

Emerging of Artificial Intelligence Economy in China

Chinese Institute of New Generation Artificial Intelligence Development Strategies

Abstract

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The development of China's intelligent technology and industry is generated endogenously from the intelligent demand created in the economic restructuring and upgrade. Based on the integration of field study and big data analysis and in order to portray and analyze the basic form, structure and dynamic mechanism of China's intelligent economy development, this report established China Intelligent Economy Sample Database covering 408 intelligent enterprises, 73 universities, 56 non-university scientific research institutions, 138 conferences held in 2017 within China, 84 industry alliances, 834 investors, 18 provinces, municipalities and autonomous regions and 13 hotspot cities.

Based on the analysis of the attributes of samples and relational data, this report states the current conditions and structure of China's intelligent economy development, reveals the "hidden order" of China's intelligent economy, identifies the essential driving force and mechanism of intelligent economy development driven by the intelligent demand created in the economic transformation and upgrade, and evaluates regional competitiveness of the development of China's intelligent industry.

The establishment time of Chinese intelligent enterprises was concentrated between 2010 and 2016, with 2014 as a peak. The regions, including Beijing, Guangdong, Shanghai, Zhejiang and Jiangsu are with the highest concentration of intelligent enterprises and Beijing account for 43.9%. 77.7% of the intelligent enterprises are distributed in the application layer. Enterprises in the base layer and technology layer have a relatively small percentage. As for the core technologies relied by intelligent enterprises, machine learning, big data and robot technology are the TOP 3. China's intelligent enterprises widely distributes in 17 application domains, including enterprise technology integration and solution offer, essential technology R&D application platform, intelligent hardware and intelligent manufacturing.

Based on the analysis of the relational data of 408 intelligent enterprises, this report

finds the "hidden order" of the development of China's intelligent economy. With digital and intellectualized empowerment, the real time online data sharing platform and national AI innovation platforms become the dominator of the development of intelligent economy. At least 25% of the core human capital in the intelligent enterprises has academic and working experiences in overseas universities, scientific research institutions, R&D organizations and enterprises. The intelligent enterprises' technological empowered objects are almost domestic enterprises, and 22.6% of the technology input comes from foreign enterprises and institutions. Among the key investors of intelligent industry, both investment institutions and non-investment institutions are included. Among non-investment institutions, Tencent, Alibaba Group, Baidu, Lenovo, JD.com, Xiaomi, Fosun International and Ant Financial are the most active investors.

Main dynamic mechanism of the development of China's intelligent economy consist of platform-dominant innovative ecosystem, new incubator organizations, new innovative areas and governments' positive responses to policies. During development, platforms have already evolved from pure trading platforms and innovative enterprises into mutually nesting innovative ecosystem including several sub-systems. The emergence of new incubator organization and model, like the "Platform+Empowerment+Developer", has accelerated the integration of intelligent technology, economy and society. Due to the gathering and netting interactions by diversified innovative subjects, new innovative areas distributed in city central areas and sub central areas become the space "polarization" carriers. The releasing of local governments policies and the planning and building of special industrial parks are more manifested by the positive responses to the local intelligent enterprises and the actual demand of industrial development.

In terms of the Intelligent Industrial Regional Competitiveness Evaluation Index ranking, Beijing, Guangdong, Zhejiang, Shanghai and Jiangsu are among the first

echelon. Provinces, municipalities and autonomous regions in the second echelon include Shandong, Anhui, Hubei, Tianjin, Fujian, Sichuan, Chongqing, Liaoning, Guizhou and Heilongjiang.

In terms of the development of intelligent technology and industry, China is no longer a follower, but is endeavored to be a leader. The development of China's intelligent technology and intelligent economy become not only the endogenous driving force of the transformation and upgrade of the Chinese economy, but can also make contribution to the prosperity and development of the world.

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I. Introduction

Human society has undergone agricultural economy and industrial economy to the present date, mainly fueled by manpower, electric power and fossil energy. With the rise and development of the Fourth Industrial Revolution, human society are about to enter into the era of intelligent economy with data and computing as the drivers. Intelligent technology germinated when computer emerged in the 1940s. And on the 1956 Dartmouth Conference, the concept of Artificial Intelligence (AI) was first proposed, namely, the research and development of theory, technology, and method for mimicking, extending and expanding human intelligence. As the Internet, Internet of Things, big data, super computer and brain science develop in the 21st century, AI walks into our production and life from the tower of ivory. Different from the early development, the new generation of AI, based on the Internet and big data, is no longer confined to simply mimicking AI via computers. Rather it is an intelligent system that integrates machines, human and network in a three dimensional space structure constituted by physics, society and Internet.

With the development of intelligent technology and industry, data and computing are becoming key factors for fueling economic growth and development. As the engine of the Fourth Industrial Revolution, the development of intelligent technology and economy in China is derived internally from intelligent demand created by economic restructuring and upgrading. Because of the unique information environment and data ecology, China is rising rapidly in intelligent technology, and is becoming a force that cannot be neglected in the world. Especially with the formulation and implementation of national strategies like *Made in China 2025*, *Internet Plus*, *A Next Generation Artificial Intelligence Development Plan*, China's intelligent technology and economy will witness an explosive growth.

In the field of intelligent technology and industry development, China's innovation

has been shown not only in data ecology, but also in many fields and links including algorithm, intelligent chip, operating system and open innovative platform. Regarding data ecology, by the end of December, 2017, the number of Chinese netizens has reached 772 million; mobile netizens 753 million, accounting for 97.5% of all Chinese netizens; rural netizens 209 million, accounting for 27.0% of all Chinese netizens. Supported by Internet infrastructure, the Internet applications maintained a rapid growth in 2017. Among them, the annual growth rate of online take-out users reached 64.6%; the annual growth rate of mobile online take-out users and mobile travel booking users reached 66.2% and 29.7% respectively; the percentage of mobile payment used for netizens' offline consumption increased from 50.3% in 2016 to 65.5%; offline mobile payment accelerates penetration into rural areas; the percentage of rural netizens using offline mobile payment increased from 31.7% in December 2016 to 47.1%; the number of netizens purchasing Internet financial products reached 129 million; 221 million people solved the urban short-distance transportation demand through shared bikes.^[1]

The improvement of data ecology and the economic intelligent demand strongly drive the development of intelligent technology and intelligent industry. Since 2014, many intelligent chip companies have sprung up in China, including Cambricon Technologies, SenseTime, HiSilicon Technologies, Hangzhou C-SKY Microsystems, Hikvision and Ali-NPU. Under the guidance of 4 national AI innovation platforms like Alibaba Group, Tencent, Baidu and iFLYTEK, Chinese enterprises are constantly gaining breakthroughs in the key technologies of computer vision, machine learning, image recognition, biological recognition, speech recognition and natural language processing. Having experienced Windows of the PC era, Android and iOS of the mobile Internet era, the operating system compatible with the new generation Artificial Intelligence is breaking down the monopoly of existing operating systems.

^[1] China Internet Network Information Center (CNNIC): the 41st *Statistical Report on Internet Development in China* January 30th, 2018

The platform-dominant innovative ecosystem has assembled large number of developers of intelligent technology applications. "Platform+Empowerment+Developer" has become an organizational form in the intelligent economy oriented by "Mass Entrepreneurship and Innovation".

Being different from the previous three Industrial Revolutions, China is no longer a passive follower in the intelligent technology and industry. Instead, China endeavors to become an active leader. Following the issue of *A Next Generation Artificial Intelligence Development Plan* by the State Council, many provinces, municipalities and autonomous regions responded to it one after another, and formulated their own AI development planning, implementation opinion and action plan. Local government's policy response is not only aimed at national strategies, but also a response to the demand of local intelligent enterprises and industrial development

II. Research Design and Method

In order to accurately depict and reveal the status quo, basic form, inner structure and driving mechanism of the development of China's intelligent economy, we take the intelligent economy as a complex adaptive system. The innovative subjects constituting intelligent economy are diversified, including not only intelligent enterprises, but also organizations and institutions like universities, non-university scientific research institutions, linkers, investors and government. The development of intelligent technology and economy is shown as the formation and evolution of Value Network through diversified innovative subjects' netting and interaction. The Value Network analysis of how diversified innovative subjects connect and interact with each other is the basic research method to reveal the dynamic mechanism and "hidden order" of intelligent economy development.

We have conducted a field research of intelligent enterprises, universities,

non-university scientific research institutions, linkers, investors, government and the innovative ecosystem constituted by them in cities where AI development is typical, including Beijing, Shenzhen, Guiyang, Shanghai, Hangzhou and Tianjin. Based on the field research and existing literature, we have established China Intelligent Economy Sample Database which includes 408 intelligent enterprises, 73 universities, 56 non-university scientific research institutions, 834 investors (investment institutions and non-investment institutions), 138 AI conferences held in China, 84 industry alliances, government policies issued by 18 provinces, municipalities, autonomous regions and 13 hotspot cities, and industrial parks planned and built by them.

In order to understand the basic form and structure of intelligent economy development in China, the sample data collected includes two types: attribute data and relational data. Attribute data refers to the basic information of 6 types sample subjects, namely enterprises, universities, non-university scientific research institutions, linkers (AI conferences and alliances), investors and government. And relational data refers to the three dimensional relations (human capital, technology, and investment and financing) and interactive rules being included in the interrelations between sample nodes (sample enterprises) and relational nodes (other enterprises, organizations and institutions).

In this report, the Value Network statistical analysis of mere 408 sample enterprises gives us as many as 10305 nodes and 15390 relations. Because the sample of intelligent enterprises account for 69% of all AI enterprises in China, the analysis of attribute data and relational data of 408 intelligent enterprises sample nodes, 9897 relational nodes and 15390 relations summarize and reveal the inner structure and basic form of the development of China's intelligent technology and economy as well as the dynamic mechanism of the development and evolution.

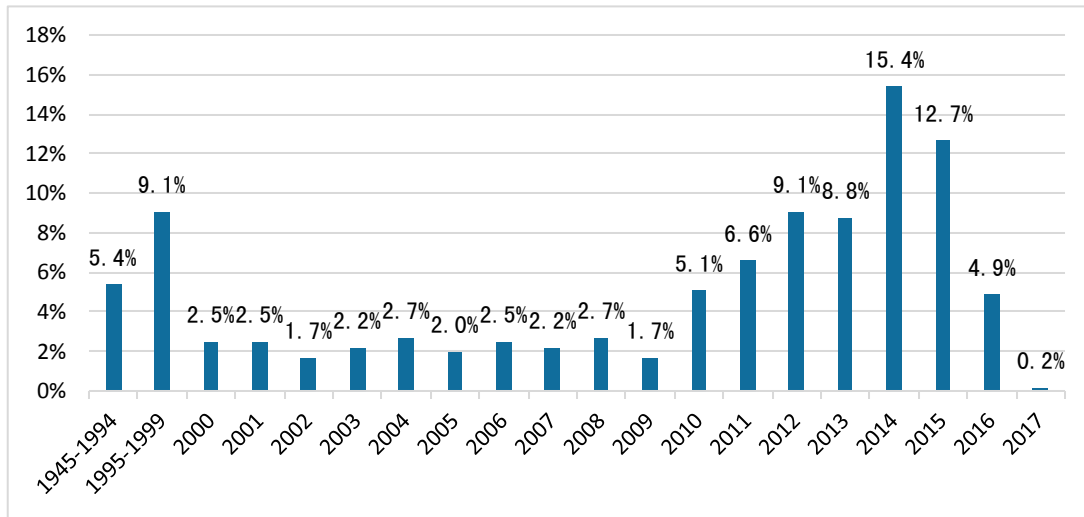
III. The Basic Form and Structure of Intelligent Economy in China

The structure analysis of intelligent economy in China is mainly based on the attribute data of 408 sample enterprises, while the basic form analysis is based on relational data. Through the attribute data and relational data, this report summarizes and reveals the dynamic mechanism and “hidden order” of China’s intelligent economy development.

1. The Structure of Intelligent Economy

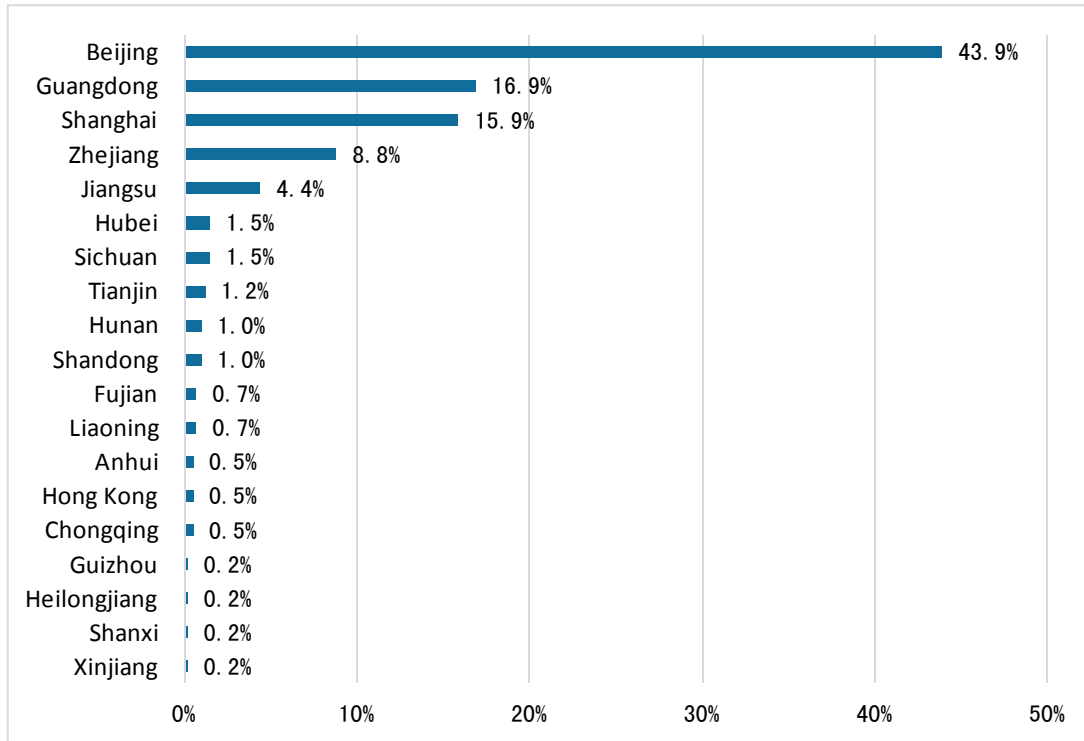
China’s intelligent enterprises started from the mid-1990s. Compared to the US, there is a five-year lag behind in the start point of every period: germination, development, and high-speed growth. China’s intelligent enterprises were mainly established between 2010 and 2016, accounting for 53.8% of the total number. The peak time is 2014, when 15.4% were created. By June 2017, the total number of AI enterprises has reached 2542 worldwide. Among them, the US has 1078 enterprises, and China 592, with a proportion of 42.4% and 23.3% respectively. The remaining 872 enterprises spread over Sweden, Singapore, Japan, UK, Australia, Israel, India, etc.^[1]

^[1] China Internet Network Information Center (CNNIC): the 41st *Statistical Report on Internet Development in China* January 30th, 2018.



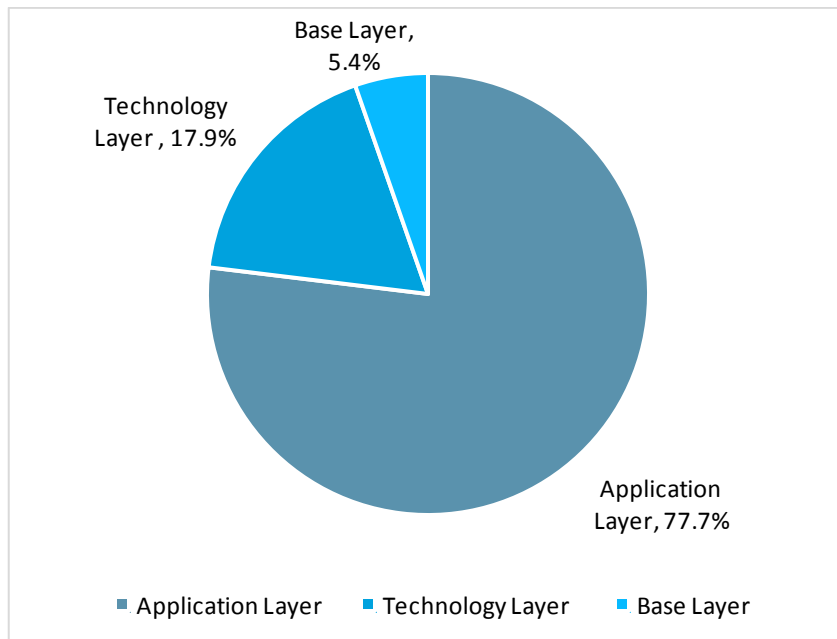
Graph 1, Distribution of the 408 intelligent enterprises' establishment time

Geographically, China's intelligent enterprises are mainly distributed in Beijing, Guangdong, Shanghai, Zhejiang, Jiangsu, Hubei, Sichuan, Tianjin, Hunan and Shandong. Among them, Beijing takes up the highest proportion of 43.9%, and Haidian District holds the most enterprises; Guangdong comes as second with a proportion of 16.9%, and Shenzhen and Guangzhou hold the most; the third is Shanghai with 15.9%, and Pudong New Area holds the most; the fourth is Zhejiang with 8.8%, and Hangzhou holds the most. At present, Beijing, Shanghai, Guangzhou, Shenzhen and Hangzhou are the hotspot cities where intelligent economy is most intensive and active.



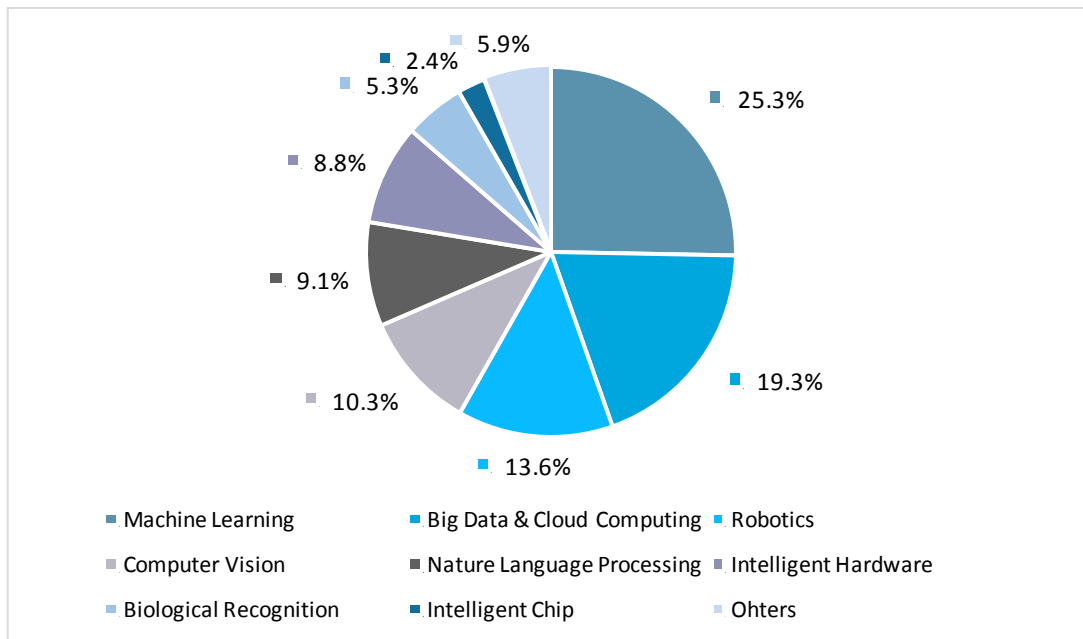
Graph 2, Regional distribution of the 408 intelligent enterprises

From the perspective of **industrial level**, the intelligent enterprises of application layer take up the highest proportion, which is 77.7%; enterprises of technology layer come to the next, taking up 17.9%; enterprises of base layer rank third, accounting for 5.4%. There are 4 enterprises which belong to 2 layers at the same time. Comparing to the industrial layer distribution of intelligent enterprises of the US, the proportion of application layer enterprises in China is far more than that of the US, while the proportion of base and technology layer is obviously less than that of the US.



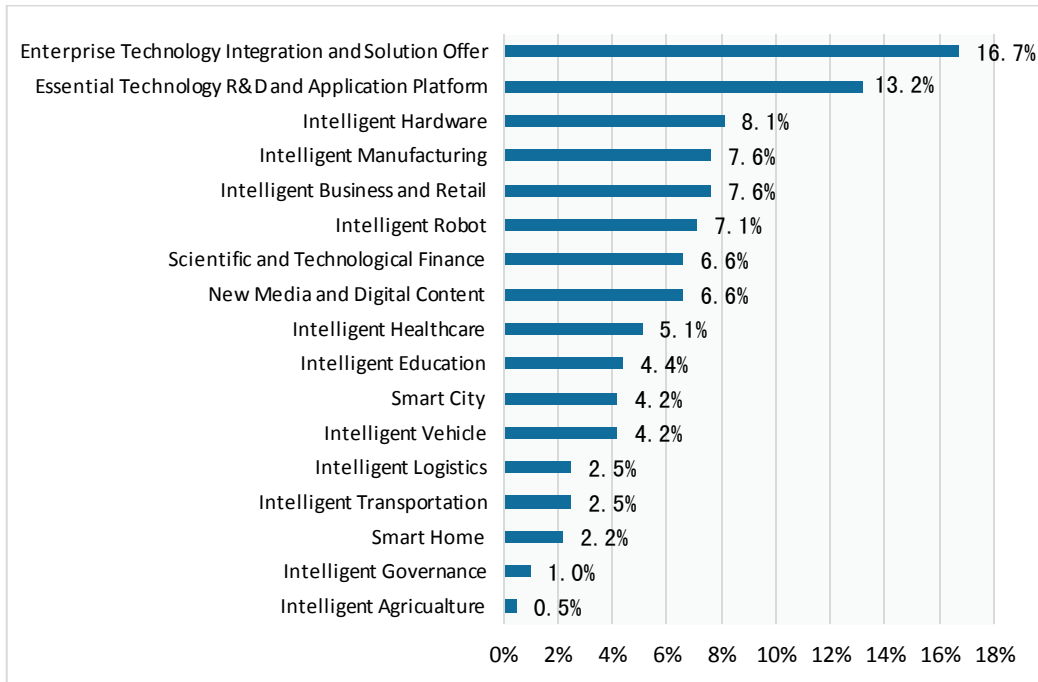
Graph 3, Layer distribution of the 408 intelligent enterprises

From the perspective of **core technology** distribution, machine learning is the highest in proportion with 25.3%; and it is followed by big data and cloud computing, robot technology, and computer vision, with a proportion of 19.3%, 13.6% and 10.3% respectively. The proportion of natural language processing, intelligent hardware, biological recognition and intelligent chip is 9.1%, 8.8%, 5.3% and 2.4% respectively.



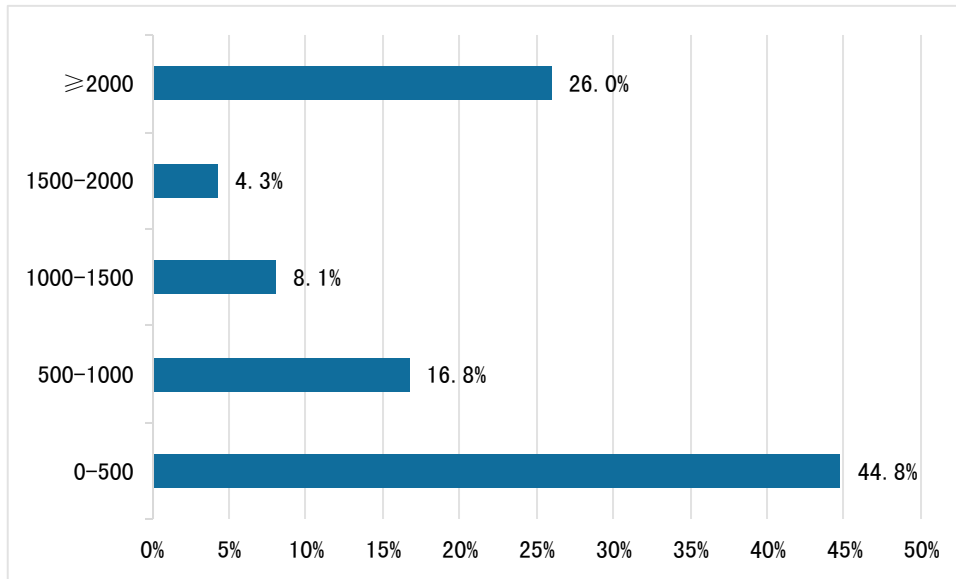
Graph 4, Distribution of the 408 intelligent enterprises' core technologies

China's intelligent enterprises are widely distributed in 17 **application fields**, among which enterprise technology integration and solution offer, essential technology R&D and application platform are the two fields with the highest proportion of enterprises, 16.7% and 13.2% respectively. There is a relatively high proportion of enterprises in the fields of intelligent hardware, intelligent manufacturing, intelligent business and retail, intelligent robot, scientific and technological finance, new media and digital content, which is 8.1%, 7.6% , 7.6% , 7.1% , 6.6% , 6.6% in sequence. The highest proportion of enterprise technology integration and solution offer as well as essential technology R&D and application platform shows that the development of intelligent technology and economy in China on the one hand strives to break through the bottleneck of key technologies, while on the other hand, promotes a rapid penetration and integration of key technologies to existing industries by integrating technologies and providing solutions.



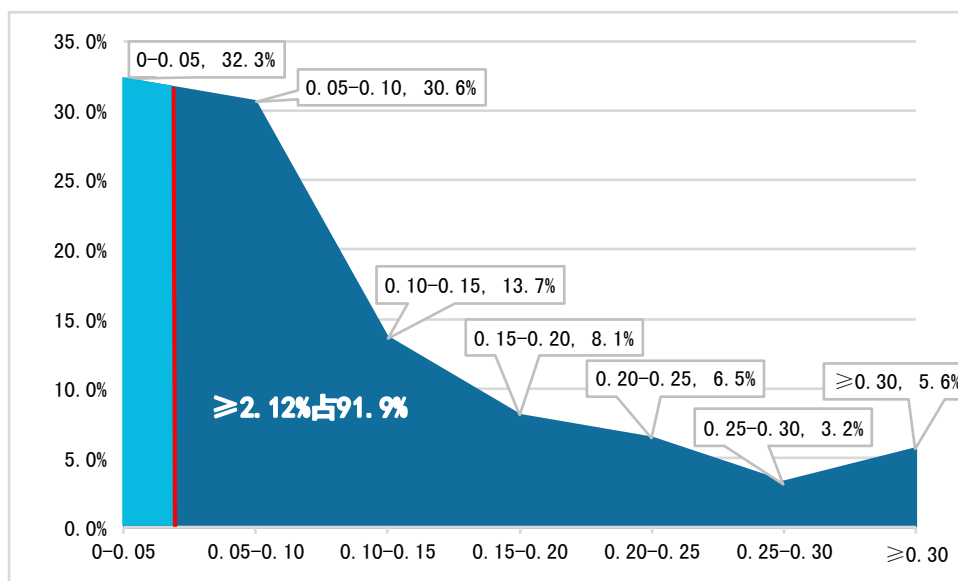
Graph 5, Distribution of the 408 intelligent enterprises' application fields

More than 44.8% intelligent enterprises have less than 500 **employees**. And the proportion of enterprises with 500-1000 employees is 16.8%; those with 1500-2000 employees, only 4.3%. Although the proportion of enterprises with 1500-2000 employees is low, these enterprises are all platform enterprises in the base and technology layer and the leader of China's intelligent economy development.

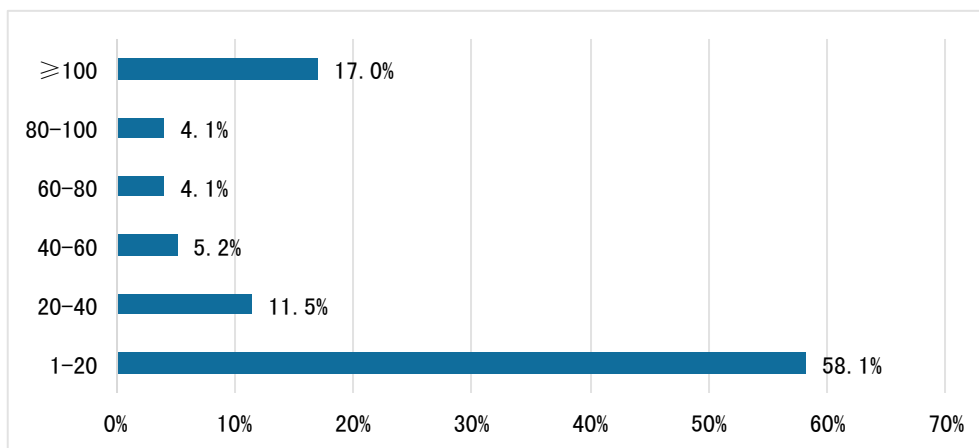


Graph 6, Distribution of the 346 intelligent enterprises' employees (Unit: Person)

More than 60% intelligent enterprises have a **R&D intensity** higher than 5%, which is far above the average level of domestic enterprises (2.12%). High-intensive R&D investment injects a powerful impetus into the development of intelligent technology and economy. In all sample enterprises, only 17.3% intelligent enterprises have more than 100 patents, while those with less than 20 patents account for 57.9%. China's AI technological patents are mainly concentrated in unicorn enterprises and listed companies.



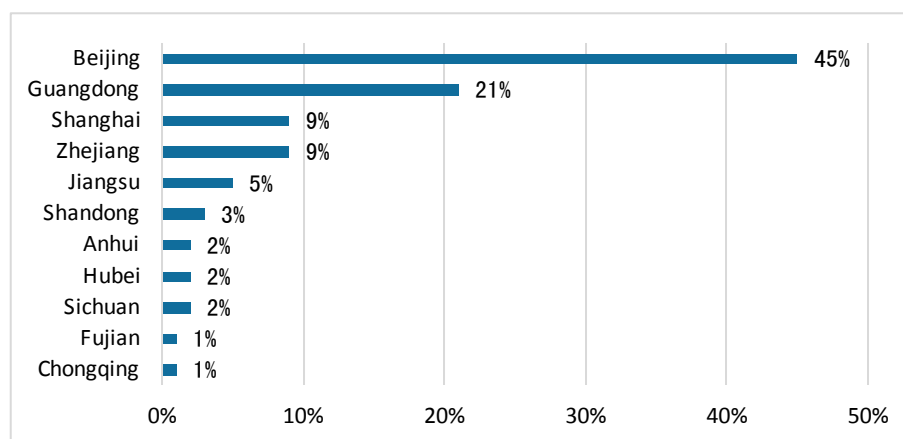
Graph 7, Distribution of the 123 intelligent enterprises' R&D intensity



Graph 8, Distribution of the 270 intelligent enterprises' patent (Unit: Piece)

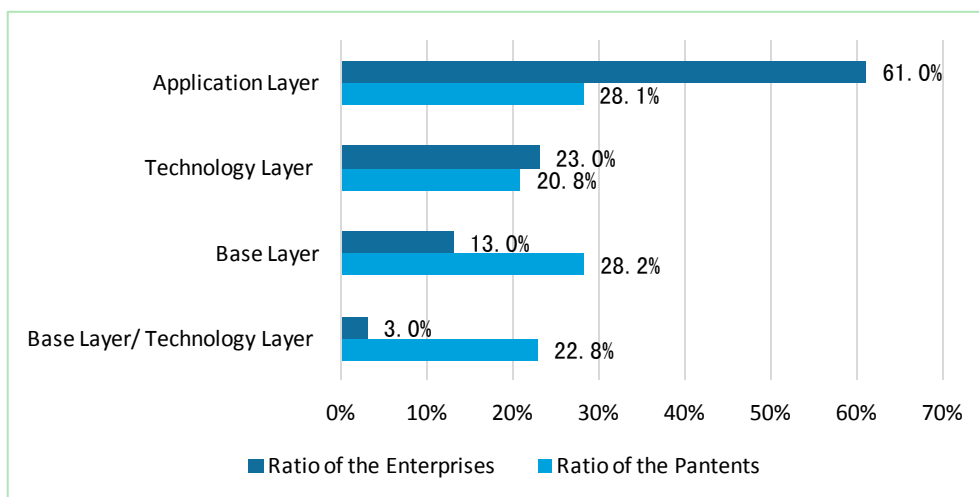
Intelligent enterprises with **patent number ranking** among TOP 100 are mainly distributed in four provinces and municipalities, namely Beijing, Guangdong, Shanghai and Zhejiang, where hold 84% of all. Among them, Beijing has the highest percentage, which is 45%; Guangdong, as second, 21%; Shanghai and Zhejiang share

the third place, both 9%. The TOP 100 intelligent enterprises in terms of patent number mainly concentrate in the application layer, accounting for 61% of all. The percentages of those belong to the technology and base layer are 23% and 13% respectively. And 3% belong to the base layer and technology layer at the same time.



Graph 9, Regional distribution of TOP 100 intelligent enterprises ranked by patent number

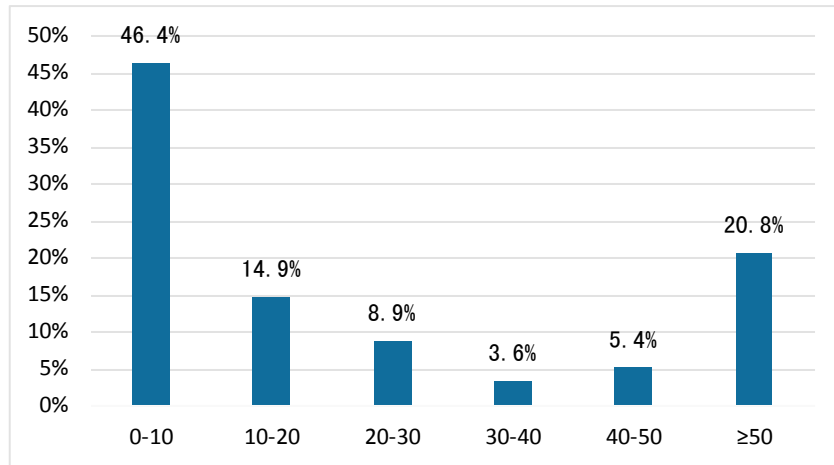
Among TOP 100 enterprises ranked by patent number, although application layer enterprises take up a relatively high percentage, the proportion of patents obtained by them is few, only 28.1%. While technology and base layer enterprises account for a low percentage, but the proportion of patents they get is as high as 48.4%. Special attention shall be paid to those spread across base and technology layers. Though only 3% of the total sample enterprises, their patent number accounts for 22.8%. Therefore, AI patents are mainly concentrated in the base and technology layer enterprises.



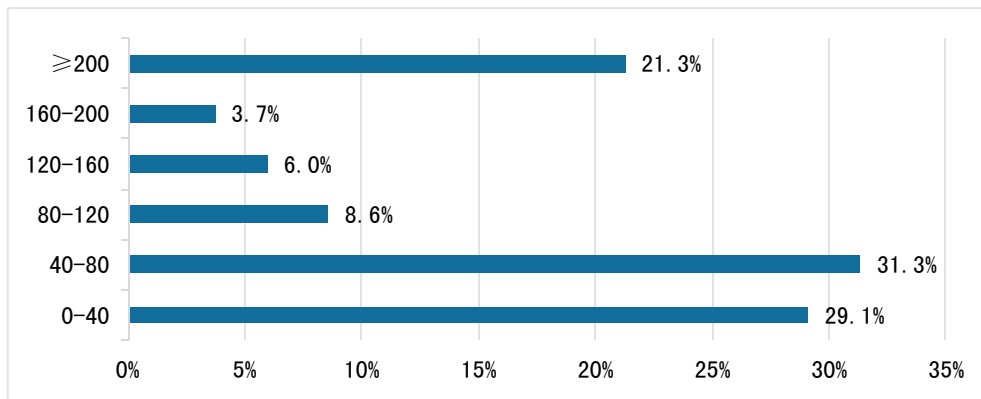
Graph 10, Layer distribution of TOP 100 intelligent enterprises ranked by patent number

Intelligent enterprises with **sales revenue**^[1] less than 1 billion Yuan account for 46.4%, and those higher than 5 billion Yuan account for 20.8%. Meanwhile, intelligent enterprises with assessment/ market value between 4 and 8 billion Yuan have the highest percentage, 31.3%. There are also 21.3% enterprises having an assessment/ market value exceeding 20 billion Yuan. Beijing, Hangzhou, Shanghai, Shenzhen and Nanjing are the cities where the assessment/ market value TOP 100 sample enterprises are concentrated. The percentage of these cities is 45%, 13%, 13%, 11%, 4% and 3% in sequence. From industrial level, TOP 100 enterprises in terms of assessment/ market value mainly distribute in the application layer with 69%; technology layer, 19%; base layer, 9%.

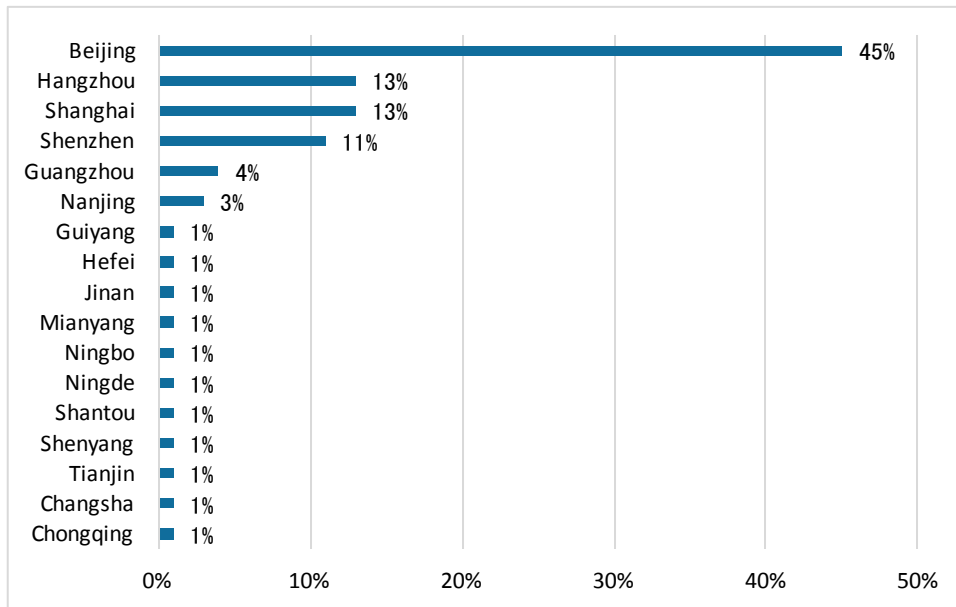
^[1] In the data collection process of employees, patents, sales revenue, assessment/ market value and financing amount, the number of sample enterprises which can obtain data is less than 408. Therefore, the statistical analysis of the data is based on the sample of enterprises that can obtain the data.



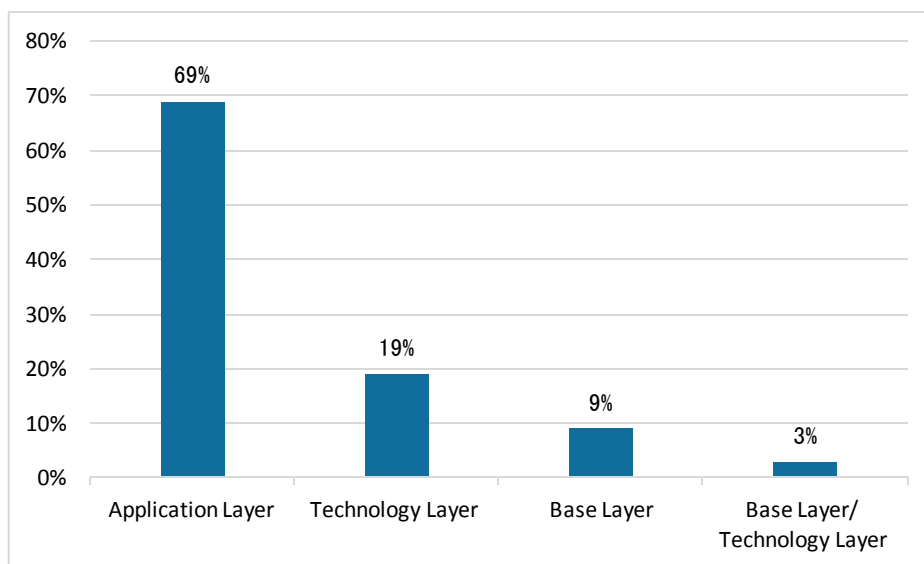
Graph 11, Distribution of the 169 intelligent enterprises' sales revenue (Unit: 100 million Yuan)



Graph 12, Distribution of the 268 intelligent enterprises' assessment/ market value (Unit: 100 million Yuan)

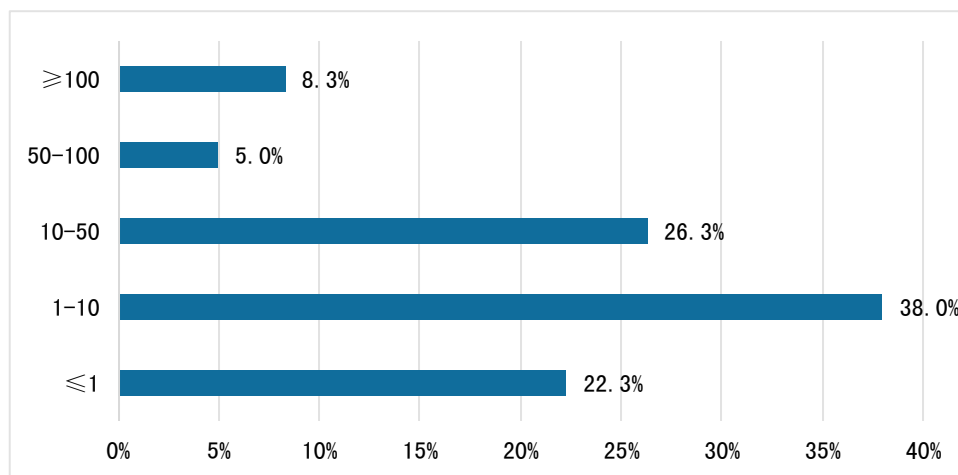


Graph 13, Regional distribution of TOP 100 intelligent enterprises ranked by assessment/ market value

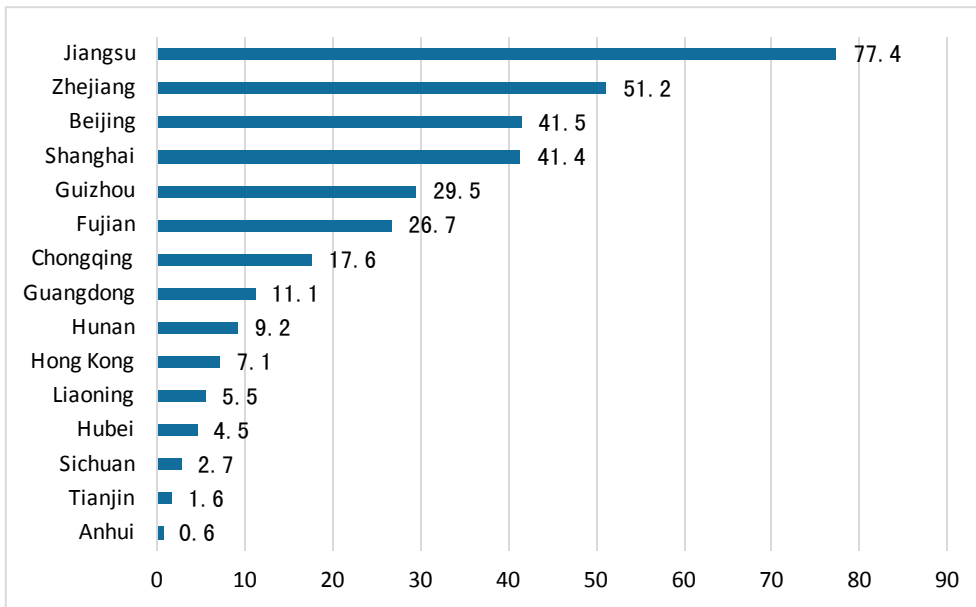


Graph 14, Layer distribution of TOP 100 intelligent enterprises ranked by assessment/ market value

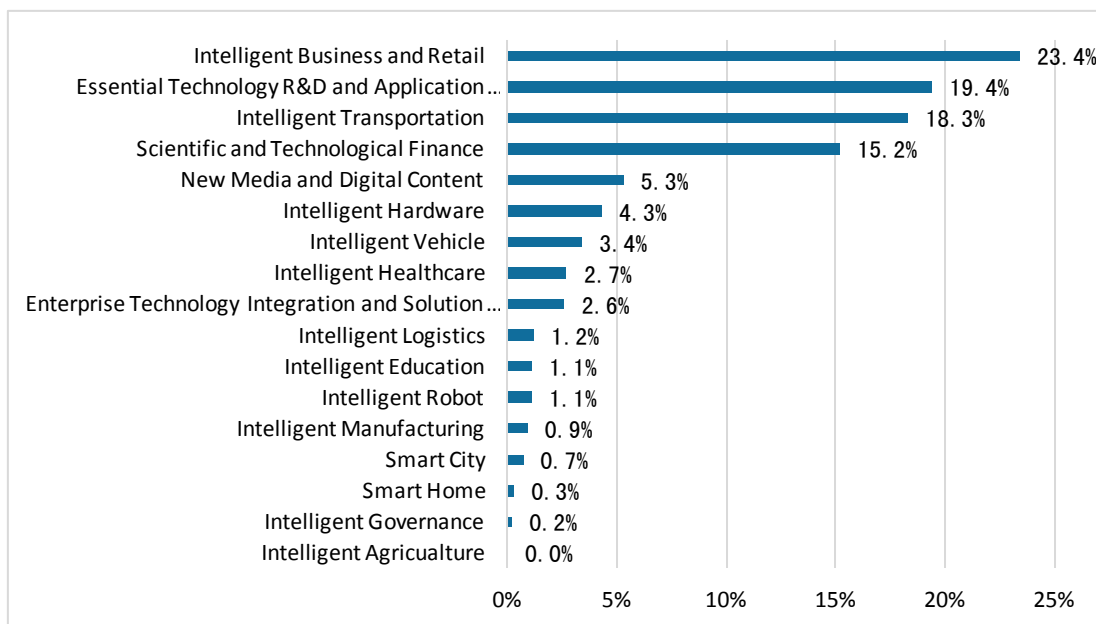
23.3% of intelligent enterprises have less than 100 million Yuan **financing amount**; 64.3% have 100 million to 5 billion Yuan financing amount; only 13.3% has exceeded 5 billion Yuan. Jiangsu, Zhejiang, Beijing, Shanghai and Guizhou are the provinces and municipalities where the sample enterprises have the highest amount of financing, with an average of 7.74 billion Yuan, 5.12 billion Yuan, 4.15 billion Yuan, 4.14 billion Yuan and 2.95 billion Yuan respectively. Though Guizhou is situated in the backward areas of Southwest China, enterprises there have obtained a relatively high amount of financing because of the rapid development of Guiyang big data industry. From the perspective of distribution of financing amount in application fields, the following four fields: intelligent business and retail, essential technology R&D and application platform, intelligent transportation, and scientific and technological finance enjoy the highest financing total amount, taking up 23.4% , 19.4% , 18.3% and 15.2% respectively. The proportions of financing amount of new media and digital content, intelligent hardware, intelligent vehicle, intelligent healthcare, enterprise technology integration and solution offer are all between 2% and 6%, which shows these application fields enjoy relatively high proportions.



Graph 15, Distribution of the 300 intelligent enterprises' total financing amount(Unit: 100 million Yuan)



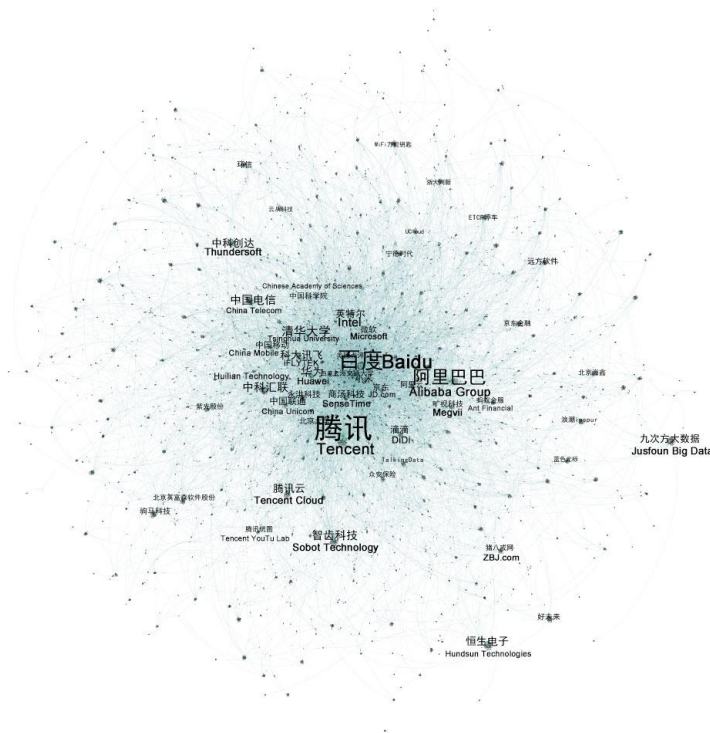
Graph 16, Regional distribution of the 300 intelligent enterprises' average financing amount (Unit: 100 million Yuan)



Graph 17, Proportion of the financing used in application areas to total financing within the 300 intelligent enterprises

2. The "Hidden Order" of Intelligent Economy

Value Network Structure of the intelligent economy in China as shown in Graph 18 is obtained by putting the relational data of the 408 sample enterprises into the Gephi 9.1 society network analysis software. The statistical analysis of Graph 19 shows that the Value Network based on 408 enterprises has altogether 10305 nodes and 15390 relations, which can basically summarize the outline and form of the intelligent economy development in China. The Value Network has an average degree of 2.987, average clustering coefficient 0.074, and average path length 4.901, which statistically shows that China's intelligent economy is highly concentrated.



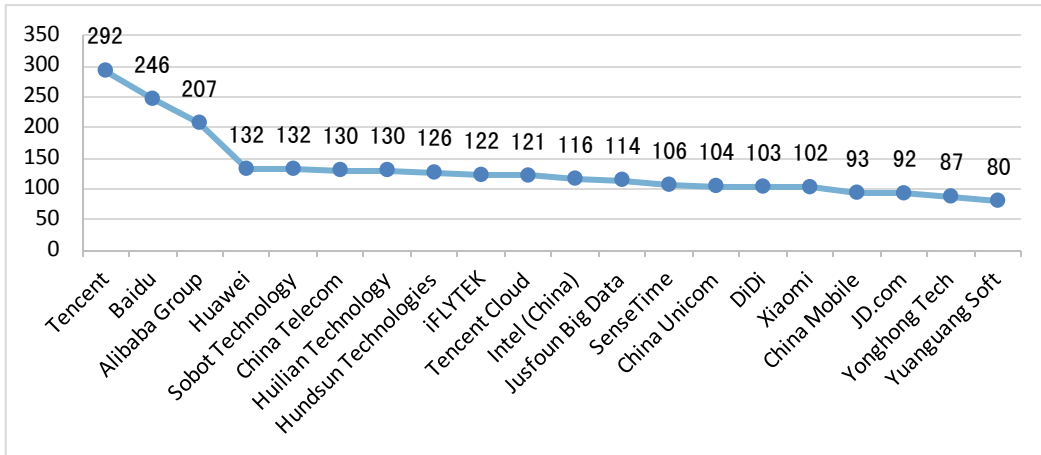
Graph 18, Value Network of the intelligent economy in China based on the 408 sample enterprises

Graph 19, Value Network statistics of the whole sample enterprises

Index	Value
Total Number of Sample Nodes	408
Total Number of the Value Network's Nodes	10305
Total Number of the Value Network's Relations	15390
Average Degree	2.987
Average Clustering Coefficient	0.074
Average Path Length	4.901

(1) Who is the Leader

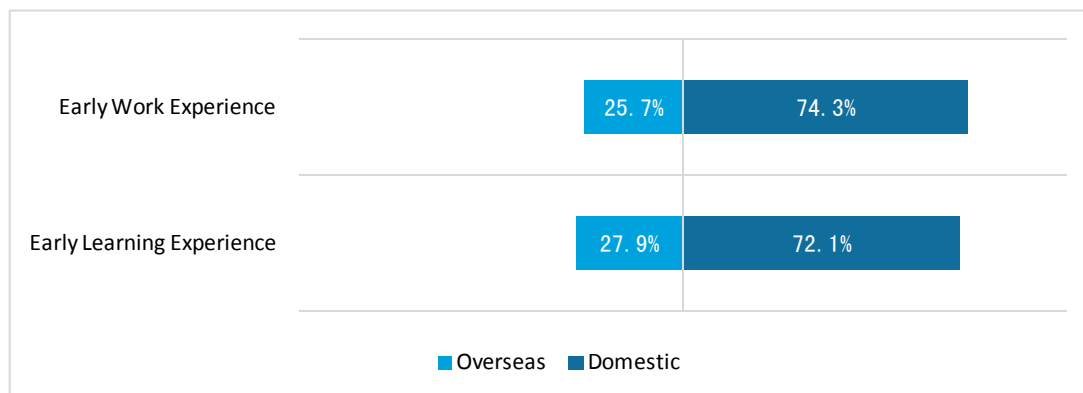
In China's intelligent economy development, the most influential and radiating TOP 20 enterprises are Tencent, Baidu, Alibaba Group, Huawei, Sobot Technology, China Telecom, Huilian Technology, Hundsun Technologies, iFLYTEK, Tencent Cloud, Intel (China), Jusfoun Big Data, SenseTime, China Unicom, DiDi, Xiaomi, China Mobile, JD.com, Yonghong Tech and Yuanguang Soft. No matter from the perspective of human capital, or from technology, investment and financing relations, they all play an important role in the intelligent technology and economy development in China. Especially the four national AI innovation platforms--Tencent, Alibaba Group, Baidu and iFLYTEK, with digital and intellectualized empowerment, they promote the integration of intelligent technology, economy and society which not only create new technologies, new products, new formats and new models, but also trigger a series of organizational and institutional changes. The four enterprises become the key leaders of China's intelligent economy development.



Graph 20, Distribution of TOP 20 sample enterprises in terms of degree centrality and betweenness centrality (Unit: Degree)

(2) Who is the Supplier of Core Human Capital

In China's intelligent enterprises, 27.9% of the core human capital graduate from overseas universities, and 72.1% come from domestic colleges, universities and scientific research institutions; 25.7% have work experience in overseas companies or scientific research institutions, and 74.3% have experience in domestic ones. The proportion of core human capital with overseas early learning experience is higher than those with early work experience. From the perspective of both early learning and work experience, the core human capital which China intelligent economy development needs mainly comes from domestic enterprises, universities and scientific research institutions. Meanwhile, regarding the cultivation of human capital, overseas universities and enterprises have also made their contribution to the intelligent economy development in China.



Graph 21, Statistics of the relational data of the sample enterprises' core human capital

Among domestic educational institutions, the TOP 15 are Tsinghua University, Peking University, Shanghai Jiao Tong University, Zhejiang University, USTC, Chinese Academy of Sciences, Fudan University, Harbin Institute of Technology, Beijing University of Posts and Telecommunications, Beihang University and Xidian University. Among overseas educational institutions, the TOP 15 are Stanford University, Carnegie Mellon University, Harvard University, University of California-Berkeley, University of Cambridge, MIT, University of Pennsylvania, Columbia University, University of Illinois Urbana-Champaign and Yale University. When it comes to the core human capital of China intelligent economy, these universities are an important source where the early learning experience comes from. Regarding gaining early work experience, the TOP 10 domestic enterprises and organizations are Baidu, Alibaba Group, Tencent, Huawei, Chinese Academy of Sciences, Tsinghua University, Shanda, China Mobile, Kingsoft and NetEase. The TOP 10 overseas enterprises and organizations are Microsoft, Google, IBM, Intel, Yahoo, HP, Microsoft Research, Oracle, Motorola, Cisco and Facebook.

Graph 22, TOP 20 organizations in terms of gaining early learning experience and work experience

Early Learning Experience TOP 20 Relational Nodes				Early Work Experience TOP 20 Relational Nodes			
Domestic	Degree	Overseas	Degree	Domestic	Degree	Overseas	Degree
Tsinghua University	92	Stanford University	27	Baidu	60	Microsoft	58
Peking University	66	Carnegie Mellon University	11	Alibaba Group	51	Google	18
Shanghai Jiao Tong University	51	Harvard University	8	Tencent	42	IBM	16
Zhejiang University	42	University of California-Berkeley	7	Huawei	25	Yahoo	14
USTC	39	University of Cambridge	7	Chinese Academy of Sciences	23	Intel	12
Chinese Academy of Sciences	33	MIT	7	Tsinghua University	11	HP	9
Fudan University	26	University of Pennsylvania	6	Shanda	10	Microsoft Research	9
Harbin Institute of Technology	25	Columbia University	6	China Mobile	10	Oracle	7
Beijing University of Posts and Telecommu	18	University of Illinois Urbana-Champaign	6	Kingsoft	9	Motorola	7

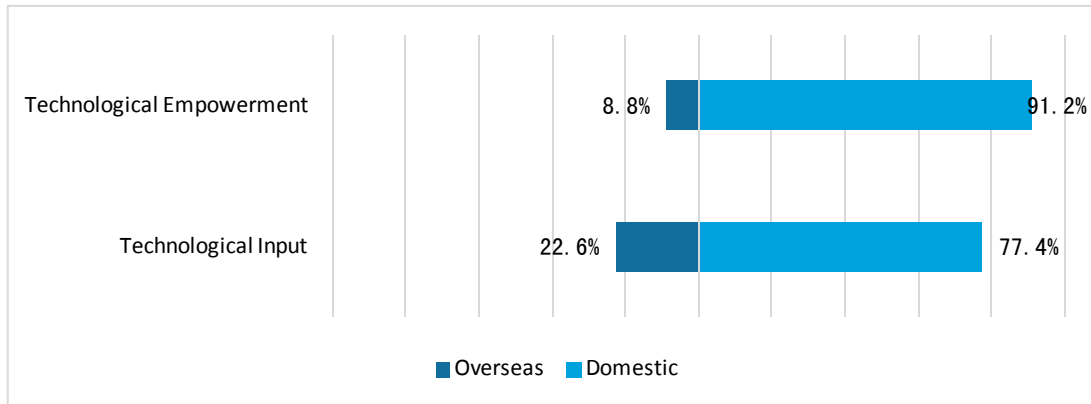
communications							
Beihang University	15	Yale University	5	NetEase	8	Cisco	6
Xidian University	15	Rennes School of Business	4	Microsoft Research Asia	8	Facebook	5
Huazhong University of Science & Technology	14	University of Rochester	3	Zhejiang University	8	Qualcomm	5
Nanjing University	12	State University of New York	3	Langxun Tech	7	Stanford University	5
Tongji University	12	Northwestern University	3	Sohu	7	Nokia	5
Nankai University	11	Georgia Institute of Technology	3	Chinese Academy of Engineering	7	eBay	5
Renmin University of China	11	Princeton University	3	ZTE	7	Goldman Sachs	4
Shandong University	10	National University of Singapore	3	Datang Telecom	6	Apple	4
HKUST	10	University of Idaho	2	JD.com	6	Siemens	4
Xi'an Jiaotong University	9	University of Texas	2	Lenovo	6	IBM Research	3

Chinese University of Hong Kong	9	University of London	2	SINA	6	LinkedIn	3
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Both domestically and internationally, the institutions where China's intelligent economy core human capital gaining early work experience not only include Internet enterprises, but also traditional IT enterprises, universities and scientific research institutions. In particular, the companies and research institutes set up in China by multinational corporations, such as Motorola, Intel, Microsoft, etc, have made significant contributions to the cultivation of core human capital of China's intelligent economy.

(3) Who is Empowering the Intelligent Economy

The result of statistical analysis shows that, from the perspective of technological input relations, 77.4% of the 408 sample enterprises' technological input relations come from domestic enterprises, while the remaining 22.6% come from overseas ones. From the perspective of technological empowerment relations, 91.2% of the 408 sample enterprises technological empowerment relations are with domestic enterprises and 8.8% are with overseas ones. So from the perspective of both technological input and empowerment, domestic enterprises play a major role. Compared to technological empowerment relations, technological input relations has a higher overseas proportion, which means that China's intelligent economy relies heavily on overseas technology, and most of all, the core technology field lags behind that of overseas enterprises.



Graph 23, Relationships of “Technological Input – Technological Empowerment” between intelligent enterprises

As for the intelligent economy in China, enterprises ranking among the top in terms of technological input relations include China Transinfo, Singulato Motors, ZBJ.com, China Unicom, AbleCloud, Huochebang, iFLYTEK, China Telecom, Ofo and China Mobile. Top enterprises ranked by technological empowerment include Sobot Technology, Huilian Technology, Tencent Cloud, SenseTime, Thundersoft, Yonghong Tech, Easemob and Tencent. Among the top ranked enterprises in terms of technological input and empowerment relations, iFLYTEK is a special sample whose performance is very prominent in both fields.

Graph 24, TOP 20 enterprises in terms of “Technological Input – Technological Empowerment” relations

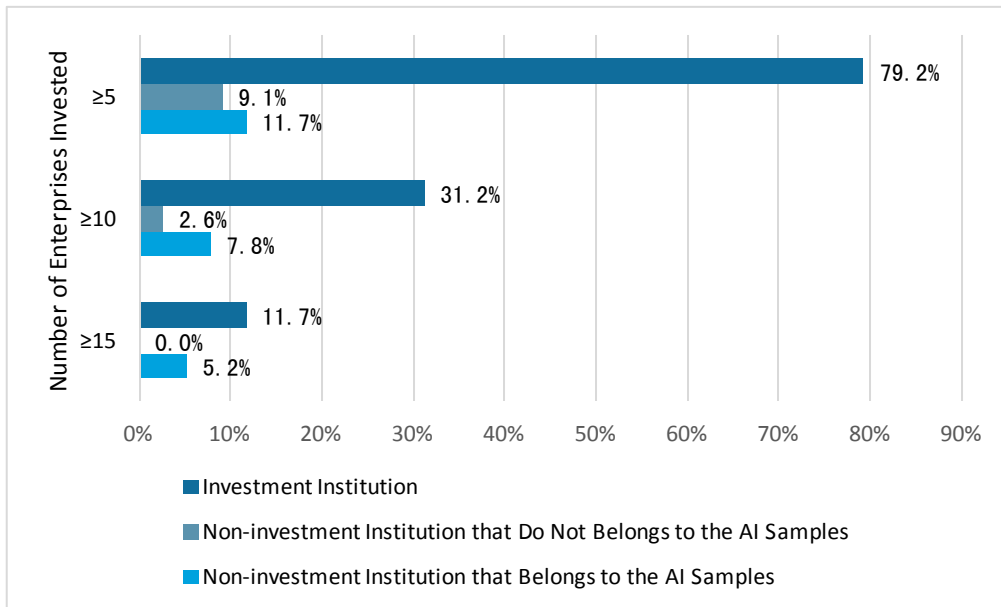
Technological Input Relations TOP 20 Sample Nodes			Technological Empowerment Relations TOP 20 Sample Nodes		
Company	Technological Input	Technological Empowerment	Company	Technological Input	Technological Empowerment
China Transinfo	56	33	Sobot Technology	0	121
Singulato Motors	41	0	Huilian Technology	14	113
ZBJ.com	33	18	Tencent Cloud	3	99
China Unicom	27	28	SenseTime	3	81
AbleCloud	25	18	Thundersoft	15	77
Huochebang	25	3	Yonghong Tech	5	73
iFLYTEK	23	42	Easemob	2	64
China Telecom	22	31	Tencent	17	58
Ofo	19	11	ATA	3	53
China Mobile	19	27	Infen Software	8	53
Baidu	18	31	Wulian	5	51
Mobike	18	6	ETCP	4	48
Sugon	17	27	Yunke	0	47
Tencent	17	58	Cloudwalk Technology	5	46
Cloudwise	17	36	Megvii Technology	4	45
Yuanguang Soft	15	42	Seeyon	2	45
Thundersoft	15	77	GrowinIO	7	44
CANBOT	14	2	Beijing Hisign	0	42

			Technology		
Mango TV	14	5	iFLYTEK	23	42
Huilian Technology	14	113	Yuanguang Soft	15	42

Besides the 408 intelligent enterprises, top relational nodes in terms of technological empowerment mainly include three kinds of organizations and institutions: the first type is universities and scientific research institutions, including Tsinghua University, Peking University and Chinese Academy of Sciences; the second is overseas intelligent hardware and software enterprises, including NVIDIA, Microsoft and IBM; the third is domestic software, hardware and Internet enterprises, including Lenovo, Inspur and SINA.

(4) Who is the Investor

By the statistical analysis of the relational data of the 408 intelligent enterprises in terms of investment and financing, 834 investors (investment institutions and non-investment institutions) are found. Each of the 834 investors invests 2 intelligent enterprises on average. Among these investors, 13 investors invest more than 15 sample enterprises, accounting for 1.6% of all investors; 32 investors invest more than 10 enterprises, accounting for 3.8%; 77 investors invest more than 5 enterprises, accounting for 9.2%. The 77 investors are key investors for China's intelligent economy.



Graph 25, Type distribution of important investors

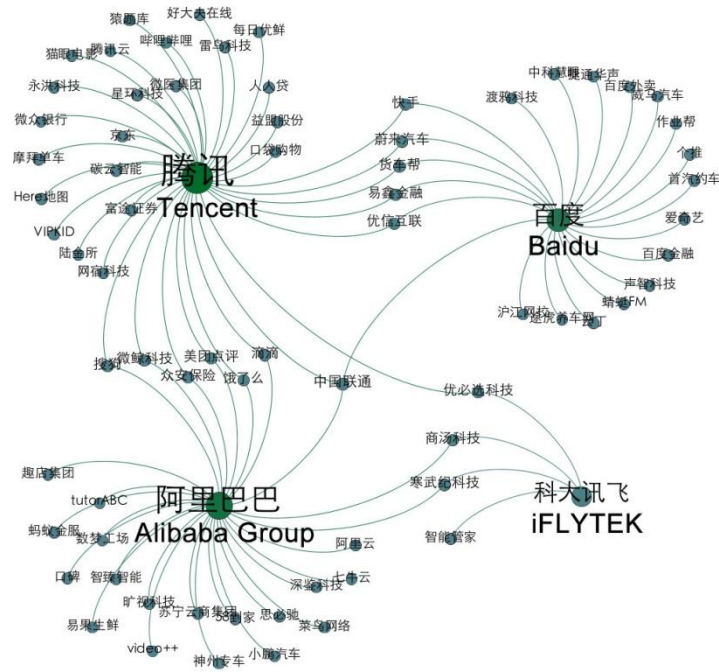
Among key investors, 61 are investment institutions, accounting for 79.2%; 16 are non-investment institutions, taking up 20.7%. During the development of China's intelligent economy, the most active TOP 10 investment institutions are Sequoia Capital China, IDG Capital, Matrix Partners China, ZhenFund, Yunfeng Capital, Qiming Venture Partners, Northern Light Venture Capital, Shunwei Capital Partners, SIG China and Hillhouse Capital. The most active TOP 10 non-investment institutions are Tencent, Alibaba Group, Baidu, Lenovo, CITIC Group, JD.com, Xiaomi, Fosun International, Ant Financial and Intel.

Graph 26, The most active TOP 10 investment institutions during the development of China's artificial intelligence

Ranking	Institution	Headquarters Location ^[1]	Number of Enterprises invested	Proportion of the Total Sample
1	Sequoia Capital	United States	44	10.8%
2	IDG Capital	United States	38	9.3%
3	Matrix Partners	United States	27	6.6%
4	ZhenFund	Beijing, China	24	5.9%
5	Yunfeng Capital	Shanghai, China	20	4.9%
6	Qiming Venture Partners	Shanghai, China	19	4.7%
7	Northern Light Venture Capital	Beijing, China	16	3.9%
7	Shunwei Capital Partners	Beijing, China	16	3.9%
9	SIG China	United States	15	3.7%
10	Hillhouse Capital	United States	14	3.4%

Among the non-investment institutions in China's intelligent economy, the four national AI innovation platforms-- Alibaba Group, Tencent, Baidu and iFLYTEK, are the most active ones. The four big platforms altogether invest 87 sample enterprises, among which Tencent invests 35 enterprises; Alibaba Group, 27; Baidu, 21; and iFLYTEK, 4. If the non-sample enterprises, especially a large number of start-ups are also taken into consideration, then the number of enterprises being invested by the four big platforms is even more.

^[1] The information of the investors' headquarters location is all from Zero2IPO Group.



Graph 27, Value Network of the BIG 4 platform enterprises and sample enterprises invested by them

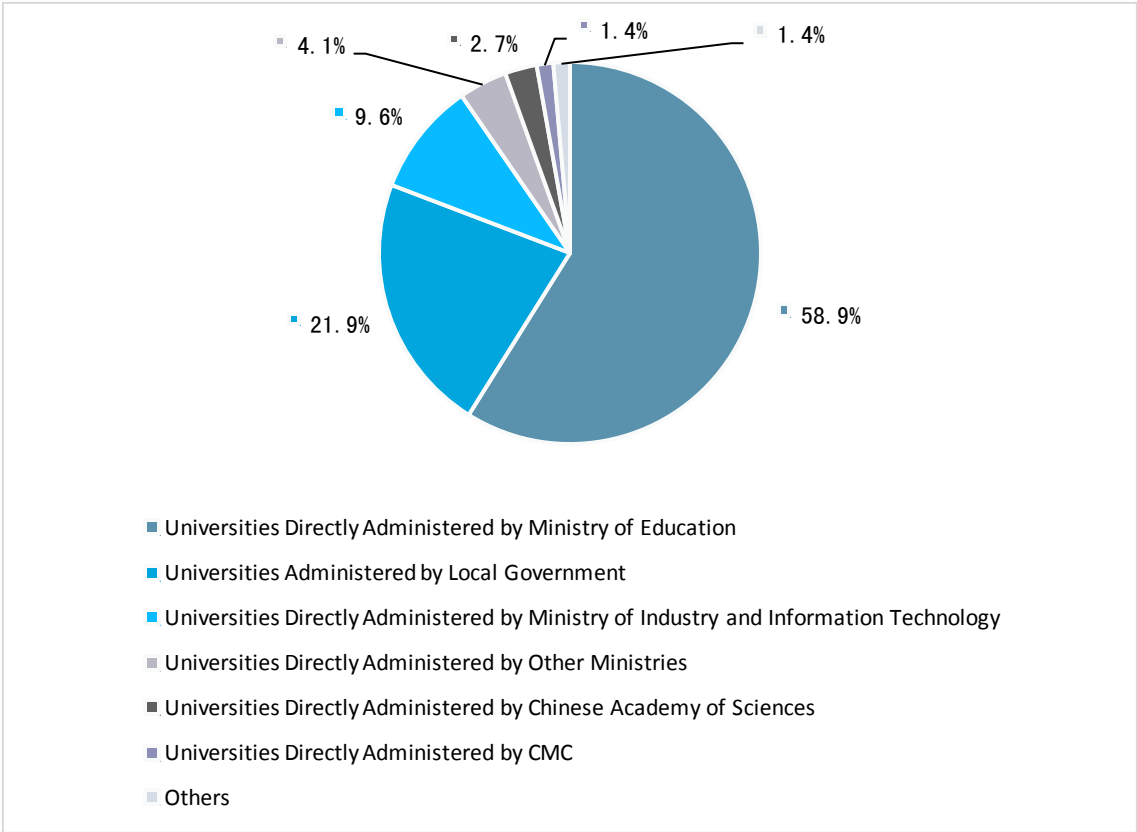
Graph 28, The most active TOP 10 non-investment institutions during the development of China's artificial intelligence

Ranking	Non-investment Institution	Headquarters Location	Number of Enterprises invested	Proportion of the Total Sample
1	Tencent	Guangdong, China	35	8.6%
2	Alibaba Group	Zhejiang, China	27	6.6%
3	Baidu	Beijing, China	21	5.2%
4	Lenovo	Beijing, China	15	3.7%
5	CITIC Group	Beijing, China	13	3.2%
6	JD.com	Beijing, China	12	2.9%
7	Xiaomi	Beijing, China	10	2.5%
8	Fosun International	Shanghai, China	9	2.2%
9	Ant Financial	Zhejiang, China	8	2.0%
9	Intel	United States	8	2.0%

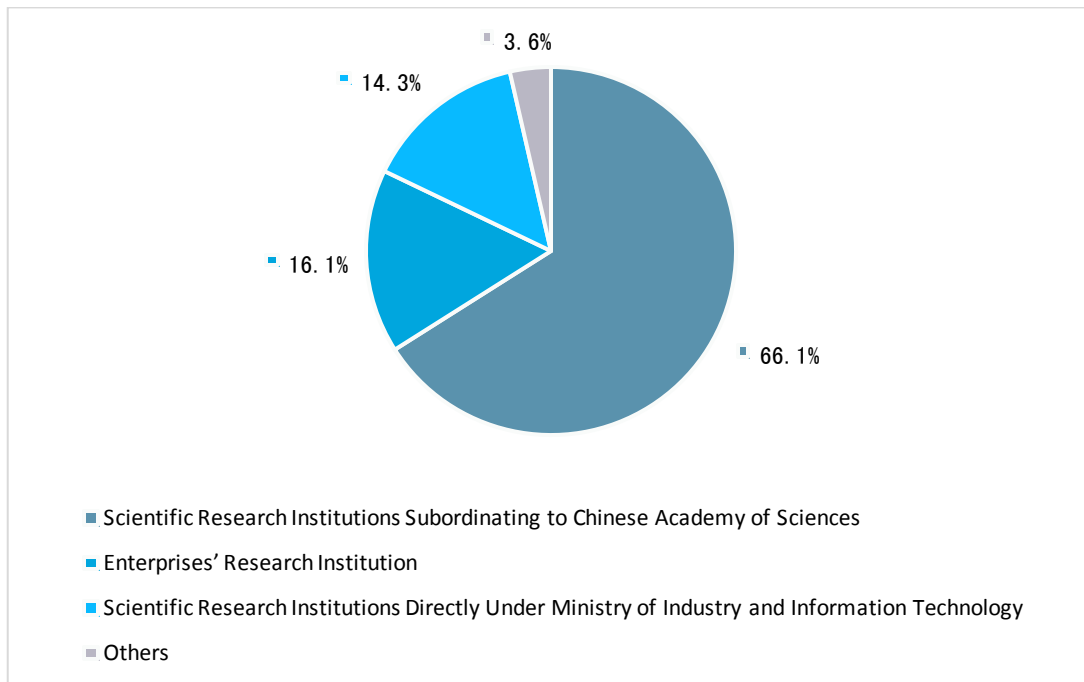
(5) Collaboration among Diversified Innovative Subjects

As a complex adaptive system, the development of China's intelligent economy is the result of interaction and collaboration among diversified innovative subjects. Besides intelligent enterprises, the innovative subjects which made up intelligent economy also include universities, non-university scientific research institutions, investors, linkers, government and other organizations and institutions. The interaction and collaboration of diversified subjects jointly promote the development of the intelligent technology and industry in China.

So far, there are altogether 73 universities in China engaging in AI basic research, technology development and talent cultivation. Among them, there are 43 directly administered by Ministry of Education, 16 administered by local government, 7 directly administered by Ministry of Industry and Information Technology, and 1 university in Hong Kong. Besides universities, 56 non-university scientific research institutions spreading across China are also important parts for intelligent technology innovation and talent cultivation. Among the 56 non-university scientific research institutions, 37 are scientific research institutions subordinating to Chinese Academy of Sciences, accounting for 66.1%; 9 are enterprises' research institutions, accounting for 16.1%; 8 are scientific research institutions directly under Ministry of Industry and Information Technology, 14.3%; and 2 belong to other types, 3.6%.

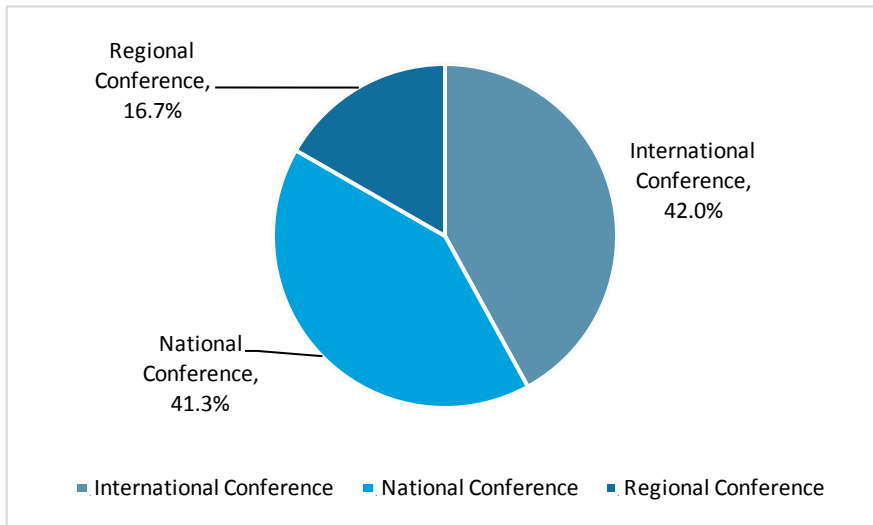


Graph 29, Attribute distribution of the sample universities



Graph 30, Type distribution of the AI related non-university scientific research institutions

During the development of intelligent economy, AI conferences and industry alliances as linkers have been serving as "information path" and "Structural Holes". From Jan 1st, 2017 to Dec 31st, 2017, 138 conferences involving AI and robots are held within China. Among them, 58 are international conferences, 57 are national conferences and 23 are regional and industrial conferences. The convening of high-level conferences, especially international ones have promoted the exchange of knowledge and technology between diversified innovative subjects.



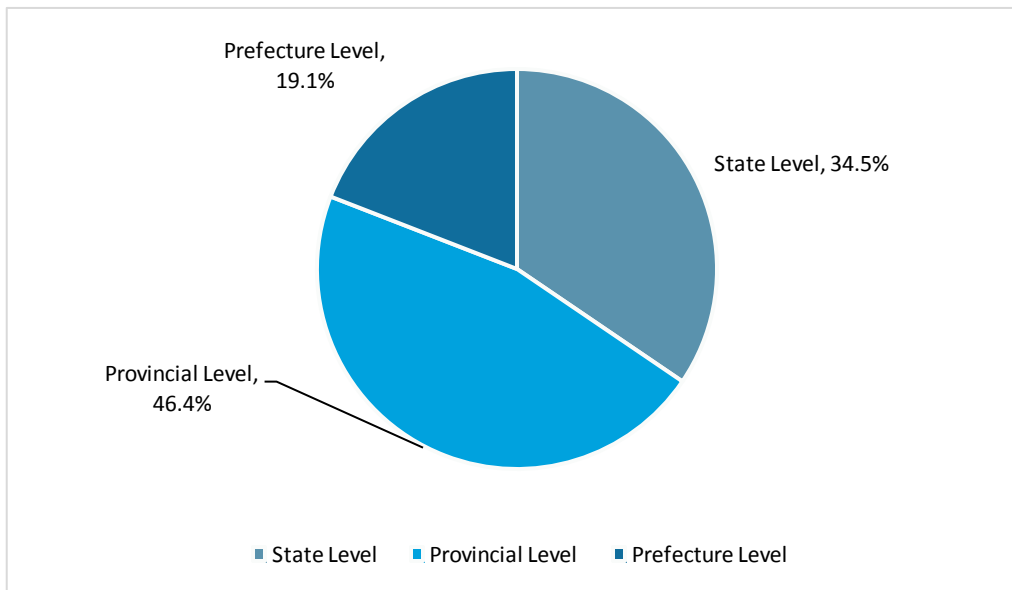
Graph 31, Hierarchical distribution of the conferences

Among the 138 conferences held in 2017, there were 54 conferences in the Beijing-Tianjin-Hebei Region, including 17 international conferences and 29 national conferences; 41 in the Yangtze River Delta, including 23 international conferences and 10 national conferences; 25 in the Pearl River Delta, including 9 international conferences and 11 national conferences; 18 in other regions, including 9 international conferences and 7 national conferences. Regardless of the number of conferences or the level of conferences, the three major economic circles are obviously dominant which is consistent with the regional distribution of China's intelligent technology and economy.

Graph 32, Distribution of the AI related conferences in each region

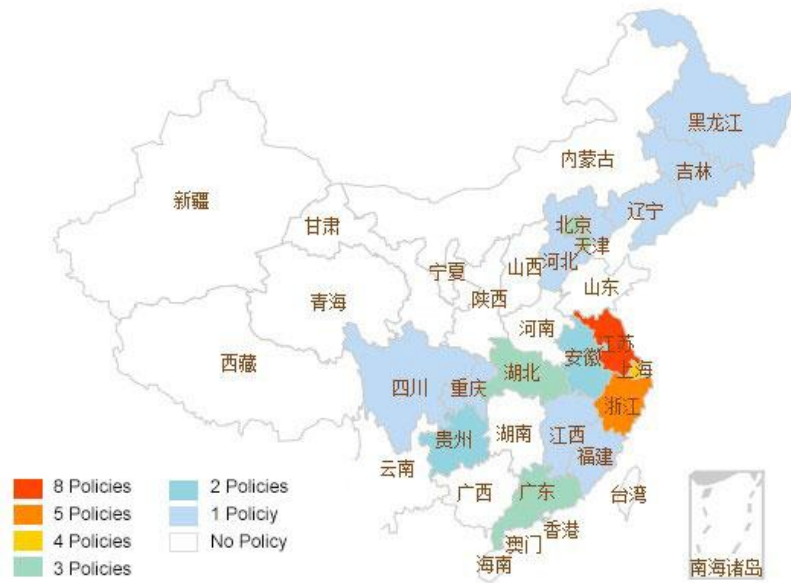
Region	Total Number of Conferences	Number of International Conferences	Number of National Conferences	Number of Regional/ Industrial Conferences
Beijing-Tianjin-Hebei Region	54	17	29	8
Yangtze River Delta	41	23	10	8
Pearl River Delta	25	9	11	5
Others	18	9	7	2

Among the linkers, industry alliances are more responsible for the collaborative innovation of government, industry, universities and research institutions. Among the 84 AI related industry alliances, 34.5% are at state level, 46.4% at provincial level, and 19.1% at prefecture level. From the perspective of the geographical distribution of industry alliances, Beijing-Tianjin-Hebei Region holds 24 alliances; Yangtze River Delta holds 24; Pearl River Delta, 14; others, altogether 22. Similar to the geographical distribution of conferences, the three economic circles also hold the most active collaboration of diversified innovative subjects.



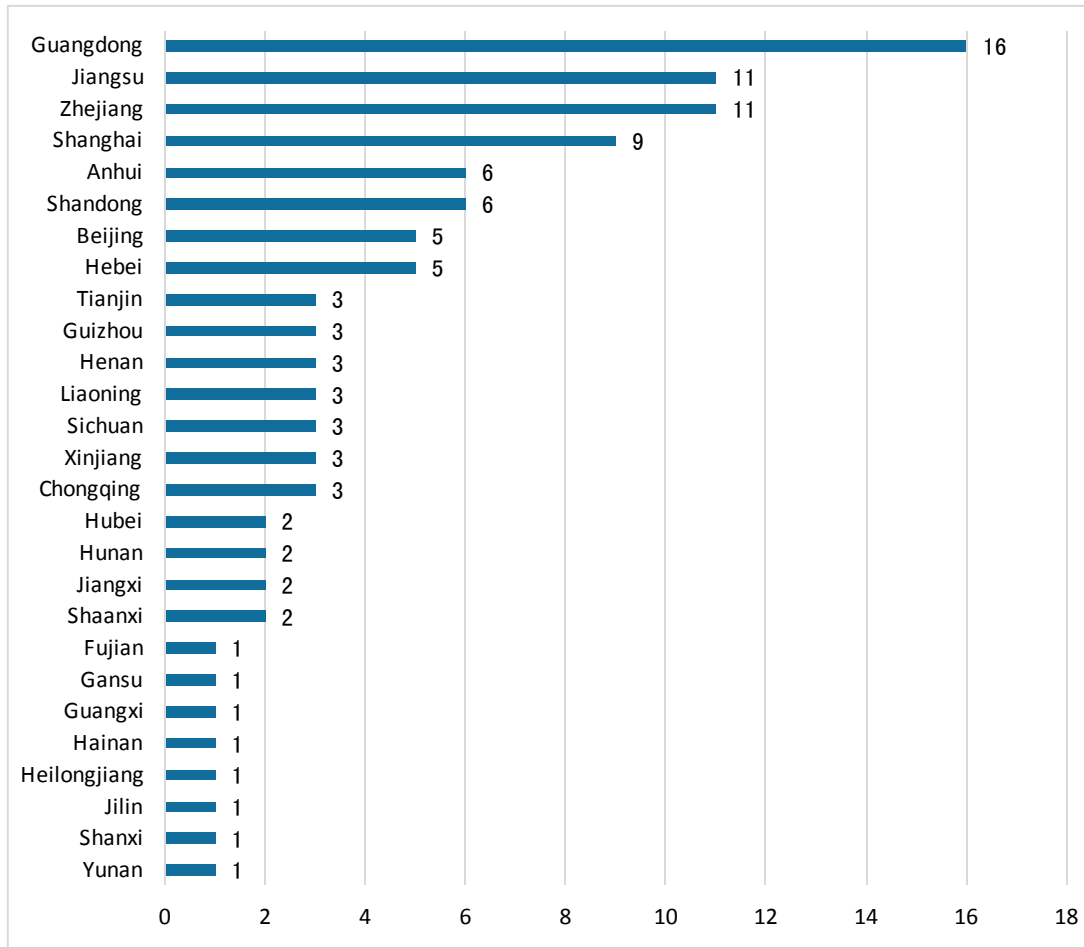
Graph 33, Hierarchical distribution of the AI industry alliances

From the actual situation of local government policies, local development of AI industry is not only a response to national strategies, but also a response to the internal demand of industrial development. Among the 31 provinces, municipalities and autonomous regions, 18 of them, one after another, have issued relevant policies to promote AI development. The provinces, municipalities and autonomous regions that have issued most policies are ranked as Jiangsu, Zhejiang, Shanghai, Guangdong, Beijing, Tianjin and Hubei. **By the end of March 31st, 2018, 13 cities have issued relevant policies on AI development, and the top seven cities ranked by issued policy number are Nanjing, Shanghai, Beijing, Suzhou, Tianjin, Wuhan and Hangzhou. 13 hotspot cities for AI industrial development are widely distributed in 9 provinces, municipalities and autonomous regions, which are Shanghai, Jiangsu, Tianjin, Beijing, Hubei, Zhejiang, Chongqing, Guangdong and Guizhou. Among them, Jiangsu has 3 hotspot cities, which are Nanjing, Suzhou and Changzhou; Guangdong has 2 hotspot cities: Shenzhen and Guangzhou; Zhejiang has also 2: Hangzhou and Ningbo.**



Graph 34, Statistics of the AI related policies issued by each local government

So far, 27 provinces, municipalities and autonomous regions are planning or building AI industrial park. Among them, the top four provinces with most industrial parks are **Guangdong, Jiangsu, Zhejiang and Shanghai**. Especially in Guangdong Province, the planning and building of AI industrial park is in full swing in major manufacturing cities. And it is becoming the core impetus for restructuring and upgrading the manufacturing clusters.



Graph 35, Regional distribution of the AI industrial parks across the country

IV. The Driving Force and Mechanism of Intelligent Economy Development in China

Based on the investigation and data analysis, this report finds out the construction of platform-dominant innovative ecosystems, the formation of new innovative areas, the development of new incubator organizations and the local government policy responses have constituted the key driving force and mechanism of the intelligent economy development in China.

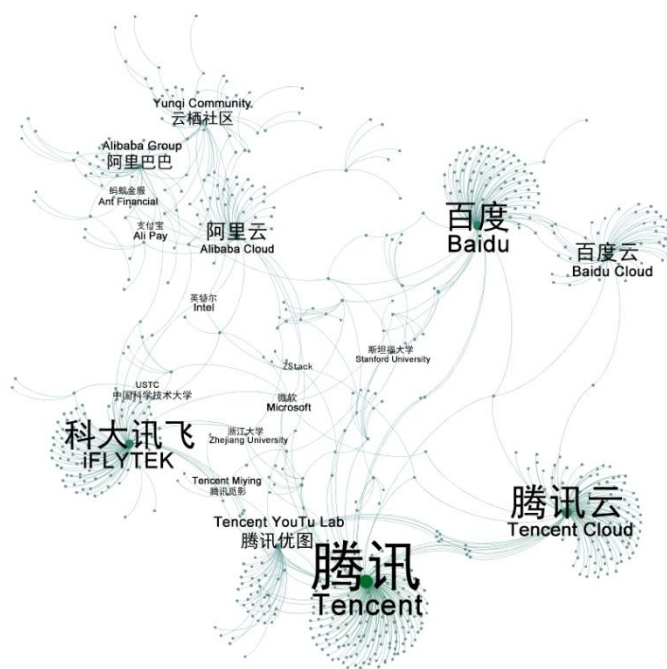
1. Platform-dominant Innovative Ecosystem

During the Value Network analysis of China's intelligent economy, it is found that the sample nodes with strong radiation and driving force are all platform enterprises. Different from the industrial economy, platform enterprises based on data ecology are the leaders of intelligent economy. Data based on platforms are real-time online and shareable. Sound data ecology makes computing and intelligence the key factors to enhance efficiency of resource allocation.

In Nov. 2017, on the kick-off meeting for China's Development Planning for a Next Generation Artificial Intelligence and major scientific and technological projects, Ministry of Science and Technology announced the first batch of nation-building AI open innovative platforms. Baidu, Alibaba Group, Tencent and iFLYTEK undertook the following national AI open innovative platforms: automotive drive, urban brain, medical imaging and intelligent voice respectively. Through the construction of national AI innovation platforms, the Chinese government endeavors to build a market-oriented new system for AI scientific innovation, with enterprises as the main body and **government-industry-university-institution collaborating** to innovate.

The leading role of the platforms is mainly manifested in: first is the dominant player of the data ecology. Most of the existing open innovative platforms are data and computing platforms evolved from trading platforms. Good data ecology has laid a solid foundation for innovation and accumulation of key technologies including algorithms, chips and operating systems. Second is the formation of a mutually nesting, powerful innovative ecosystem, including several sub-platforms /modules, in the evolution of the platforms. On the one hand, the platform-dominant ecosystem can continuously adapt to the intelligent demand generated in the process of China's economic restructuring and upgrading. On the other hand, the sub-platforms /modules

gradually build a new innovative ecosystem dominated by their own during the evolution process. For example, the sub-platforms and their innovative ecosystems derived from Alibaba's platform, including Taobao, Tmall, Alipay, Ant Financial, Alibaba Cloud and Cainiao, jointly constitute the powerful driving source of intelligent technology innovation and industry development. Third is that the platforms and their dominant innovative ecosystems have the powerful empowerment capabilities and accelerate the integration of intelligent technology, economy and society through the new organization pattern of "Platform+Empowerment+Developer". For example, since Tencent formulated and implemented open platform strategy in 2011, by opening up traffic, technology and fund to the third parties, the number of registered developers at its platform has approached to 6 million in 5 years' time.



Graph 36, Value Network of the four AI open innovation platforms

2. New Innovative Areas

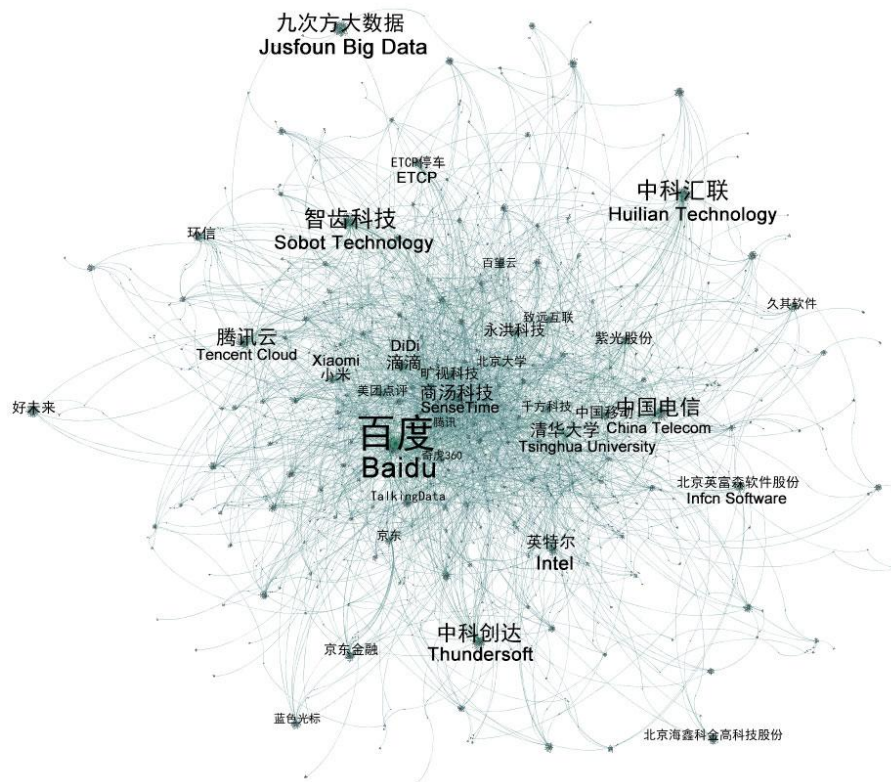
China's intelligent technology and economy development has shown an obvious "polarization" trend. The first symptom of "polarization" is region cluster, especially the cluster of intelligent economy in hotspot cities located at eastern coastal areas like Beijing-Tianjin-Hebei Region, Yangtze River Delta and Pearl River Delta. Among the 408 intelligent enterprise samples, 179 are distributed in Beijing, 65 are in Shanghai, 48 Shenzhen, and 32 Hangzhou. Even in hotspot cities, intelligent enterprises also concentrate in specific areas, forming several new innovative areas like Haidian District in Beijing, Nanshan District in Shenzhen and Yuhang District in Hangzhou.

Being different from industrial parks and high-tech parks, new innovative areas are characterized by the highly concentrated innovative enterprises, start-ups, universities, scientific research institutions, linkers and other relevant institutions. By cultivating the innovative ecosystem which coordinates three clusters: basic research, product development and scale production, the diversified innovative subjects have achieved high-frequency interaction and formed a dynamic innovation cluster. New innovative areas are not only clusters holding the most innovative enterprises, but also the most active linkers.

Beijing Haidian District not only gathers Megvii Technology, SenseTime, Qfeeltech, Yi+, Atman, Moran Cognitive Tech, Sobot Technology, Pachira, SoundAI, Unisound, Benewake, Momenta, SmartEye, Horizon Robotics, Cambricon Technologies, DeePhi Tech, Huiyihuiying and other enterprises, but also has famous universities and scientific research institutions in the field of intelligent technology including Tsinghua University, Peking University and Beihang University.

Echoing Beijing Haidian District in the north, in the south Shenzhen Nanshan District is another new innovative area with most active AI development, where clusters more

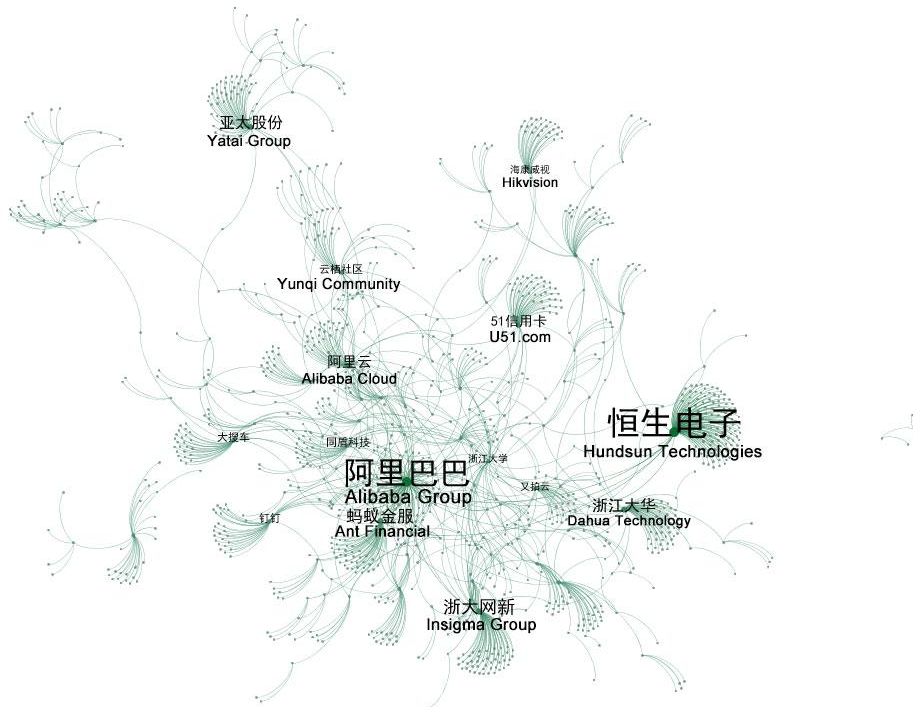
than 40 intelligent enterprises. And nearly 200 new R&D institutions are located at surrounding places including Research Institute of Tsinghua University in Shenzhen and Shenzhen Institutes of Advanced Technology of CAS. They jointly promote the development of intelligent technology and industry.



Graph 37, Value Network of the AI sample enterprises in Beijing

In Hangzhou, Alibaba Group, Alibaba Cloud, Foxconn Technology Group and Zhejiang University together constitute the innovative ecosystem on which the development of regional intelligent technology and economy relies. The AI Town in particular has rapidly assembled nearly 100 innovative platforms and projects in less than one year, including John Hopcroft center of SJTU, Baidu Innovation Center-Hangzhou, Alibaba-Zhejiang University Joint Research Institute of Frontier

Technologies, National Engineering Laboratory of Virtual Reality and Augmented Reality of Beihang University and Zhejiang Lab. In addition to the AI Town, Hangzhou also deploys the intelligent technology and industry development in Yunqi Cloud Town, Hangzhou Dream Village and Qingshanhu Science& Technology City.



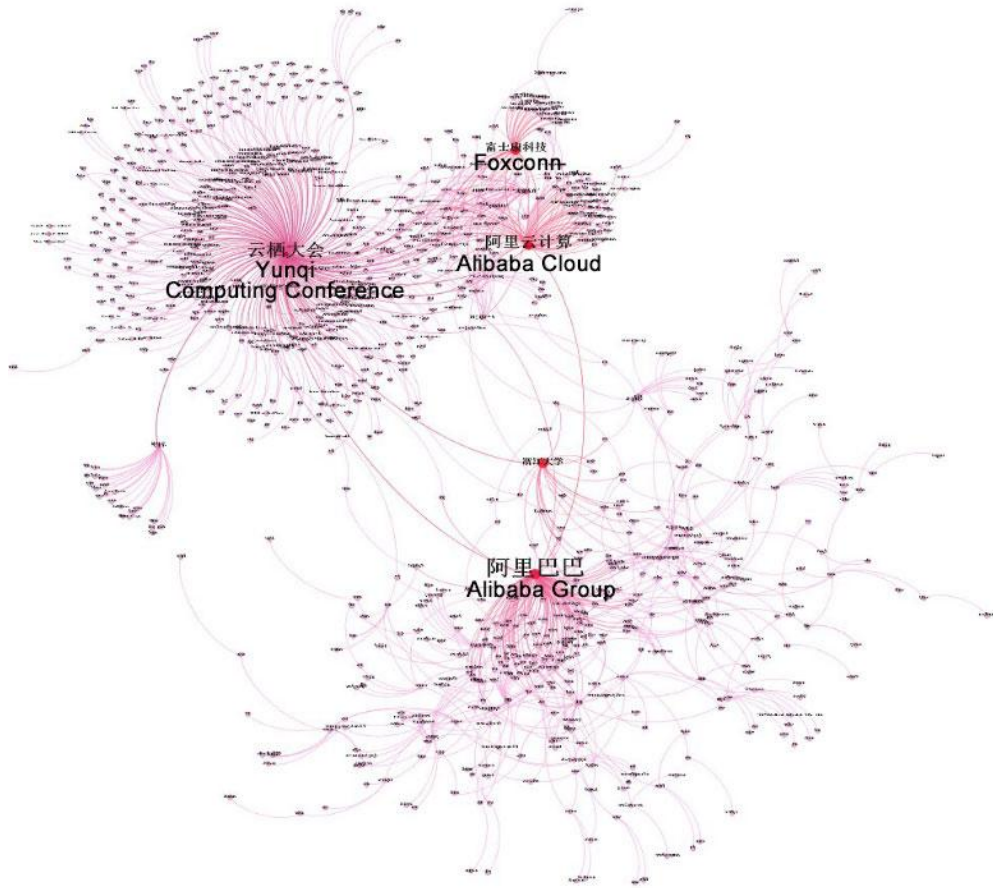
Graph 38, Value Network of the AI sample enterprises in Hangzhou

3. New Incubator Organizations

During the development of intelligent technology and economy, besides the development of platform-dominant innovative ecosystems and new innovative areas, another important development mechanism is platform entrepreneurship and incubation. Relied on the platform-dominant innovative ecosystem, through the organization pattern of "Platform+Empowerment+Developer", the new incubator

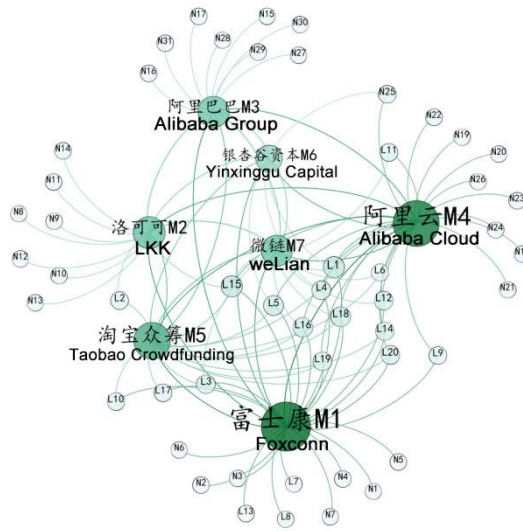
organization constitutes an important part of intelligent technology and economy innovative ecosystem. Among them, the typical cases are the Yunqi Computing Conference, TF- Entrepreneur Accelerator and IngDan Technology.

The Yunqi Computing Conference is one of the world's largest top summits on cloud computing hosted by Alibaba Group. It empowers the developers and promotes the development of intelligent technology and economy by demonstrating the cutting-edge technology and development trend in the fields of cloud computing and intelligent technology. In October 2017, on the four-day long Yunqi Computing Conference themed as Apsara Intelligence, about 450 technology enterprises took part in the exhibition and the exhibition area was more than 30,000 square meters. It attracted nearly 60,000 people from 67 countries and regions in the world. 15 million people from 137 countries and regions watched online live broadcast. The Conference intensively demonstrated the innovative achievements made in AI, visual intelligence, chip computing, unpiloted technology, smart home, urban management, operating system and other fields.



Graph 39, Value Network of the Yunqi Computing Conference’s incubating organizations

TF- Entrepreneur Accelerator is a one-stop maker empowerment platform co-founded by Alibaba Cloud and Foxconn at the Yunqi Computing Conference in 2015. Based on the cloud computing platform and big data processing capability of Alibaba Cloud, crowdfunding and marketing capability of Ali e-commerce platform like Tmall and Taobao, design and manufacturing capacity of Foxconn, complementary capabilities of many other companies, entrepreneurs are provided with a series of services including intellectual property protection, inspection and testing, industrial design, production-manufacturing, online crowdfunding and sales.



Graph 40, Topological diagram of the TF- Entrepreneur Accelerator's innovation incubating network

IngDan Technology, born in Shenzhen, adopts the pattern of "modulized innovation" and provides entrepreneurs with "empowerment" services by taking the advantage of market experience accumulated by Cogobuy Group in IC component industry, as well as the technology and manufacturing strength of Fortune Global 500 and suppliers from Pearl River Delta. Since its establishment in 2014, IngDan incubation platform has already assembled 24,000 intelligent hardware projects, 15000 professional suppliers, nearly 20 million fan users, and become China's largest intelligent hardware enterprise innovation and entrepreneurship platform.

4. Government Policy Response

In recent years, local governments successively issued development planning, implementation opinion and action plan related to artificial intelligence and robotics. The introduction of local government policies is not only to respond to the national development strategy of artificial intelligence, but more importantly to respond to the

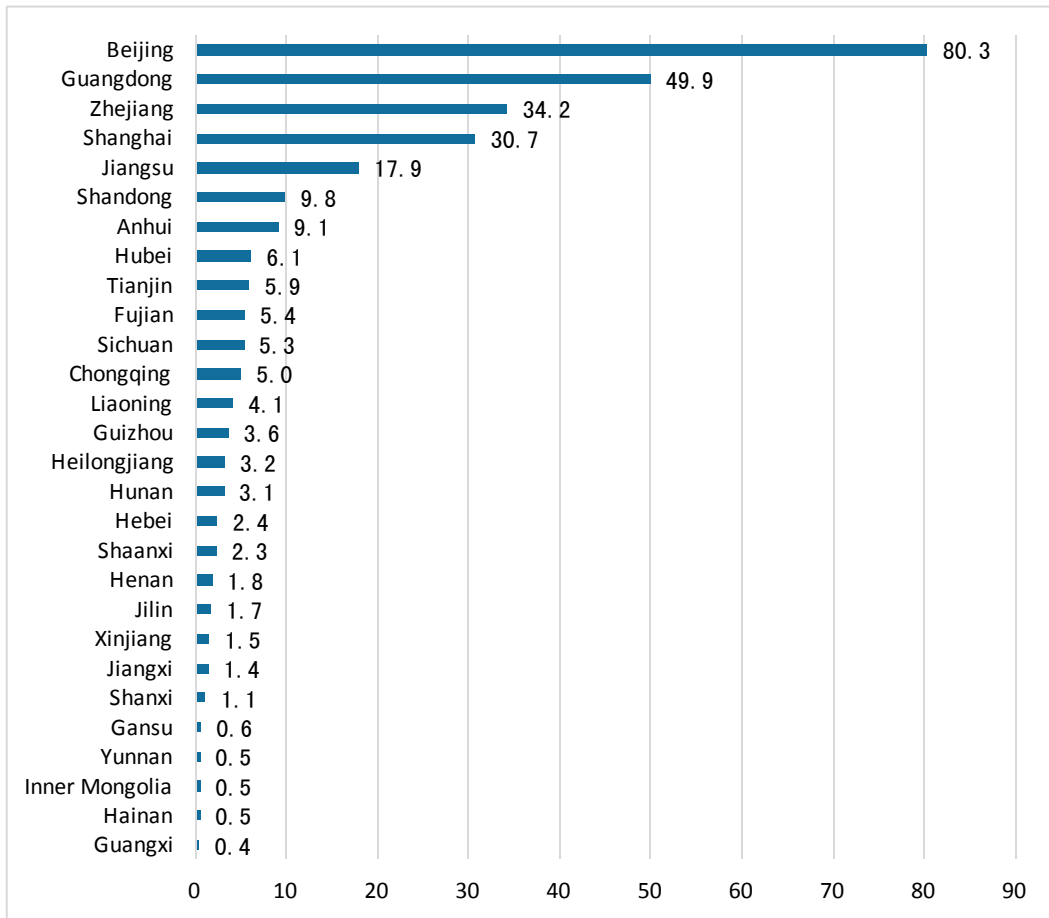
actual demand of local intelligent enterprises and industrial development. In particular, 18 provinces, municipalities and autonomous regions issued development planning, implementation opinion and action plan related to the development of artificial intelligence after the state introduced *A Next Generation Artificial Intelligence Development Plan* on July 20th, 2017. At the same time, 27 provinces, municipalities and autonomous plan and build artificial intelligence and robotics industrial parks. The governments' positive response creates a good policy environment and atmosphere for the development of intelligent technology and industry.

V. Industrial Regional Competitiveness Evaluation

This report establishes an evaluation system based on 6 first-class indicators, namely enterprise capabilities, university and non-university scientific research institution's innovation capabilities, linking capabilities (conference and industry alliance), responsiveness of government policy and openness of innovative ecosystem, and 19 second-class indicators. It is used for evaluating the industrial regional competitiveness of intelligent economy development in different provinces, municipalities and autonomous regions. Graph 41 shows the evaluation system of industrial regional competitiveness. And Graph 42 is the ranking of the industrial regional competitiveness evaluation index of China's Artificial Intelligence.

Graph 41, Evaluation Index System of Industrial Regional Competitiveness

	First-class Indicator	Second-class Indicator
Industry Foundation	Enterprise Capability	Number of Enterprises
		Number of Enterprises in the Base and Technology Layer
		Enterprises' Assessment/ Market Value
		Number of Enterprises' Patents
		Technological Empowerment
	Financing Capablity	Number of Investors
		Enterprises' Financing Amount
Development Environment	University and Non-university Scientific Research Institution's Innovation Capability	Number of Universities and Non-university Scientific Research Institutions
		Number of Papers
		Number of Patents
	Linking Capability	Number of Conferences
		Number of Industry Alliances
	Responsiveness of government policy	Number of Industrial Parks
		Number of Policies
	Openness	Early International Learning Experience
		Early International Work Experience
		International Technological Input
		International Technological Empowerment
Number of International Conferences		



Graph 42, Regional Competitiveness Index Ranking of the AI Industrial in China

From the regional competitiveness index ranking of China's AI industry, Beijing, Guangdong, Zhejiang, Shanghai and Jiangsu are among the first echelon in terms of intelligent industry development, with a score of 80.3, 49.9, 34.2, 30.7 and 17.9 respectively. Provinces, municipalities and autonomous regions in the second echelon include Shandong, Anhui, Hubei, Tianjin, Fujian, Sichuan, Chongqing, Liaoning and Guizhou, with a score of 9.8, 9.1, 6.1, 5.9, 5.4, 5.3, 5.0, 4.1 and 3.6 respectively.

Graph 43, Comprehensive Ranking of Industrial Regional Competitiveness Evaluation Index

Region	Comprehensive Ranking	Enterprise Capability	Financing Capability	University and Non-university Scientific Research Institution's Innovation Capability	Linking Capability	Responsiveness of government policy	Openness
Beijing	1	1	1	1	1	5	1
Guangdong	2	2	4	13	2	2	3
Zhejiang	3	3	3	9	4	3	4
Shanghai	4	4	2	3	3	4	2
Jiangsu	5	7	5	2	5	1	5
Shandong	6	5	9	16	8	9	10
Anhui	7	6	8	15	11	6	11
Hubei	8	11	15	4	9	9	6
Tianjin	9	15	6	12	7	7	8
Fujian	10	8	14	20	20	18	7
Sichuan	11	9	16	5	12	12	14
Chongqing	12	12	11	10	6	12	9
Liaoning	13	10	7	11	17	12	15
Guizhou	14	14	12	24	14	11	16
Heilongjiang	15	16	17	7	10	18	17
Hunan	16	13	13	8	14	21	12
Hebei	17	19	17	24	23	8	17
Shaanxi	18	19	17	6	14	21	13
Henan	19	19	17	19	13	16	17
Jilin	20	19	17	14	17	18	17
Xinjiang	21	18	17	23	23	16	17
Jiangxi	22	19	9	18	23	15	17
Shanxi	23	17	17	21	17	24	17

Gansu	24	19	17	17	23	24	17
Yunnan	25	19	17	22	21	24	17
Inner Mongolia	26	19	17	24	23	23	17
Hainan	27	19	17	24	21	24	17
Guangxi	28	19	17	24	23	24	17

Considering the sub-item ranking in the evaluation index, provinces, municipalities and autonomous regions ranking among the top by industrial competitiveness are all regions where intelligent enterprises gather. Therefore, the intelligent demand arising from urban economy restructuring and upgrading is the key factor in leading innovative resource clustering and industrial development. Provinces, municipalities and autonomous regions with high score in universities and scientific research institutions, such as Heilongjiang (7), Shaanxi (6), Sichuan (5) and Hubei (4), haven't shown corresponding level and capability in the development of intelligent industry. However, Guangdong, ranking 13th, and Zhejiang, ranking 9th in terms of universities and scientific research institutions, are at the forefront in the development of intelligent industry. Therefore, cultivating and building innovative ecosystems with great vitality is the prerequisite and foundation for regions to develop intelligent industry.

VI. Summary and Issues to be Further Studied

Being different from the previous industrialization, the rising and development of China's intelligent technology and economy is derived internally from intelligent demand created by economic restructuring and upgrading. The Fourth Industrial Revolution and the restructuring and upgrading of Chinese economy co-exist in harmony, providing a rare historic opportunity to the development of intelligent technology and economy in China. **The basic conclusions of this report include:**

(1) The emergence of computer and the Internet has fundamentally changed the scope of human economic and social activities. The adaptive behaviors of economic and social subjects towards the environmental changes brought about by the emergence of the “physics—society—network” three dimensional interactive space is the logical starting point and basic motivation of the emergence and development of the intelligent technology and industry. Under the Internet of Everything environment, an object, individual or organization is no longer isolated. Instead, they are in the networked world where infinite possible connections may happen. Connection is the basis of intelligence. Connection not only creates knowledge, but also empowers each other. Connection, knowledge creation and empowerment will shape an unprecedented intelligent economy era driven by data and computing.

(2) The concept of AI first proposed in 1956 more refers to a sub-branch of computer science, namely the knowledge and technology system studying, developing and mimicking human intelligence. However, intelligent technology based on data driver of the three dimensional interactive space is oriented to emerging technology and commercialization. The innovation and commercialization of intelligent technology makes data and computing into cheap input factors that human production and life needs. The production of the "key factors", including data and computing constitutes the core intelligent industry. The input and application of "key factors" in existing industries generates the new intelligent industry. The intelligent economy belongs to the category of new economic form, which not only includes new products, new technologies, new industries and new patterns resulted from the integration of intelligent technology and economy, but also the organizational and institutional innovation adapted to it.

(3) The intelligent demand created by China’s economic and social restructuring and upgrading is the endogenous driving force for the development of intelligent

technology and economy. The intelligent demand of Chinese economy comes from three aspects: first is the Internet, especially the development of mobile Internet and Internet of Things; second is the change of demand structure and the increased complexity of economy and society, especially the numerous consuming and social pain points constantly arising from economic and social production and life which creates intelligent solutions; third is the restraint on labor force, resources and environment. The endogenous demand of three aspects together forms a side of the intelligent technology and industry development in China.

(4) Strong intelligent demand posed by economy and society promotes the emergence of key algorithms. Adapted to the applications of key algorithms, the innovation and development of AI chip, key hardware, operating systems and platform organizations will result in forming several platform-dominant innovative ecosystems. Driven by market competition, the development and evolution of dominant innovative ecosystems will lead to the emergence of guiding technology communities. Thus, key technology can be integrated into economy and society more rapidly, showing increasing returns effect.

(5) The "Platform+Empowerment+Developer" organization pattern has accelerated the innovation and spread of dominant guiding technology communities. Under the powerful empowerment of the platforms, intelligent economy belongs to the new form of entrepreneurial economy, namely the developer economy.

(6) Being different from traditional industrial parks and high-tech parks, the development of intelligent technology and economy relies on new innovative areas. New innovative areas are usually distributed in the central and sub-central areas of big cities. And they are innovative clusters where diversified innovative subjects collaborate to develop, including platform enterprises, innovative enterprises, start-ups, universities, scientific research institutions, new R&D organizations,

investors, linkers and other organizations. When intelligent technology and economy polarize in new innovative areas, they also continue to spread to other regions through the expansion of platform-dominant innovative ecosystems and the development of new incubator organizations in different places.

Issues worth paying attention to while conducting the research of intelligent technology and economy:

(1) During the development of intelligent technology and economy, there is no direct correlation between the distribution of universities and scientific research institutions and the development of intelligent industry. For example, provinces, municipalities and autonomous regions such as Heilongjiang, Liaoning and Shaanxi enjoy rich intelligent technology innovation resources, but local intelligent industry development lags behind. In terms of the development of intelligent technology and industry, whether the “Two skin phenomenon” of science and technology and economy still exist, and what is the cause of existence are issues that need further consideration.

(2) During the development of intelligent industry and economy, the key to respond to national strategies is to adapt to the intelligent demand arising from regional economic restructuring and upgrading and increase the effective science and technology supply. Whether a dynamic innovative ecosystem or innovative governance system can be cultivated and established is the key to enhance the effective science and technology supply capacity. If it is merely a new war for investment, attracting investment and talents, a bubble of intelligent technology and economy may be triggered.

(3) Although China has been in the forefront of the world in the development of intelligent industry, it is worth paying attention to how to strengthen the innovation of

the source and make the technological innovation and industrial development of artificial intelligence sustainable. Only when we attach great importance to the problems and deficiencies existing in the development of China's artificial intelligence, improve the innovation capabilities of the source and seize the commanding heights of science and technology, can we remain invincible in the development of artificial intelligence industry in China.

(4) Under the condition that the social attention of AI is increasing rapidly, it is necessary to carry out the extensive science popularization and the appropriate cross-fields interdisciplinary research with dual attributes. In particular, we should attach great importance to the study of standards, laws and ethical issues that may be brought about by the development of artificial intelligence technology, and take precautionary measures.

In the Fourth Industrial Revolution, China is no longer a simple follower, but is endeavored to be a leader. Along with the emergence and development of intelligent technology and economy, China, being called "World Factory" in the past, will rapidly grow into a scientific and technological innovation center with global influence. The development of intelligent technology and economy in China not only accelerates the pace of China's economic restructuring and upgrading, but also make its own contribution to the prosperity and development of the world.

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Emerging of Artificial Intelligence Economy in China

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