Clarivate™

Top 100 Global Innovators 2021

10-year anniversary edition


100

Celebrating 10 years of Top 100 Global Innovators

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Break-out

ideas

29 that have led the way.

These 29 companies have appeared in the Top 100 Global Innovators list every single year since its inception a decade ago.

With an average age of a century, the foundational stories of these firms and the themes they teach, endure and resonate today.

Company history information was sourced from publicly available web records, including company websites, and best efforts were made to share with organizations for veracity.

1665 — Saint-Gobain

In October 1665, King Louis 14th of France granted a charter to minister Jean-Baptiste Colbert for a new glass and mirror making company, the Royal Mirror Glass Factory. With glassmaking expertise in the 17th century monopolized by Venice, the new company brought valuable Venetian glass makers, and their rare knowledge, across the Alps. After 365 years of prosperity and expansion with orders from the royal household (including the Hall of Mirrors at Versailles), today Saint-Gobain is a global supplier and innovator of high-performance and sustainable materials (including glass) across a broad range of industries including construction, mobility, health and manufacturing.

1875 — Toshiba

In 1875 Hisashige Tanaka opened Tanaka Engineering Works in Tokyo, manufacturing telegraphic equipment. Five years later, Ichisuke Fujioka established Hakunetsu-sha & Company, with a focus on developing the first Japanese-designed electric lamps. Later changing its name to Tokyo Electric in 1899, by 1905, Fujioka's firm had formed a partnership with Thomas Edison's General Electric and in 1921 created the world's first double coil incandescent light bulb. In the meantime, Tanaka Engineering Works had renamed as Shibaura Engineering Works. In 1939 the two companies, both members of the Mitsui zaibatsu (a family of companies) and already partnering heavily, merged to form Tokyo Shibaura Electric. In 1984 the company rebranded to the abbreviated name Toshiba.

Foreword

Saint-Gobain designs, manufactures and distributes materials and solutions for the construction, mobility, healthcare and other industrial application markets. Developed through a continuous innovation process, they can be found everywhere in our living places and daily life, providing wellbeing, performance and safety, while addressing the challenges of sustainable construction, resource efficiency and the fight against climate change.

We are a 356-year-old company that constantly reinvents itself to serve customers and society as a whole. We have pledged to be carbon neutral by 2050 and set for ourselves ambitious 2030 milestones to reduce our own environmental impact. Where we make the biggest difference however is in the way our innovative offerings provide benefits to our customers, thanks to our sustainability and performance solutions that help them on their own journey towards a low-carbon, more resilient economy.

At a time of great challenges, innovation is more than ever at the core of Saint-Gobain's strategy. For all our teams around the world, it is a time of responsibility as well as of exciting and engaging opportunities for the decades to come, in full alignment with our purpose, "*Making the World a Better Home*," and our taste for science and technology.

In quickly evolving and competitive markets, all our teams are fully mobilized to grasp those innovation challenges. United by the same mindset, we invest in a strong R&D structure and we rely on passionate researchers all around the world. We leverage our intellectual property efforts, a key strategic asset that protects our business operations and our technical differentiation over time.

We are very proud once again, for the 10th year running, to be on this list of remarkable companies recognized by the Top 100 Global Innovators program.

Our sincere congratulations to all other recipients, as well as a strong encouragement for all of us to continue bringing forward science in order to tackle the world's challenges, and we wish to express immense thanks to Clarivate for promoting the importance of innovation through this recognition.

Benoît Bazin
Chief Operating Officer,
Saint-Gobain

1876 — Ericsson

Lars Magnus Ericsson opened his small telegraph equipment repair shop on Drottninggatan, central Stockholm in 1876. He soon expanded from small local repair jobs to working for the state railway company, where he began selling his own equipment. In six years, the workshop had expanded to 50 employees and was growing internationally. By 1897, L M Ericsson & Co had multiple factories both in Sweden and abroad and had produced more than 100,000 wall-mounted microphone and hand speaker telephones.

1876 — GE

With the storied formation of Thomas Edison's early laboratory in 1876 in Menlo Park, New Jersey, perhaps Edison's greatest innovation was the creation of an institution dedicated to technology commercialization itself. Edison gathered financial stakes in many different corporations over the next 16 years, much of that equity via licensing his patents. The General Electric Company was finally formed in 1892 by the merging of the Thomson-Houston Electric Company (created by less well-known, but equally important GE founders, Elihu Thomson and Edwin Houston), and Edison's own General Electric. Just four years later, GE was an inaugural member of the Dow Jones Industrial Average.

1890 — Emerson Electric

John Wesley Emerson was a Union army veteran who provided $50,000 ($1.5m today) and the use of his name to Scottish-born orphans Charles and Alexander Meston. The brothers had patented an alternating current electric motor design and saw the opportunity to connect it to a fan. Opening premises in St. Louis, Missouri, the Emerson Electric Manufacturing Company supplied the United States with some of its first electric fans, bringing blessed relief for many during the humid American summer. While it no longer makes fans, Emerson is still based in St. Louis today, just nine miles from its first workshop downtown. Amongst many products for industrial, commercial and residential customers, it still produces climate technology solutions for hot days.


Perpetual
inspiration

A habit for the new

Communication technology expands rapidly, whole new industries are being created and the worlds of entertainment and electronics collide.

Advances in mobility replace century-old technologies, kicking off new rounds of innovation in energy storage, mechanics and power generation.

Manufacturing technology takes automation techniques to heart, opening previously unimagined horizons for efficiency.

Inspired by models from the United States and Europe, new companies are being founded in East Asia, opening new markets but also creating competition.

The world is dealing with the aftereffects of pandemic and technical enablement in the office is changing the way people work.

This was the world a century ago in 1921.

While innovation takes aim at the future, the drivers and dynamics that shape it are more constant.

The forces that stimulate ideas – utility, efficiency, reliability – repeat through every industry and technology.

The trade-offs fought against by engineers and designers change in intensity, but not consequence.

The innovation methods developed, honed and mastered a decade or a century before, retain their importance.

As exposure to volatility in markets causes headaches and havoc, as the world recovers from a year of painful change and emerges from the shadow of disease, the underlying and hidden power of organizational customs are weighed.

Innovation culture, a heritage of ideation, developing institutional habits focused on the new; these endure. They add a counterweight to volatility. They provide a strength for society to lean on and tap into. They act as a driving force for recovery and new growth.

In the end, markets decide whether success is achieved, whether products and companies remain relevant – but who decides the likelihood of that success, or the level of that underlying power? That, at Clarivate, we can measure.

Introducing the Top 100 Global Innovators™, 10-year anniversary edition.

1890 — Dow

Bromine is a useful but very reactive element. Originally discovered in the early 19th century, it is found in salt water but is difficult to manufacture. Canadian-born Herbert H. Dow invented the Dow process – a way of electrolytically extracting bromine from brine – and opened the door to the first economical production in quantity. His first attempt at business met with bankruptcy, but settling in Midland, Michigan he opened the Midland Chemical Company in 1890. Looking to diversify both his business and his electrolysis process, but his financial backers being less than enthusiastic, he gained funding from his fellow professors at the Case School of Applied Science (now Case Western Reserve University). Reorganizing under first the Dow Process Company, then later The Dow Chemical Company, he succeeded in applying his technique to chlorine. Dow is still headquartered in Midland.

1894 — Roche

With money from his father and patents from business partner (and chemist) Max Carl Traub, Fritz Hoffmann opened Hoffmann, Traub & Co in 1894 aged just twenty-six. Marrying Adele La Roche in 1895, and with Traub leaving the firm the next year, the company was renamed F. Hoffmann-La Roche & Co. From its first premises on Grenzacherstrasse in Basel, Switzerland, Hoffmann quickly created cough syrup and vitamin medicinal products to be sold across Europe. Roche is still headquartered on Grenzacherstrasse, albeit in a much larger building.

1899 — NEC

In the late 1880s, Kunihiko Iwadare, a Japanese electrical engineer, was working in the heady atmosphere of Edison Machine Works (later known as GE). Returning home, he took on contracts to represent GE and Western Electric (much later known as Lucent, now Nokia) as their agent in Japan. Galvanized by what he had seen in New York and with support from Western Electric, at the age of 42 Mr Iwadare established the Nippon Electric Company (NEC) in 1899. 122 years later, NEC generates almost $30 billion in annual revenues.

Creating the list

Innovation and patent activity are related, but not quite the same.

One is a process, the other one of many potential outcomes of that process. However, a sophisticated view of patent information – going beyond simply counting them – provides a measure of the ideation culture that produced those patents. This is how we do that.

Volume

To create an initial shortlist, we set a volume threshold that Top 100 candidates must meet. This is set at 100 granted patents received in the past five years, and more than 500 in the Derwent World Patents Index™ (DWPI™) in total, over any time period.

Influence

We assess the level of influence the ideas patented by each candidate have on the ideas of others, by reviewing the number of external citations their inventions have received in the past five years. These are references made to their patents during the application and examination process from patents that are registered later by someone else.

Success

We look at how successful each candidate is at getting their applications for patent protection issued by the patent offices of the world. Using the same five-year window, we review the proportion of granted patents to patent applications.

Globalization

We measure the investment levels of each candidate in their patent applications, a metric designed to assess both the importance of invention to the companies as well as the footprint of commercialization. Aimed at a set of jurisdictions that speak to significant cost – the United States, Europe, Japan and Mainland China – we assess the proportion of each candidate's activity that was filed in all four.

Using these four thresholds, we rank and collate the thousands of candidates down to the Top 100 Global Innovators.

Leaning on advanced data

Derwent™

Powering the innovation lifecycle from idea to commercialization, Derwent offers trusted patent data, applications and services. Our solutions are used to monitor technology trends and competitive landscapes, inform FTO opinions, prosecute patents, monetize and license assets and support litigation activities.

Derwent World Patents Index

A database built around ideas, DWPI records where and when inventions are patented across 59 patent-issuing states and authorities.

DWPI re-writes these patents into English-language invention summaries, their intended use, why they are needed and what is novel about them – 3.5 million times a year.

Derwent Patents Citation Index™

A sister database to DWPI, Derwent Patents Citation Index focuses on inventions that have been referenced by applicants and patent examiners in later, following patent applications.

Emulating the DWPI invention-level structure, Derwent Patents Citation Index automatically removes double, triple (or more) counting of citation events between the same patented ideas.

1902 — 3M

The five founders of the Minnesota Mining and Manufacturing Company thought they had a winner. Signing incorporation papers at 201 Waterfront Drive, Two Harbors, northern Minnesota in 1902, they believed the corundum deposits along the north Lake Superior shore were a mineral fortune waiting to happen when turned into grinding abrasives. Their hopes were dashed when they discovered the corundum was actually low-grade (and poor abrasive) anorthosite. Quickly re-financing, the founders turned to research, sourcing different materials that they could use to manufacture sandpaper. A century after their founding, the company finally renamed itself in 2002 after its nickname: 3M.

1906 — Honeywell

Mark Honeywell started his first company, M C Honeywell Heating and Sanitary Work, at the turn of the 20th century. Honeywell pioneered automated heating controls. After installing his revolutionary hot water system in his own house, he patented his hot water expansion tank design in 1906. Building a profitable company, by the 1920s, mutually blocking patents between Honeywell and competitor the Minneapolis Heat Regulator Company saw the two firms join forces and become the Minneapolis-Honeywell Regulator Company. 115 years later, Honeywell is a global conglomerate, and still well known for its automated heating controls.

1910 — Hitachi

In 1906, Namihei Odaira was working as an electrical engineer for the Kuhara Mining Company, at its copper mine in the then small village of Hitachi in Ibaraki Prefecture, Japan. Located on the east coast of Japan, about 80 miles northeast of Tokyo, Odaira's routine maintenance work led to his team designing a new electric motor. Funded by Kuhara-san, the president of the mining company, Odaira's firm became independent in 1920. Hitachi, the village, is now a city of 175,000 people. Hitachi, the company, is today a global conglomerate with businesses that span construction, telecommunications, data and AI.

Top 100 Global Innovators 2021

As we enter 2021, the world looks different.

Pandemic has increased attention on healthcare, protective equipment and diagnostics. It has also changed the workplace, introduced new economic pressures and drastically accelerated existing ones.

Innovation in 2021 has an increased urgency and a heightened need. Upended industries need to react fast, and economies need new value.

At Clarivate, we take this mission as our own, our goal to guide, inform and provide clarity. We help to accelerate the lifecycle of innovation by providing actionable information and insights, helping customers solve some of the world's most complex problems and reducing the time from new ideas to life-changing inventions.

Each year we celebrate those companies and institutions that contribute new ideas, solve problems and create new economic value. From our analysis, we rank the 100 innovators that sit right at the top of that global innovation landscape.

Here are the Top 100 Global Innovators 2021.

1916 — Boeing

Seattle timber baron William Boeing became fascinated with flight in 1910 after attending the first U.S. airshow in Los Angeles. In 1915, he took flying lessons before purchasing his own airplane, a Martin TA trainer. Within months, Boeing had decided he could build a better airplane, and enlisted the help of his friend, U.S. Navy Lieutenant George Conrad Westervelt. The result was a seaplane made of wood, linen and wire – the B & W after its designers' initials. Exactly one month later, on July 15, 1916, Boeing founded Pacific Aero Products Company. When the United States entered World War I on April 6, 1917, Boeing had already been thinking about the prospects of military aviation. The following month the company changed its name to Boeing Airplane Company, and the U.S. Navy ordered 50 of the company's new Model C trainers. In July 1927, Boeing's newly-formed airline – Boeing Air Transport soon evolved into United Aircraft and Transport. Though dissolved in 1934, its businesses live on in The Boeing Company, United Technologies and United Airlines. Today, Boeing is one of the world's largest aerospace companies and America's largest exporter.

1918 — Panasonic

March 7, 1918, Tokyo: 23-year old Konosuke Matsushita opens Matsushita Electric Housewares with just three employees – himself, his wife Mumeno and his brother-in-law Toshio Iue (who would later found Sanyo Electric). In less than a year, the company would have 20 employees and focus on high quality and easy to use household electrical plugs and sockets. In 1955 the brand Panasonic was used by Matsushita Electric for the first time, only becoming the name of the firm in 2008. In 2009, 91 years after the original foundation, Sanyo Electric merged into Panasonic Corporation, reuniting the founding family's businesses.

1926 — Shin-Etsu Chemical

In the 1920s a plant manager at the Nichitsu conglomerate, Iwahasi Yu, created the Shin'etsu Electric Company as a new subsidiary, taking its name from the Shin'etsu region of central Japan. Continuing the development begun at Nichitsu of synthetic production of natural chemicals, by September 1926, the subsidiary had morphed into Shin'etsu Nitrogenous Fertilizer, producing chemical fertilizer and agricultural lime products. With the end of WWII, the large Nichitsu zaibatsu was broken up into several companies that still exist today, including Shin-Etsu Chemical.

Top 100 Global Innovators 2021

Innovator	Country / region	Industry	Recognition (2012–21)	Highlights
3M	United States	Chemicals and materials	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
ABB	Switzerland	Industrial systems	2012 2014 2015 2020 2021	
Abbott	United States	Pharmaceuticals	2014 2015 2016 2017 2018 2020 2021	
AGC	Japan	Chemicals and materials	2014 2015 2018 2019 2020 2021	
Aisin Seiki	Japan	Automotive	2015 2016 2017 2018 2019 2020 2021	
Amazon	United States	Software, media, fintech	2016 2017 2018 2019 2020 2021	
AMD	United States	Semiconductors	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Analog Devices	United States	Semiconductors	2012 2013 2014 2016 2017 2018 2019 2020 2021	
Apple	United States	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Arm	United Kingdom	Semiconductors	1st time entrant 2021	
ASUS	Taiwan	Electronics and computing equipment	1st time entrant 2021	
AT&T	United States	Telecommunications	2013 2014 2015 2020 2021	
BASF	Germany	Chemicals and materials	2012 2015 2016 2017 2018 2019 2020 2021	
Bayer	Germany	Pharmaceuticals	2012 2016 2017 2018 2019 2020 2021	
BD	United States	Medical and biotechnology	2016 2017 2018 2019 2020 2021	
BlackBerry	Canada	Telecommunications	2014 2015 2016 2020 2021	
Boeing	United States	Aerospace and defense	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
BorgWarner	United States	Automotive	1st time entrant 2021	
Bose	United States	Electronics and computing equipment	1st time entrant 2021	
Boston Scientific	United States	Medical and biotechnology	2017 2018 2019 2020 2021	
Bristol Myers Squibb	United States	Pharmaceuticals	2012 2016 2017 2021	
Casio Computer	Japan	Electronics and computing equipment	2015 2016 2018 2020 2021	
China Academy of Telecommunications Technology	China, Mainland	Government and academic research	1st time entrant 2021	
Cisco	United States	Telecommunications	2019 2020 2021	
Corning	United States	Industrial systems	2012 2013 2014 2015 2017 2019 2020 2021	

10-Year Top 100 Global Innovator

2020 Innovator to watch

Innovator	Country / region	Industry	Recognition (2012–21)	Highlights
Daikin Industries	Japan	Industrial systems	2012 2015 2016 2017 2018 2019 2020 2021	
Dolby Laboratories	United States	Electronics and computing equipment	2017 2018 2019 2020 2021	
Dow	United States	Chemicals and materials	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Emerson Electric	United States	Industrial systems	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Ericsson	Sweden	Telecommunications	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Facebook	United States	Software, media, fintech	2018 2020 2021	
Foxconn	Taiwan	Electronics and computing equipment	2018 2019 2020 2021	
Fraunhofer-Gesellschaft	Germany	Government and academic research	2014 2015 2016 2017 2018 2019 2020 2021	
FujiFilm	Japan	Electronics and computing equipment	2013 2014 2015 2016 2017 2018 2019 2020 2021	
Fujitsu	Japan	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Furukawa Electric	Japan	Energy and electrical	2015 2016 2018 2019 2020 2021	
GE	United States	Industrial conglomerate	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Google	United States	Software, media, fintech	2013 2014 2015 2016 2017 2018 2019 2020 2021	
Hitachi	Japan	Industrial conglomerate	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Honda	Japan	Automotive	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
Honeywell	United States	Industrial systems	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
HP	United States	Electronics and computing equipment	2012 2013 2014 2015 2020 2021	
Huawei	China, Mainland	Telecommunications	2015 2017 2018 2019 2020 2021	
Immersion	United States	Electronics and computing equipment	2020 2021	
Intel	United States	Semiconductors	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	🏆
ITRI	Taiwan	Government and academic research	2015 2018 2019 2020 2021	
Johnson & Johnson	United States	Pharmaceuticals	2014 2015 2016 2017 2018 2019 2020 2021	
Johnson Controls	United States	Industrial systems	2016 2017 2018 2019 2020 2021	
KAIST	South Korea	Government and academic research	2013 2021	
Kawasaki Heavy Industries	Japan	Industrial systems	2016 2017 2018 2019 2020 2021	

Top 100 Global Innovators 2021

Innovator	Country / region	Industry	Recognition (2012–21)	Highlights
Kinpo Electronics	Taiwan	Electronics and computing equipment	1st time entrant 2021	
KLA Corporation	United States	Semiconductors	1st time entrant 2021	
Kobe Steel	Japan	Mining and metals	2015 2016 2017 2018 2019 2020 2021	
Komatsu	Japan	Industrial systems	2015 2016 2017 2018 2019 2020 2021	
LG Electronics	South Korea	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
LS Electric	South Korea	Energy and electrical	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Medtronic	United States	Medical and biotechnology	2015 2016 2017 2018 2019 2020 2021	
Microchip Technology	United States	Semiconductors	2020 2021	
Microsoft	United States	Software, media, fintech	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Mitsubishi Electric	Japan	Energy and electrical	2012 2013 2014 2015 2016 2018 2019 2020 2021	
Mitsubishi Heavy Industries	Japan	Industrial systems	2013 2014 2015 2016 2017 2018 2019 2020 2021	
NEC	Japan	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Nichia	Japan	Chemicals and materials	2018 2019 2020 2021	
Nike	United States	Consumer goods and food	2013 2014 2015 2016 2017 2018 2019 2020 2021	
Nippon Steel	Japan	Mining and metals	2013 2014 2015 2016 2017 2018 2019 2020 2021	
Nissan	Japan	Automotive	2014 2015 2016 2017 2018 2019 2020 2021	
Nokia	Finland	Telecommunications	2017 2018 2019 2020 2021	
NortonLifeLock	United States	Software, media, fintech	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Novartis	Switzerland	Pharmaceuticals	2015 2016 2017 2018 2019 2020 2021	
NTT	Japan	Telecommunications	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
NXP Semiconductors	Netherlands	Semiconductors	2017 2018 2019 2020 2021	
Omron	Japan	Semiconductors	2014 2017 2018 2019 2020 2021	
Oracle	United States	Software, media, fintech	2014 2015 2016 2017 2018 2019 2020 2021	
Panasonic	Japan	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Philips	Netherlands	Medical and biotechnology	2012 2014 2015 2016 2017 2018 2019 2020 2021	

10-Year Top 100 Global Innovator

2020 Innovator to watch

Innovator	Country / region	Industry	Recognition (2012–21)	Highlights
Qorvo	United States	Telecommunications	1st time entrant 2021	
Qualcomm	United States	Telecommunications	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Quanta Computer	Taiwan	Electronics and computing equipment	2019 2020 2021	
Raytheon Technologies	United States	Aerospace and defense	2012 2013 2019 2020 2021	
Renesas Electronics	Japan	Semiconductors	2017 2018 2019 2020 2021	
Roche	Switzerland	Pharmaceuticals	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Saint-Gobain	France	Chemicals and materials	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Samsung	South Korea	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Schneider Electric	France	Energy and electrical	2020 2021	
Shin-Etsu Chemical	Japan	Chemicals and materials	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
SK Telecom	South Korea	Telecommunications	1st time entrant 2021	
Sony	Japan	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
TDK	Japan	Electronics and computing equipment	2013 2014 2015 2018 2019 2020 2021	
TE Connectivity	United States	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Tencent	China, Mainland	Software, media, fintech	2020 2021	
Texas Instruments	United States	Semiconductors	2013 2014 2015 2018 2019 2020 2021	
Thales	France	Aerospace and defense	2013 2014 2016 2017 2018 2019 2020 2021	
Toshiba	Japan	Electronics and computing equipment	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
Toyota	Japan	Automotive	2012 2013 2014 2015 2016 2017 2018 2019 2020 2021	
University of California	United States	Government and academic research	2017 2020 2021	
Xerox	United States	Electronics and computing equipment	2012 2013 2014 2015 2017 2018 2019 2020 2021	
Xiaomi	China, Mainland	Telecommunications	2019 2020 2021	
Xilinx	United States	Semiconductors	2013 2014 2015 2016 2017 2018 2019 2020 2021	
Yaskawa Electric	Japan	Industrial systems	2016 2017 2018 2019 2020 2021	
Yazaki	Japan	Automotive	2016 2017 2021	

One year on

Increased entries in the Top 100 from: Mainland China, the United Kingdom, South Korea, Taiwan and the United States

Jump in electronics and semiconductor firms in the Top 100: Bose, Kinpo Electronics, KLA, ASUS, Arm and Qorvo are new entrants

The importance of innovation in the automotive sector underlined by the addition of two further companies: BorgWarner and Yazaki, notably both major suppliers rather than OEMs

Two fewer entries from France and three fewer from Japan

The first Mainland Chinese research institution enters the Top 100 – the Chinese Academy of Telecommunications Technology; joining ITRI in Taiwan, the University of California in the U.S. and Fraunhofer-Gesellschaft of Germany. Also rejoining the Top 100 is KAIST in South Korea

The first British company enters the Top 100, Arm, while also this year being acquired by Nvidia

Nine first-time Top 100 Global Innovators (six of which were predicted as *Innovators to Watch*): BorgWarner, ASUS, Bose, Kinpo, China Academy of Telecommunications Technology, Arm, KLA, Qorvo and SK Telecom

1926 — Toyota

Sakichi Toyoda, the son of a carpenter, was a prolific inventor and entrepreneur that specialized in power looms for the textile industry. Establishing Toyoda Automatic Loom Works in November 1926, the company was expanded under Sakichi's eldest son Kiichiro Toyoda, who focused the business on manufacture and development of their Type G Automatic Loom. Spotting the opportunity to create a domestic Japanese automotive industry, Kiichiro opened the company's Automotive Production Division in September 1933. Toyota Automatic Loom Works still exists today as Toyota Industries, is a $20.5 billion company, and still makes textile equipment. The Automotive Production Division, now the Toyota Motor Corporation, is a $286 billion company.

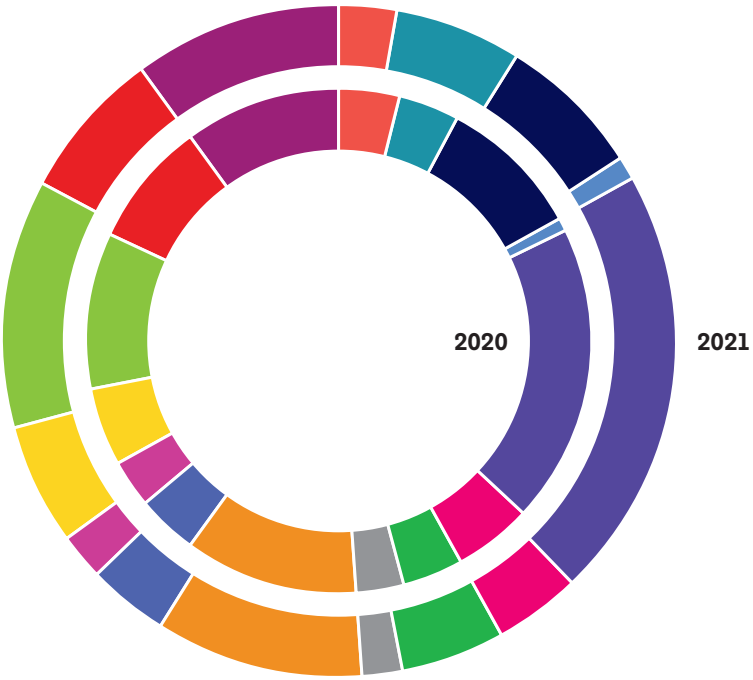
1935 — Fujitsu

In 1923, the Fuji Electric company was created as a joint venture between Furukawa Electric and German industrial firm Siemens. The name coming from Furukawa and the Japanese transliteration of Siemens as *jiimensu*, Fuji Electric span off its telecommunications arm as Fuji Telecommunications Equipment Manufacturing (or Fuji Tsushinki). By the 1950s, the company's research in telecoms and data had produced the FACOM 100, Japan's first computer.

1938 — Samsung

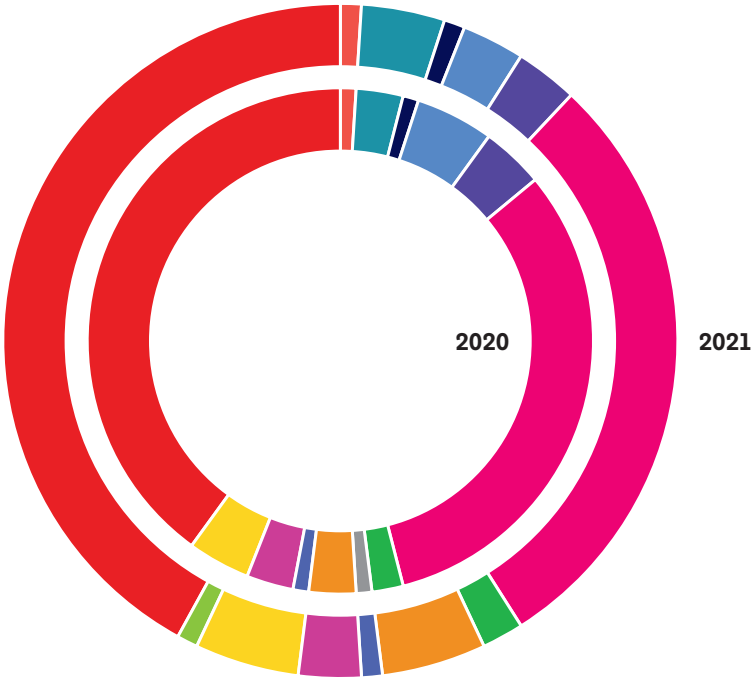
Lee Byung-chul was born in 1910 in Uirueong County, near the southern tip of the Korean peninsula. From a wealthy land-owning family, he opened a logistics business called Samsung ("three stars") with a $2,000 nest egg and 40 employees. Possibly as a reaction to the disruption the Korean War caused his growing company, he sought to diversify as quickly as possible, opening a sugar refinery, an insurance company, retail stores and, in January 1969, an electronics subsidiary by launching a radio and television station, as well as by manufacturing televisions and electronic components. Samsung Electronics' rapid rise and technical achievements put the company in the spotlight in the semiconductor industry by early 1995. Reinventing its research and product design philosophy in 1996, Samsung Electronics today is a global brand with annual sales of $200 billion.

Top 100 Global Innovators
by industrial sector



Sector	2020	2021
Aerospace and defense	4%	3%
Automotive	4%	6%
Chemicals and materials	9%	7%
Consumer goods and food	1%	1%
Electronics and computing equipment	19%	21%
Energy and electrical	5%	4%
Government and academic research	4%	5%
Industrial conglomerate	3%	2%
Industrial systems	11%	10%
Medical and biotechnology	4%	4%
Mining and metals	3%	2%
Pharmaceuticals	5%	6%
Semiconductors	10%	12%
Software, media, fintech	8%	7%
Telecommunications	10%	10%

Top 100 Global Innovators
by geography



	Country	2020	2021
	Canada	1%	1%
	China, Mainland	3%	4%
	Finland	1%	1%
	France	5%	3%
	Germany	4%	3%
	Japan	32%	29%
	Netherlands	2%	2%
	Russia	1%	0%
	South Korea	3%	5%
	Sweden	1%	1%
	Switzerland	3%	3%
	Taiwan	4%	5%
	United Kingdom	0%	1%
	United States	40%	42%

1941 — TE Connectivity

In 1941 Uncas Whitaker was a mechanical and electrical engineer (and lawyer) working for American Machine & Foundry. Starting his own firm, Aircraft Marine Products, just before the United States entered WWII, he specialized in easily inter-changeable wire connectors (avoiding more complex and unwieldy soldered connections) that the newly instigated war economy generated huge demand for. By the mid-1990s, AMP was a major U.S. electrical and electronic connector manufacturer, and was acquired by Tyco. When Tyco broke up in 2007, the roots of AMP emerged as Tyco Electronics. In 2011, it was renamed TE Connectivity. A global company now headquartered in Switzerland, one of its major product lines remains AMP Connectors.

1946 — Sony

In May 1946, Masaru Ibuka and Akio Morita established Tokyo Tsushin Kogyo (Tokyo Telecommunications Engineering Corporation) with more than 20 colleagues in a room in the Shiroki-ya department store building in Nihonbashi, Tokyo. After developing and launching Japan's first tape recorder in 1950, Ibuka's visit to the United States led to the acquisition of a patent license to manufacture transistors developed by Bell Labs. Based on this technology, the company succeeded in launching Japan's first commercial transistor radio, under the brand name 'Sony.'

1946 — Honda

Soichiro Honda was a garage mechanic and racing enthusiast, entering tuned cars into races. Opening his first company in 1937, Eastern Sea Precision Machine Company, it was a parts supplier to Toyota's automobile department. When the effects of war and the 1945 Mikawa earthquake physically damaged the business, he sold it and opened a research institute in 1946. The institute was reincorporated as the Honda Motor Company in 1948, focusing on motorcycles. By the early 1960s, Honda was the largest motorcycle manufacturer in the world, and its bikes were winning titles in international races. Racing and research ever hand-in-hand at Honda, in 1988 a Honda-engined car won both the drivers and constructors Formula One World Championships.

Tradition

# of inn

ovation

1947 — LG Electronics

The first ancestor of the LG group of companies was the Lak Hui Chemical Industrial Corporation, opened in 1947 by Koo In-Hwoi, a Seoul retail store owner. The company specialized in cosmetics and face creams. Pronounced "Lucky," in 1958 it created Goldstar during the reconstruction of South Korea after the Korean war. Goldstar, with an early technical partnership with Hitachi, was by the 1960s manufacturing radios, refrigerators and televisions for the domestic Korean market. By the end of the decade, the firm had begun semiconductor fabrication. In 1983, the overall ownership had changed to the Lucky Goldstar Group, and finally LG in 1995.

1952 — NTT

Founded as a state company in 1952, Nippon Telegraph and Telephone was only privatized in 1985. Now a $109 billion company, NTT has subsidiaries across IT consulting and mobile communications, and still provides the backbone of telecommunications across Japan.

1968 — Intel

In 1953, Bill Shockley, co-inventor of the transistor, opened the Shockley Semiconductor Laboratory in Mountain View, California. Not knowing it at the time, he had just created Silicon Valley. Eight immensely talented members of the lab, upset with Shockley's management style and with financial backing from Sherman Fairchild, opened Fairchild Semiconductor in 1957. The eight included Gordon Moore and Robert Noyce. While at Fairchild, Noyce invented the first silicon integrated circuit. He and Moore created their own firm in 1968, NM Electronics. Within a month this was changed to Intel – short for Integrated Electronics. They opened their first major facility two years later in the pear orchards on the corner of Bowers Avenue and Central Expressway in Santa Clara. Intel is still on the site today.

The hidden value of innovation culture

Understanding how powerful the innovation culture is inside any firm is a powerful indicator of long-term success.

Markets are good at measuring outcomes (revenues, sales, cash) and inputs (investment, research and development, employees, acquisitions). However, the market struggles to measure the conversion of investment to outcomes. They can know it after the fact, through measuring the returns on those investments, yet not so well while the process is occurring, nor often at all for younger companies.

To understand the value of consistency in innovation, we looked at the stock performance of the 10-year Top 100 Global Innovators, specifically the 28 publicly traded companies with consistent stock makeup over the period (out of the full 29), and treated them as a single investment cohort.

Taking a starting point as October 2014, the 28 companies on average returned almost 2.5x growth by October 2020. This is a compounded growth rate of 16% per year, compared to just 9% for the Dow Jones Industrial Average or 10% for the S&P 500. While an investment in a tech index like the NASDAQ Composite could have provided greater returns, most of our cohort are not tech stocks.

To measure the value of the consistent Top 100 Global Innovators against a control, we looked at innovators that left the Top 100 list early on, of which there were 24. Their return was 1.2x between 2014 and 2020, after just 6 years opening a valuation gap between the two groups *of $57 billion per company*. For the lower group, that is more than double their actual 2020 value.

Lastly, the events of 2020 widened the gap further, with the 10-year Top 100 Global Innovators increasing the valuation gap at a time of significant economic disruption.

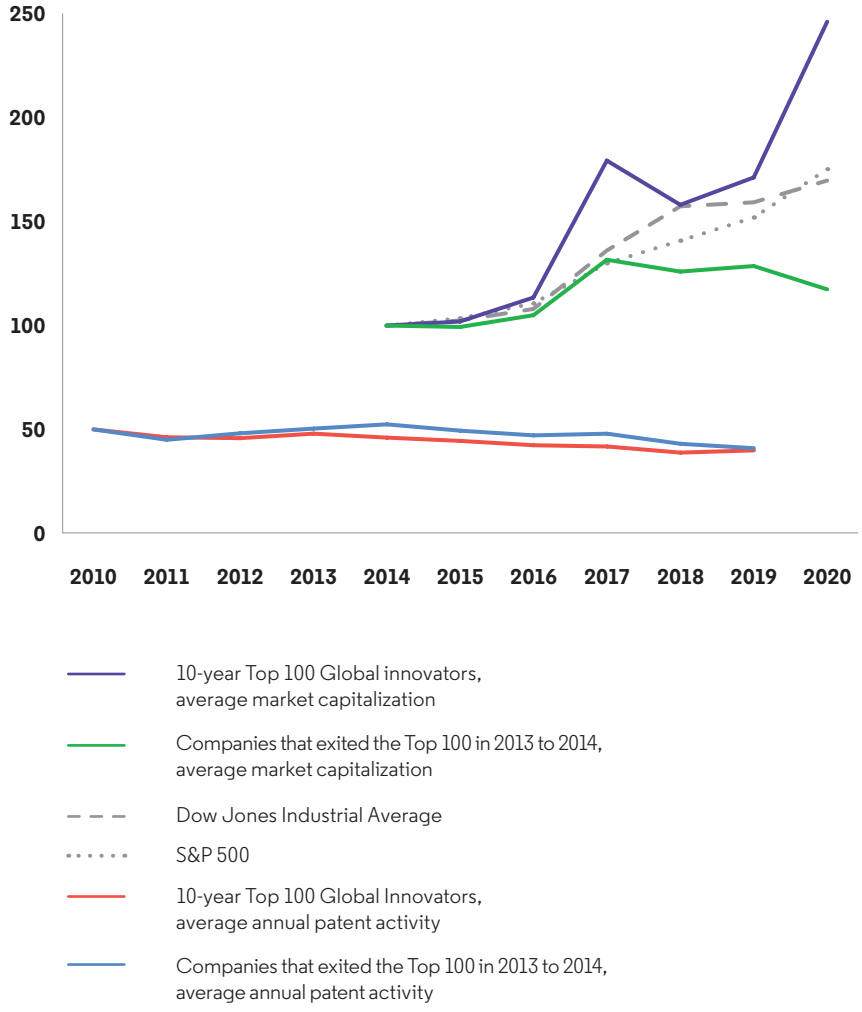
While there are many variables, such as the markets the companies sit in geographically and industrially, and these groups of companies are relatively small, our conclusion is that innovation culture matters a great deal.

Sustaining a trend we noted in our study last year, the volume of patent activity from both groups of companies continues to decline, as focus further shifts from profligacy in patent filing to selectivity. It also means that simply measuring the number of inventions or patents companies produce contains no information on their innovation culture, other than they file for patent protection.

Assessing the commitment, the influence and the novelty of their patented research shines daylight onto the otherwise hidden strengths these companies contain.

Figure 1: Measuring the value of innovation culture

Companies that have remained on the Top 100 list for the past ten years display significant growth well above both market averages and companies that have exited the list – even as patent activity remains comparable. This study points to the hidden value of these companies' enduring commitment, as well as the influence and novelty of their patented research.



Market capitalization growth between Oct 2014 and Oct 2020 of 10-year Top 100 Global Innovators (n=28) v Companies that exited the Top 100 in 2013 or 2014 (n=24), Includes comparison to Dow Jones Industrial Average and S&P 500, 2014 values = 100;

Average annual patent activity between 2010 and 2019 of 10-year Top 100 Global Innovators, v Companies that exited the Top 100 in 2013 or 2014, 2010 values = 50

1969 — AMD

Founding another of the "Fairchildren" (companies created by alumni of Fairchild Semiconductor), Jerry Sanders was Fairchild's director of marketing (and an electrical engineer). With Moore and Noyce leaving the firm the year before, and frustration growing among the engineers with the direction at Fairchild, Sanders helped seven of his colleagues (Frank Botte, John Carey, Jack Gifford, James Giles, Sven Simonsen, Lawrence Stenger and Edwin Turney) open Advanced Micro Devices in Sunnyvale, California on May 1, 1969. In 1999, AMD launched the first microprocessor to cycle a billion times a second (though within days of fierce competitor Intel) and today manufactures chips for the PC market with features just 14 silicon atoms wide.

1974 — LS ELECTRIC

LS ELECTRIC was founded in 1974 as Lucky Packing, a business of the wider LG Group of companies at the time. The power and automation industry firm separated from LG to become part of the LS Group in 2003, becoming LSIS. In 2020, LSIS changed its name to LS ELECTRIC, transitioning to a digital platform business.

1975 — Microsoft

Bill Gates and Paul Allen met at Lakeside School in Seattle, Washington, in the late 1960s. With Gates studying at Harvard, and Allen working at Honeywell in Boston, the two friends were excited by the potential of new microcomputers, such as the Altair 8800. Demonstrating their BASIC interpreter to Altair manufacturer Micro Instrumentation and Telemetry Systems at their headquarters in Albuquerque, New Mexico, in 1975 Gates and Allen signed a contract with MITS for the rights to their interpreter for $3,000. Both became MITS contractors via their consultancy company, Micro-Soft, founded right there in Albuquerque. In 1979, Gates and Allen moved the company back to their hometown, settling now-Microsoft in Bellevue, Washington.

An ideation keel

The painful story of 2020 includes millions of families losing loved ones, and millions more suffering the stress and worry of economic insecurity as wealth retracts at rates never seen in the modern age.

That suffering has not been equal, affecting groups of people disproportionately – minorities, the elderly, the ill, the poorest – and industries unevenly – hospitality, sports, travel, retail. The lasting effects are not entirely known, but it seems likely that the world is changed forever.

However, pharmaceutical companies have taken on the immediate mission of hunting for the societal protection a vaccine will provide. Software firms rapidly provided new ways for people to still work effectively at a distance. High tech manufacturers redirected 3D printing equipment to personal protective equipment (PPE) production and brewers made alcohol gel.

Even as the healthcare crisis subsides, all engineers, research scientists, product designers, software developers – innovators everywhere – represent a resource for human society to weather the storm of COVID-19.

The history we have reflected on in this study offers comfort. We see that humanity has suffered shock events like conflict and disease before, and just as capital and wealth are destroyed today, innovation will continue to be a source of replenishment. Stimulated by the new and pre-pandemic challenges our society faces such as climate change, energy challenges and now rapid market shifts, new solutions provide an overwhelming force for a return to economic growth and the creation of new jobs and industries.

The keel of ideation, the stability that the world's innovators add and the counterweight to volatility they can contribute are more critical today than ever before.

Our foundational belief at Clarivate that innovation can change the world for the better has never been more urgent. We recommit to provide the information innovators everywhere need to turn bold ideas into life-changing innovations – now and in the changing world ahead.

1976 — Apple

Homestead High School, Cupertino, California, 1971: a common friend introduces Steve Wozniak, who graduated a few years before and was working at Hewlett Packard, to Steve Jobs, then still a senior. Both members of the Homebrew Computer Club, Wozniak designed computers in his spare time which he gave away (even offering designs to HP, which they declined), while Jobs constantly tried to get Wozniak to have them make money. Finally convinced, they created Apple Computer Inc on April 1, 1976; named after a fruit orchard Jobs had visited in Oregon and intentionally chosen to sound different to the generic three-letter-acronyms of existing firms. When their first major investor came along, an Intel marketing executive, they insisted Wozniak quit his cherished job at HP. Today, Apple generates over $260 billion in revenue, its Apple Park HQ just 3,500 yards from Homestead High School.

1982 — NortonLifeLock

Gary Hendrix, a computer science doctorate, was working at the Stanford Research Institute, Menlo Park, California on AI natural language processing and semantics in the mid-1970s. In 1979, with a $25,000 grant from the National Science Foundation, he formed the Machine Intelligence Corporation with colleagues from SRI, where they designed and ran their language algorithms on recently released Apple II computers. Gaining a huge $30m in funding from multiple backers, the company quickly burned its cash and failed. Convinced he could make something, Hendrix returned to his job at SRI, and in 1982 he formed Symantec. Acquiring Peter Norton Computing in 1990, Symantec became best known for its Norton Utilities software. In 2019, Symantec was acquired by Broadcom and became NortonLifeLock.

1985 — Qualcomm

Irwin Jacobs, a University of California San Diego professor of computer science and engineering, founded Linkabit Corporation in 1968, a firm specializing in communication electronics. Sold in 1980, several Linkabit colleagues (Jacobs, along with Franklin Antonio, Adelia Coffman, Andrew Cohen, Klein Gilhousen, Andrew Viterbi and Harvey White) left in 1985 to form Qualcomm. A play on "quality communications," the new company expanded from satellite communications into digital wireless systems and developed the first standardized Code Division Multiple Access (CDMA) digital cellular system that is still the foundation of the mobile systems we use today.

About Clarivate

Clarivate™ is a global leader in providing solutions to accelerate the lifecycle of innovation. Our bold mission is to help customers solve some of the world's most complex problems by providing actionable information and insights that reduce the time from new ideas to life-changing inventions in the areas of science and intellectual property.

We help customers discover, protect and commercialize their inventions using our trusted subscription and technology-based solutions coupled with deep domain expertise. For more information, please visit clarivate.com.

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