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3D Printing Quarterly Report—Q2 2016

3D PRINTING–A FAST MOVING MARKET

Developments in 3D Printing

A Sector by Sector Overview

Overview

This report explores recent developments across 12 sectors as it relates to 3D printing and its impact on each sector. We've limited our scan to the last three months to demonstrate the pace and scope of activity in the market.

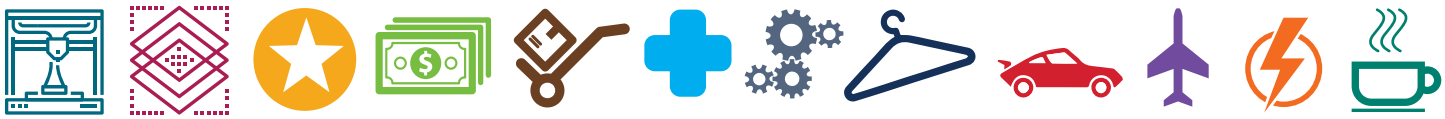

Table of Contents

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3D Printing Technology (General)

3D printer shipments in U.S. jump 20% in 2015: IDC

International Data Corp (IDC) research found 3D printer shipments in the U.S. grew by almost 20% in 2015 compared to 2014. Looking ahead, 3D printer shipments in the U.S. are expected to grow by a 16% CAGR through 2020. Shipments in the very low-end, where 3D printers sell for below $1,000, are projected to grow at a 12% CAGR through 2020.

Bain & Co predicts 3D printing market will grow to $12.5B by 2018

Bain & Co. forecasts that the additive manufacturing market is set to grow from approximately $7 billion today to $12.5 billion by 2018. Identifying a number of barriers to wide scale adoption that still remain –scalability, talent shortfalls and material costs – the consultancy expects these barriers to be broken down as material costs decrease due to increased adoption and the market expands.

HP's Jet Fusion 3D 3200 Printer up to 10 times faster than competing machines

HP is now taking orders for its Jet Fusion 3D 3200 printer, which is reportedly up to 10 times faster than others on the market in its category and claims to be the first commercial 3D printer based on an open software and materials platform. HP's list of partners includes publicly-traded companies like Nike, BMW, Autodesk, Johnson & Johnson, Materialise, Proto Labs, and Siemens, and developments arising from these partnerships could interest investors.

3D printing tech lets you "edit" objects as they're being printed

Cornell researchers created an 'On-the-Fly Print system' able to pause mid-print so objects can be measured or tested. Edits or refinements can be made to the physical object while it is still in the printer, which uses a modified 'wire print' method of extruding quick-hardening plastic meant to create a wire frame skeleton of a solid object instead of printing the whole thing to assist in rapid prototyping.

Scientists successfully 3D print the world's smallest lens

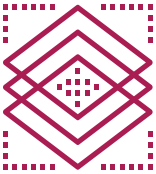
Scientists have leveraged 3D printing to create the world's tiniest lens, measuring two times the width of a human hair. The lens could allow for the development of cameras the size of a grain of salt. The miniscule lens could have many applications, possibly revolutionizing health imaging, clandestine surveillance, robotics, and drone technology.

Onshape's FeatureScript lets 3D CAD users create their own built-in parametric features

Onshape has released FeatureScript, a new open programming language that allows users to create and modify parametric features. Due to its entirely cloud-based service, OnShape is creating new opportunities for designers who need to collaborate remotely. In real-time, designers are able to collaboratively design 3D models via the cloud, using tablets, smartphones and computers.

3D printing companies request Supreme Court clarification over cheerleader uniform copyright case

3D printing companies Formlabs, Shapeways and 3D scanning, and 3D printing provider Matter and Form, have sent an amicus brief to the U.S. Supreme Court, seeking clarification over a copyright issue in a 2015 6th Circuit Court of Appeals ruling. This ruling could impact DIY 3D printing and design as it argues designs not 100% utilitarian can be copyrighted. The case, Star Athletica v. Varsity Brands, revolves around cheerleader uniforms; Star Athletica was sued by global player and competitor Varsity Brands over claims the uniforms violated their copyrighted designs.



Materials

Polymaker unveils PC-Max, its strongest 3D printing filament for load-bearing parts

Polymaker's PC-Max filament is its strongest 3D printable filament. The company says it is an upgraded version of PC-Plus, specifically intended for the engineering sector, and has been under development for more than a year. The filament is more impact resistant than any other Polymaker material and ideally suited to engineering uses in regards to load-bearing parts.

Hemp 3D printing filament 30% stronger than PLA

Kanèsis launched an Indiegogo campaign for its HempBioPlastic 3D printing filament. The company filed a patent application for the eco-friendly 3D printing material. Its filament is demonstrably more efficient than several bioplastics on the market and is around 20% to 30% stronger than PLA. The company claims HempBioPlastic's wood-like appearance makes it highly valuable for aesthetically minded printing projects as well.

Reflow works with waste pickers to turn plastic into 3D printer filaments

Reflow, a startup out of Amsterdam, partners directly with waste pickers, converting the plastic they amass into a high-quality 3D printer filament. The company plans on reinvesting 25% of their profits to set up local manufacturing capabilities, while reinvesting $3 from each filament roll directly to improve waste collectors' lives. The company aims to address and eliminate the hazards and injustices waste collectors face.

Nottingham University researchers aims to establish 3D printing materials libraries with $5.1M grant

U.K. Researchers at Nottingham University were awarded a $5.1-million grant by the Engineering and Physical Sciences Research Council (EPSRC) to establish a series of 3D printing materials libraries. The project will involve investigating the formulation of new materials. The researchers believe creating a series of materials libraries could attract industries to 3D printing by removing assumptions regarding the price of processes and materials.

Military/Government

Russian team to launch carbon-reinforced 3D printer for satellite parts on ISS

Russia's Sputnix, Anisoprint, and Moscow Polytechnic University, have teamed together to create a 3D printer for use on the International Space Station. They say the printer will use composite printing materials to produce technological components for batteries, antennas, and the microsatellite CubeSat while on board. The project aims to overcome issues faced when building and producing in outer space, such as launch trauma, size constraints, and the difficulties of sending new materials into orbit.

Marines learn benefits of 3D printing

Marines from various units were recently able to learn, assemble and design 3D objects using the Invent3D printer at Marine Corps Base Camp Lejeune in North Carolina. Aircraft mechanics, supply Marines and small-arms repair technicians attended classes to integrate 3D printers into various military occupational specialties, allowing the Marines to design and print any product when it is needed.

Navy will 3D print critical parts for Marine rotorcraft by 2017

The U.S. Navy says six 'safety critical' parts on a number of the Marine Corps' most in-demand rotorcraft with be 3D printed as of next year. Naval Air Systems Command officials plan to 3D print and field parts for the MV-22B Osprey, the new CH-53K King Stallion, which is still in the early phases of production, and the H-1 Marine Corps Light/Attack Helicopters, including the AH-1Z Viper.

3D printing will have a significant impact on military supply chain

At an event hosted by the Naval Surface Warfare Center, a director of engineering and product support for the Navy Supply Command said 3D printing will create a paradigm shift in the military's supply chain, from the current order and stocking system to "just in time" inventory. The Navy has acknowledged key engineering and legal issues will need to be resolved before 3D manufacturing technology can be leveraged to streamline its supply chain, including new contracting strategies for on-demand or automated IDIQ.

Israeli Air Force maintains old planes with 3D printing

The Israeli military is using 3D printing technology to maintain a fleet of F-15 fighter jets acquired by the IAF in 1980. The use of additive manufacturing not only keeps the aircraft relevant, but also allows for implementation of advanced equipment and improved systems such as enhanced engines, communication devices and radar systems.

Money/Investments

Study finds 77% of businesses seek to increase 3D printing spending by 2017

A Sculpteo study found the number of businesses across a wide range of industries and geographic areas that spend over $10,000 on 3D printing a year increased to 10% in 2016, from only 5% in 2015. Overall, 77% of respondents said they planned to increase their spending on 3D printing technologies and services within the next year. The study also lists 'Three Big Ideas' driving 3D printing: innovation (23%), efficiency (19%), and democratization (19%).

3D Printer Formlabs buys 500 Startups-backed Pinshape

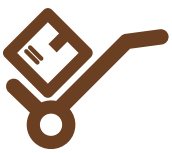
Formlabs, a designer and manufacturer of 3D printing systems, acquired venture-backed Pinshape. Based in Vancouver, Canada, Pinshape is one of the fastest growing consumer marketplaces for 3D printable products. According to Formlabs, the acquisition will pair Pinshapes' "thriving community and rich hub of 3D content" with Formlab's innovation and resources, helping designs find form.

Autodesk Spark co-leads $25 million funding round for XJet

Autodesk Spark is investing in XJet's Nano Metal Particle Jetting technology, which uses nanoparticles in liquid suspension to build 3D mental parts, allowing for more accurate production of highly complex parts than competing technologies. The funding round was led by Israeli-Chinese private equity fund Catalyst CEL Fund and Autodesk, with the funds earmarked to complete the development of and to launch XJet products into main international markets.

Metamason raises $3M in seed funding for world's first 3D printed CPAP masks

3D printing startup Metamason closed a $3-million Series Seed financing round, led by 3P Equity Partners and Tsing Capital, known as China's foremost cleantech venture capital firm. The financing will aid in development of 3D printed CPAP masks for sleep apnea patients. The company's Scan·Fit·Print process integrates 3D body scanning, patented algorithmic design and on-demand 3D printing to create CPAP masks that individually fit patients.



Transport/Logistics

UPS to launch distributed, on-demand manufacturing network based on 3D printing solutions

UPS is set to launch a distributed, on-demand manufacturing network, linking its global logistics network with 3D printers at UPS stores in over 60 U.S. locations. The network requires users first place their order on a website, powered by Fast Radius, which will then be directed to the optimal printing location, based on speed, geography and the product quality. Orders can be shipped as early as the same day. By building 3D printing capabilities into its supply chain, UPS believes it can bring new value to manufacturing customers of all sizes.

Singapore handing out SkillsFuture Awards to encourage development of logistics trades

Singapore plans to hand out 50 SkillsFuture Study Awards to encourage Singaporeans to develop new skills demanded by the logistics sector of the future, including the maintenance of 3D printing facilities. Early- to mid-career Singaporeans can apply for the award, which offers $5,000 in fee subsidies for skill upgrades. Up to 2,000 awards for various industries will be given out each year.

Fake 3D printed security seals are helping thieves steal cargo

G4S, a British multinational security services company, says an increasing number of criminals are using 3D printed security devices to disguise cargo thefts. According to the company, there have been incidents of cargo thieves using 3D printed cargo seals and padlocks to obscure the signs of tampering caused during thefts. By creating perfect replicas of certain well-known cable seals such as the ISO 17712, thieves can quickly replace a broken seal with a 3D printed replacement, giving security personnel no reason to identify the cargo as having been tampered with.

Global tech expert suggests national and international tax authorities' focus on IP is expected to intensify in a 3D setting

According to one global technology expert, 3D printing could flatten global supply chains. However, he notes that few comparable models exist in current manufacturing and distribution settings to calculate transfer pricing and associated taxes in a 3D world. He points out that a 3D product's value comes more from its IP than from its production costs, but tax authorities in different countries could disagree on the appropriate split of tangible/intangible values, resulting in double taxation. He adds production locations multiply in 3D-enabled supply chains but several location-related tax issues could emerge, including proliferating permanent establishments, exit taxes, and substantial contribution provisos.

Healthcare

FDA issues long-awaited 3D printing guidance for medical devices

The FDA has released a draft guidance for medical device manufacturers working with 3D printing. The FDA has cleared more than 85 applications for 3D printed devices, though none have been for high-risk devices requiring premarket approval. What the FDA describes as 'leap-frog' draft guidance aims to provide manufacturers with the agency's initial thinking about the technical considerations for manufacturing 3D printed devices, as well as its thoughts on characterizing and validating such devices.

3D printing tech combines multiple drugs in a single pill

Scientists at the National University of Singapore are addressing the challenges of prescription adherence with 3D printing. They aim to use a 3D printer to combine multiple doses of different medications in a single time-release tablet. The system works by allowing a doctor to enter the medications the patient needs to take, the dosage and how often. This information is used to generate a computer model of a small multi-pronged template, which is then sent to a 3D printer that creates a mold of the template. A non-toxic liquid polymer is then mixed with the medication and poured into the mold, creating a positive cast of the template.

Scientists aim to kill brain cancer by 3D printing tumors

A team led by Dr. Will Shu and Dr. Nicholas Leslie of Heriot-Watt University's Institute of Biological Chemistry, Biophysics and Bioengineering will 3D print brain tumor stem and cancerous cells using a novel technique. They hope to study the printed tumors and experiment on them with various drug treatments. One researcher says the 3D printed tumor features cells that continue to grow rapidly, more closely mimicking the growth of these aggressive tumors in real life, adding that it should provide a new way of testing drugs, leading to new treatments and speeding up the process by which they can become available to patients.

Expert says 3D printed drugs could be the 'Uber for chemistry'

A chemistry professor at the University of Glasgow suggests the pharmaceutical industry's adoption of 3D printed drugs will dramatically cut costs, improve efficiency, and bring more personalized medicine to those in need. Lee Cronin and his lab are developing 3D printed reactionware, a process that combines inexpensive 3D printing with the 'chemical internet,' which could lead to a new and cost-effective means for producing custom chemical reactors outside traditional laboratory environments. He contends, however, his 'Uber for Chemistry' model, when applied to the pharmaceutical industry, would require a major overhaul of existing practices.

Pfizer using 3D printing to streamline arthritis research

With aims of developing osteo and rheumatoid arthritis drugs, Pfizer has integrated 3D printing technology into its process, allowing it to streamline its research. It includes using a MakerBot Replicator Desktop 3D Printer to print a custom rat bone holder, capable of holding the bone at an exact orientation and accommodating all the bone samples. Pfizer scientists say 3D printing has allowed them to find in-house solutions to problems, saving them time and cutting costs.

3D printing pen will enable surgeons to draw stem cells directly onto patients' bones and joints

A group of scientists form the Australian Research Council's Center of Excellence for Electromaterials (ACES), who in recent years have been working on the BioPen, are now conducting detailed experiments with the device and improving it for new capabilities. The pen's newest capability, effectively printing viable human stem cells into damaged joints, will allow the cells to, in turn, regrow cartilage on the joints. The pen is the first device to allow "in-situ biofabrication."

Manufacturing/Construction

Forbes suggests 3D printing is making manufacturing more competitive

This Forbes contributor suggests 3D printing is making manufacturing more competitive, indicating that 71% of manufacturers are currently using 3D printing for prototyping and final products, with more manufacturers evaluating the technology for high-volume production than ever before (more than half compared to 38% two years ago). Additionally, more than half of U.S. manufacturers believe that within the next three to five years, 3D printing will be more useful in the production of aftermarket part or products, and over 60% expect to rely on 3D printing for producing older, obsolete products.

Laboratory unveils China's largest SLM 3D printer for production of metal parts

The Wuhan National Laboratory for Optoelectronics unveiled its large-scale selective laser melting 3D printer model. The laboratory claims it is one of the world's largest high-precision SLM 3D printers, based on a laser beam system comprising four 500W fiber lasers capable of simultaneously scanning the metal 3D printed part. The printer also addresses manufacturing issues, including the creation of complex and high performance thin-walled precision parts, such as engine blades and other complex precision parts.

Google Alphabet interested in 3D construction sector

Google's parent company Alphabet is focusing on the main innovations driving change regarding 3D printing over the coming years; among them, the adoption of additive manufacturing by the construction sector. The company's CEO believes the biggest impact of 3D printing will be felt in the construction industry by making the entire sector cheaper, more efficient, and superior while retaining the ability to realize dynamic designs.

CyBe's 3D printed concrete formworks pave the way for 3D printed viaducts

Dutch startup CyBe Construction, a concrete 3D printing company, has successfully completed tests on two of its 3D printed concrete formworks using its CyBe R, a three-meter tall 3D printer. The 3D printed concrete formworks could be embedded in the core of structures and could be used to build 3D printed viaducts and roads in the future. The company claims concrete 3D printing can cost-effectively realize freeform, organic shapes in construction while maintaining quality standards of existing construction methods.

Researchers create 3D printing method for extremely lightweight 'architectured foam' structures

Researchers from the Masdar Institute of Science and Technology in Abu Dhabi filed a 3D printing patent for a 3D printing method of ultra-strong lightweight 'architectured foam' structures. The structures can be made from a variety of metals, plastics and composite materials, and have the potential of making machines used in aerospace, medical, and automotive industries far lighter and stronger. The structures can also be programmed to exhibit optimal thermal, electrical or mechanical properties, opening the structures for a variety of applications.

Wearables

3D printing breakthrough makes low-cost flexible carbon nanotube sensors for wearables possible

An Isreali research team claims their custom 3D printing solution produces fixable hybrid nanocrystal/carbon nanotubes that can be 3D printed onto flexible surfaces. This technique can even be used for sensors that are tunable at the UV-near infrared range by selecting specific nanocrystals. They operate at room temperature and are inexpensive due to an effective use of materials and production space.

Materialise introduces Luxura, a quality finish for 3D printed wearables

Materialise has launched Luxura, a quality finish for 3D printed wearables. The product was developed to offer makers a finish for their products specifically designed for wearables, giving a silk-like surface texture, smooth to the touch, and an in-depth color permeation. Luxura is available in 15 colors.

United Sciences' 3D printed Aware earbuds huge hit on Kickstarter

United Sciences' revolutionary ear 3D scanning technology is capable of perfectly capturing the unique structure of the inner ear. The company's Aware earbuds provide a perfect fit and sound, and have biometric sensors to carefully monitor brain and body functions. The product has been a hit on Kickstarter, having raised $100,000.

3D printed smart tags used by sneaker company to combat counterfeiting

Brooklyn sneaker company Greats uses 3D printed smart tags that can track the designer sneakers back to the factory, effectively proving their authenticity. The tags were developed in collaboration with Chronicled, a shoe and fashion software authentication company, and Origin, a San Francisco based 3D printing company, and were created for Greats' new Beast Mode 2.0 Royale Chukkah sneakers, released in late 2015 and endorsed by NFL player Marshawn Lynch. The aim of the 3D printed smart tag is to crack down on shoe counterfeiting, an illegal industry worth about $240 billion.

Auto Industry

EDAG's 3D printed "Soulmate" concept car equipped with IoT, driver automation

EDAG Engineering's Soulmate concept car features a 3D printed lightweight steel frame inspired by biological systems. The company also created 3D-printed housing for the electric-powered Soulmate's on-board charger, as well as a 3D-printed headlight. The vehicle demonstrates a number of new technologies likely to be standard on tomorrow's breed of personal transportation, including autonomous driving and an IoT-embedded dashboard.

Local Motors buys two BAAM 3D printers as part of microfactory expansion plan

Local Motors, the company behind the world's first consumer 3D printed car, wants to open 100 microfactories over the next ten years. It's embarking on this plan with the purchase of two Big Area Additive Manufacturing (BAAM) machines, one of the largest 3D printers in the world, to outfit its first automotive microfactory in Phoenix. In the coming decade, it plans to open 100 more of these microfactories featuring the large printers where customers will be able to design, customize, and build their own 3D printed vehicles on-demand and directly on-site.

3D Systems, Confederate Motors partner to build P51 Combat Fighter motorcycle

Confederate Motors, a well-known American road bike manufacturer, has teamed with 3D systems to develop complete assembly kits for their P51 Combat Fighter motorcycle, consisting of more than 140 different 3D printed parts. The motorcycle company specializes in unique builds and produces very small batches of motorcycles and, until recently, used around 60 different machines for each bike. To speed up development time, Confederate Motors approached 3D Systems to accelerate prototyping through on-demand stereolithography (SLA) and selective laser sintering (SLS) 3D printing solutions.

Aviation

Airbus tests structure, aerodynamics, and AI for future aircraft with 3D printed THOR plane

A 3D printed miniplane from Airbus, known as THOR, is made almost entirely from 3D printed parts outside of electrical components. THOR, which stands for Test of High-tech Objectives in Reality, is being used as a testbed for new airplane technologies and low-risk experiments. Airbus says it will use THOR to efficiently test different 3D printed structural parts, advanced aerodynamics, and even artificial intelligence. According to the company, 3D printing technologies provide a faster way of manufacturing the test aircraft.

3D Systems completes GE aircraft bracket challenge with 70% lighter bracket with same functionality

3D Systems completed a GE Aircraft design challenge to create a 3D printable engine bracket significantly lighter than existing brackets. It was able to do so in collaboration with software company Frustum. The company's 3D printed a metal engine bracket is 70% lighter and meets all functional requirements of current designs. By shaving extra pounds off parts, $10 million can be saved industry-wide, according to GE estimates.

McFarlane Aviation wants to get 3D printing off the ground for entire aerospace industry

McFarlane Aviation, a Kansas-based manufacturer of replacement aircraft parts, wants to expand by opening an additive manufacturing facility. They aim to force the approval of 3D printed aircraft parts by working closely with the FAA. The company explains 3D manufacturing of aircraft parts is a cost-effective, green technology, particularly in regards to the minimal waste of metals used in complex and intricate parts.

Energy

Scientists discover that 3D printed polymer turns methane to methanol

With a polymer reactor created from a 3D printer, scientists at Lawrence Livermore National Laboratory can produce methanol from methane at room temperature and pressure. They removed enzymes from methane-eating bacteria before mixing them with polymers, which were then 3D printed into reactors. The reactor could serve as a more effective means of converting methane into usable energy.

Gartner says industrial Scale 3D Printing on the Rise

Gartner predicts by 2019, 10% of all O&G companies will be using 3D printers for the production of parts and equipment used within operations. It notes, however, that using 3D printing to manufacture replacement parts on-site could lead companies to fall foul of patent and other legal issues surrounding the duplication of parts without permission or payment.

3D printed oil-skimmer can safely fight oil spills, according to researchers

Chinese scientists from the Lanzhou Institute of Chemical Physics have developed a 3D printed oil-skimmer that safely and efficiently collects oil floating on the water's surface. The researchers claim their relatively small 3D printed oil-skimmer brings unprecedented oil collection options to the table, and safely stores collected oil without endangering other areas. The oil-skimmer consists of mesh, treated with low surface energy materials, and a bottom container, both 3D printed. The mesh has excellent water-repelling properties, enabling it to filter the oil out of the water. The oil is then collected in the bottom container, which is kept afloat by the 3D printed mesh.

Food

Finnish company aims to develop 3D printed food vending machines

The VTT Technical Research Centre of Finland plans to develop a vending machine using 3D food printing technology. The company is testing starch and cellulose-based materials while working with a variety of different proteins, including oats, faba beans and whey. The company receives funding from the Finnish agency for innovation funding, Tekes, and will concentrate on materials with the right flow qualities for 3D processing.

FarmBot Genesis develops world's first open-source CNC farming machine

The FarmBot Genesis is the world's first open-source CNC farming machine. Made from 3D printable plastic components as a kit, it can be used to remotely plant, water, and monitor a garden. It can also be controlled digitally through a simple web-based interface. The system is able to gather and use real-time weather data, so it knows when watering is necessary and when it can let nature do the work. It can also store this rainwater in a barrel and release it at programmed times, and can even power itself with solar panels.

Choc Edge announces Wi-Fi and drawing app upgrades for Choc Creator 2.0+ 3D printer

Choc Edge announced two hardware and software upgrades for their 3D food printer. They now offer Wi-Fi connectivity, making the printers easier to use in kitchens, as well as a mobile drawing app, allowing users to instantly print their own designs.