

IOT ONE INSIGHT REPORT

Industrial Internet of Things Ecosystem Development in China



SEPTEMBER 2018



Table of Contents

1	Executive Summary	2
	Report Methodology & Content Overview	4
	About IoT ONE	6
2	Chinese Government Policy Support	7
	Made in China 2025	8
3	Regional Geographic Concentration	10
	Geographic Distribution by Technology Domain	11
	Geographic Distribution by Target Industry	12
	Company Age and Size by Technology Domain	13
	Target Customer Function by Technology Domain	15
	Target Customer Industry by Technology Domain	16
	Target Customer Function and Industry	17
	Leading IoT Ecosystem Partners	18
4	Featured Company Index	20
5	IoT Ecosystem Research Contact	25



Executive Summary

The Industrial Internet of Things (IoT) has the potential to fundamentally shift the way businesses create value, whether internally for their operations or externally for their customers. It is critical to understand that all incremental value from IoT systems comes from transforming data into useful information. The flow of data provides the ability to monitor systems in real time, control assets remotely, optimize the performance of processes, and gain radically deeper insight into how facilities, assets, devices, and people operate.

The Chinese government understands the transition that is taking place and is investing heavily to establish China as a leader in digital innovation. IoT technologies are key enablers in China's mission to evolve from the leading high-volume manufacturer to a country that competes on quality and innovation, while remaining a cost leader. China's aspirations extend across the economy from manufacturing to healthcare technology. IoT technologies are likewise horizontal in scope. Technologies like 5G and machine learning will enable new products and processes across the economy. China's sustained economic growth and stability will depend in some large part on its success in establishing leadership in the core IoT technology domains of device hardware, device software, connectivity, cloud platforms, and applications.

Why is China's strategic imperative important to your business? Whether you operate in China, compete with Chinese companies, or look to China as a high growth market, you will be impacted by China's investment in IoT innovation and system deployment. This report is written for technology providers and system operators that are committed to remaining profitable and relevant in an era of data-driven value creation. We encourage these companies to monitor the rapid development of China's IoT ecosystem in order to assess risks posed by new competitors, opportunities presented by industry upgrading, and cost effective strategies for implementing agile digital innovation in emerging economies.

Our central finding is that China is poised to become a leader in both the development and deployment of IoT technologies. Foreign companies have much to gain by participating in China's next stage of industrial development. However, they must do so with a strategy that is sufficiently agile to compete in China's dynamic markets yet attentive to the risks posed by rising competitors. Our findings in brief:

- China's unique innovation model is designed around a deeply embedded public-private collaboration in which the state provides strategic direction and financial incentives through subsidized research and project deployment, while private companies drive technology and business model innovation. State-owned-enterprises (SOEs) operate as extensions of the state by allocating resources to strategic domains. They are not innovation leaders but will remain an important lever for economic management.
- China is most suitable as a testbed for experimental deployment of new business models and operating processes, rather than complex, cutting edge technologies. Chinese end users are highly adaptable due to the lack of entrenched operating processes and their comfort level with digital technologies.

- Chinese Industrial IoT companies focus primarily on ‘devices’ and ‘software’. There are few Chinese companies with competitive core hardware technologies. However, they excel at integrating existing technologies into innovative form factors. Chinese companies have also emerged as leaders in software domains such as machine vision and data visualization. Foreign product manufacturers and operators have a strong opportunity to collaborate with Chinese IoT companies both to upgrade their technological capabilities and to integrate their existing technologies into new solutions that Chinese companies can bring to ‘long tail’ or lower-tier markets.
- China’s Industrial IoT companies are heavily consolidated in Beijing, Shanghai, and Guangdong. These cities also contain more than 80 percent of foreign research and development centers, which simplifies coordination. However, there is a trend among both Chinese and foreign firms to expand to western cities, such as Chengdu, Xi’an and Wuhan, where developer resources are relatively inexpensive.
- The majority of Chinese Industrial IoT companies were established after 2010. They are significantly smaller than digital market leaders in China’s Consumer Internet, averaging less than 238 employees. This is due to the recent adoption of Industrial IoT solutions in scale and to the fragmentation of industrial market niches. The Industrial IoT is widely expected to surpass the Consumer Internet in terms of market size; however, the market will remain relatively fragmented due to industry-specific regulations, requirements, and B2B sales processes.
- European companies are lagging significantly behind American companies in terms of engagement with Chinese Industrial IoT companies. Among the 10 foreign companies with the most local partnerships, one is European (Bosch), one is Korean (Samsung), and the remaining eight are American. This trend indicates that European companies will be at a disadvantage as industrial value creation shifts from a reliance on hardware toward a reliance on software.
- Likewise, industrial companies lag information technology and telecommunications companies in forming partnerships with Chinese Industrial IoT companies. Of the 20 most active partners, only Bosch, State Grid Corporation of China, and China National Petroleum Corporation have their roots in the industrial sector. The other 17 are companies such as Intel, Tencent, and China Mobile. It is thus plausible that traditional market leaders will lose market share to information technology and connectivity providers in the coming decade.

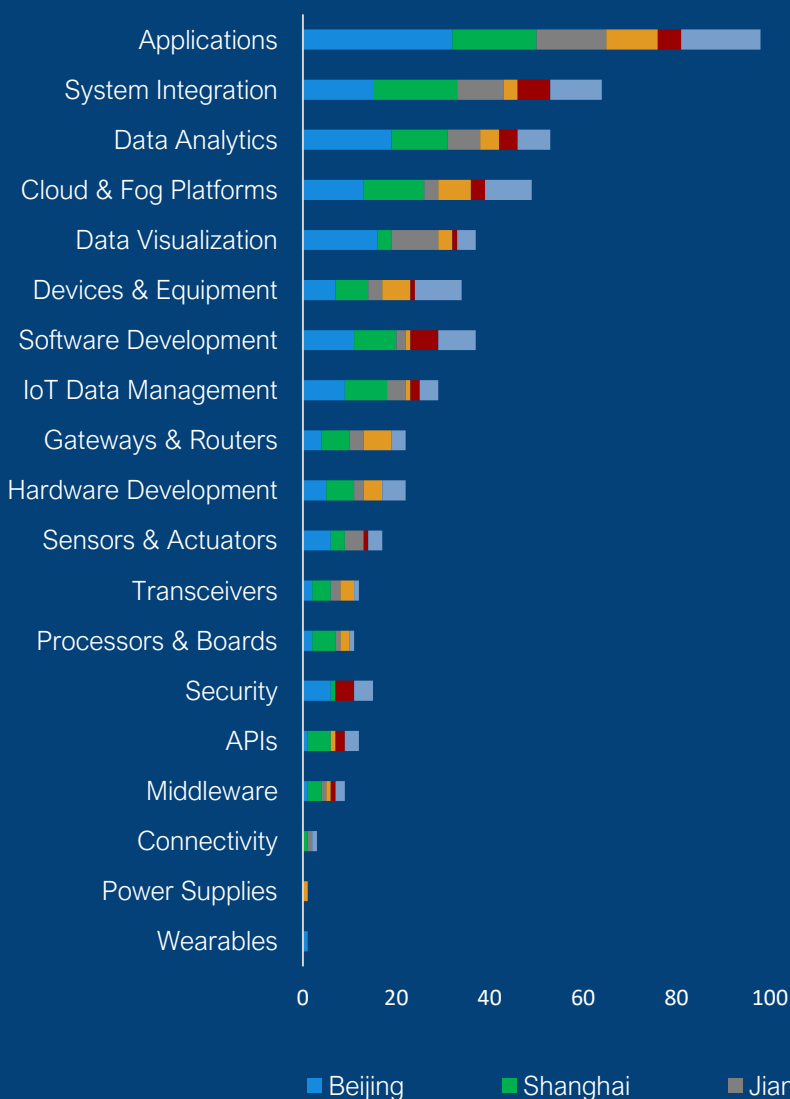
This report captures the current state of the Industrial IoT market in China, with a focus on the entrepreneurial companies that will power China’s industrial transformation. We hope it is a useful reference source as you develop and implement your digital transformation strategy.

Report Methodology & Content Overview

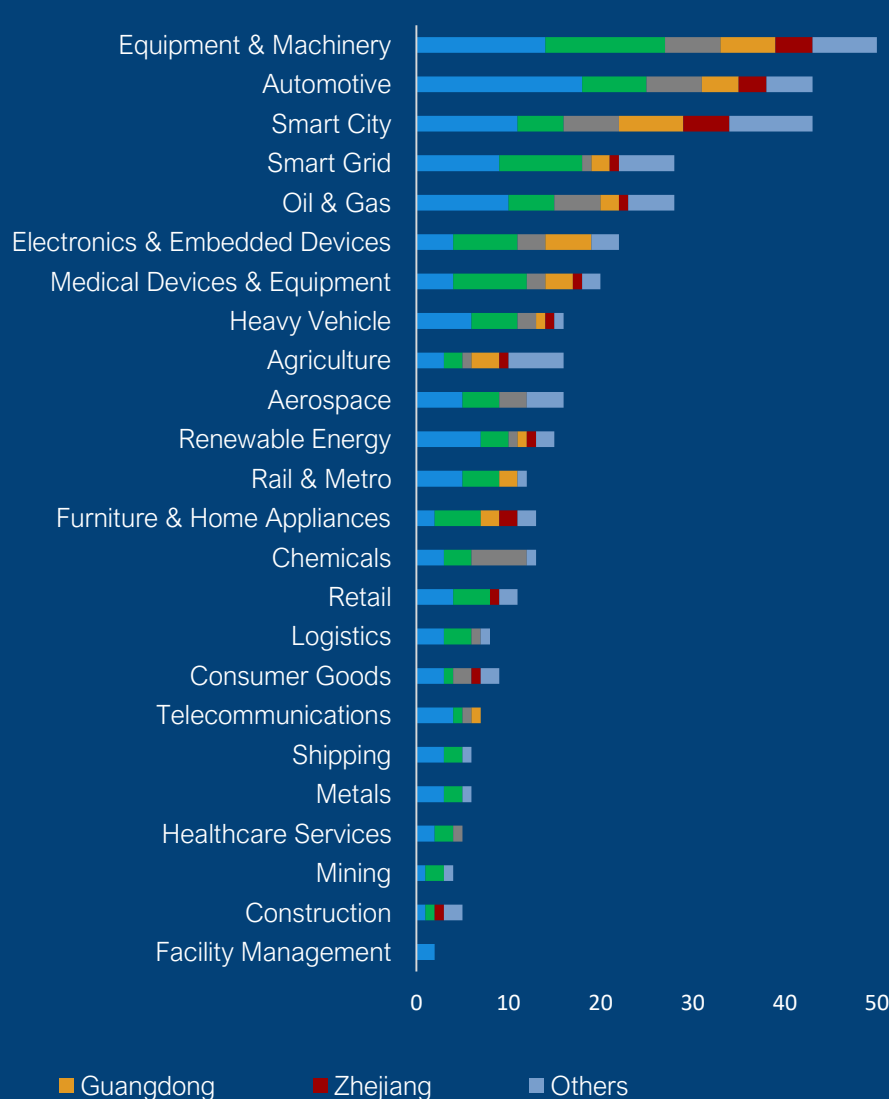
This report is based on research into 134 Chinese companies that are contributing to the Industrial Internet of Things (IoT) ecosystem as software, hardware, or service providers. The companies provide technologies or services in 19 solution domains and serve 24 industries and 13 functions. For each of the 134 companies, we provide an overview of the company’s value proposition, products, size, financial maturity (when available), target customers, and partners. Multiple solution domains, industries and functions may be selected for each company. We also identified 34 investors, incubators, and technology parks that serve as innovation enablers. These organizations support development of a scalable ecosystem and often act as conduits to communicate strategic national objectives to entrepreneurs.

This report is not a definitive survey of all relevant Chinese companies. Through other projects, IoT ONE has assessed more than 600 companies in China with Industrial IoT solutions. There are undoubtedly many more that we remain unaware of. This report is also not a statistical representation of the ecosystem. Software providers were prioritized over hardware and service providers due to their importance in enabling new solutions and business models. The report also has a bias towards startup companies, with less attention provided to mature players. This is due to our impression that our audience will receive greater value by learning about companies that are difficult to identify and may otherwise remain unknown.

Company Categorization by Solution Domain



Company Categorization by Industry Focus



About IoT ONE

IoT ONE published this report to further our mission of helping companies understand the evolving Industrial Internet of Things (IoT) landscape. The first Internet wave disrupted retail, media and finance. Traditional companies declined and new leaders emerged. The second Internet wave is disrupting how products and operations create value. It will impact every company that builds or operates physical infrastructure, assets and devices. The core question companies must consider is “Will you disrupt or be disrupted by the Industrial Internet of Things?” Our “micro-to-macro” research covers the four central knowledge domains that guide strategy development for both IoT technology development and adoption.

Use cases define the range of possible solutions that exist today or will exist in the future. Use cases differ in market readiness. The predictive maintenance use case is easily envisioned but technically challenging. In contrast, asset-as-a-service use cases can be technically simple but may disrupt value chains.

The IoT technology stack enables use cases. Bottleneck technologies can delay or prevent uses case adoption. For example, battery constraints limit the deployment of sensors for environmental monitoring.

Business model or process innovation is often required in order to obtain value from a connected product or an internal system. The most significant challenges may be organizational rather than technical.

Partner ecosystems are as critical as intellectual property for success in Industrial IoT markets. Few companies possess all of the competencies internally that are needed to bring solutions to market.

IoT ONE provides research and advisory services to help companies manage the threats and opportunities brought by the Industrial Internet of Things. We conduct research globally, because innovation transcends borders and cultural differences, and we support the planning and execution of innovation strategies in Asia. Our methodology combines IoT domain expertise with innovation strategy and organizational development experience. And our engagement with technology and startup ecosystems gives us access to specialized expertise and entrepreneurial perspective.

We hope you find this report useful as you position your company for profitable long-term growth.

Erik Walenza

Founder and CEO, IoT ONE

Mark Greeven

Partner & Asia Innovation Lead, IoT ONE

Wei Wei

Partner & Asia Research Lead, IoT ONE

Industrial Internet of Things Ecosystem Development in China



“Mass entrepreneurship could offer an endless source of creativity and wealth. It could be a goldmine...”

- China Premier Li Keqiang -

“If we work together, that will make us understand each other, appreciate each other, help each other.”

- Alibaba Chairman Jack Ma -



Chinese Government Policy Support

In less than 40 years, China has transformed from mass imitation to mass innovation. This transformation has been implemented by China's entrepreneurial private sector with significant policy support from the government. For the first 30 years of the 'opening up' period, government policy focused heavily on directing infrastructure investments and incentivizing manufacturers to move operations to China. Since the 2008 financial crisis, a series of government initiatives have encouraged technology innovation with the objectives of building a more balanced economy, assuming leadership in emerging industries, and providing meaningful employment for the country's millions of annual college graduates.

In 2015, China's government launched the 'Made in China 2025' and 'Internet Plus' policies to encourage the use of information technologies in traditional industries such as manufacturing, logistics, and energy production. Meanwhile, the 'Mass Entrepreneurship and Innovation' policy was launched as a national strategy to encourage Chinese to start new businesses or evolve their current business. Together, this array of policies has been remarkably successful at cultivating entrepreneurial activity. Twenty years ago the most qualified Chinese aspired to work for government. Ten years ago they prioritized foreign firms. Today foreign firms struggle to compete with local startups and private technology firm for top talent.

The Chinese government is also encouraging engagement in international standards bodies and consortiums. China has allocated \$400 billion for 5G development and adoption in the current 5-year economic plan with the objective of setting the next generation of standards. Meanwhile, the China Academy of Information and Communications Technology has become an active member of the Industrial Internet Consortium (IIC) and is coordinating with local and foreign IIC members to launch IoT testbed projects, such as Water Utility Management in Guangxi province and Brownfield Quality Control at Haier.

Exhibit 1: Chinese government initiatives impacting Industrial IoT technology development and adoption

Initiatives	Governing Agency	Focus Areas
Made In China 2025	<ul style="list-style-type: none"> Ministry of Industry and Information Technology (MIIT) 	<ul style="list-style-type: none"> Industrial technology innovation Industrial capability upgrading IT and operational technology integration
Science and Technology Innovation 2030	<ul style="list-style-type: none"> Ministry of Science and Technology (Department of Innovation and Development) 	<ul style="list-style-type: none"> Quantum computing Smart grid integration Big data analytics Smart manufacturing and robotics
Internet +	<ul style="list-style-type: none"> Ministry of Science and Technology Ministry of Agriculture National Development and Reform Commission 	<ul style="list-style-type: none"> Intelligent agriculture 5G standards and early adoption Internet of Things Pervasive cloud computing
New-model Urbanization	<ul style="list-style-type: none"> Ministry of Housing and Urban-Rural Development 	<ul style="list-style-type: none"> Smart city technology development City infrastructure digitalization
Healthy China 2030	<ul style="list-style-type: none"> National Health and Family Planning Commission 	<ul style="list-style-type: none"> Electronic health records Healthcare analytics Regional health information platforms

Made in China 2025

The Made in China 2025 policy has been among the most influential, and controversial, drivers of economic activity since it was announced in 2015. The policy arose from concern that China's competitiveness will be weakened by rising labor costs, saturation of the market for low cost goods, overcapitalization, and low efficiency. To overcome these challenges, the government is encouraging industries to digitalize and automate. The report can be synthesized into nine support mechanisms intended to help ten strategic industries realize nine strategic priorities and move the country towards twelve economic transformation targets. It is a blueprint for transforming China into a technology leader in traditional and emerging industries.

In mid-2018, the Chinese government began to reduce public emphasis on the policy in response to criticism and concern from trading partners. A recent report by the United States Trade Representative (USTR) on unfair trading practices cited the Made in China 2025 policy 116 times. In contrast, China's controversial cybersecurity law was cited only 13 times. This and other industrial policies are at the center of the ongoing trade negotiations between China and the United States.

The details of China's industrial policies and implementation approach will evolve but they are unlikely to deviate from the goals of digitalizing the economy and achieving leadership in digital technology domains. Foreign firms that do business in China are wise to regularly assess how government policy impacts both their markets and the local companies that are potential partners or competitors.

9 Support Mechanisms

1. Institutional Mechanism Reform
2. Fair Market Environment
3. Financial Support Policies
4. Fiscal & Taxation Policy
5. Multi-level Talent Cultivation Systems
6. SME Enterprise Policy
7. Manufacturing Openness
8. Organization & Implementation System
9. State Council Oversight & Support

10 Strategic Industries

1. Advanced IT
2. Aerospace & Aeronautical
3. Agricultural Equipment
4. Automated Machines & Robots
5. Biopharma & Medical Products
6. Maritime Equipment & Shipping
7. New Energy Vehicles & Equipment
8. New Materials
9. Power Equipment
10. Rail Transport Equipment

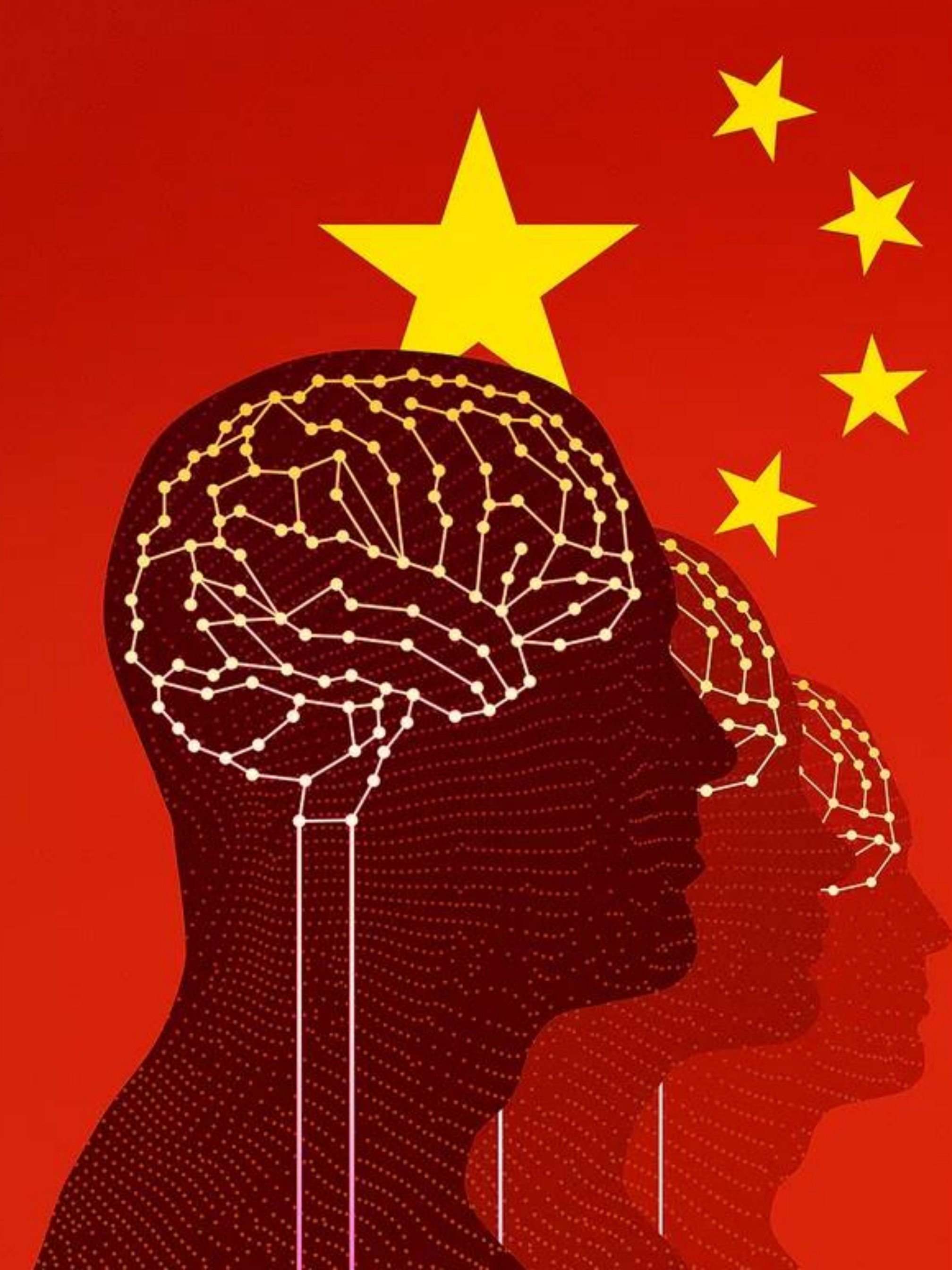
9 Strategic Priorities

1. Manufacturing Innovation Capability
2. Integration of IT & Industry
3. Fundamental Industrial Capabilities
4. Quality & Branding
5. Green Production
6. Breakthroughs in Major Areas
7. Manufacturing Structural Adjustment
8. Service-oriented Manufacturing
9. Manufacturing Internationalization

12 Economic Transformation KPIs	2015	2025
1. R&D cost / revenue (%)	0.95	1.68
2. Patents / billion RMB of revenue (#)	0.44	1.10
3. Manufacturing quality (index)	83.5	85.5
4. Value-added increase over 2015 (%)	-	4
5. Annual labor productivity growth (%)	-	6.5
6. Broadband penetration (%)	50	82
7. Digital R&D penetration (%)	58	84
8. Key process control rate (%)	33	64
9. Energy decrease over 2015 (%) ¹	-	34
10. CO ² decrease over 2015 (%) ¹	-	40
11. H ² O use decrease over 2015 (%) ¹	-	41
12. Industrial solid wastes utilization (%)	65	79

¹ Decrease measured relative to the sum of economic value-add.

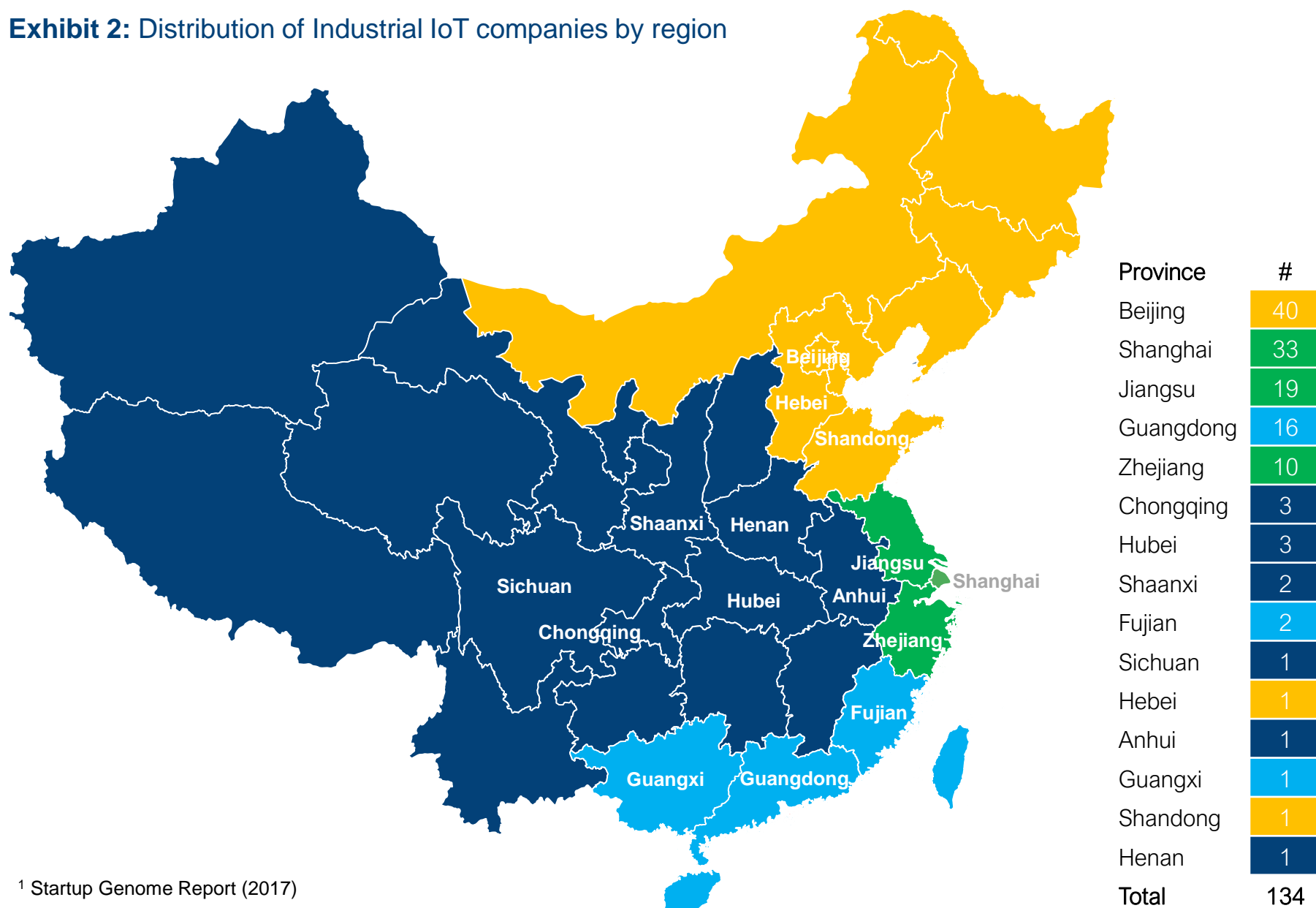




Regional Geographic Concentration

- North** 42 of the assessed companies are headquartered in northern provinces. The north has benefited from central government support and proximity to state-owned enterprises. The region is dominated by Beijing, which has produced the second most unicorns globally, following Silicon Valley, and hosts China’s leading universities, research centers, and venture capital firms.¹
- East** 62 of the assessed companies are headquartered in eastern provinces. The east is China’s most internationalized region and is home to nearly 60 percent of foreign companies in China. Shanghai is a global center of entrepreneurial activity with the fourth most unicorns and is the fifth most valuable startup ecosystem globally.¹
- South** 19 of the assessed companies are headquartered in southern provinces. Guangdong has China’s fourth-largest economy and invests more than 4% of provincial GDP annually in R&D, putting it on par with South Korea and Sweden. The south has the highest ratio of economic activity driven by private-sector activity and is considered China’s most dynamic region.
- West** 11 of the assessed companies are headquartered in western provinces. The government has prioritized development of Western provinces to more evenly distribute economic activity and we expect to see the importance of western provinces increase in the coming years.

Exhibit 2: Distribution of Industrial IoT companies by region



¹ Startup Genome Report (2017)

Geographic Distribution by Technology Domain

Northern China has the highest concentration of software companies among the four regions. This is particularly true of R&D-intensive domains such as Data Analytics and Security software. Eastern China is the most service-oriented region, with companies more likely to provide system integration services in addition to their technology products. Southern and western China are the strongest regions in terms of IoT hardware. This report prioritized software vendors and a comprehensive survey of IoT vendors would likely show hardware vendors to be the largest category in the south and west.

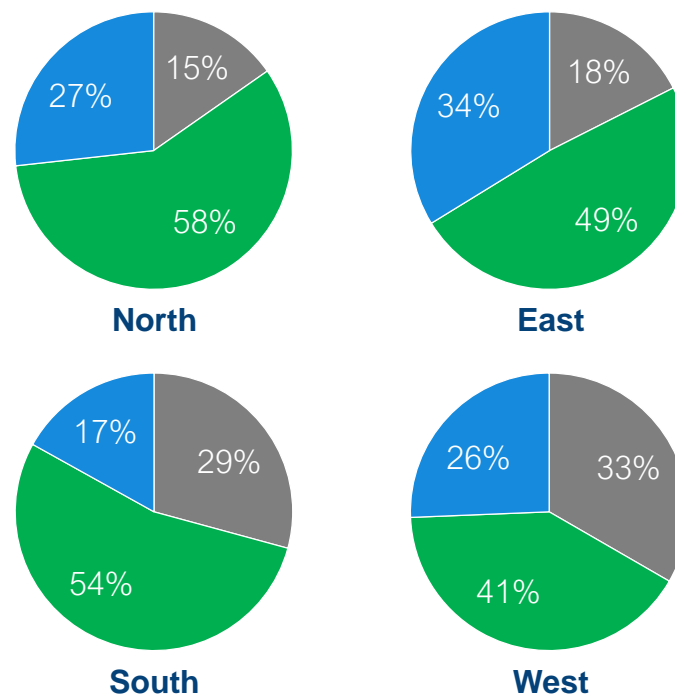


Exhibit 3: Geographic distribution of Industrial IoT companies by technology domain

Technology Domain	Headquarter Location														
	Beijing	Shanghai	Jiangsu	Guangdong	Zhejiang	Chongqing	Hubei	Shaanxi	Fujian	Guangxi	Henan	Shandong	Sichuan	Hebei	Anhui
Applications	32	18	15	11	5	3	1	1	1	1	1	1	1	1	1
System Integration	15	18	10	3	7	1		1	1			1			
Data Analytics	19	12	7	4	4		1	1		1					
Cloud & Fog Platforms	13	13	3	7	3	1	1	1	2	1		1			
Data Visualization	16	3	10	3	1	1	1			1					
Devices & Equipment	7	7	3	6	1	1	3	1			1		1	1	1
Software Development	11	9	2	1	6			1	1						
IoT Data Management	9	9	4	1	2			1				1			
Gateways & Routers	4	6	3	6		1	1		1						
Hardware Development	5	6	2	4		1	1	1			1		1		
Sensors & Actuators	6	3	4		1		1				1				
Transceivers	2	4	2	3										1	
Processors & Boards	2	5	1	2									1		
Security	6	1			4										
APIs	1	5		1	2	1									
Middleware	1	3	1	1	1				1						
Connectivity		1	1			1									
Power Supplies				1											
Wearables	1														

KEY Hardware Software Services

Geographic Distribution by Targeted Industry

Among all Chinese provinces, either Beijing or Shanghai has the most IoT companies across all target industries with the exception of chemicals, which is led by Jiangsu province. Companies that serve industries dominated by state-owned enterprises, such as telecommunications and rail and metro, are particularly consolidated in Beijing. Companies that serve private sector industries such as medical devices and home appliances are more likely to be headquartered in Shanghai.

Companies serving the smart city and agriculture industries are the most evenly dispersed across China. The ongoing drive to develop western China will likely lead to further investment in smart city initiatives in second and third tier cities. Companies in southern and western provinces are naturally focused on agriculture due to their proximity to producers. Aerospace, smart grid, and other state-led industries are also moving west due to the national imperative to more evenly distribute economic development.

Exhibit 4: Geographic distribution of Industrial IoT companies by industry

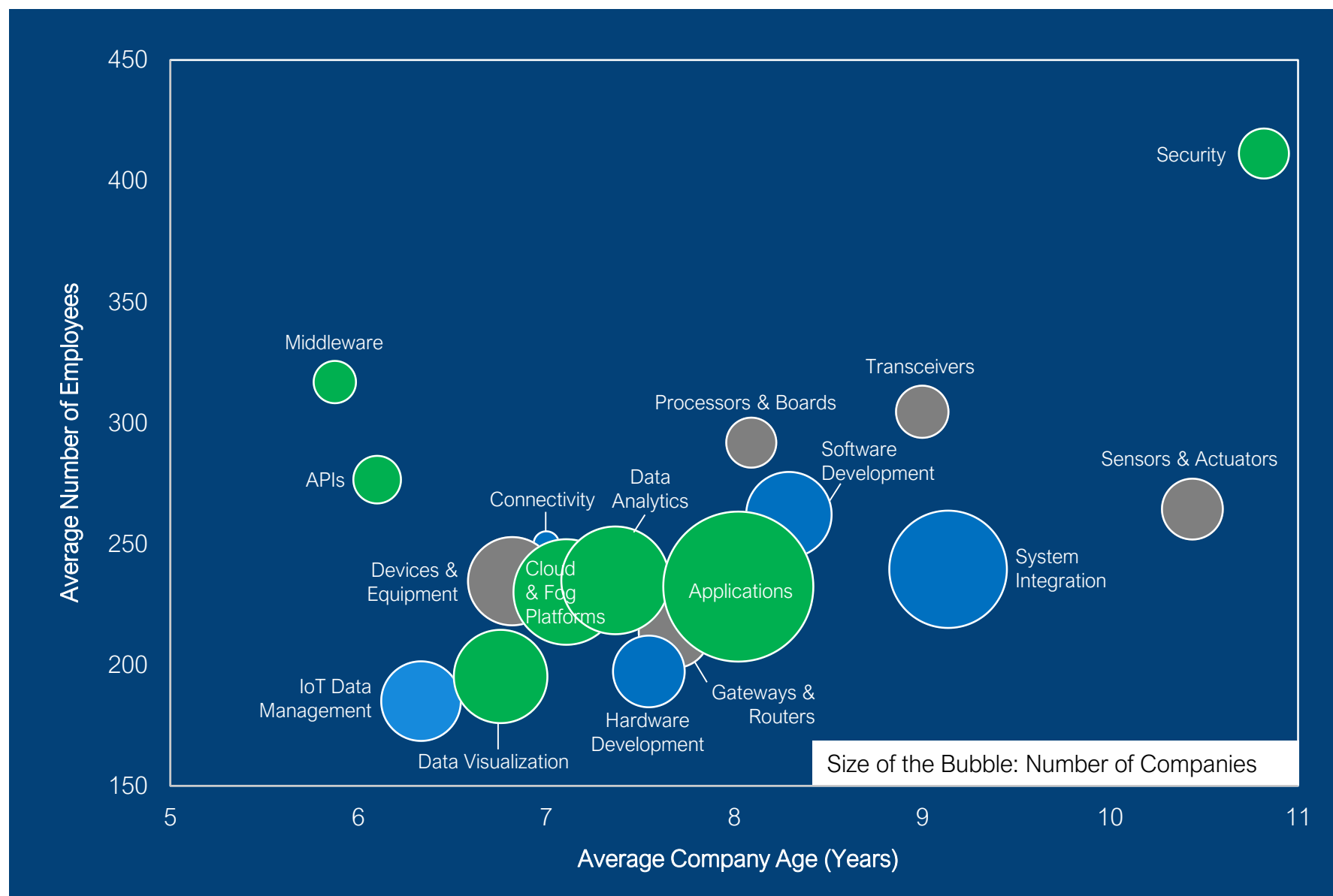
Target Customer Industries \ Headquarter Locations	Beijing	Shanghai	Jiangsu	Guangdong	Zhejiang	Hubei	Fujian	Sichuan	Shandong	Shaanxi	Anhui	Chongqing	Hebei	Henan	Guangxi
Equipment & Machinery	14	13	6	6	4		2			1					
Automotive	18	7	6	4	3		1				1				
Smart City	11	5	6	7	5	1	1	1				1			
Smart Grid	9	9	1	2	1	2		1		1		1			
Oil & Gas	10	5	5	2	1	3		1							
Electronics & Embedded Devices	4	7	3	5		1	1			1					
Medical Devices & Equipment	4	8	2	3	1						1				
Heavy Vehicle	6	5	2	1	1										
Agriculture	3	2	1	3	1	1		1		1			1		1
Aerospace	5	4	3					1			1	1	1		
Renewable Energy	7	3	1	1	1		1								
Rail & Metro	5	4		2					1						
Furniture & Home Appliances	2	5		2	2										
Chemicals	3	3	6			1									
Retail	4	4			1										1
Logistics	3	3	1			1									
Consumer Goods	3	1	2		1										1
Telecommunications	4	1	1	1											
Shipping	3	2							1						
Metals	3	2				1									
Healthcare Services	2	2	1												
Mining	1	2							1						
Construction	1	1			1				1						
Facility Management	2														

Company Age and Size by Technology Domain

The average age of companies covered in this study is 7.7 years and the median age is 6.0. Average age is skewed upwards by companies founded in the 1990s. As shown in the following page, there was a surge in entrepreneurial activity following the 2018 financial crisis. This was initially driven by China’s financial stimulus, which was larger than that implemented by the United States, the European Union, and Japan combined. The surge has continued to grow in recent years due to a complex set of factors including government policy, a glut of capital trapped in China that is seeking high returns, improvements in innovation capacity, and a cultural shift that has made entrepreneurship socially prestigious.

The average Chinese Industrial IoT company employs 238 people. This relatively small scale is due both to the immaturity of the companies and the market. We expect the market to remain relatively fragmented for the coming three or more years. Consolidation will occur as two trends converge – first, increasing IoT adoption will clarify which use cases have scalable markets, and second, solution standardization will enable companies to productize solutions that today remain highly customized. In the meantime, China’s vibrant Industrial IoT ecosystem will continue to see a net addition of competitors in the market.

Exhibit 5: Age & employee size distribution of Industrial IoT companies by technology domain



KEY Hardware Software Services

Company Age and Size by Technology Domain

Exhibit 6: Establishment of Industrial IoT companies in the hardware, software and service fields

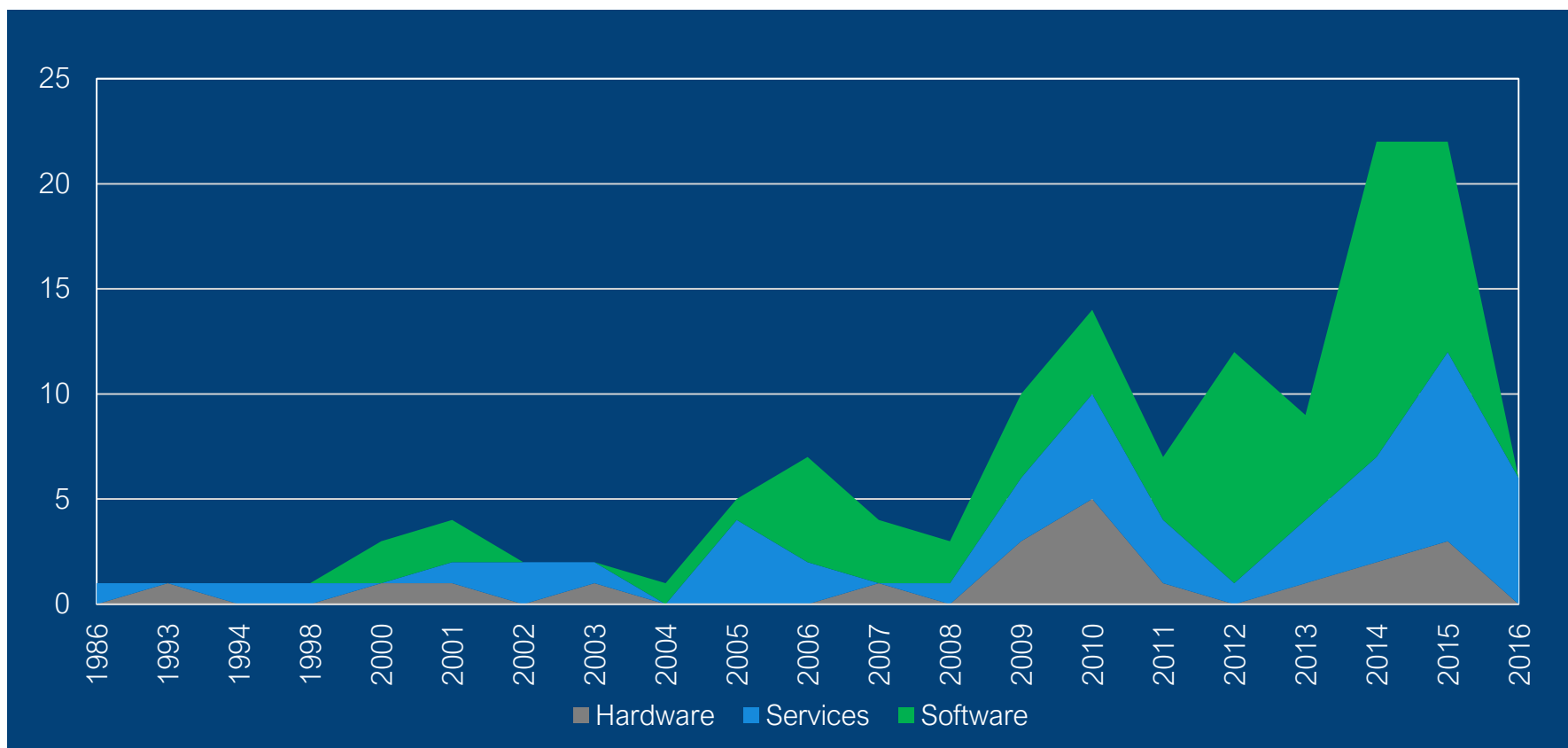
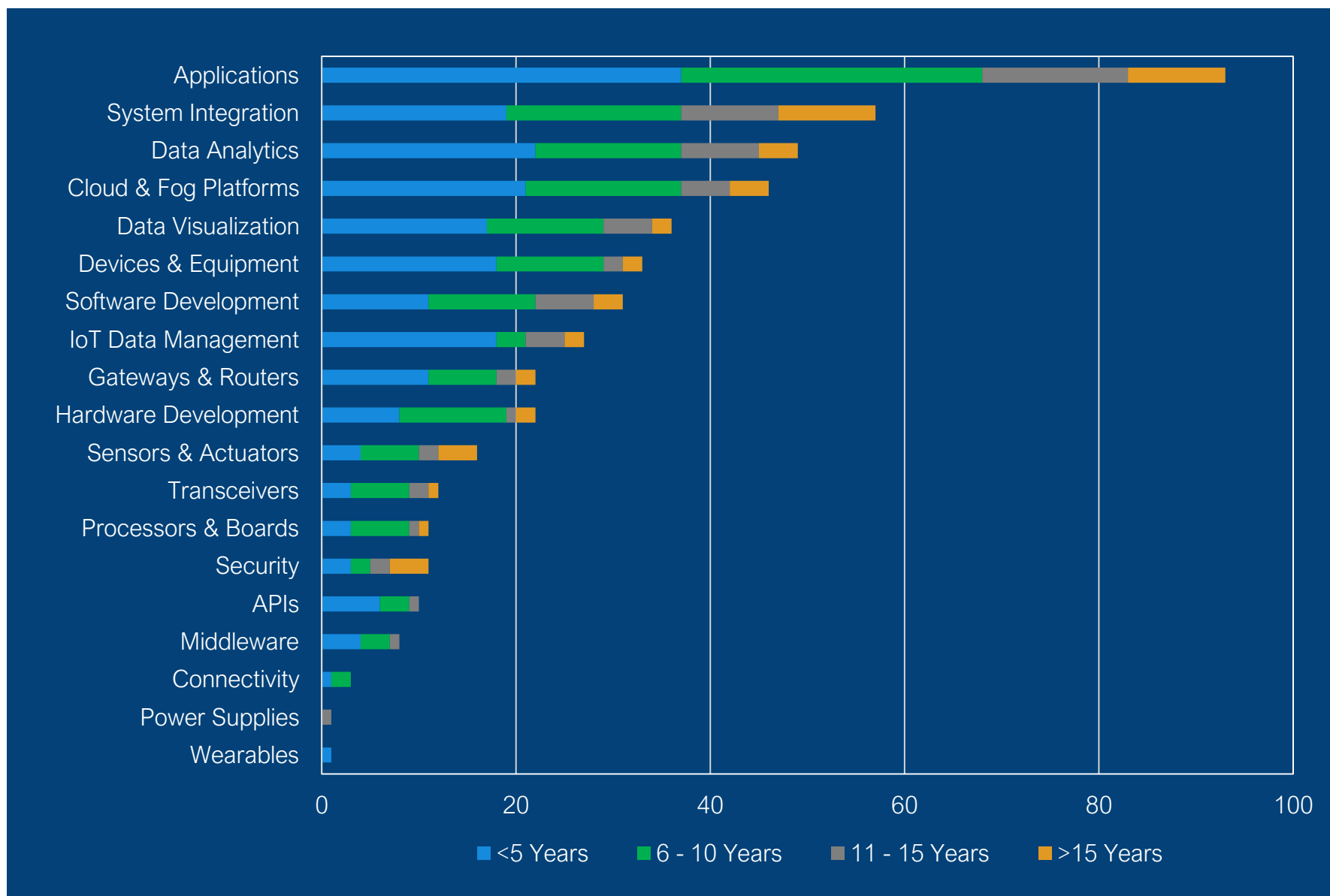


Exhibit 7: Age distribution of Industrial IoT companies by technology domain



Target Customer Functions by Technology Domain

Chinese Industrial IoT companies follow the global trend of viewing operations rather than the IT department as the primary customer. IoT companies are not disengaged from IT departments. Companies focusing on software development, IoT data management, and security continue to heavily prioritize IT as a customer. However, companies increasingly communicate directly with manufacturing, logistics, equipment maintenance and other ‘end user’ functions.

Two outliers are worth noting. First, the large number of companies producing devices and equipment for logistics and field services is driven largely by our inclusion of drone technology companies that provide delivery or mapping in this report. Second, it is common for SaaS application companies servicing the warehouse management function to also provide system integration support in order to meet customer requirements and convert projects.

Exhibit 8: Target customer functions of Industrial IoT companies by technology domain

Technology Domains \ Target Customer Functions	Manufacturing	Information Technology	Logistics	Equipment Maintenance	Product Development	Field Services	Facility Maintenance	Natural Resource Production	Warehouse Management	Quality Assurance	Sales & Marketing	Environmental Health & Safety	Human Resources
Applications	46	39	25	20	15	15	11	9	13	9	6	4	2
System Integration	35	20	14	14	7	10	4	4	11	5	2	1	2
Data Analytics	22	29	14	14	9	7	7	9	3	4	5	3	
Cloud & Fog Platforms	26	22	10	15	8	6	3	8	1	7	3		
Data Visualization	19	19	7	9	5	6	6	5	4	3	5	1	1
Devices & Equipment	14	7	13	5	5	16	5	2	2	1	3	2	1
Software Development	16	16	6	8	8	4	2	2	2	3	5	1	1
IoT Data Management	13	16	5	3	5	1	4	4	1	3	2		
Gateways & Routers	15	9	3	9	3	3	4	5		1			
Hardware Development	8	5	6	5	7	7	4	1	3		2		
Sensors & Actuators	6	4	8	2	3	4	4	2	2		2	1	1
Processors & Boards	1	4	5	3	4	3	1	2				1	1
Transceivers		4	6	2	4	1	2				1	1	1
APIs	6	5	2	1	1		2	2		1			
Security	2	10	3	1		2					1	1	
Middleware	2	5	1		1	1	1			1	1		
Connectivity		2	2		1								
Wearables		1			1								
Power Supplies					1								

KEY Hardware Software Services

Target Customer Industries by Technology Domain

The five most common customer industries are prioritized by 47% of the companies covered in the report. These industries can be broken it two segments. The first segment includes the equipment and machinery and automotive industries and comprises 23% of companies. These industries are attractive because of the high value of the individual assets and the large aggregate size of the industry. Companies addressing equipment and machinery often provide solutions related to overall equipment efficiency (OEE), such as predictive maintenance. The automotive industry is driven by the race to establish leadership in autonomous vehicle technologies. The second segment includes the smart city, smart grid, and oil and gas industries and comprises 24% of companies. Technology adoption in these industries is driven by government investment, either through local governments (as in smart cities) or through subsidies provided to state-owned enterprises in order to encourage the digitalization of their operations.

Exhibit 9: Target customer industries of Industrial IoT companies by technology domain

Technology Domains	Target Customer Industries																							
	Equipment & Machinery	Automotive	Smart City	Smart Grid	Oil & Gas	Electronics & Embedded Devices	Medical Devices & Equipment	Agriculture	Aerospace	Heavy Vehicle	Renewable Energy	Rail & Metro	Furniture & Home Appliances	Retail	Chemicals	Consumer Goods	Logistics	Telecommunications	Shipping	Metals	Healthcare Services	Construction	Mining	Facility Management
Applications	32	32	24	16	16	16	14	11	13	10	7	8	4	5	6	5	4	3	5	2	2	2	3	1
System Integration	25	19	13	13	12	13	7	6	10	6	3	7	5	3	3	3	1		4	5		2	3	
Data Analytics	16	13	18	9	11	4	13	6	5	7	5	5	3	6	6	4	4	4	2	1	3	1	1	
Cloud & Fog Platforms	20	11	11	7	7	10	8	3	5	7	9	4	5	3	4	1	2	6	3	3	1	3	1	1
Data Visualization	13	11	10	5	5	2	6	4	3	5	3	2	2	6	5	4	3	4	1		3	1	1	
Devices & Equipment	6	11	9	9	7	8	2	7	6	1		2	3	3	1	3	1	1		2	1		1	1
Software Development	13	13	8	3	3	7	4	1	4	3	3	2	2	6	1	3	1		1		3	1	1	1
IoT Data Management	9	6	7	5	5	3	3		2	5	4	4	1	2	6	3	2	4	2		1	2	2	1
Hardware Development	8	7	10	6	5	2	4	5	3	2	3	3	2	1	1	1	1			1				
Gateways & Routers	8	1	7	8	6	2	1	1	2	3	8	2	1		2		2	1	1	2	1	2	1	1
Sensors & Actuators	3	6	8	5	6	3	2	2	1		1	1	1	2	3	3	3		2	2			2	
Security		4	8	2	3	1	2	1	1			3	2		2		1	2		1		1		
Processors & Boards	3	5	3	3	2	2	2	4	2				2					1	1					
Transceivers	2	3	3	2	2	1	2	4	1				2					3	1	1		1		
APIs	4	3	4	1	1	1	1	1	1	2	2	2	1		1		1		1		1	1		
Middleware	2	1	1	2		3		1					1			1		1						
Power Supplies		1				1							1											
Connectivity			1															1						
Wearables		1																						1

KEY Hardware Software Services

Target Customer Functions and Industries

A comparison of customer focus by function and industry reveals several innovation clusters. Companies developing manufacturing solutions focus heavily on three high-volume, high-value discrete manufacturing industries – equipment and machinery, automotive, and electronics and embedded device. Those working with IT departments prioritize city governments and automotive manufacturers – a trend driven by China’s mission to become a leader in smart transportation systems. Logistics solutions are often supported by smart city initiatives to streamline and track the flow of goods in China’s congested cities. And equipment maintenance solutions are, intuitively, oriented around the equipment and machinery industry.

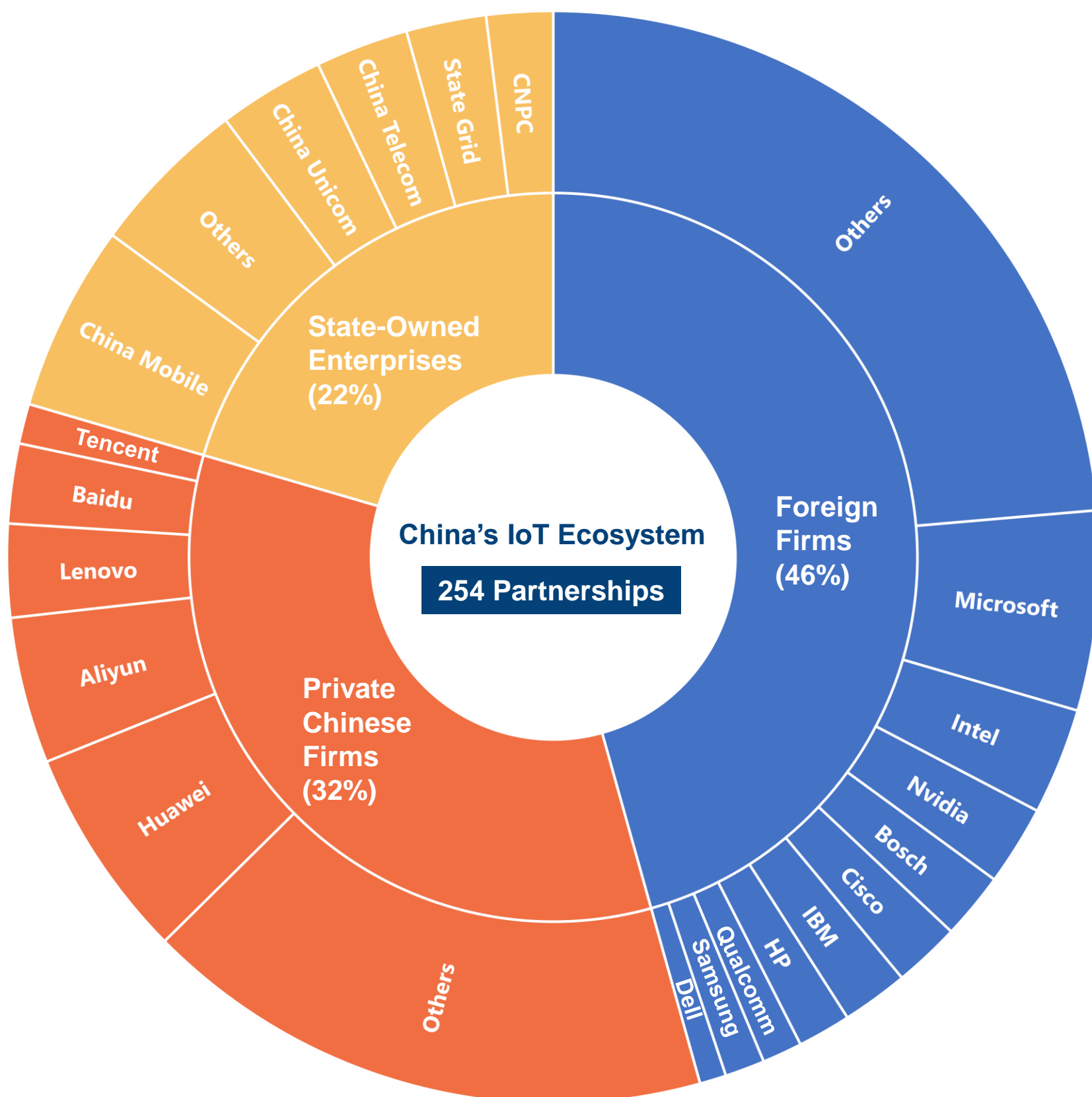
Exhibit 10: Target customer functions and industries of Industrial IoT companies

Target Customer Industries \ Target Customer Functions	Manufacturing	Information Technology	Logistics	Equipment Maintenance	Field Services	Product Development	Natural Resource Production	Facility Maintenance	Quality Assurance	Sales & Marketing	Environmental Health & Safety	Human Resources	Procurement & Sourcing
Equipment & Machinery	36	13	7	18	7	7	5	3	8	2		1	1
Smart City	11	24	18	8	8	7	3	8	1	5	3		
Automotive	26	16	12	9	6	10	4	1	4			2	
Oil & Gas	13	9	4	9	12	3	11	8		1	1		1
Smart Grid	9	9	8	6	12	2	4	11		1	1		
Heavy Vehicle	13	3	1	8	3	2	6	3	2	1			1
Renewable Energy	10	7	2	7	5	1	7	3	1				
Medical Devices & Equipment	6	10	5	5		10	1	1	2	1	1		
Agriculture	1	6	10	1	8	1	4	5	1	1	2	1	
Electronics & Embedded Devices	15	5	3	4	1	4	1		5	2			
Aerospace	11	7	3	3	6	2		1	2		1		
Chemicals	10	3	1	4	1		5	3	2	1	2		
Rail & Metro	5	6	4	2	3		3	4	1		1		
Retail	5	5	3	3	1	1				5		1	
Furniture & Home Appliances	4	3	2	3	2	5			1	1			
Consumer Goods	4	4	3			1	1			4			1
Metals	5	2	1	2	1	1	3	1		1			
Shipping	2	1	4	1		1	1	2	1	1		1	
Telecommunications	2	6	2	1		1	2	1					
Logistics		2	6		1	1		1		1			
Healthcare Services	1	3	1		1	4				1		1	
Mining	1	1	2	1	2		1	1	1				
Construction	2	2	1	2				1	1				
Facility Management	1	1				1		1					

Industrial IoT Partner Ecosystems in China

An evaluation of disclosed partnerships between Chinese Industrial IoT companies and external organizations reveals that foreign firms are very active in China with 46 percent of partnerships. However, it is notable that eight of ten more active foreign partners were American, with only one European and one Korean firm. Industrial companies are also under-represented. It is also striking that the most active partners are from the IT or telecommunications industries with the exception of Bosch, State Grid, and CNPC. We may conclude that European industrial companies could lose competitiveness in China due to their lack of engagement with the local ecosystem of digital technology providers.

Exhibit 11: Most active partners in China's Industrial IoT ecosystem



Industrial IoT Partner Ecosystems in China

Chinese telecommunications companies and private technology conglomerates are investing heavily to place themselves in the center of technology ecosystems that either provide them with access to data or position them as preferred solution providers for ecosystem partners.

Foreign Firms

Microsoft	Intel	IBM	Bosch	

Private Chinese Firms

Huawei		Aliyun	Lenovo, Tencent

State Owned Enterprise

China Mobile	China Unicom	China Telecom	CNPC

Featured Company Index (1/5)

#	Company	Technologies	Target Industries	#	Company	Technologies	Target Industries
25	51VR	Wearables, Applications, Software Development	Facility Management, Automotive	38	Benewake	Sensors & Actuators, IoT Data Management, Hardware Development	Automotive, Smart City
26	99Cloud	Gateways & Routers, Middleware, Cloud & Fog Platforms, IoT Data Management	Telecommunications, Smart Grid	39	Bohua	Data Analytics, Cloud & Fog Platforms, System Integration	Rail & Metro, Oil & Gas, Equipment & Machinery, Heavy Vehicle, Metals
27	AbleCloud	Applications, Data Analytics, Data Visualization, System Integration	Furniture & Home Appliances, Medical Devices & Equipment, Retail	40	Boonray	Processors & Boards, Applications, Data Analytics	Smart Grid, Smart City
28	AlBird	Applications, Data Analytics, Data Visualization	Agriculture, Oil & Gas, Smart Grid	41	CAS Loong Source	Applications, Data Analytics, Data Visualization	Medical Devices & Equipment, Healthcare Services, Smart City, Agriculture
29	Alauda	Applications, Cloud & Fog Platforms, Software Development	Automotive, Equipment & Machinery, Renewable Energy, Aerospace	42	Caxa Technology	Applications, Cloud & Fog Platforms, Hardware Development, Software Development	Heavy Vehicle, Automotive, Equipment & Machinery
30	Alinket	Transceivers, Gateways & Routers, APIs	Healthcare Services, Medical Devices & Equipment, Furniture & Home Appliances, Logistics	43	CHENGLAN	Data Analytics, Cloud & Fog Platforms, IoT Data Management, Software Development	Medical Devices & Equipment, Healthcare Services
31	Allwinner Tech	Processors & Boards, Power Supplies	Furniture & Home Appliances, Automotive, Electronics & Embedded Devices	44	Chinaleem	Transceivers, Sensors & Actuators, Applications, System Integration	Oil & Gas, Smart Grid, Smart City
32	Anylink	Gateways & Routers, APIs, Cloud & Fog Platforms, IoT Data Management	Equipment & Machinery, Rail & Metro, Aerospace, Construction	45	Co-Trust	Transceivers, Gateways & Routers, Applications	Equipment & Machinery
33	Archermind	Applications, Middleware, System Integration, Software Development	Electronics & Embedded Devices, Consumer Goods	46	Coderise	Gateways & Routers, Applications, Cloud & Fog Platforms	Oil & Gas, Renewable Energy, Heavy Vehicle
34	ASAT Tech	Gateways & Routers, Applications, System Integration, IoT Data Management	Smart Grid, Renewable Energy, Oil & Gas, Mining	47	CONTRON	Applications, APIs, System Integration, Software Development	Shipping, Rail & Metro, Smart Grid, Smart City
35	Aspire	Applications, Data Analytics, System Integration	Aerospace, Electronics & Embedded Devices, Equipment & Machinery, Heavy Vehicle	48	CSG	Applications, Data Analytics, System Integration, Hardware Development	Equipment & Machinery, Rail & Metro, Medical Devices & Equipment
36	B&P Automation	Applications, System Integration	Equipment & Machinery, Electronics & Embedded Devices	49	DataCVG	Data Analytics, Data Visualization, Cloud & Fog Platforms, Software Development	Logistics, Retail, Smart City
37	BDStar	Processors & Boards, Transceivers, Sensors & Actuators, Applications, System Integration	Automotive, Agriculture, Shipping	50	Datahunter	Applications, Data Analytics, Data Visualization, IoT Data Management	Heavy Vehicle, Consumer Goods, Equipment & Machinery, Oil & Gas

Featured Company Index (2/5)

#	Company	Technologies	Target Industries	#	Company	Technologies	Target Industries
51	DBSC	Gateways & Routers, Applications, Cloud & Fog Platforms, Hardware Development	Smart Grid, Smart City, Equipment & Machinery, Renewable Energy	64	G7	Transceivers, Sensors & Actuators, Applications, Data Analytics, Data Visualization	Electronics & Embedded Devices, Automotive, Logistics
52	DGT-Factory	Applications, Data Visualization, System Integration, Software Development	Automotive, Equipment & Machinery	65	Gizwits	Applications, Data Analytics, Cloud & Fog Platforms, IoT Data Management	Smart City, Automotive, Medical Devices & Equipment, Electronics & Embedded Devices
53	Dt Dream	APIs, Middleware, Cloud & Fog Platforms, Security, IoT Data Management	Smart City	66	GLODIO	Transceivers, Gateways & Routers, IoT Data Management, Connectivity	Smart City, Logistics
54	E-Plant	Applications, Data Analytics, Data Visualization, IoT Data Management	Automotive, Chemicals	67	Goldenet	Applications, Data Analytics, Security, System Integration	Agriculture, Smart City
55	Efy Tech	Transceivers, Applications	Aerospace, Agriculture	68	Guandata	Data Analytics, Data Visualization, IoT Data Management, Software Development	Retail, Consumer Goods
56	EQuota	Applications, Data Analytics, Data Visualization, IoT Data Management	Industry Agnostic	69	Guide Technology	Sensors & Actuators, Applications, System Integration	Oil & Gas, Metals, Shipping, Smart City, Smart Grid
57	Eversec	Applications, Cloud & Fog Platforms, Security, Software Development	Smart City, Electronics & Embedded Devices	70	Guoyun	Data Analytics, Data Visualization, Cloud & Fog Platforms, IoT Data Management	Smart City, Telecommunications
58	EVUN	Applications, System Integration, Software Development	Automotive	71	Hanway	Applications, Cloud & Fog Platforms, System Integration	Medical Devices & Equipment, Equipment & Machinery, Electronics & Embedded Devices
59	Ewatt	Sensors & Actuators, Hardware Development	Logistics, Smart Grid, Oil & Gas, Smart City	72	HDIM	Gateways & Routers, Cloud & Fog Platforms, System Integration	Equipment & Machinery, Renewable Energy, Smart City
60	Ewininfo	Applications, APIs, System Integration, Software Development	Automotive, Equipment & Machinery, Electronics & Embedded Devices	73	Hekr	APIs, Data Analytics, Cloud & Fog Platforms, Software Development	Equipment & Machinery, Renewable Energy, Smart City, Agriculture
61	FineBI	Data Analytics, Data Visualization, IoT Data Management	Chemicals, Equipment & Machinery, Consumer Goods, Smart City	74	Hibao Software	Applications, Cloud & Fog Platforms, System Integration, Software Development	Aerospace, Automotive, Equipment & Machinery, Electronics & Embedded Devices
62	Flexem	Gateways & Routers, Cloud & Fog Platforms	Electronics & Embedded Devices, Oil & Gas, Metals, Chemicals	75	Hikvision	Sensors & Actuators, Security, System Integration	Furniture & Home Appliances, Automotive, Smart City
63	Foresight	Sensors & Actuators, Applications, System Integration	Retail, Consumer Goods, Automotive, Medical Devices & Equipment, Electronics & Embedded Devices	76	Hite	Sensors & Actuators, Gateways & Routers, System Integration, Hardware Development	Smart Grid, Smart City, Renewable Energy, Rail & Metro, Oil & Gas, Metals, Chemicals

Featured Company Index (3/5)

#	Company	Technologies	Target Industries	#	Company	Technologies	Target Industries
77	Hualong	Applications, Data Visualization, System Integration	Electronics & Embedded Devices, Equipment & Machinery	90	LEAN	Applications, Cloud & Fog Platforms, System Integration, IoT Data Management	Rail & Metro, Construction, Shipping, Mining
78	Huazhi	Gateways & Routers, Applications, Cloud & Fog Platforms	Electronics & Embedded Devices, Equipment & Machinery	91	LEANTEK	Applications, Data Visualization, System Integration	Industry Agnostic
79	HYDATA	Applications, Data Analytics, Data Visualization, IoT Data Management	Smart City, Rail & Metro	92	Lewei	Sensors & Actuators, Applications, System Integration	Consumer Goods, Equipment & Machinery, Logistics
80	IdealTech	Applications, Data Visualization, System Integration	Aerospace, Smart Grid, Smart City	93	Lidar	Sensors & Actuators, Applications, Data Analytics, Data Visualization	Smart City, Smart Grid, Mining, Agriculture
81	INGSHI	Applications, APIs, Data Analytics, IoT Data Management	Chemicals, Equipment & Machinery, Automotive, Heavy Vehicle, Oil & Gas	94	Lingxi	Applications, Data Analytics, Data Visualization, System Integration	Aerospace, Automotive, Equipment & Machinery
82	Insigma	Applications, Security, System Integration, Software Development	Furniture & Home Appliances, Smart City, Construction	95	MByte	Applications, System Integration	Equipment & Machinery
83	Intellifusion	Gateways & Routers, Applications, Data Analytics	Smart City	96	Merit Data	Data Analytics, Cloud & Fog Platforms, IoT Data Management, Software Development	Smart Grid, Electronics & Embedded Devices, Equipment & Machinery
84	Jiyi UAV	Processors & Boards, System Integration, Hardware Development	Aerospace, Agriculture, Smart Grid, Oil & Gas	97	Ming Jiang	Cloud & Fog Platforms, System Integration	Furniture & Home Appliances, Equipment & Machinery, Metals, Electronics & Embedded Devices
85	JOUAV	Processors & Boards, Applications, Hardware Development	Aerospace, Agriculture, Smart City, Smart Grid, Oil & Gas	98	MiraMEMS	Processors & Boards, Sensors & Actuators, System Integration, Hardware Development	Electronics & Embedded Devices, Equipment & Machinery, Automotive, Medical Devices & Equipment
86	JTT	Applications, Hardware Development	Rail & Metro, Smart City, Agriculture	99	Mixlinker	Gateways & Routers, Applications, Data Visualization, Cloud & Fog Platforms	Equipment & Machinery
87	Jzaegis	Sensors & Actuators, Applications, Hardware Development	Retail, Consumer Goods	100	Morewis	Applications, Middleware, Cloud & Fog Platforms, Software Development	Automotive, Electronics & Embedded Devices, Equipment & Machinery
88	K2Data	Applications, Data Analytics, Data Visualization, IoT Data Management	Smart Grid, Renewable Energy, Equipment & Machinery	101	MSJ	Gateways & Routers, Applications, Middleware, Cloud & Fog Platforms	Industry Agnostic
89	Kule Tech	Applications, System Integration, IoT Data Management, Hardware Development	Electronics & Embedded Devices, Equipment & Machinery	102	MXchip	Processors & Boards, Transceivers, Cloud & Fog Platforms, Hardware Development	Furniture & Home Appliances, Equipment & Machinery, Medical Devices & Equipment

Featured Company Index (4/5)

#	Company	Technologies	Target Industries	#	Company	Technologies	Target Industries
103	New Core Tech	Applications, Data Analytics, Data Visualization, Cloud & Fog Platforms, IoT Data Management	Heavy Vehicle, Automotive, Medical Devices & Equipment, Furniture & Home Appliances, Equipment & Machinery	117	Qianyuan Kunhe	Applications, Data Analytics, System Integration, Software Development	Aerospace, Automotive, Oil & Gas
104	New Hope Data	Cloud & Fog Platforms, System Integration, Software Development	Chemicals, Electronics & Embedded Devices, Furniture & Home Appliances	118	QUECTEL	Processors & Boards, Transceivers, Connectivity	Industry Agnostic
105	NJU Electronics	Applications, Hardware Development	Industry Agnostic	119	Realtime Technology	Applications, Cloud & Fog Platforms, System Integration	Industry Agnostic
106	OE	Data Analytics, Cloud & Fog Platforms	Oil & Gas, Smart Grid, Renewable Energy	120	Rootcloud	Gateways & Routers, Cloud & Fog Platforms, IoT Data Management	Renewable Energy, Smart Grid, Facility Management, Heavy Vehicle
107	OneNET	Applications, Cloud & Fog Platforms, Connectivity	Industry Agnostic	121	RS TECH	Applications, Data Analytics, System Integration	Industry Agnostic
108	OPSOFT	Applications, Data Visualization, System Integration	Industry Agnostic	122	Ruff	Gateways & Routers, Applications, Middleware, System Integration	Smart Grid, Agriculture, Equipment & Machinery
109	OrienTech	System Integration, Software Development	Equipment & Machinery, Retail, Heavy Vehicle	123	Scinan IoT	Data Analytics, Cloud & Fog Platforms, Hardware Development	Smart City, Furniture & Home Appliances, Equipment & Machinery, Medical Devices & Equipment
110	oTMS	Applications, Data Analytics, Cloud & Fog Platforms, IoT Data Management	Shipping, Retail, Logistics	124	Sciyon	Sensors & Actuators, Gateways & Routers, Applications, System Integration	Oil & Gas, Smart City, Aerospace
111	Percent	Applications, Data Analytics, Data Visualization, Software Development	Equipment & Machinery, Renewable Energy, Oil & Gas, Retail	125	SENSORS Data	Data Analytics, Data Visualization, Cloud & Fog Platforms, Software Development	Retail, Consumer Goods
112	Philorise	Applications, Data Analytics, Data Visualization, Software Development	Medical Devices & Equipment, Rail & Metro, Smart City	126	Shidewei	Applications, Data Visualization	Industry Agnostic
113	PowTronic	Applications, System Integration	Smart Grid, Equipment & Machinery, Automotive, Electronics & Embedded Devices, Heavy Vehicle	127	Skycloud Software	Applications, Data Analytics, Data Visualization, Cloud & Fog Platforms	Aerospace, Automotive, Medical Devices & Equipment, Telecommunications
114	Promisense	Sensors & Actuators	Oil & Gas, Chemicals	128	SOA	Gateways & Routers, Applications, APIs, Hardware Development	Industry Agnostic
115	Proudsmart	Gateways & Routers, Data Analytics, Data Visualization, Cloud & Fog Platforms	Shipping, Smart Grid, Equipment & Machinery, Construction	129	SymLink	Gateways & Routers, Applications	Oil & Gas, Smart Grid, Renewable Energy
116	QFEELTECH	Processors & Boards, Applications, Hardware Development	Automotive, Smart City, Equipment & Machinery	130	Talent Cloud	Applications, Data Analytics, Data Visualization, Cloud & Fog Platforms	Agriculture

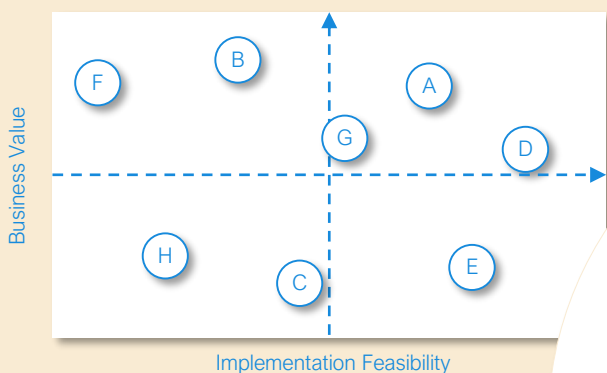
Featured Company Index (5/5)

#	Company	Technologies	Target Industries	#	Company	Technologies	Target Industries
131	ThingLinx	Data Analytics, Cloud & Fog Platforms, System Integration, Software Development	Oil & Gas, Equipment & Machinery, Smart Grid	145	Videa Software	Applications, Data Visualization, System Integration	Automotive, Equipment & Machinery
132	Tiandi Hexing	Applications, Security, System Integration	Smart Grid, Oil & Gas, Chemicals, Metals, Rail & Metro	146	WellinTech	Applications, Data Visualization, System Integration	Equipment & Machinery, Automotive, Heavy Vehicle
133	Tongfang Cloud	Gateways & Routers, APIs, Cloud & Fog Platforms, Hardware Development	Renewable Energy, Smart City, Automotive, Heavy Vehicle	147	WIDE-WORLDZ	Applications, System Integration, Hardware Development	Agriculture
134	TOPRIE	Processors & Boards, Transceivers, Cloud & Fog Platforms	Agriculture, Automotive, Telecommunications	148	Winicssec	Data Analytics, Security, System Integration	Rail & Metro, Smart Grid, Oil & Gas, Automotive, Aerospace
135	Touchnet Technology	Applications, System Integration, Software Development	Equipment & Machinery, Automotive, Heavy Vehicle	149	Wisu	Applications, Data Analytics, Security, System Integration	Medical Devices & Equipment, Smart City
136	Transwarp	APIs, Middleware, Data Analytics, Software Development	Industry Agnostic	150	Witium	Processors & Boards, Transceivers, Cloud & Fog Platforms	Industry Agnostic
137	Turing Robot	Applications, Middleware	Furniture & Home Appliances, Electronics & Embedded Devices	151	WYSEngine	Data Analytics, Data Visualization, Cloud & Fog Platforms, IoT Data Management	Renewable Energy, Oil & Gas, Chemicals, Heavy Vehicle, Telecommunications
138	UEC	Applications, Data Analytics, Cloud & Fog Platforms, System Integration	Smart City, Automotive, Medical Devices & Equipment	152	Xery 3D	Devices & Equipment, Application	Aerospace, Automotive, Medical Devices & Equipment
139	UISEE	Applications, Hardware Development	Automotive	153	XLOONG	Wearables, Data Visualization, Software Development	Retail, Healthcare Services, Automotive
140	Ultra Power	Applications, Data Analytics, Data Visualization, Security	Automotive, Telecommunications, Smart City, Logistics	154	YITU	Data Analytics, Security, Applications, Software Development	Medical Devices & Equipment, Automotive, Smart City
141	Unisound	Applications, Data Analytics, Data Visualization, Software Development	Medical Devices & Equipment, Healthcare Services, Smart City	155	Yonghong Tech	Data Analytics, Applications, IoT Data Management	Industry Agnostic
142	Unitoon	Sensors & Actuators, System Integration, Software Development	Equipment & Machinery, Mining	156	Yuemes	Applications, System Integration	Automotive
143	Veizu	Applications, Data Analytics, Data Visualization	Equipment & Machinery, Oil & Gas, Chemicals, Automotive, Heavy Vehicle	157	ZETTAKIT	Applications, Cloud & Fog Platforms, Security, IoT Data Management	Rail & Metro, Chemicals, Oil & Gas, Telecommunications
144	VF	Transceivers, System Integration, Hardware Development	Agriculture, Oil & Gas, Smart Grid, Smart City	158	Ziyan	Devices & Equipment, Applications	Smart Grid, Oil & Gas, Field Service, Resource Management

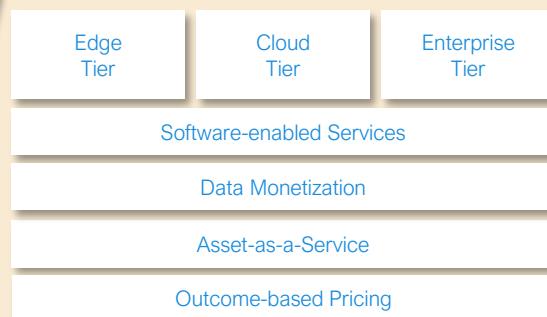
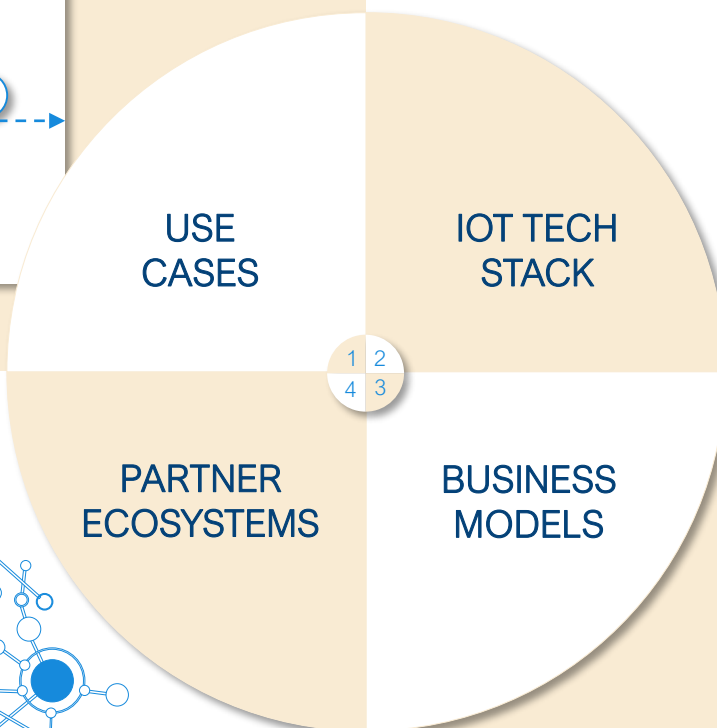
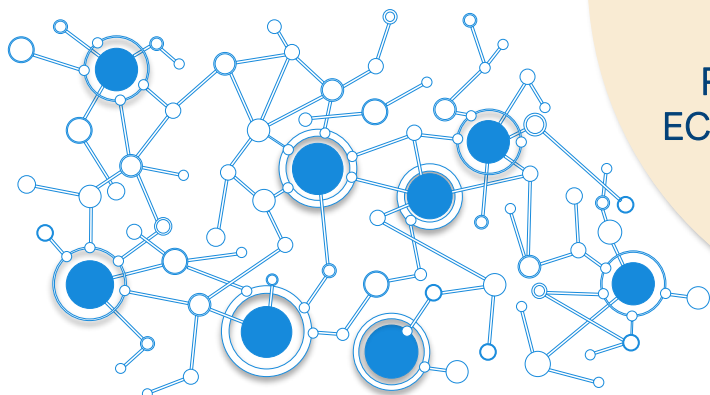
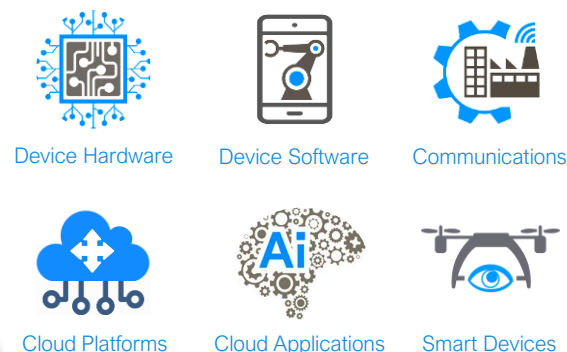
IoT Ecosystem Research Contact

IoT ONE helps companies access the external information they need to make confident business decisions. We provide customized IoT landscape reports with the objective of helping you make informed decisions about how IoT technologies will impact your top line, bottom line and competitive position.

Which IoT use cases have the potential to create new business opportunities or disrupt your existing business?



Which technologies will enable disruptive use cases and what is their current state of maturity?



What partner ecosystem will help you fill capability gaps and stay agile as your products and operations evolve?

What IoT-enabled business models and operating processes will improve your competitive positioning



ERIK WALENZA

Founder & CEO

erik.walenza@iotone.com

+86 156 0183 9705

338 Nanjing West Road, Tian An Center, Shanghai, China



MICHAEL MAEDER

Partner & Industrie 4.0 Lead

michael.maeder@iotone.com

+49 157 5894 5781

Geiseltgasse 88, 81545 Munich, Germany

IOT ONE INSIGHT REPORT

Industrial Internet of Things Ecosystem Development in China

