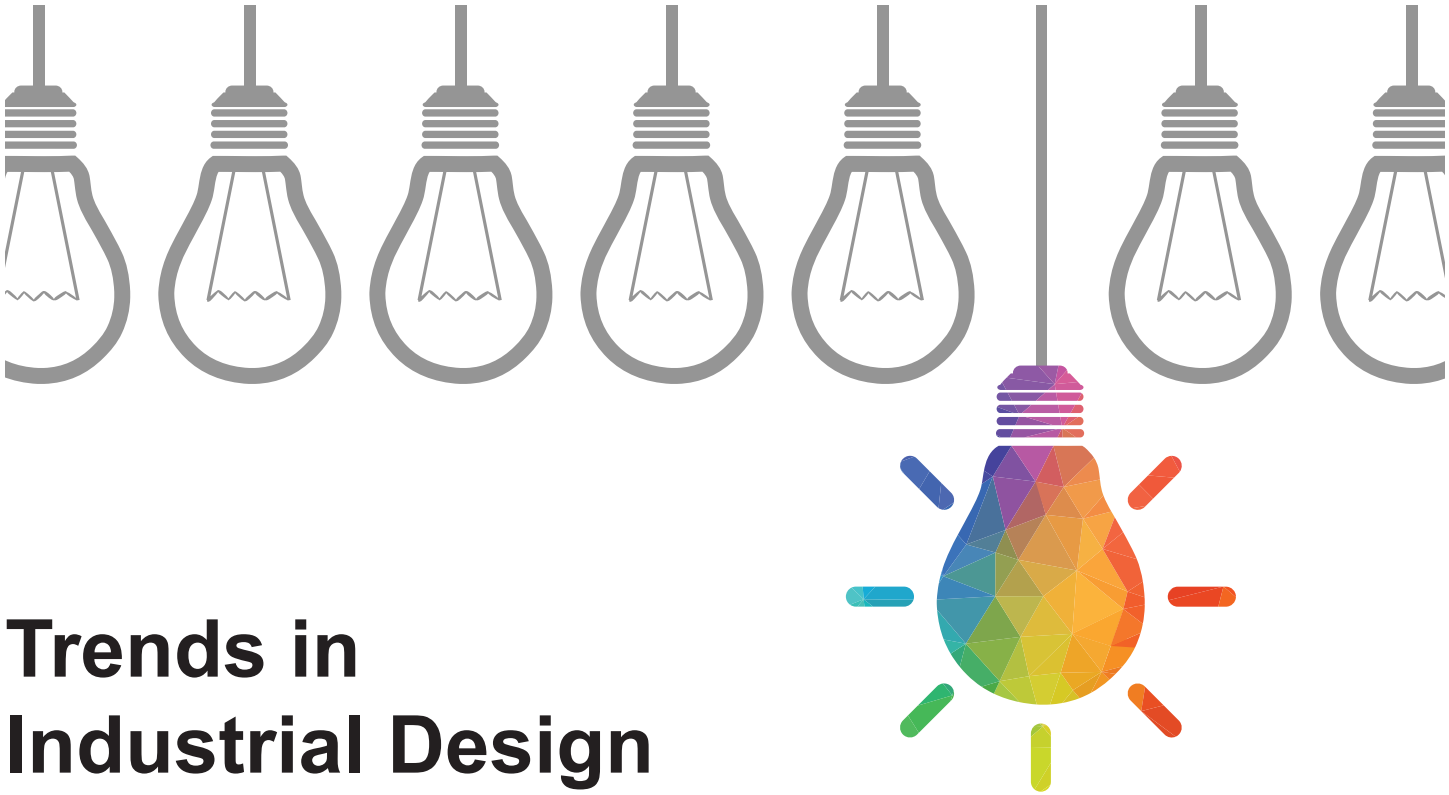


Trends in Industrial Design

Graphical User Interface (“GUI”) design patents offered a new approach to protecting software-related innovation just as the USPTO was changing its examination practices to make software-related utility patents harder to obtain. GUI design patents are especially attractive because these applications are granted almost 100% of the time.

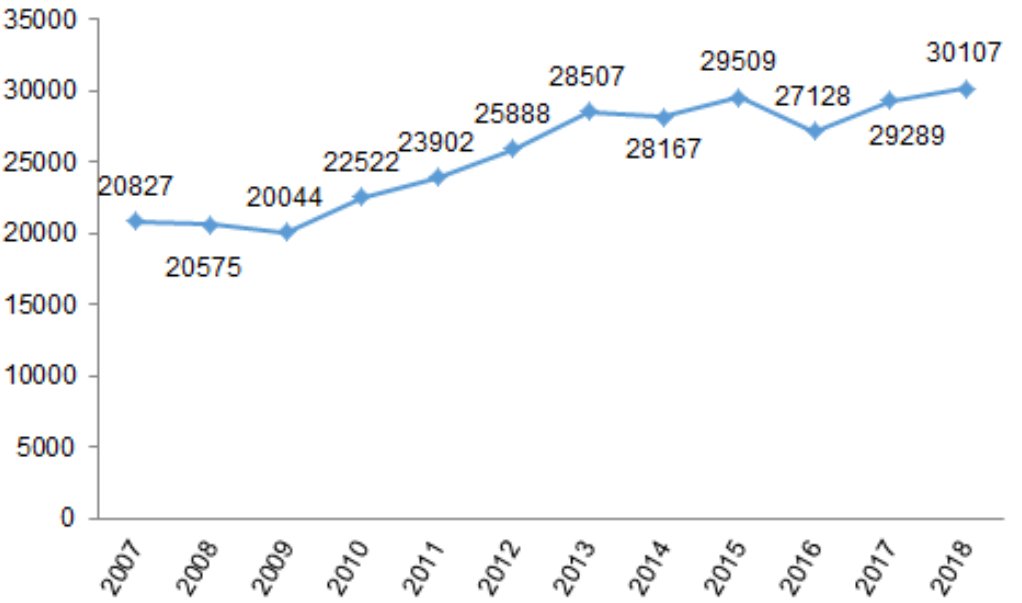
Trends in Industrial Design

As consumers become ever more discerning and global competition continues to rise, the role of industrial design is increasingly vital for providing a positive customer experience and for product differentiation in all economic sectors. Industrial Design is focused on design patent protection of the ornamental features of a functional product. The term of a design patent is 15 years from issuance and typically less than a utility patent term of 20 years from filing. To delve deeper into the trends of patenting industrial design innovation, we have defined the following technology clusters within the general Industrial Design industry:

Level I Clusters	**Level II Clusters**
Graphical user II-terrace	-
Industrial Design	Automobile & Transportation
	Building & Architecture
	Computer &. Accessories
	Consumer Electronics
	Cosmetics & Personal Accessories
	Home Furnishing
	Machinery
	Medical/Laboratory Equipment
	Office Equipment
	Pet Products
	Power Generation & Distribution
	Sports Apparel
	Sports Equipment
	Textile & Clothing
	Tools/Hardware
	Toys
	Weapons

Taxonomies and expanded definitions of these clusters are included in appendix A.

Patent filings are on the rise in the Industrial Design industry



Our data was limited to design patents - the most prevalent type of patent being sought in the Industrial Design industry. Design patents have traditionally had several advantages over utility patents. First, there is a significantly higher allowance rate than for utility patents. Second, design patents are issued in 12-18 months, unlike utility patents, which typically take over three years or even longer in hot areas where finding qualified examiners would be difficult. Third, statutory law provides damages in the sum of total profits on an article of manufacture that infringes a protected design whereas infringement damages for utility patents are parsed to the smallest saleable unit or part that embodies the invention (making damages calculations highly complex).[69] The predictability of both the prosecution process for design patents and of the damages for infringement has created a favorable climate for design patent filings. And indeed, we see a rising number of design patent filings in the past decade.

While there has been considerable growth in patent filings in the Industrial Design industry in the past decade, there have also been a couple of dips. The first dip in patent filings occurred during the Great Recession of 2008, when many economic sectors experienced a difficult climate that led to reduced patenting activity. The second dip, in 2016, was likely created by an atmosphere of uncertainty in the wake of the Supreme Court's *Samsung v. Apple* decision, in which the Court held that an "article of manufacture" could refer to the finished product *or a component of the finished product*. This decision upended the long-held view that design patentees were always entitled to total profits from an infringing product.

Recent court decisions have adopted a four-factor test advocated by the Solicitor General in an amicus brief in *Samsung v. Apple*. The test considers the scope, design prominence, conceptual distinctness, and severability of the patented design and the infringing finished product. Under this test, it is still possible to obtain damages in the sum of total profits on the finished product, and at least one jury has awarded such damages since the *Samsung v. Apple* case.

The recent case law appears to have assuaged applicants' concerns regarding the value of design patents, and this renewed optimism is reflected in the number of patent filings that keeps increasing year over year.

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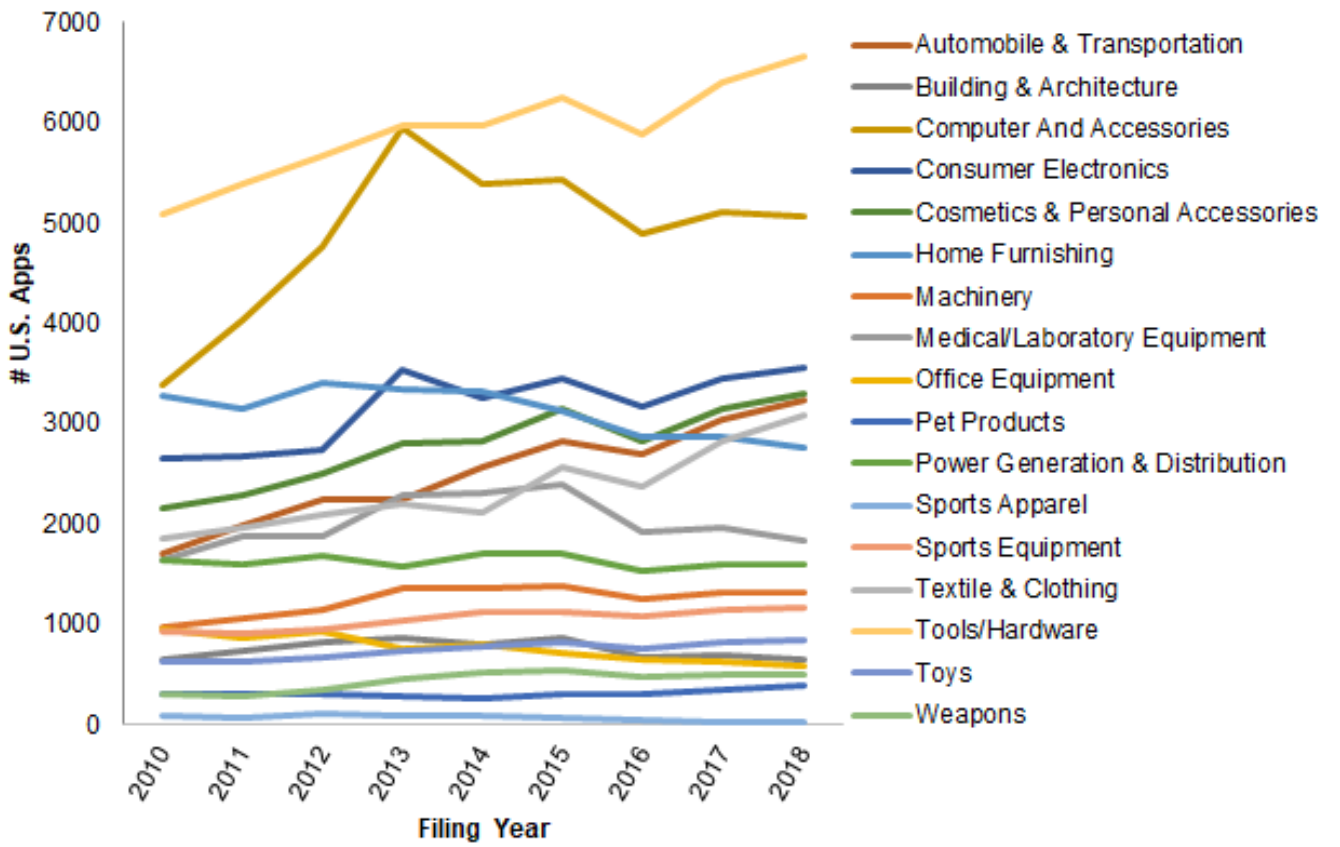
[69] https://www.jdsupra.com/legalnews/recent-developments-determining-design-36881/

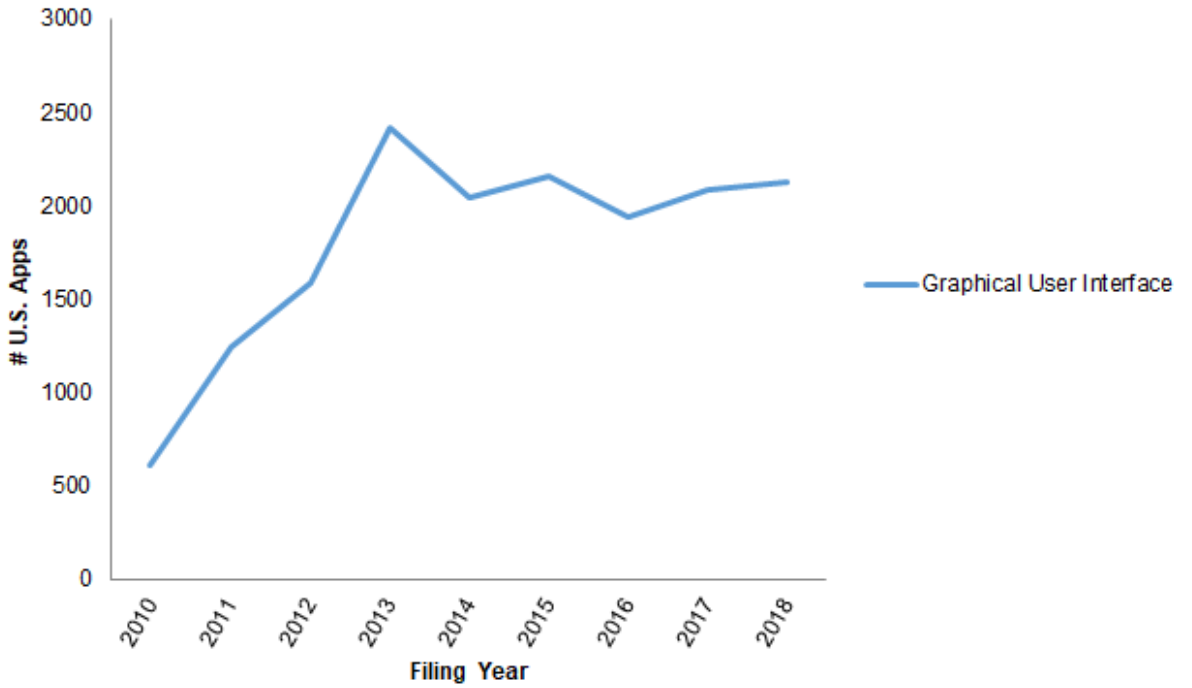
Patent filings are increasing across multiple technology clusters in the Industrial Design industry



Our study shows that there is a marked upward trend in a number of technology clusters within the Industrial Design industry. Automobile & Transportation, Computer And Accessories, Cosmetics & Personal Accessories, and Textile & Clothing are some of the clusters in which patent filings are growing most steeply.

In technology clusters where design patents are declining (such as Pet Products, Sports Equipment, and Medical/Laboratory Equipment), it is possible that innovators are choosing other methods of protecting their designs (such as trademark or trade dress protection) on products that are likely to be rapidly replaced by newer design versions. Further, innovators may alternatively or additionally only seek patents on breakthrough design innovations or on designs for less iterative product versions.

High tech innovators are protecting software innovations with design patents on graphical user interfaces ("GUIs")

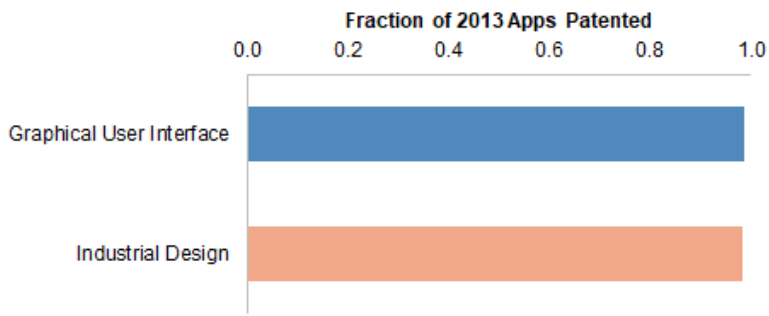


GUIs are visual elements through which users can interact with electronic devices (*e.g.*, apps on smart devices or websites on computers). GUIs include icons, fonts, layout, logos, colors, animation/movement and framing/placement. GUIs are eligible for design patent protection on their ornamental features, so long as their design is not dictated solely by its function.

Between 2010 and 2013, a series of high-publicity lawsuits involving claims of infringement of GUI design patents, brought GUI design patents to the forefront of intellectual property trends. The appeal of these patents was enhanced by the high damages awards sought (and sometimes awarded) for the infringement of even a single GUI design patent.

In addition, GUI design patents offered a new approach to protecting software-related innovation just as the AIA was being implemented and the USPTO was changing its examination practices to make software-related utility patents harder to obtain. GUI design patents were especially attractive because these applications are granted almost 100% of the time.

Even though the rise in GUI design patent filings has not been as steep in recent years as it had been between 2010 and 2013, the uptrend in these filings continues.

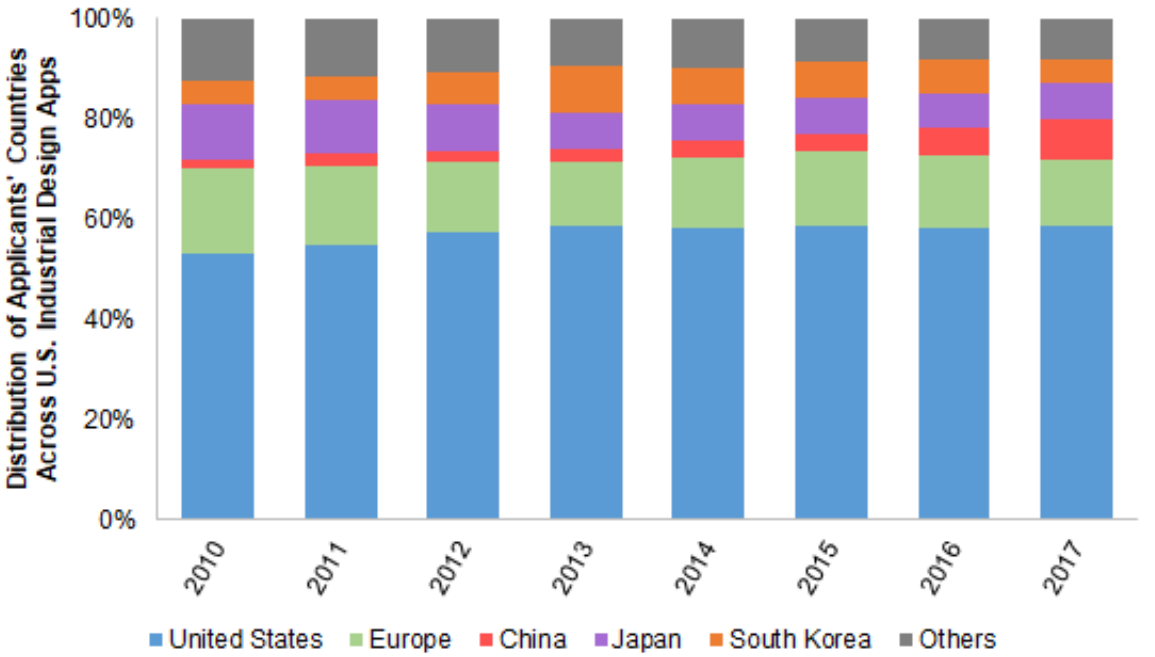


Numerous industry leaders are top filers in specific technology clusters within the Industrial Design industry

USING 2016 DATA:		
		Most Families Flied by
		(Applicants in alphabetical cinder)
Industrial Design		Delta Faucet Co, General Motors, LG, Nike, Samsung
Level I		
Graphical User Interface		Apple, Google, Jpp, Microsoft, Samsung
Industrial Design		Delta Faucet Co., General Motors, LG, Nike, Samsung
Level I	**Level II**	
Graphical User interface	-	
Industrial Design	Automobile & Transportation	Bridgestone Corp., Ford, General Motors, Goodyear, Honda
	Building & Architecture	Biotekt USA, Cambria Co., Chelsea Building Products, Clarkwestern Dietrich Building Systems, LG, Matthews International Corp., Clarkwestern Dietrich Building Systems
	Computer & Accessories	Apple, Google, LG, Microsoft, Samsung
	Consumer Electronics	
	Cosmetics & Personal Accessories	Air Cool Industrial Co., Cartier International, Citizen Watch Co, Hunter Fan Co., Youngo
	Home Furnishing	Bridgestone Corp., Mortarless Technologies, Okamura Corp., Philips, Steelcase
	Machinery	Caterpillar, Deka Products, Holley Performance Products, Mitsubishi, Samsung, Sintokogio
	Medics /Laboratory Equipment	3M, Beckton Dickinson And Co., Karl Storz, Siemens, Water Pik
	Office Equipment	Amsterdam Printing & Litho, Brother Industries, Hewlett-Packard, RPG Holdings, Seiko Epson Corp.
	Pet Products	Classic Brands, Doskocil Manufacturing Co., Hyper Pet, Petsmart Home Office, Shenzhen Xingrisheng Industrial Col
	Power Generation & Distribution	Guangdong Bestek E-Commerce Co., Japan Aviation Electronics Industry, LG, Molex, Wago Verwaltungsgesellschaft
	Sports Apparel	Acushnet Co., Brutus Park Creations,, Game Changer Goods, Plus Meditech Co., Sport Maska
	Sports Equipment	Acushnet Cp., Callaway Goff Co., Dunlop Sports Co., Karsten Manufacturing Corp., Microsoft, Nike
	Textile &Clothing	Cambria Co. Cole Haan, Converse, Nike, Under Armour, Sketchers U.S.A.
	Tools/Hardware	Den Faucet Co., Hansgrohe SE, Hunter Fan Co., LG, Spectrum Brands
	Toys	Anki, BMW, Daimler AG, Porsche, Sanrio Co., Tomy Co.
	Weapons	3M, Crimson Trace Corp., Ncstar, Vista Outdoor Operations, Whg Properties

As discussed, industrial design has been growing in importance for businesses in a growing number of industries. The broad applicability of industry design innovation is reflected in the wide variety of companies that are top filers in specific technology clusters and subclusters in our study.

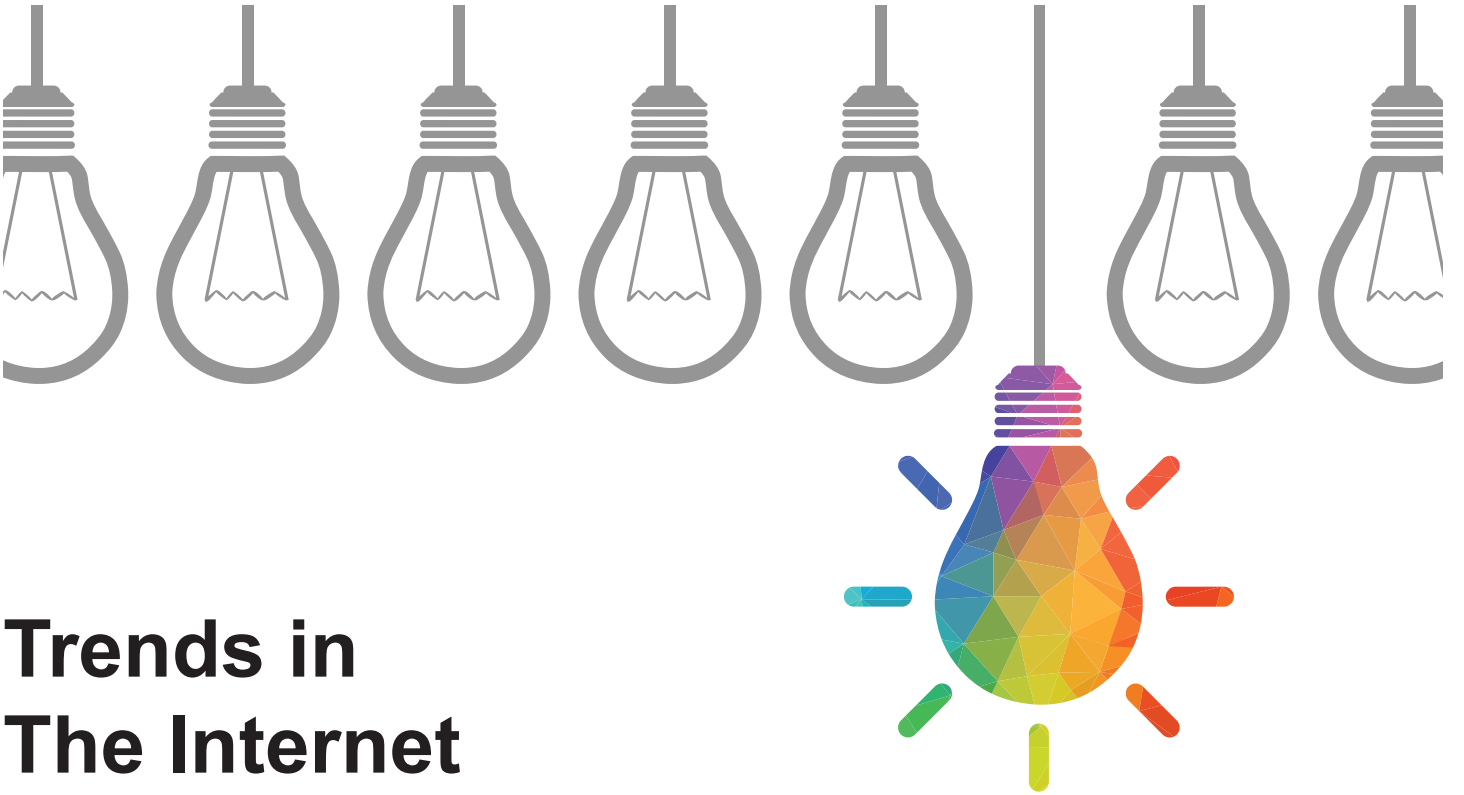
U.S.-based patent filings related to the Industrial Design industry are holding steady near 60%



The number of U.S.-based patent filings in the Industrial Design industry is growing. Even though the percentage of U.S.-based applications is holding steady, the overall number of patent filings is increasing, thereby increasing the number of U.S.-based applications, too. This trend is likely to continue as more and more businesses recognize the value of adding design patents to their intellectual property portfolios.

Also of note is the rapid rise in Chinese patent filings in the Industrial Design area. The rise in Chinese Applications corresponds with the adoption of the Hague Agreement Concerning the International Registration of Industrial Designs, which took effect in 2015. The Hague Agreement is an international registration system, which offers the possibility of obtaining protection for up to 100 industrial designs in member countries by filing a single international application in a single language.[70] The Hague Agreement has simplified international filing in a number of countries, and is likely to help grow the number of design patent filings even further by both U.S.-based and foreign entities.

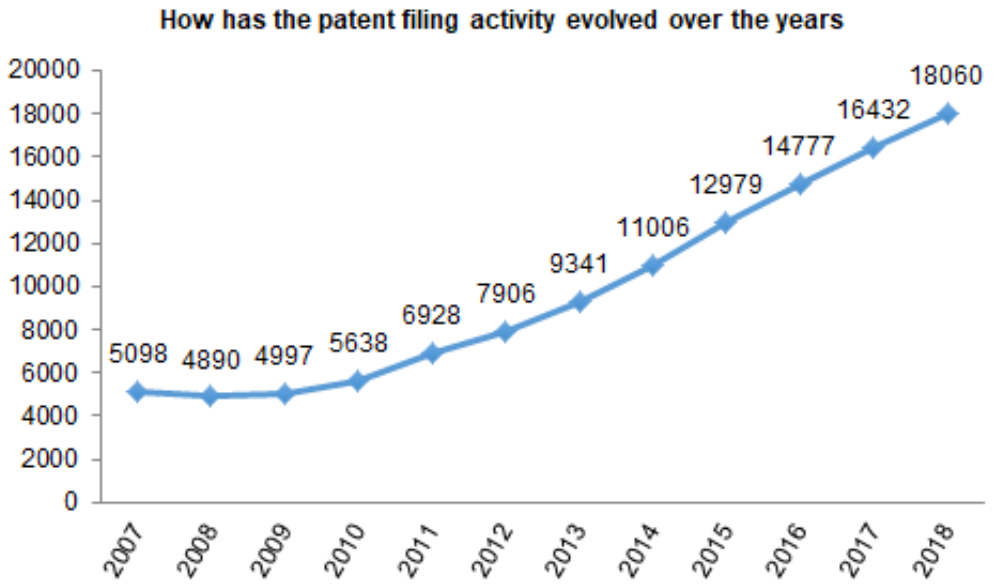
[70] https://www.uspto.gov/patent/initiatives/hague-agreement-concerning-international-registration-industrial-designs



Trends in The Internet of Things (IoT)

The high volume of patent filings relating to applications of IoT is a strong indicator of an ever-increasing role for this technology in the economy.

Patent filings relating to the Internet of Things ("IoT") are skyrocketing. A rapidly increasing number of patent filings is consistent with the fact that IoT is one of the most innovative and competitive industries right now and that it is likely to continue to innovate for years to come.



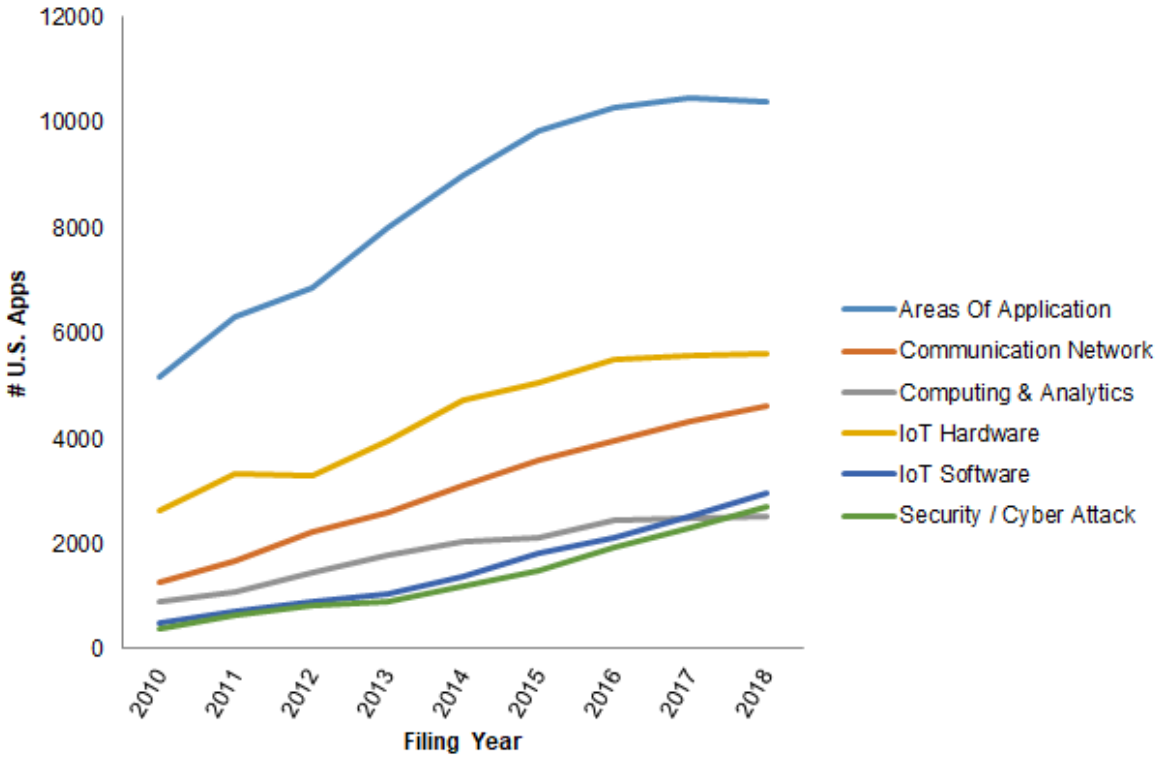
IoT is impacting and changing a wide range of industries, while also still developing as a technology itself. Indeed, the total size of the IoT market is predicted to grow to between $1.4 and $3.7 trillion by next year.[71] As it becomes integrated into more and more aspects of our lives and businesses, IoT also must address a number of concerns, including security, privacy, and compatibility. To delve deeper into the trends of patenting IoT innovation, we have defined the following technology clusters within the general industry of IoT:

Taxonomies and expanded definitions of these clusters are included in appendix A.

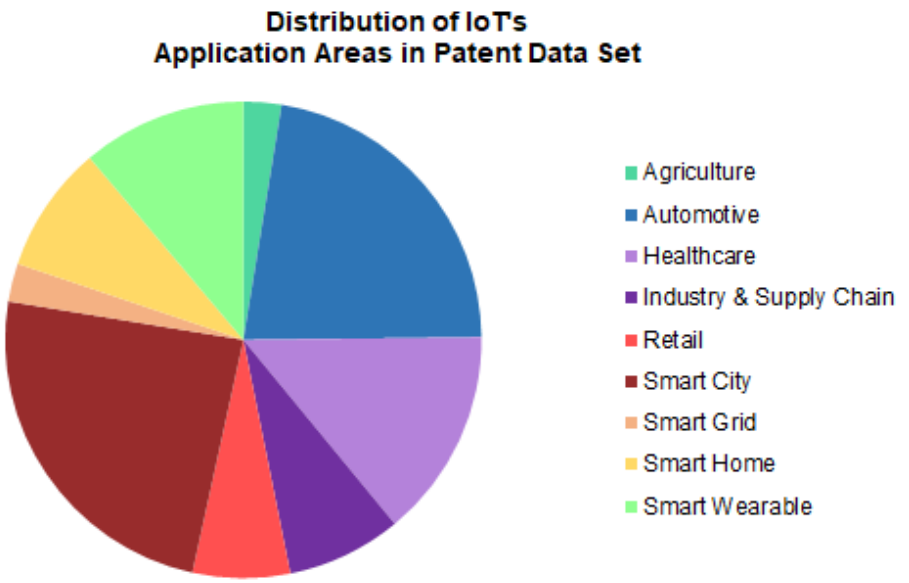
IoT-Level I Clusters	Level II Clusters
Application Area	Agriculture
	Automotive
	Healthcare
	Industry & Supply Chain
	Retail
	Smart City
	Smart Grid
	Smart Home
	Smart Wearable
Application Software	
Backbone Network (Network Infra	
Cloud Computing And Analytics	
Communication Network	Communication Techniques
	Mesh Networking
	Wireless Protocols
Edge Computing And Analytics	
Gateway Equipment	
Operating Systems	
Security/Cyber Attack	
Sensors And Actuators	
Storage & Servers	

[71] https://www.forbes.com/sites/louiscolumbus/2018/06/06/10-charts-that-will-challenge-your-perspective-of-iots-growth/#659607643ecc; https://www.forbes.com/sites/louiscolumbus/2018/06/06/10-charts-that-will-challenge-your-perspective-of-iots-growth/#7a6fdea63ecc

The majority of patent filings relate to the applications of IoT, with heavy emphasis on smart cities, automotive, and healthcare



Virtually every industry could be made more efficient and productive by incorporating IoT capabilities into its operations, and virtually every industry has taken notice of this technology and is spending heavily on IoT integration.[72] The high volume of patent filings relating to applications of IoT is a strong indicator of an ever-increasing role for this technology in the economy.



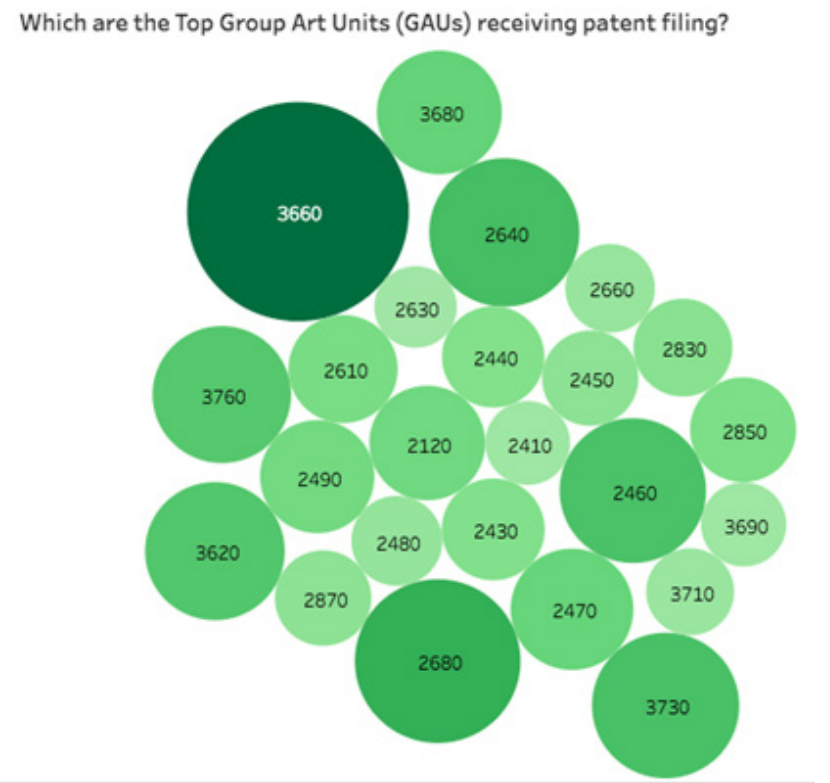
[72] https://innovationatwork.ieee.org/industry-iot-growth-trends/

Smart City IoT has the highest number of patent filings. This finding may be due both to the wide range of activities (from public safety to traffic regulation to air quality) in which the deployment of IoT would be beneficial in an urban setting and to the growing adoption of IoT projects by local governments.[73]

In the United States, there is also a strong emphasis on IoT innovation in the healthcare and automotive industries.[74] In healthcare, the majority of IoT applications relate to patient monitoring, energy metering, and imaging devices.[75] In automotive, IoT has gained acceptance throughout the lifecycle of the vehicle - from the design stage, to manufacturing, to making the driving experience easier, safer, and more enjoyable.[76]

The technical diversity in IoT innovation is evidenced by the large number of Art Units examining IoT applications

As noted above, the applications of IoT span many technological areas. Thus, it is perhaps not surprising that IoT patent applications are assigned to a wide variety of Art Units at the patent office. In fact, the applications are broadly dispersed across multiple different technology centers (each of which relates to a high-level type of technology). Given that different Art Units are associated with different allowance rates, applicants in the IoT space are likely to encounter a broad distribution of allowance prospects.



[73] https://www.mckinsey.com/~/media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx
[74] https://iot-analytics.com/top-10-iot-segments-2018-real-iot-projects/
[75] https://healthtechmagazine.net/article/2018/08/why-healthcare-iot-rise-infographic
[76] https://www2.deloitte.com/insights/us/en/focus/internet-of-things/iot-in-automotive-industry.html

USING 2016 DATA:				
		# Apps Filed in this Year assigned to Art Unit w:		
		Most Industry Apps	**2nd Most Industry Apps**	**3rd Most Industry Apps**
		Art Unit	Art Unit	Art Unit
IoT		3667	3663	3762
Level I		3667	3663	3762
Areas of Application		2412	2471	2646 | 2462
Communication Network		3667	2122	2859
Computing & Analytics		3762	375	3736
IoT Hardware		3664	2179	3667
IoT Software		2497	2436	2435
Security/Cyber Attack				
Level I	**Level II**			
Areas Of Application	Agriculture	3671	2836 | 2887	2436
	Automotive	3667	3663	2668
	Healthcare	3762	3735	3763
	Industry & Supply Chain	3625	3628	3627
	Retail	3625	2687	2859
	Smart City	3667	2663	3661
	Smart Grid	2836	2859	2842
	Smart Home	2844	2121 | 2127	2126
	Smart Wearable	3762	2872	2859
Communication Network	Communication Techniques	2471	2412	2915
	Mesh Networking	2887	2685 | 2844	2412 | 2464
	Wireless Protocols	2645	2646	3715
Computing & Analytics	Cloud Computing And Analytics	3667	2859	2456
	Edge Computing And Analytics	2122	2457	2456
IoT Hardware	Backbone Network (Network Infrastructure)	2645	2649	2685
	Gateway Equipment	3625	2457	2645
	Sensors And Actuators	3762	3735	3736
	Storage & Servers	3664 | 2421	2136	2424
IoT Software	Application Software	3664	2179	3667
	Operating Systems	2497	2195	2116

Cellular phone, cloud-based service, and artificial intelligence leaders are filing large numbers of patent applications related to IoT

IoT is dependent on high-speed wireless networks, cloud-based computing and APIs that enable greater and faster integration between the IoT component and the existing network.[77] In addition, the use of A.I. is growing in IoT. For example, as IoT sensor and monitors generate data (*e.g.*, temperature, humidity, or vibrations), A.I. can be used to detect anomalies and particular types of events much faster and with greater accuracy.[78]

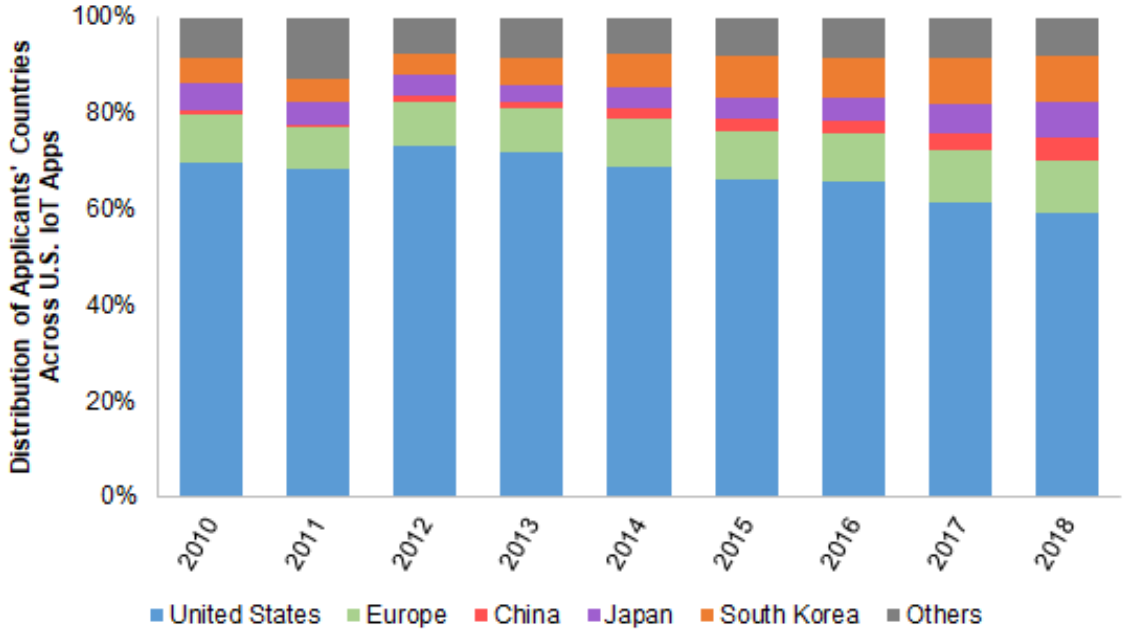
The technology leaders who are filing the most patents in IoT are major players in these fields. Companies with expertise in high-speed wireless networks – like Qualcomm, LG, Cisco, and Intel – are vying for leadership in the IoT space, alongside leaders in cloud-based services and A.I. – like IBM and Microsoft.

USING 2016 DATA:		
		Most Families Flied by
		(Applicants listed in alphabetical order)
IoT		Ford, IBM, Intel, Qualcomm Samsung
Level I		
Areas Of Application		Ford, General Motors, IBM, Samsung, Toyota
Communication Network		AT&T, Ericsson, IBM, Intel, Samsung
Computing & Analytics		Cisco, IBM, Intel, Microsoft, Qualcomm
IoT Hardware		Ford, IBM, Intel, Qualcomm, Samsung
IoT Software		General Electric, IBM, Microsoft, Samsung SAP SE
Security / Cyber Attack		Cisco, IBM, Intel, Qualcomm, Samsung
Level I	**Level II**	
Areas Of Application	Agriculture	Cnh Industrial America, Deere And Co., IBM, King Fahd University Of Petroleum And Minerals, The Climate Corp.
	Automotive	Ford, General Motors, Hyundai, Samsung, Toyota
	Healthcare	Cardiac Pacemakers, General Electric, IBM, Samsung, Tosense
	Industry& Supply Chain	Blackberry, Beneral Motors, IBM, Intel, Kyland Technology Ca, Walmart
	Retail	Century Link Intellectual Property, IBM, Microsoft, Samsung, Walmart
	Smart City	Ford, Honeywell, IBM, Samsung, Toyota
	Smart Grid	ETRI, General Electric, IBM, Kyland Technology Co., LG, Qualcomm
	Smart Home	Echostar Technologies International Corp., Google, Honeywell, Johnson Controls Technology Co., Samsung, Siemens
	Smart Wearable	Apple, IBM, Intel, Micmac$ Qualcomm, Samsung
Communication Network	Communication Techniques	

[77] https://www.forbes.com/sites/louiscolumbus/2018/06/06/10-charts-that-will-challenge-your-perspective-of-iots-growth/#659607643ecc
[78] https://www.wired.com/brandlab/2018/05/bringing-power-ai-internet-things/

	Mesh Networking	AT&T, IBM, Intel, Quo Silergy Semiconductor Technology (Hanzhou)
	Wireless Protocols	AT&T, Ericsson, Intel, Qualcomm, Samsung
Computing & Analytics	Claud Computing And Analytics	General Electric, IBM, Intel, Microsoft, Qualcomm
	Edge Computing And Analytics	AT&T, Cisco, IBM, Intel, Microsoft
IoT Hardware	Backbone Network (Network Infrastructure)	AT&T, Intel, Qualcomm Samsung, Veniam
	Gateway Equipment	AT&T, Cisco, Hyundai, Intel, Qualcomm, Verizon Patent And Licensing
	Sensors And Actuators	Ford, IBM, Intel, Qualcomm, Samsung
	Storage & Servers	Capital One Services, Ford, IBM, Intel, Microsoft, Qualcomm, Samsung
IoT Software	Application Software	General Electric, IBM, Microsoft, Swing, SAP SE
	Operating Systems	General Electric, IBM, Intel, Microsoft, NXP, Samsung

The percentage of patent applications relating to IoT filed by U.S.-based applicants is falling



The percentage of U.S. patent applications originating in China, Japan, and Korea has grown dramatically over the last five years and has contributed to U.S.-based application accounting for less than 60% of filings last year. This trend may represent a rise in IoT innovations originating from these countries and/or an increased emphasis on globalization and international patent protection. For example, it is possible that the relative rate of IoT innovation across countries has remained stable over the past decade, whereas the observed trend is explained by a change in foreign entities' prioritization of securing patent protection in the U.S. for their technologies.

Security is a critical issue for IoT

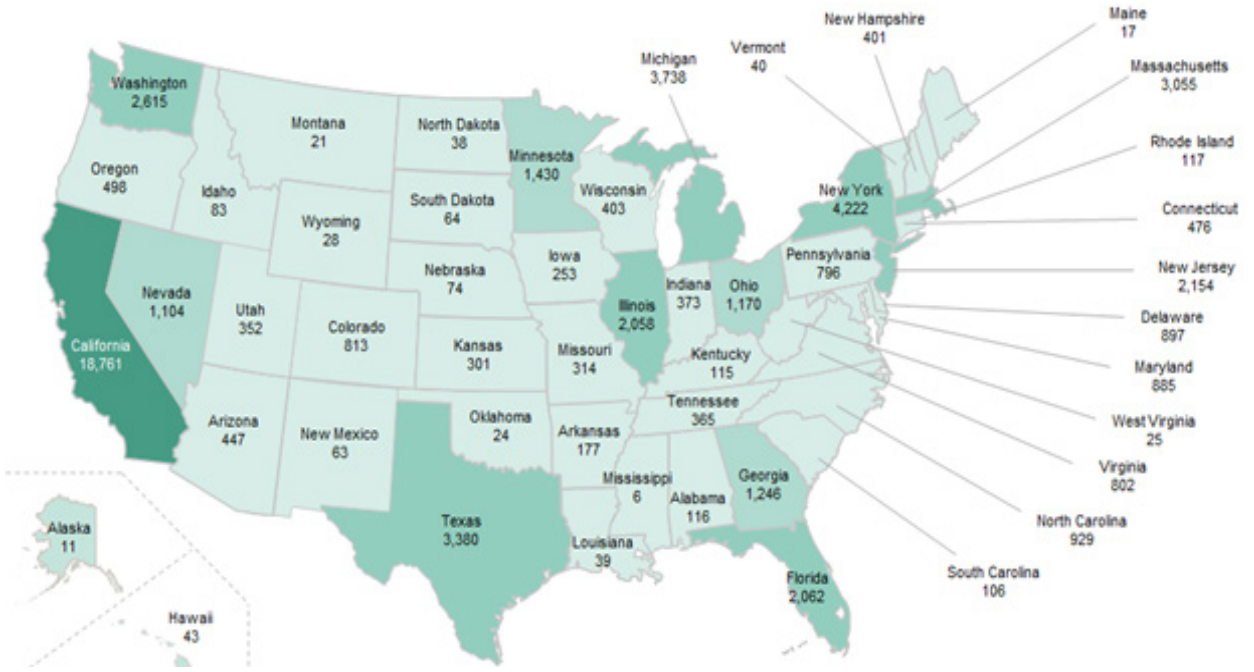
As IoT is adopted by more and more sectors of the economy, its vulnerability to cyberattacks and other malicious interference is becoming a more pressing threat. To date, there have already been documented attacks on IoT in building infrastructure, communications, and industrial infrastructure.[79]

Our study finds that security-related IoT patent filings have been steeply increasing year over year, although the overall percentage of patent applications in this space remains small. As the urgency of creating better security for IoT mounts, however, and as companies innovate to make their IoT assets less vulnerable,[80] we anticipate this technology cluster to increase in patenting activity.

IoT-related innovation is distributed across the United States

IoT innovation is taking place not only in diverse industries but also in diverse geographies. While the majority of IoT-related patent activity is concentrated in California, residents of many other states have filed a significant number of patent applications in this technology area. Residents from each of the following states have filed at least 1000 applications: Florida, Georgia, Illinois, Massachusetts, Minnesota, New Jersey, New York, and Texas.

Distribution of filings across states for the IoT industry



[79] https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/innovation/ch-en-innovation-IoT-defense-policy-and-the-internet-of-things.pdf
[80] https://www.csoonline.com/article/3289392/staying-secure-as-the-iot-tsunami-hits.html

KILPATRICK TOWNSEND

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