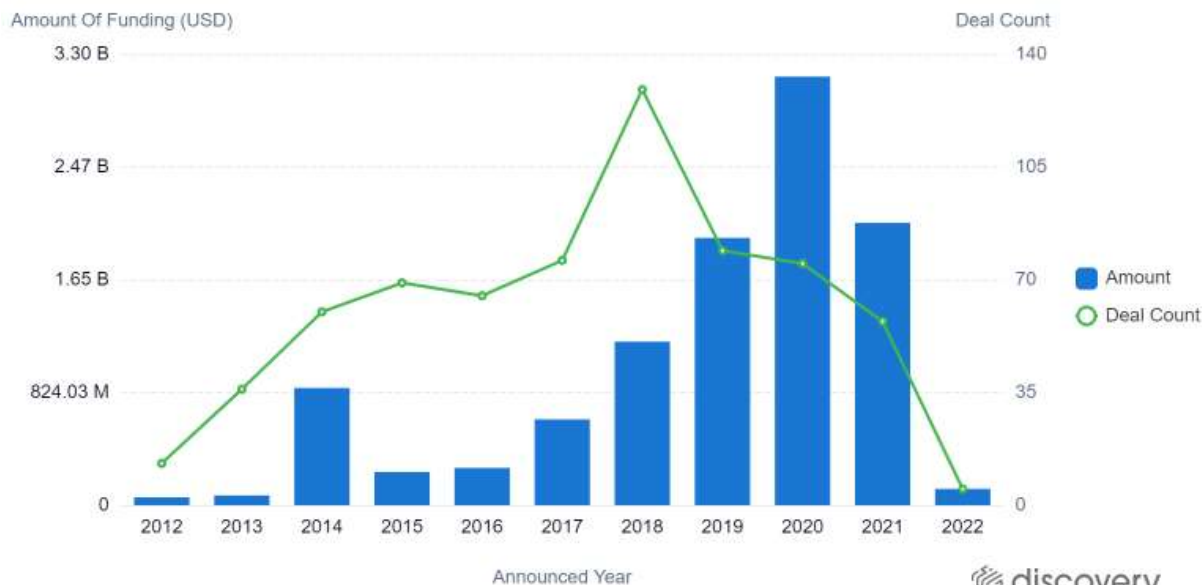
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# Venture Capitalism

Figures 9 and 10 illustrate the VC investment trend over the past 10 years and the top 10 investors within the search criteria respectively. Overall, there has been an **increase in the amount of funding received in the last 10 years**, with the amount of funding correlating with the deal count between 2012 to 2018. This correlation ends in **2019, where we see a rise in the funding received but a decrease in the number of deals, insinuating that individual companies are investing more heavily into the space than previous years**. This is highlighted in 2020, where we see the largest amount of funding received in the span of ten years, amounting to \$3.13bn, largely from Alphabet's Waymo that had [announced raising \\$2.25bn in its first external investment round](#). Notable investors include Alphabet, alongside Silver Lake Management, Canada Pension Plan Investment Board, and Mubadala Capital Ventures.

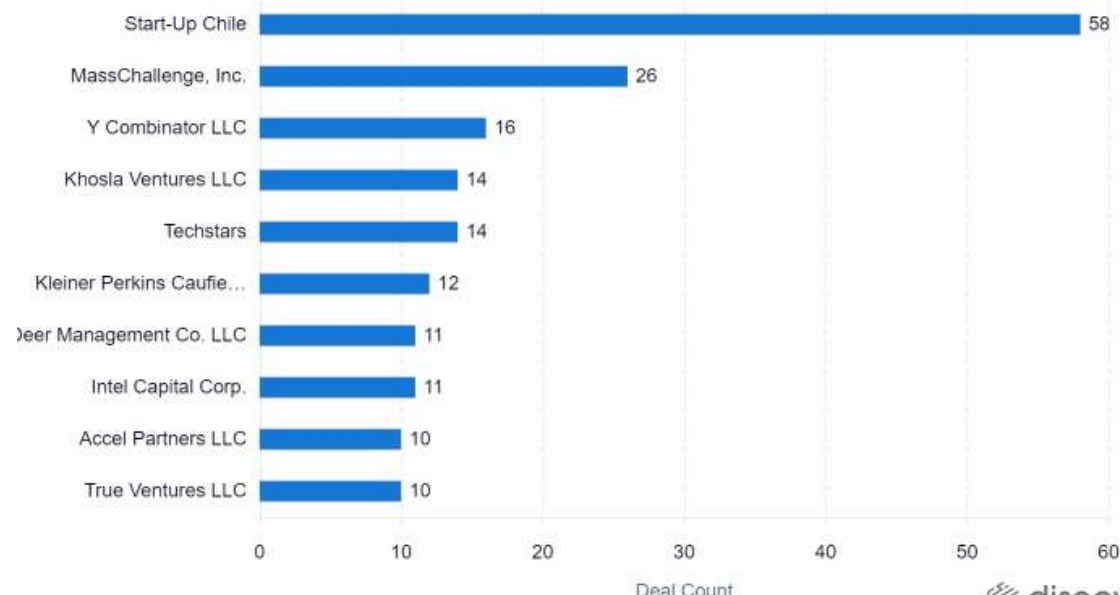
Some of the **top investors seen in figure 10 are known to invest heavily in startup companies such as Start-Up Chile, Techstars, and True Ventures LLC** — a company focused on early-stage tech startups. Looking further into these investors, it's noteworthy that **most investment types within the 3D printing space are pre-seed or seed investments** at mostly \$1M or less. This is in line with the majority of the US-based companies listed in figure 10, such as Khosla Ventures and Techstars, as these companies predominantly have a focus on working with startups in seed, early and growth-stage investments.

Figure 9 VC since 2012



Source: discovery.patsnap.com

Figure 10 Top Investors



Source: discovery.patsnap.com

# M&A Activity

M&A transactions play an important part in the 3D printing market, with M&A deals completed within the U.S., China, U.K., and Germany locations. It's necessary to explore the M&A transactions of 3D Systems Corp. In Figure 5, we see the company has a large patent portfolio with 178 patents filed.

## 3D Systems Corp.

Over the last five years, **3D Systems Corp.** recorded **nine** M&A deals. These deals were predominately the acquisition of startup companies in the U.S. and German (see Figure 10). Examples of acquisitions include **Allevi, Inc., Additive Works GmbH, Volumetric, Inc., and Kumovis GmbH**. We can deduce that these investment deals are another important step in the company's aggressive, [four-phase initiative](#) to reorganize, restructure, divest non-core assets, and invest in accelerated growth, which was announced in August of 2020. It's evident from Figure 11 that 3D Systems Corp. is successfully implementing its initiative. A negative net margin was recorded in 2017 and earlier, however, between 2020 to 2021 the company's net margin rose from **-27% to 52%**. Furthermore, 3D Systems Corp. has mostly sought M&A deals with manufacturing companies to strengthen its sales. Additionally, these M&A deals may help increase the company's consumer base and increase revenues which can be invested in R&D as well as other activities to support long-term growth.



Figure 10 M&A over time



Figure 11 Revenue over time

# Report Overview

## Purpose:

Technology Landscape Overview.

## Core Platform Query:

TAC\_ALL:(("3D" OR "3-D" OR ((3 OR Three OR Third) \$W3 ("D" OR Dimension\*))) \$SEN (Print\*)) AND (IPC:(B29C64 OR B33Y) OR CPC:(B29C64 OR B33Y)) AND AUTHORITY:(US OR EP OR WO)

NOTE: the results for the patent graphs are based on one representative per simple family.

# Connecting the dots so you can innovate better

Founded in 2007, PatSnap is the company behind the world's leading Connected Innovation Intelligence platform. PatSnap is used by more than 10,000 customers in over 50 countries around the world to access market, technology, and competitive intelligence as well as patent insights needed to take products from ideation to commercialization. Customers are innovators across multiple industry sectors, including Biotechnology, Medical devices, Pharmaceuticals, Chemical, Electronics Manufacturing, Automotive, Consumer Goods, Aviation & Aerospace, Education, and Legal Firms.

PatSnap's team of 1000+ employees work from its global headquarters in Singapore, London, and Toronto. To learn more about how PatSnap is improving the way companies innovate, visit [www.patsnap.com](http://www.patsnap.com).