

The background of the slide is a blue-tinted image of a modern industrial factory. Several large, white robotic arms are visible, positioned in a way that suggests they are working on a production line. The ceiling of the factory is high and features a complex network of steel beams and skylights, allowing natural light to filter in. The floor is a light-colored, polished surface that reflects the overhead lights. The overall atmosphere is one of advanced technology and industrial automation.

# 2020

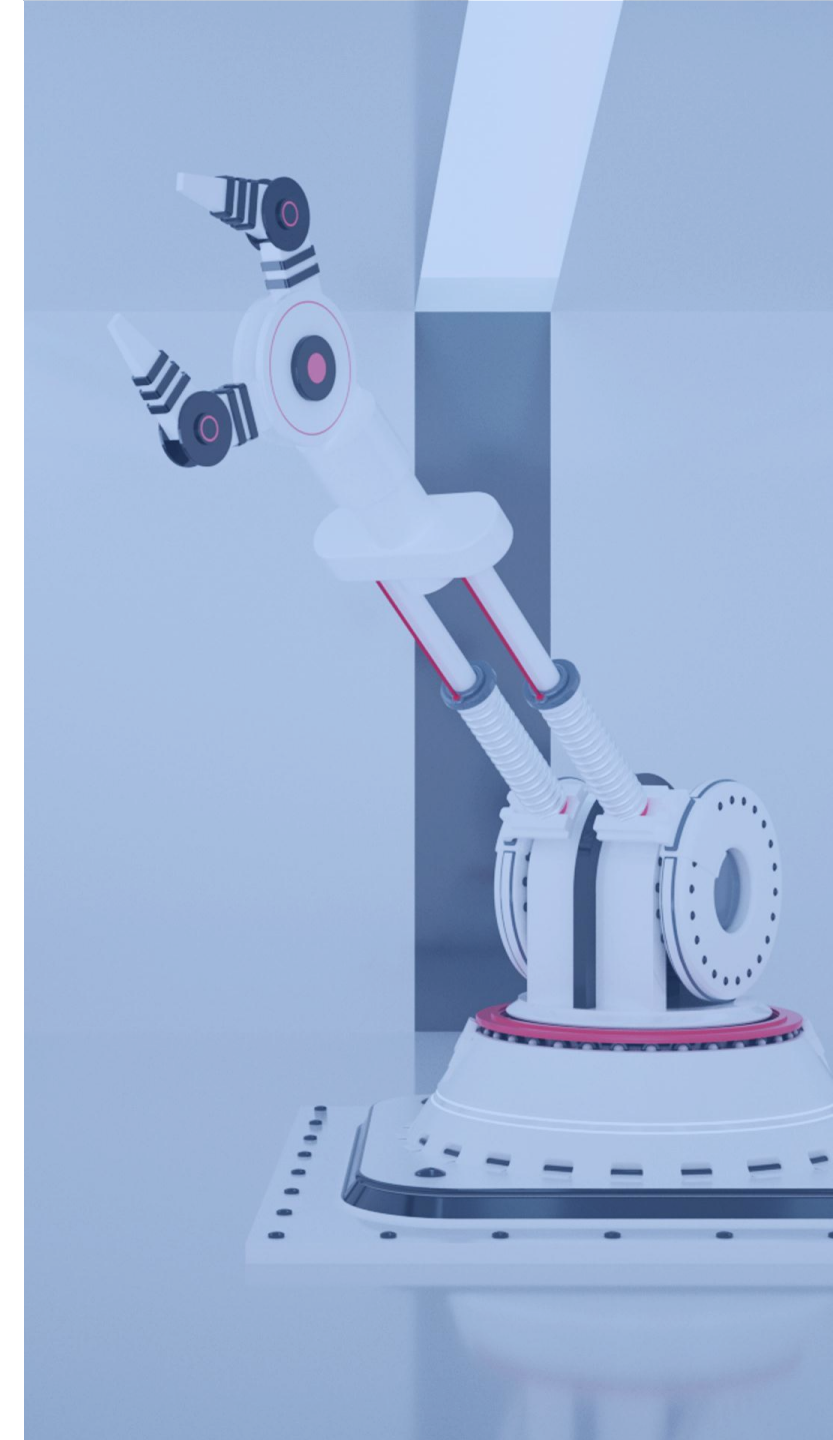
## Development status and trend of Intelligent Manufacturing in China

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GUOJIANG College

# CONTENT

- Overview of intelligent manufacturing
- Development status of Intelligent Manufacturing in China
- Development of key fields of Intelligent Manufacturing in China
- Analysis of typical implementation of Intelligent Manufacturing in China
- Analysis on the development path of Intelligent Manufacturing in China



# 01

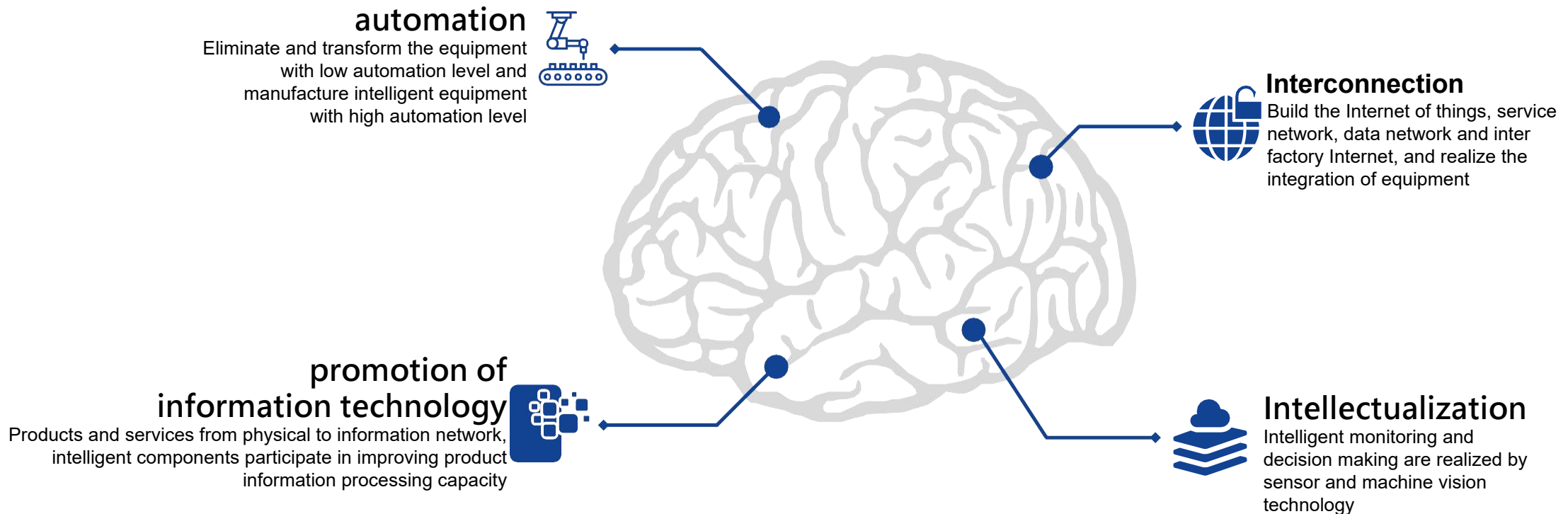
## Overview of intelligent manufacturing

- Definition of intelligent manufacturing
- Intelligent process of manufacturing industry



## 1.1 definition of intelligent manufacturing

Intelligent manufacturing (IM) is a new production mode based on the deep integration of new generation information communication technology and advanced manufacturing technology, which runs through all aspects of manufacturing activities such as design, production, management and service. It has the functions of self perception, self-learning, self decision-making, self-implementation and self-adaptive. Generally speaking, it is composed of human-computer intelligent system, intelligent robot and human intelligent system.

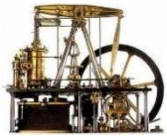


## 1.2 intelligent process of manufacturing industry

Since the end of the 18th century, human beings have experienced three industrial revolutions. Whether it is steam engine, power or electronic information technology, each revolution has brought about several times or dozens of times of human productivity. Today, we have ushered in the fourth industrial revolution, which is led by intelligent manufacturing, using information physical system to realize the modernization of production mode.



### Industrial evolution



1850's and 1960's

Steam engine revolution

- **Industry 1.0**
- The invention of the steam engine
- Mechanization
- modularization



The end of the 19th century

Electrical revolution

- **Industry 2.0**
- Electrical equipment / assembly line, etc
- Assembly line
- automation



The 1940s and 1950s

information revolution

- **Industry 3.0**
- Computer and Internet
- promotion of information technology



today

Intelligent manufacturing

- **Industry 4.0**
- digitization
- Networking
- Intellectualization

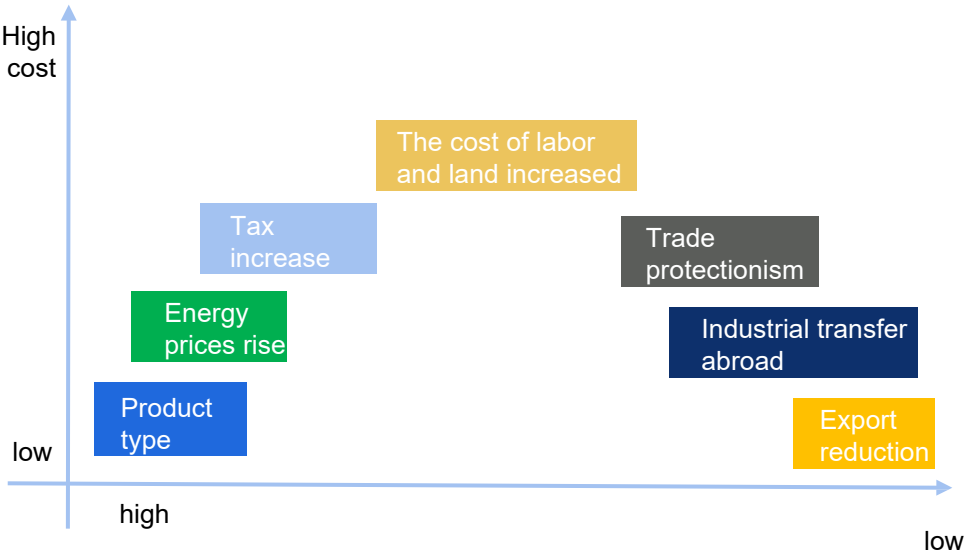
# 02

## Development status of Intelligent Manufacturing in China

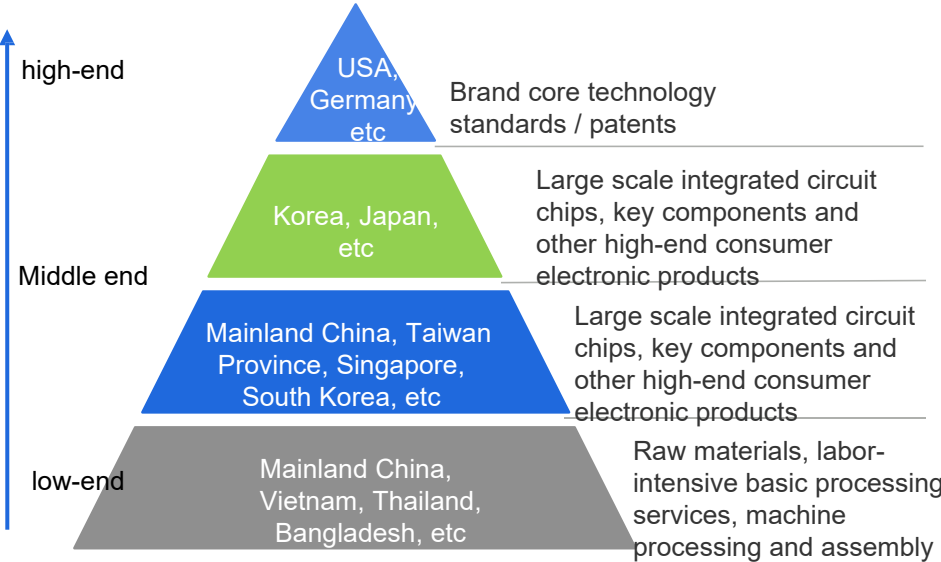
- Background and driving factors of intelligent manufacturing
- Development status of Intelligent Manufacturing in China
- Distribution of "smart belt" in China

# 2.1.2 China's manufacturing industry needs upgrading

At present, China is still in the late stage of "industry 2.0" (electrification), with relatively weak quality foundation, unreasonable industrial structure, low resource utilization efficiency, low industry informatization level, and high labor cost."Industry 3.0" (Information Technology) needs to be further popularized, "industry 4.0" (intelligent) is trying to do some demonstration as far as possible, and the automation and informatization of manufacturing are gradually arranged.



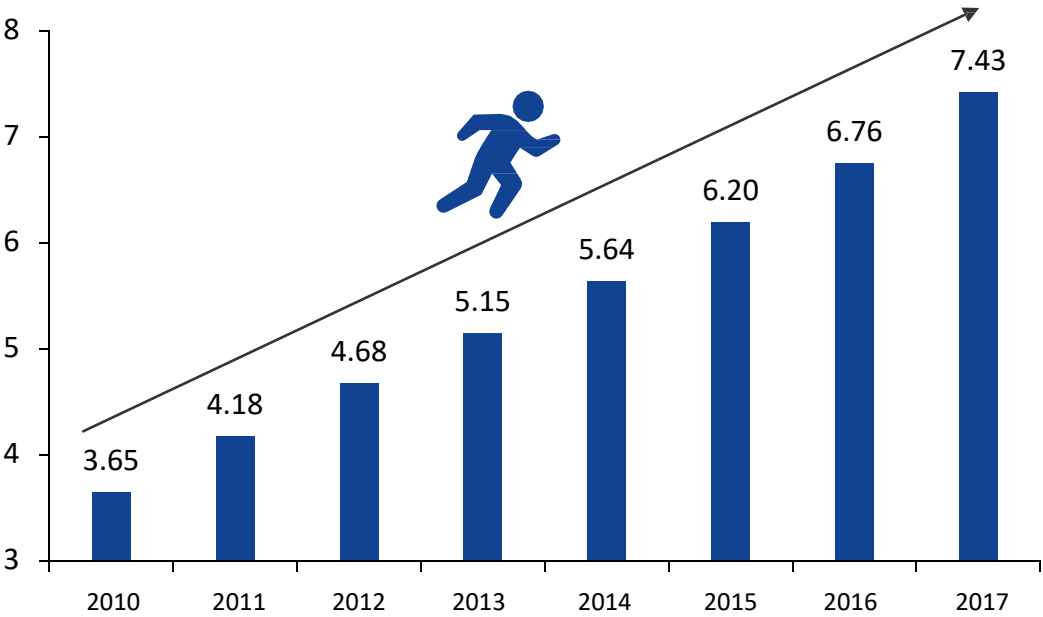
China's manufacturing industry faces major problems



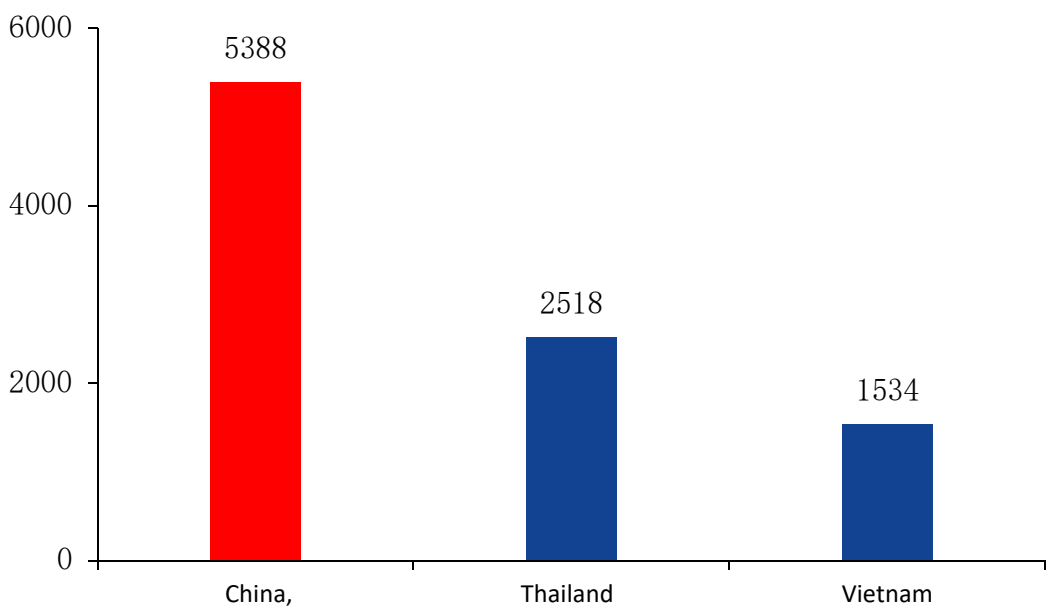
The position of China's manufacturing industry

# 2.1.3 driving factor 1 of Intelligent Manufacturing: the aging population and high wages lead to the weakening of labor advantages, and intelligent manufacturing improves production efficiency

Since the 21st century, the average wage of China's manufacturing industry has increased year by year and the growth rate has accelerated; in 2017, the average wage of China's urban unit employees reached 74300 yuan / year, 2.14/3.51 times that of Thailand and Vietnam.China's labor cost advantage is gradually losing, and the world manufacturing center is gradually transferring to Southeast Asia and other countries with low labor cost. Chinese industrial enterprises are facing higher and higher labor cost pressure.



Average wage level of China's urban unit employees from 2010 to 2017 (unit: 10000 yuan)



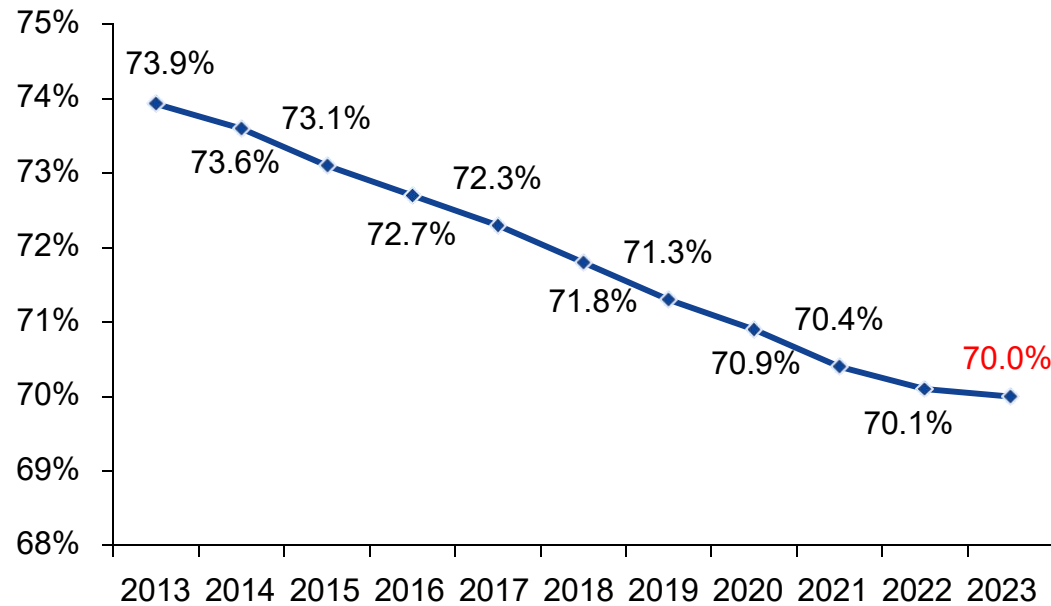
Comparison of average wage of China's manufacturing industry with other countries in 2017 (unit: yuan / month)



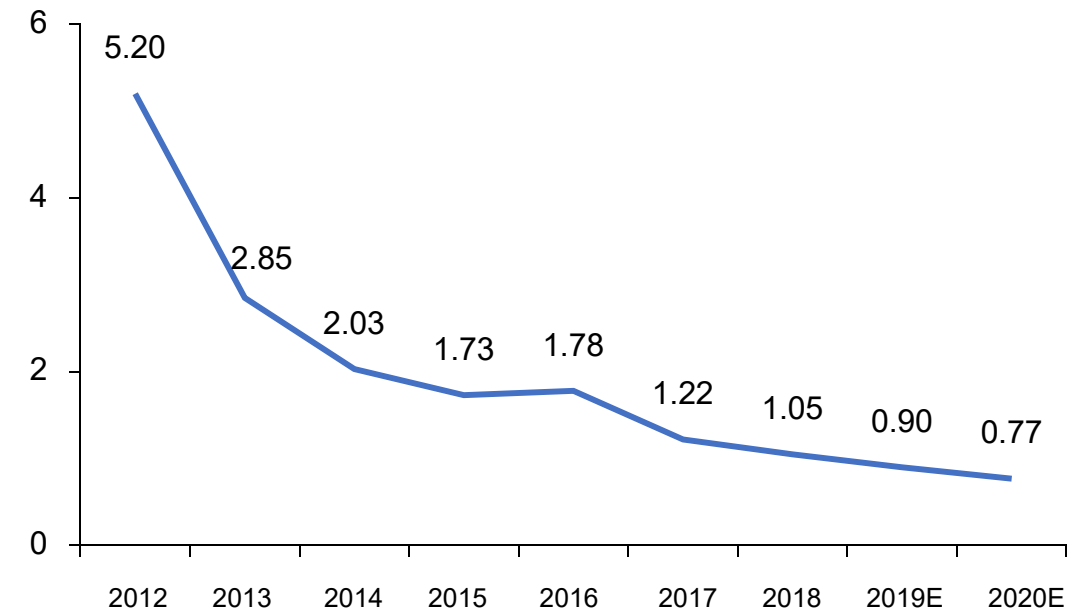
## 2.1.3 driving factor 1 of Intelligent Manufacturing: the aging population and high wages lead to the weakening of labor advantages, and intelligent manufacturing improves production efficiency



Due to the accelerated aging of the population and the continuous decrease of labor supply, the proportion of China's labor force decreased from 73.9% to 71.8% from 2013 to 2018, and is expected to drop to 70% by 2023. At the same time, the cost recovery period of industrial robots is declining, which forms a scissors gap with the rising trend of human costs. In the deterministic trend of rising human costs and equipment prices, the payback period of industrial robots is expected to be further shortened in the future, and the critical point of machine replacement economy has reached.

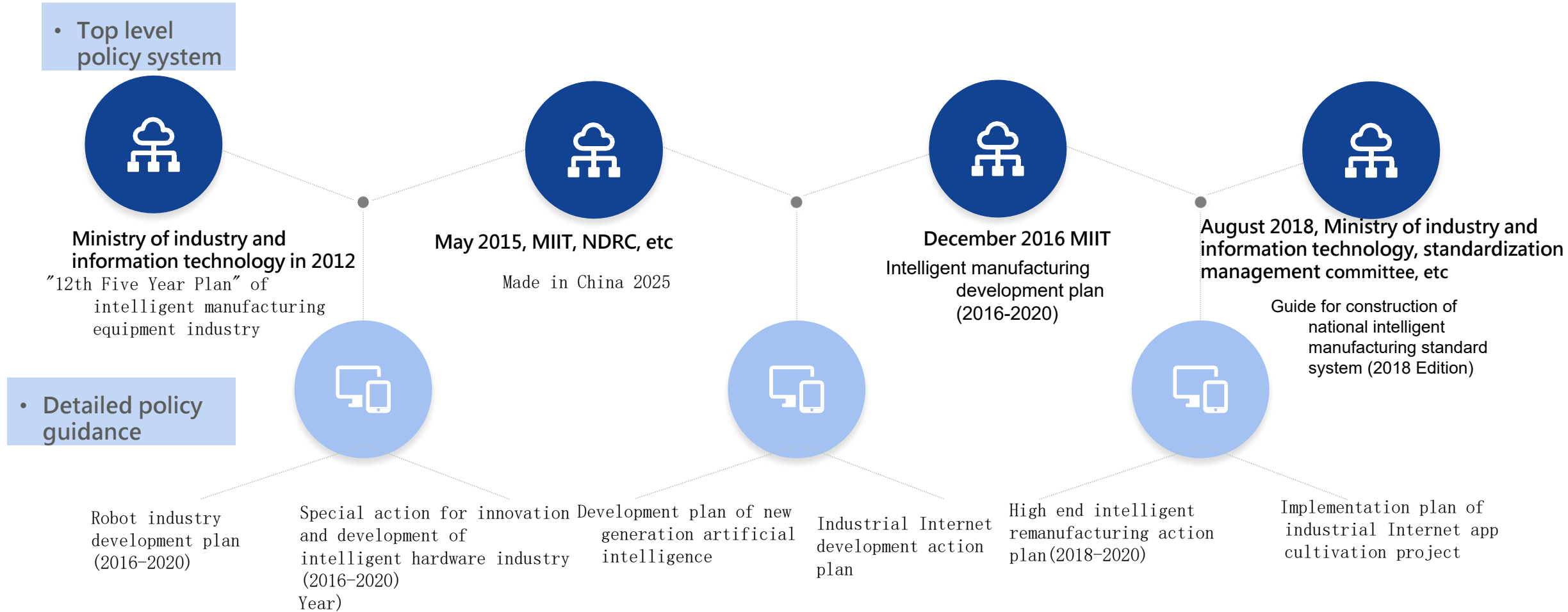


Proportion and forecast of China's labor force population in 2013-2023 (unit:%)



Calculation of cost recovery period of industrial robot from 2012 to 2020 (unit: year)

## 2.1.4 driving factor 2 of Intelligent Manufacturing: industrial policy drives manufacturing towards "intelligent manufacturing"



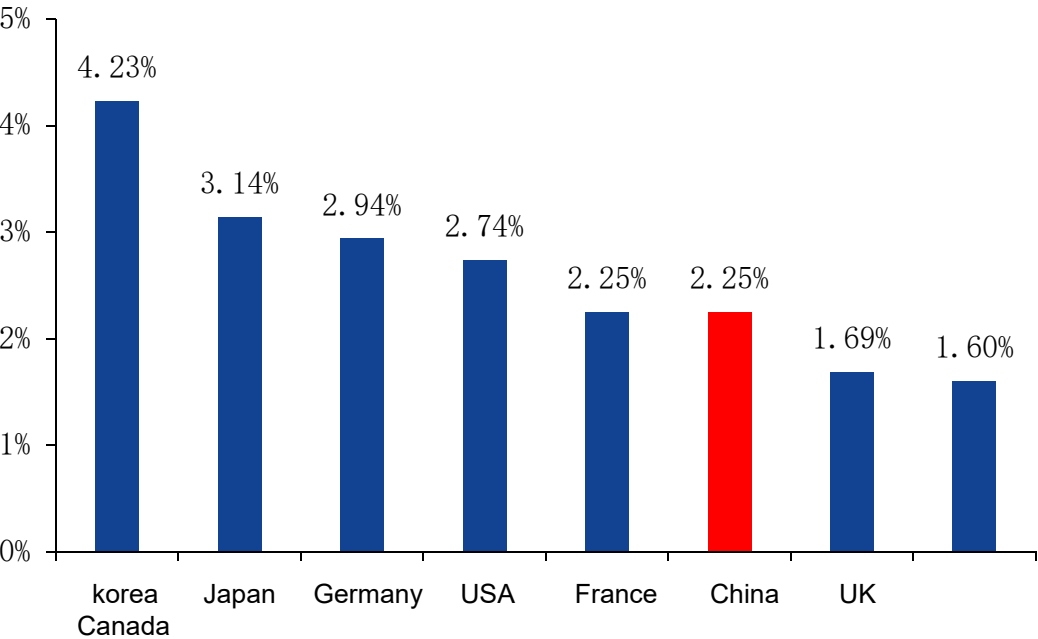
# 2.1.4 driving factor 2 of Intelligent Manufacturing: industrial policy drives manufacturing towards "intelligent manufacturing"

## Incomplete summary of China's intelligent manufacturing policies since 2015

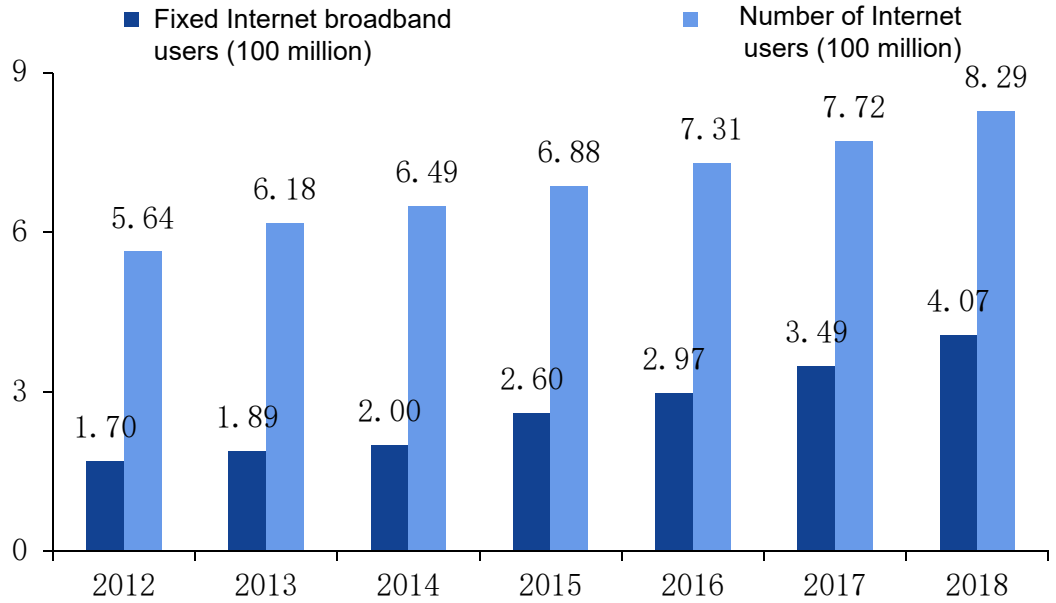
time	Issued by	File name	primary coverage
2015. 05	the state council	Made in China 2025	By 2020, the intelligent level of key areas of manufacturing industry will be significantly improved, and the operation cost of pilot demonstration projects will be reduced by 30%; by 2025, the key areas of manufacturing industry will be fully intelligent, the operation cost of pilot demonstration projects will be reduced by 50%, the production cycle of products will be shortened by 50%, and the rate of defective products will be reduced by 50%.
2015. 07	the state council	Guiding opinions on actively promoting the "Internet plus" action	Taking the intelligent factory as the development direction, we will carry out intelligent manufacturing pilot demonstration, accelerate the application of cloud computing, Internet of things, intelligent industrial robots, additive manufacturing and other technologies in the production process, and promote the intelligent upgrading of production equipment, process transformation and basic data sharing.
2016. 08	AQSIQ, State Commission of standards, Ministry of industry and information technology	Standardization and quality improvement plan of equipment manufacturing industry	By 2020, the standard system in key fields such as industrial foundation, intelligent manufacturing and green manufacturing will be basically improved, the quality and safety standards will be in line with the international standards, the conversion rate of international standards in key fields will strive to reach more than 90%, and the overall standard level of equipment manufacturing industry will be greatly improved.
2016. 09	Ministry of industry and information technology, Ministry of Finance	Intelligent manufacturing development plan (2016-2020)	By 2020, the development foundation and supporting capacity of intelligent manufacturing will be significantly enhanced. The key fields of traditional manufacturing industry will basically realize digital manufacturing, and the intelligent transformation of key industries with conditions and foundations will make obvious progress; by 2025, the intelligent manufacturing support system will be basically established, and the key industries will initially realize intelligent transformation.
2016. 09	Ministry of industry and information technology, national development and Reform Commission	Special action on innovation and development of intelligent hardware industry (2016-2018)	By 2018, the global market share of China's intelligent hardware will exceed 30%, and the industrial scale will exceed 500 billion yuan. Significant breakthroughs have been made in key technical links such as low-power and lightweight system design, low-power wide area intelligent IOT, virtual reality, intelligent human-computer interaction, and high-performance motion and attitude control, so as to cultivate a number of industry-leading listed enterprises. We have built three supporting platforms for standard development, product and application testing, and industrial supply capacity monitoring. The capacity of intelligent hardware standardization and public service has reached the international advanced level.
2017. 07	the state council	Development plan of new generation artificial intelligence	By 2020, a series of landmark products of artificial intelligence will make important breakthroughs, form international competitive advantages in some key fields further deepen the integration of artificial intelligence and the real economy, and further optimize the industrial development environment.
2017. 10	Ministry of industry and information technology	High end intelligent remanufacturing action plan (2018-2020)	By 2020, we will promote the establishment of 100 high-end intelligent remanufacturing demonstration enterprises, technology research and development centers, service enterprises, information service platforms, and industrial cluster areas, so as to drive the scale of China's remanufacturing industry to 200 billion yuan.
2018. 05	Ministry of industry and information technology	Industrial Internet development action plan	By the end of 2020, the industrial Internet infrastructure and industrial system will be initially completed, about five top-level national nodes for logo resolution will be built, with more than 2 billion logo registrations; more than 30000 industrial enterprises will be promoted to go to the cloud, and more than 300000 industrial apps will be cultivated.
2018. 09	Ministry of industry and information technology, national standard management committee	Guide for construction of national intelligent manufacturing standard system (2018 Edition)	By 2018, more than 150 intelligent manufacturing standards will be formulated and revised, covering basic common standards and key technical standards. By 2019, more than 300 intelligent manufacturing standards will be formulated and revised, covering basic common standards and key technical standards, and a relatively complete intelligent manufacturing standard system will be gradually established. Build the intelligent manufacturing standard test and verification platform, improve the public service ability, improve the standard application level and international level.

# 2.1.5 driving factor 3: leading technology and coming of all networking era

Scientific and technological innovation has increasingly become the fundamental driving force of national progress. Therefore, the Chinese government and enterprises continue to increase R & D investment. By 2016, the proportion of R & D investment in GDP has reached 2.25%, close to the level of developed countries. China is at the world's leading level in the application research of artificial intelligence, big data, 5g communication, new energy, and other specific projects such as the Hong Kong Zhuhai Macao Bridge and the large domestic amphibious aircraft "Kunlong" ag600. In addition, the gap between China and developed countries in the development of fixed broadband and other scientific and technological bases has been narrowing. In 2018, the number of fixed broadband users in China reached 407 million, and the penetration rate of fixed broadband households reached 86.1%, an increase of 11.7 percentage points over 2017.



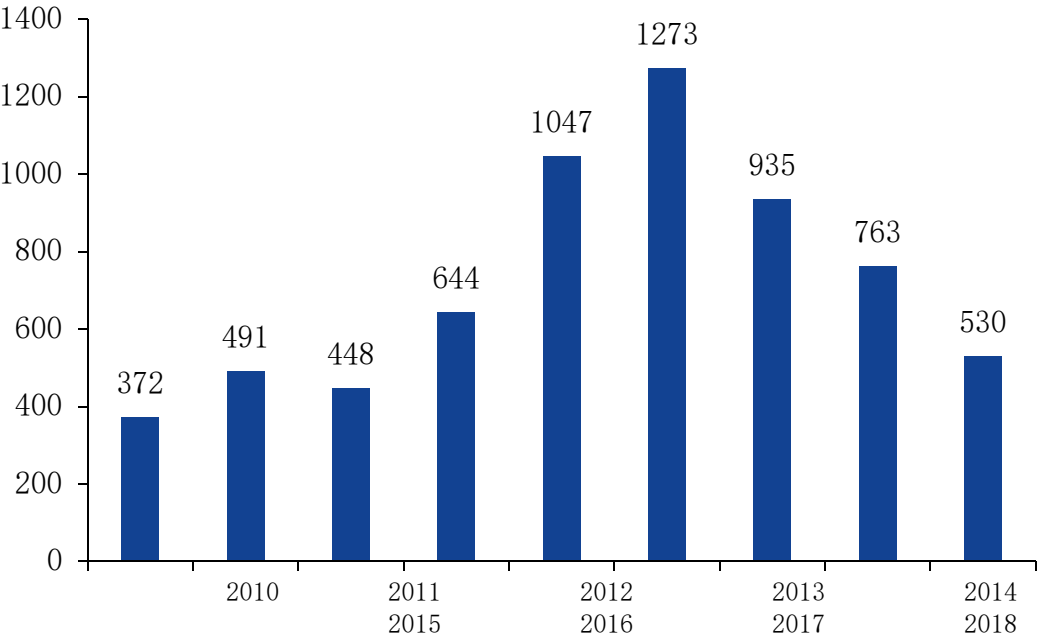
Comparison of R & D expenditure in GDP of different countries in 2016 (unit:%)



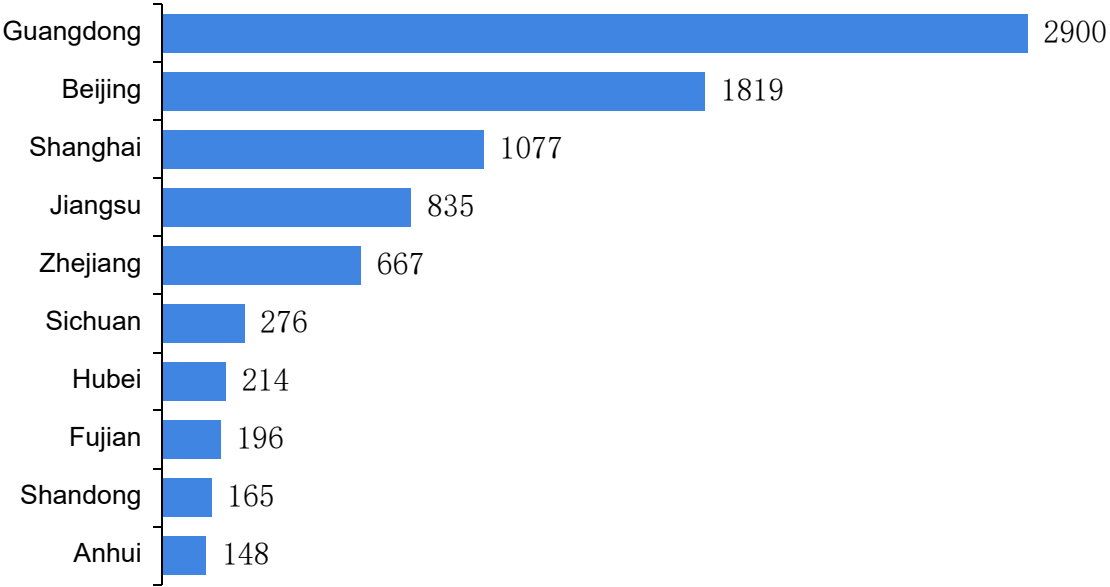
Scale of Chinese Internet users and fixed broadband users in 2012-2018 (unit: 100 million households, 100 million people)

## 2.2.1 the growth trend of China's intelligent manufacturing enterprises tends to be stable

From 2014 to 2015, the number of newly established enterprises in China's intelligent manufacturing industry increased sharply, and enterprises in industrial giants, Internet technology and other fields expanded their business scope, actively transformed and entered the intelligent manufacturing industry. In 2015, the number of new enterprises reached the peak. After 2016, the number of new intelligent manufacturing enterprises in China began to decrease, and began to vertically expand and deepen the key technologies and application fields of intelligent manufacturing. There are obvious differences in the regional distribution of China's intelligent manufacturing enterprises, which are generally distributed in the first tier cities. Guangdong province leads the market with absolute advantages.



Number of new enterprises in China's intelligent manufacturing industry from 2010 to 2018

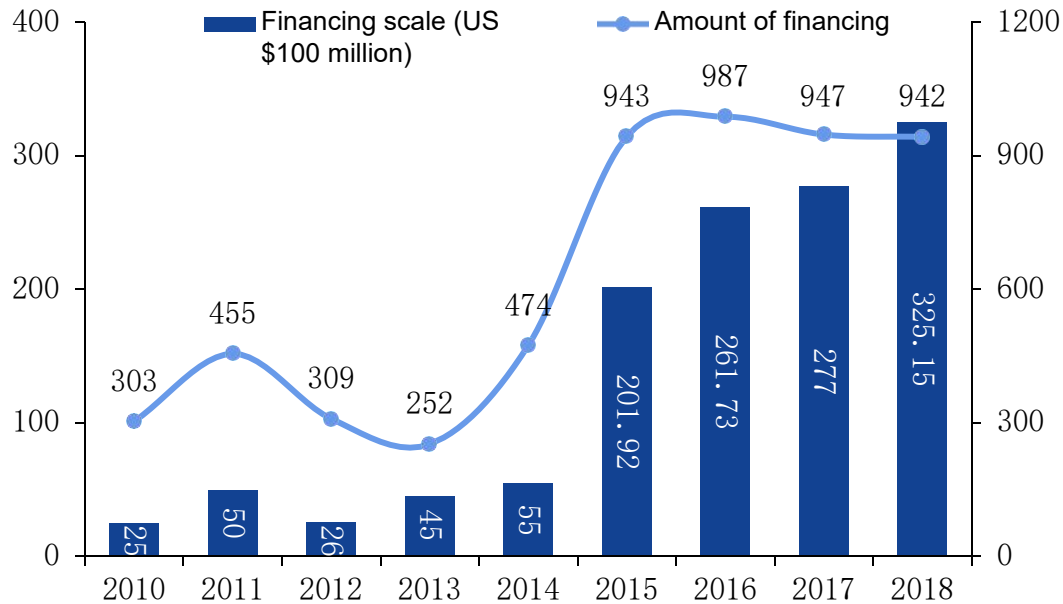


Regional distribution of new enterprises in China's intelligent manufacturing industry in 2018

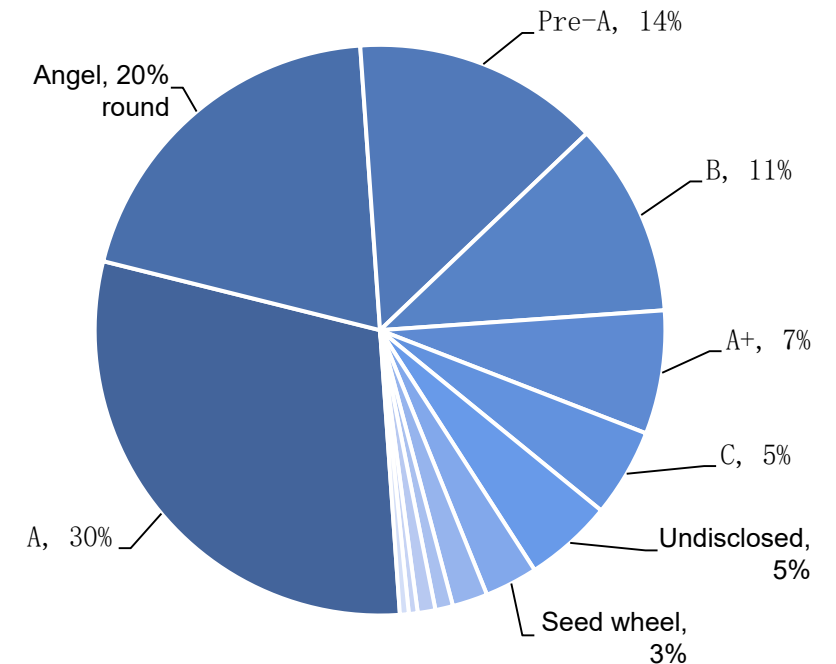


## 2.2.2 China's intelligent manufacturing industry ushers in financing peak, and start-ups are favored

Since 2015, intelligent manufacturing has been widely favored by the capital market, and the number and scale of financing have increased significantly; from 2016 to 2018, China's intelligent manufacturing development momentum is strong, ushering in the financing peak. In 2018, the financing amount of intelligent manufacturing reached US \$32.515 billion, with 942 financing cases. In terms of financing rounds, most of China's intelligent manufacturing enterprises are in the early stage (seed round-a + round), accounting for more than 50%.



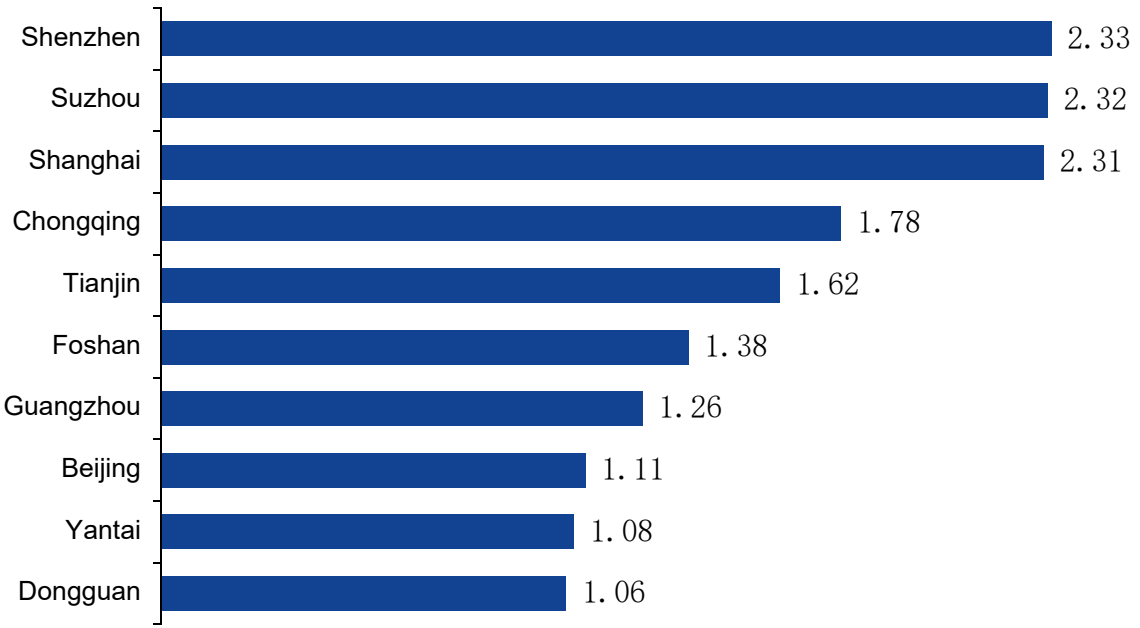
Investment and financing of China's intelligent manufacturing industry from 2010 to 2018



Distribution of financing rounds of Intelligent Manufacturing in China in 2018 (unit:%)

### 2.2.3 smart manufacturing achievements in Suzhou, Shenzhen and Foshan

Compared with the world level, the intelligence level of China is lower than that of foreign countries on the whole, which needs to be improved. However, Suzhou has a strong performance and becomes the first intelligent production in the world and China. In terms of the output value of intelligent manufacturing, the overall average output value of intelligent manufacturing of sample cities in the world intelligent manufacturing center development trend report (2019) is about 1.14 trillion yuan. Only 18 cities in the world exceed this level, including 7 cities in China: Shenzhen, Suzhou, Shanghai, Chongqing, Tianjin, Foshan and Guangzhou.



Top 10 cities of China's intelligent manufacturing output value in 2019 (unit: trillion yuan)

ranking	city	Main bearing area	Intelligent production
1	Suzhou	Wujiang District	0.7702
2	Foshan	Shunde District	0.6178
3	Shanghai	Pudong New Area	0.5940
4	Ningbo	Beilun District	0.5825
5	Shenzhen	Longgang District	0.5615
6	Wuxi	Xinwu District	0.5419
7	Chongqing	Liangjiang New Area	0.5170
8	Tianjin	Binhai New Area	0.4983
9	Dongguan	Songshan Lake area	0.4715
10	Nanjing	Jiangning District	0.4237

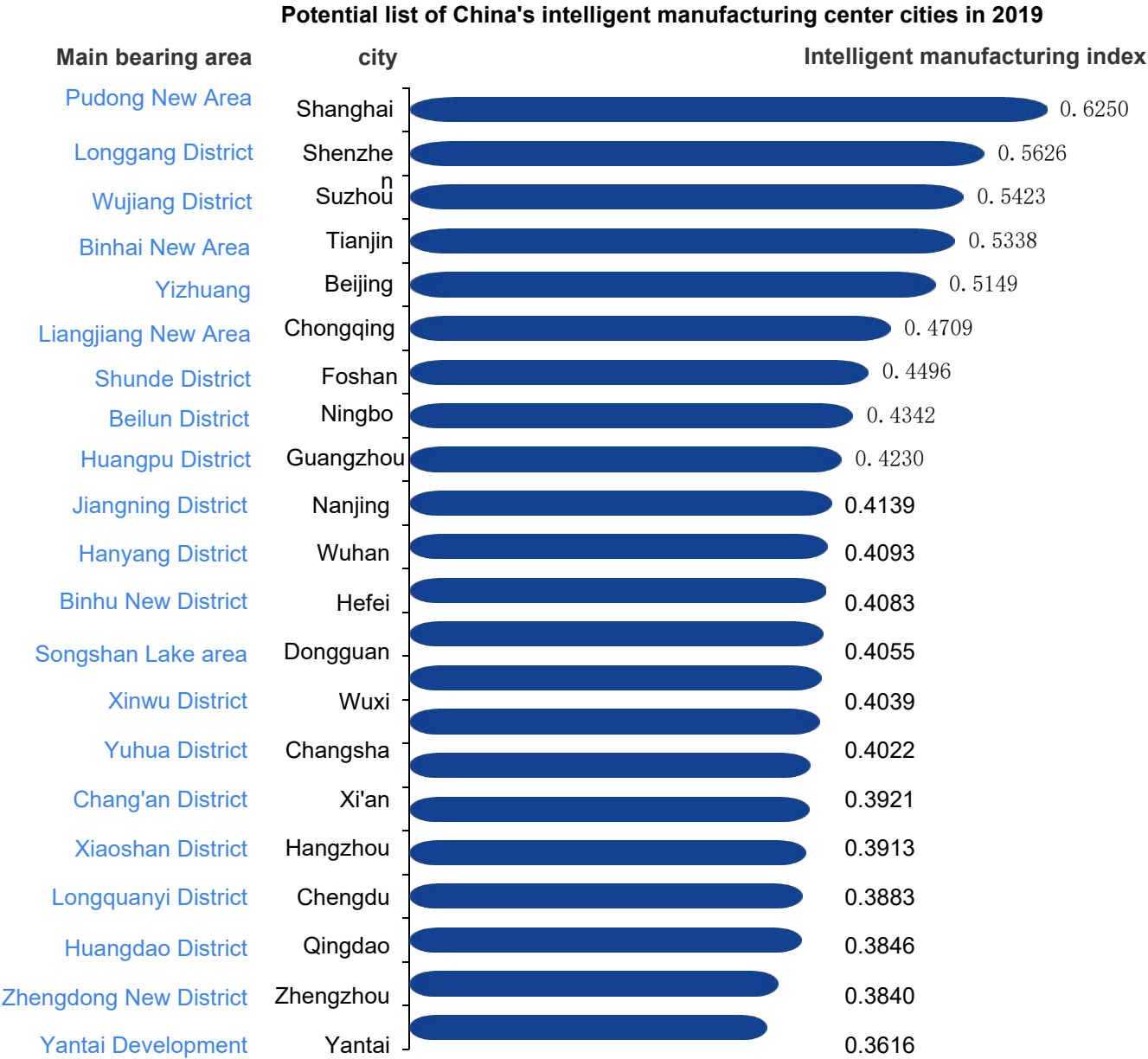
Top 10 cities of intelligent production in China in 2019

Source: the development trend report of world intelligent manufacturing center (2019) compiled by prospective industry research institute

### 2.3.1 the initial formation of China's "smart belt"

Intelligent manufacturing is considered to be the main direction of manufacturing in China. From "made in China" to "created in China", scientific and technological innovation is undoubtedly the most important starting point. From various intelligent manufacturing industrial parks springing up all over the country, to the national intelligent manufacturing demonstration pilot project and the national intelligent manufacturing comprehensive standardization and new mode application pilot project, China's "intelligent manufacturing industrial belt" (smart belt) is taking shape.

In terms of the potential list of China's intelligent manufacturing centers, Shanghai, Shenzhen and Suzhou are ranked among the top three, with Pudong New Area, Longgang District and Wujiang district as the main bearing areas.



Source: the development trend report of world intelligent manufacturing center (2019) compiled by prospective industry research institute

2.3.2 there are 816 national intelligent manufacturing pilot projects in China



In recent years, relevant departments and institutions have successively issued policies and regulations to support and promote the development of China's intelligent manufacturing industry. Among them, China's intelligent manufacturing pilot demonstration projects have been publicized in four batches with a total of 307 since 2015; intelligent manufacturing comprehensive standardization projects have been publicized in three batches with a total of 509 since 2016; two pilot projects have a total of 816 projects.

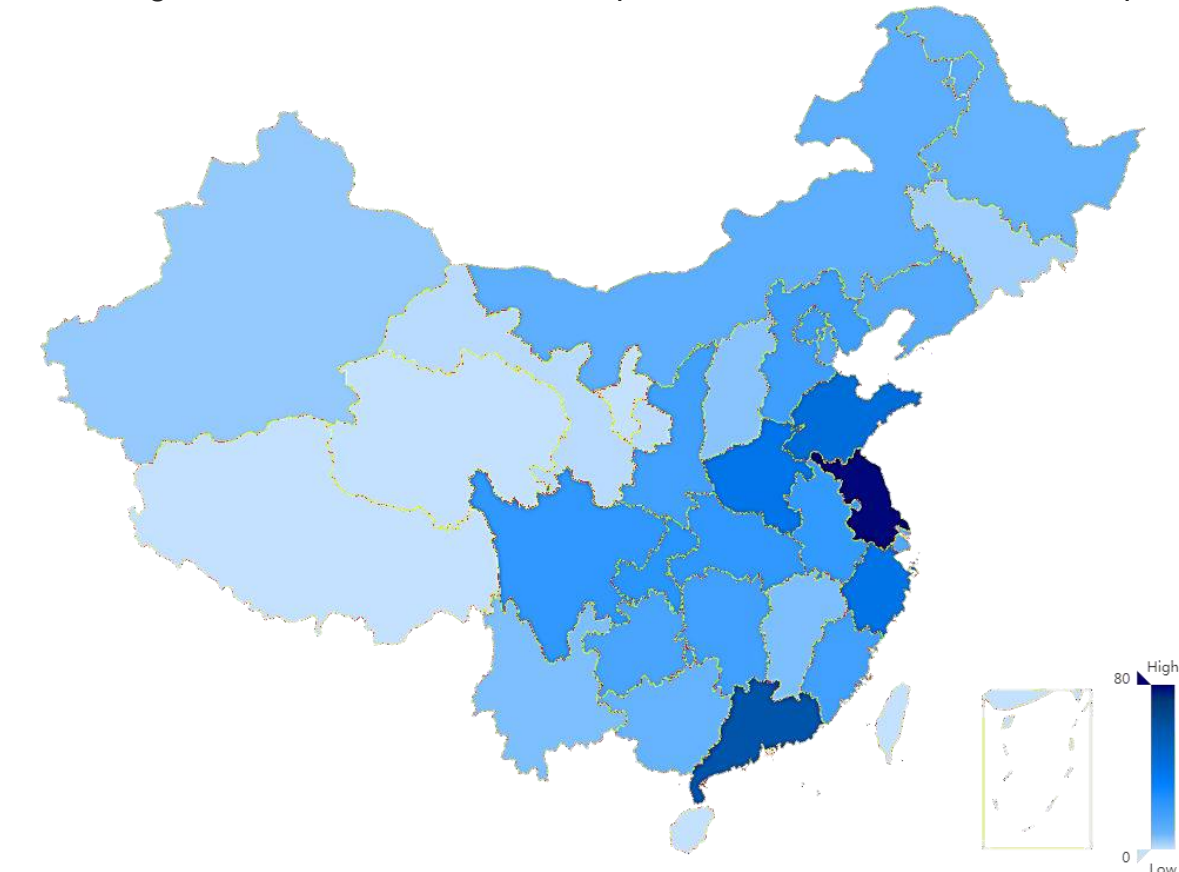
Distribution of national intelligent manufacturing pilot projects in China (unit: Unit)

ranking	region	Number of Intelligent Manufacturing Pilot Projects	Number of proposed projects for integrated standardization and new mode application of intelligent manufacturing	Number of intelligent manufacturing pilot demonstration projects	ranking	region	Number of Intelligent Manufacturing Pilot Projects	Number of proposed projects for integrated standardization and new mode application of intelligent manufacturing	Number of intelligent manufacturing pilot demonstration projects
1	Shandong	75	41	34	17	Jiangxi	22	11	11
2	Beijing	62	48	14	18	Hebei	21	9	12
3	Jiangsu	57	38	19	19	Tianjin	12	10	2
4	Guangdong	57	33	24	20	Inner Mongolia	12	8	4
5	Zhejiang	56	31	25	21	Guizhou	12	5	7
6	Shanghai	43	29	14	22	Ningxia	10	7	3
7	Fujian	39	24	15	23	Gansu	10	6	4
8	Anhui	39	20	19	24	Shanxi	9	3	6
9	Hunan	38	22	16	25	Guangxi	7	3	4
10	Shaanxi	35	21	14	26	Jilin	6	5	1
11	Henan	33	24	9	27	Yunnan	6	3	3
12	Hubei	33	21	12	28	Heilongjiang	5	3	2
13	Liaoning	30	21	9	29	Tibet	3	2	1
14	Chongqing	28	25	3	30	Qinghai	2	1	1
15	Sichuan	27	21	6	31	Hainan	2	1	1
16	Xinjiang	25	13	12					

Source: the development trend report of world intelligent manufacturing center (2019) compiled by prospective industry research institute

### 2.3.3 there are 537 intelligent manufacturing industrial parks in China

In order to develop the intelligent manufacturing industry, a large number of industrial parks have been born in the intelligent manufacturing chain, and a large number of intelligent manufacturing industry chain enterprises have been bred. In order to have the universality and scientificity of the sample, The development trend report of world intelligent manufacturing center (2019) involves all industrial parks with the name of "intelligent manufacturing" in the selection of Park samples, and a total of 537 Park samples are obtained.



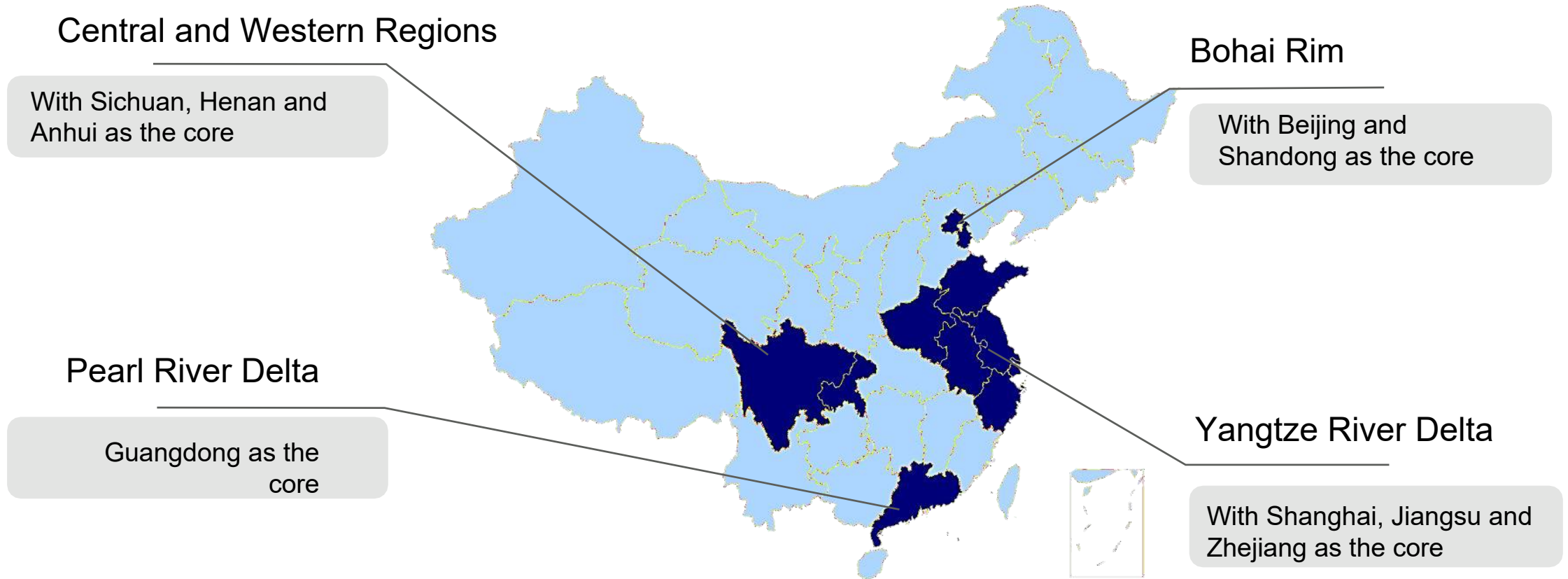
Map of China's Intelligent Manufacturing Industrial Park

Jiangsu	79	Guizhou	15
Guangdong	59	Shanghai	13
Shandong	43	Tianjin	13
Zhejiang	39	Liaoning	12
Henan	38	Inner Mongolia	10
Chongqing	23	Guangxi	8
Hubei	22	Heilongjiang	8
Sichuan	22	Jiangxi	6
Anhui	21	Yunnan	6
Beijing	18	Shanxi	5
Hebei	18	Xinjiang	4
Fujian	17	Jilin	3
Hunan	17	Gansu	1
Shaanxi	17	total	537



## 2.3.4 four industrial agglomeration areas support "China's Intelligent Manufacturing"

From the perspective of regional competition pattern of intelligent equipment industry, at present, intelligent manufacturing equipment in China is mainly distributed in areas with more developed industrial base. Under the influence of policy, China is forming four industrial agglomeration areas, namely Pearl River Delta, Yangtze River Delta, Bohai rim and central and Western China. The industrial cluster will further enhance the development level of Intelligent Manufacturing in various regions.



## 2.3.5 Bohai Rim region: abundant talent reserve and outstanding scientific research strength

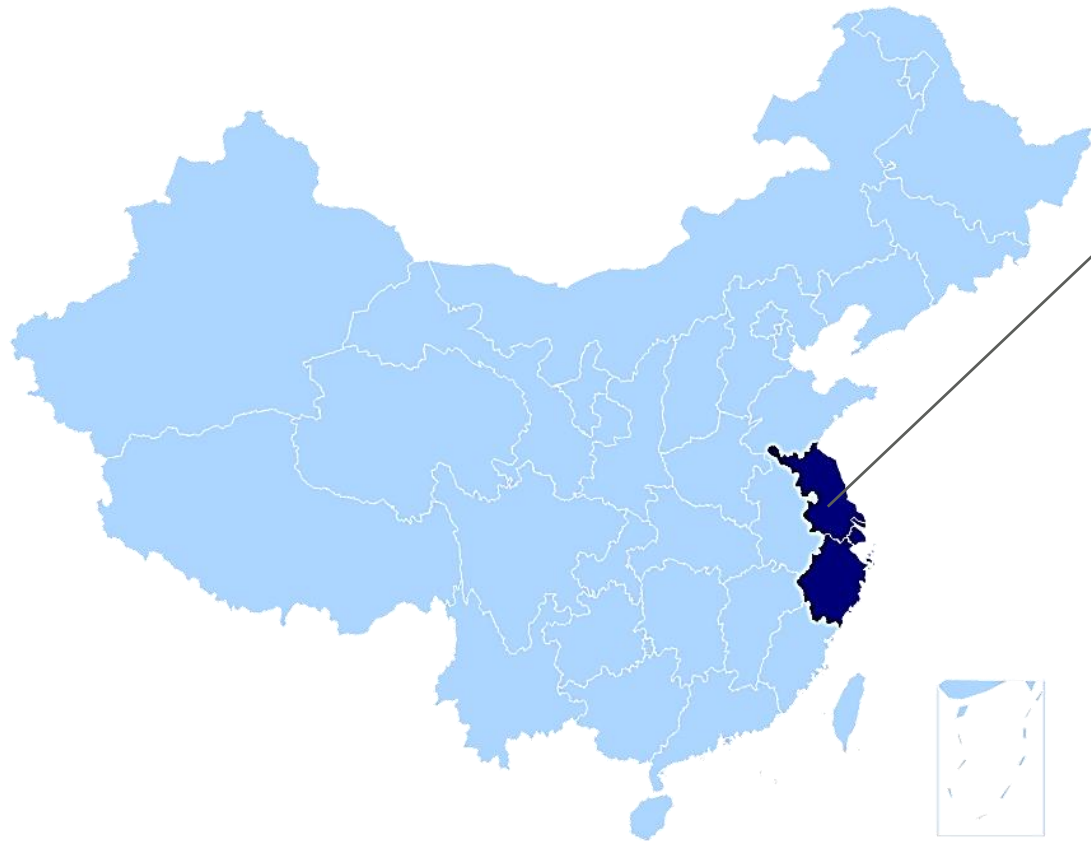


**Bohai Rim**



- Universities and scientific research institutes are highly concentrated with outstanding scientific research strength
- Relying on the advantages of regional resources and human resources, the industrial pattern of dislocation development of "core region" and "two wings" is formed
- In the fields of science and technology, Internet and other elements, we will focus on the advantages of Beijing's industrial production and services, such as science and technology and Internet

## 2.3.6 Yangtze River Delta: active economy and strong innovation ability



### Yangtze River Delta



- With Shanghai, Jiangsu, Zhejiang, Anhui as the core
- With active economy and strong innovation ability, intelligent manufacturing hardware has obvious advantages, and the development level of intelligent manufacturing is relatively balanced
- Shanghai takes the lead in key parts, robots, aerospace equipment, etc.; Nanjing has formed an equipment cluster characterized by rail transit, auto parts and new electric equipment; Changzhou has fully integrated advanced industrial design concepts at home and abroad, and accelerated the forging of "new business card" of intelligent manufacturing

## 2.3.7 Pearl River Delta: sufficient basic technology and leading industrial benefits

### Pearl River Delta



- Speed up the pace of robot replacement and gradually develop into "Chinese system" Building "main position"
- Form intelligent manufacturing application demonstration in line with the characteristics of their respective industries
- Construction of core area of robot and intelligent equipment industry in Guangzhou
- Shenzhen focuses on building robot and wearable equipment manufacturing base, international cooperation base and innovation service base

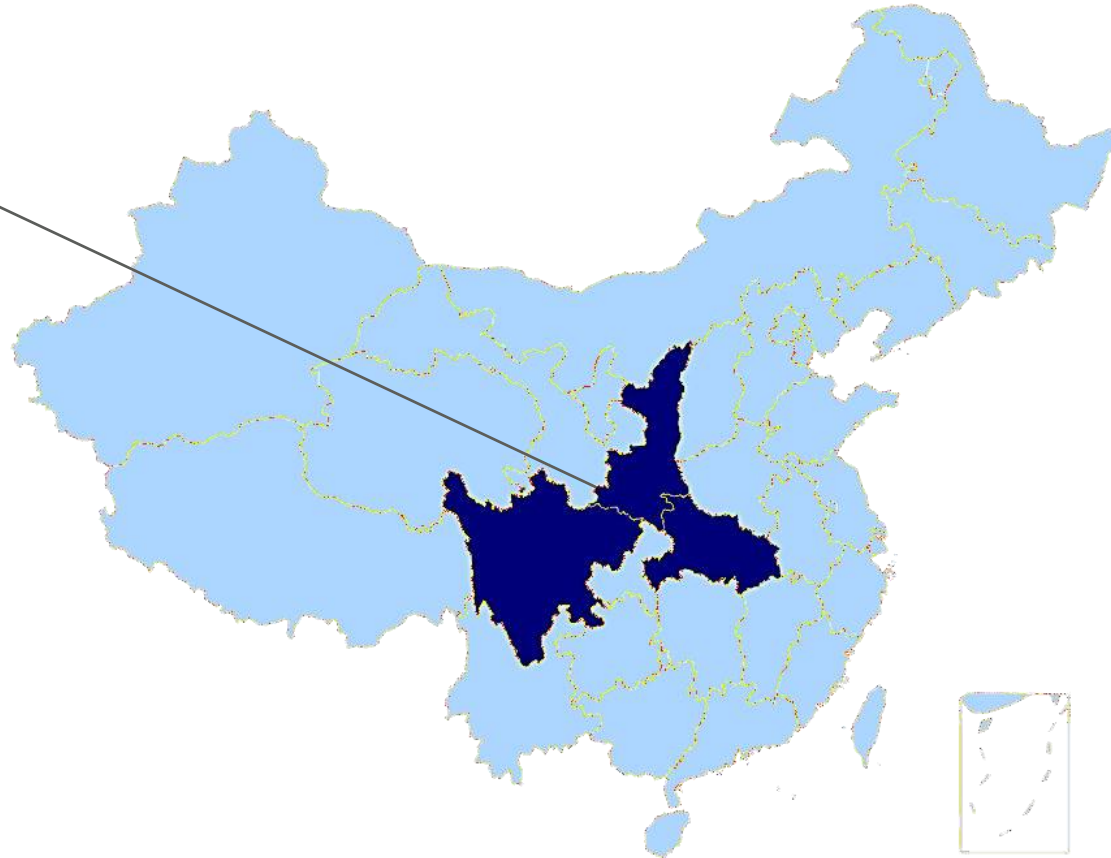
## 2.3.9 central and Western Regions -- the advantages of scientific research institutes are still in the stage of automatic evolution



### Central and Western Regions



- It lags behind the eastern region and is still in the automation stage
- Relying on Huazhong University of science and technology, Wuhan University of Posts and telecommunications, Xi'an Institute of Optics and mechanics of Chinese Academy of Sciences, and China Engineering Physics Research Institute  
Advantages of research institutes and other universities and research institutes
- With advanced laser industry as the "new bright spot" of intelligent manufacturing development, the advanced laser industry with leading technology and outstanding characteristics has been developed





# 03

## Development of key fields of Intelligent Manufacturing in China

- Industrial robot laser cutting
  - Industrial Internet Intelligent Manufacturing Department
  - Artificial intelligence system solution
- 3D printing

### 3.1.1 industrial robots: a new round of direct human substitution

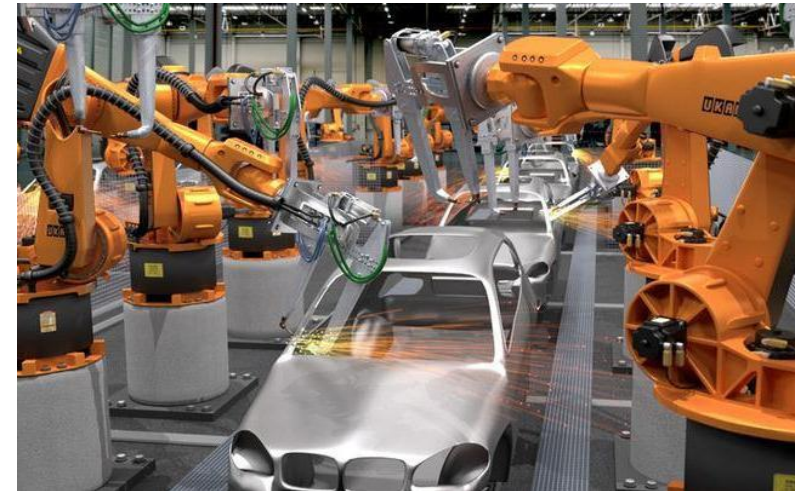
At the same time, with the acceleration of the localization process of industrial robots, the price of industrial robots has decreased. According to a report released by Oxford economics, a global forecasting and quantitative analysis company, robots are expected to replace 20 million manufacturing jobs in the world in the next 10 years. Each new robot enters the labor market, an average of 1.6 manufacturing workers will be replaced. China already accounts for one fifth of the world's industrial robots, and one in three new robots entering the labor market is installed in China. By 2030, 14 million robots will be put into use in China, leading the rest of the world.



1.6 manufacturing workers  
20 million manufacturing  
jobs

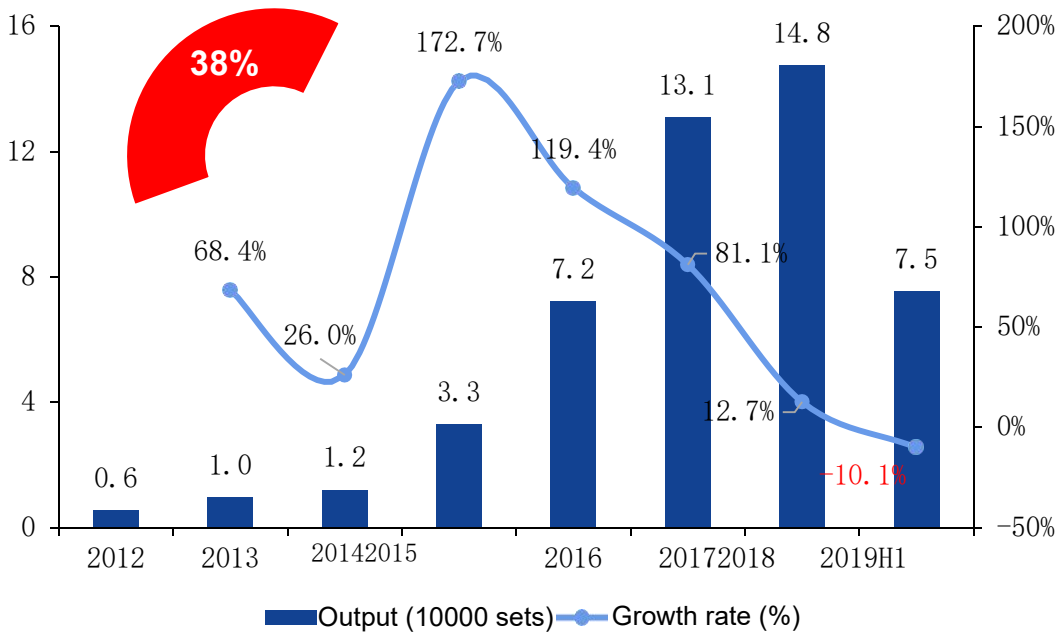


One industrial robot 14 million  
robots

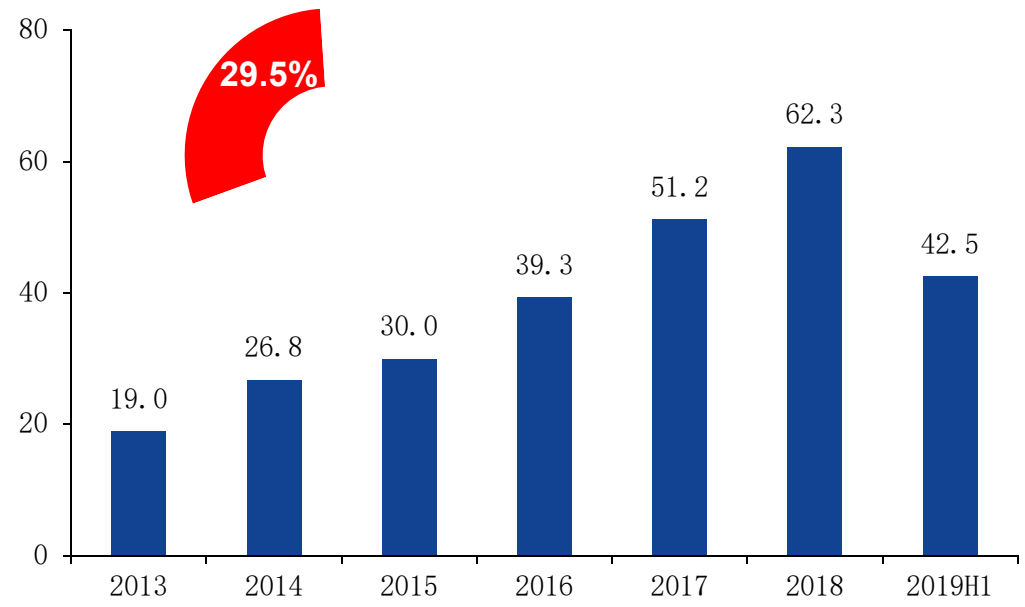


### 3.1.2 China's industrial robot production tends to be stable and still plays an important role in the world

China's industrial robots have developed rapidly, accounting for about one third of the global market share, and have become the world's largest application market for six consecutive years. In 2018, China's industrial robot production reached 148000 units, accounting for more than 38% of the global output. Constrained by the slowdown in the demand of downstream industries -- the automobile industry ushered in the first decline in sales in 28 years, and the growth of 3C industry also fell sharply. In the first half of 2019, the order growth of the whole industry was weak, and the output continued to decline, only 75000 units, with a decline rate of 10.1%. However, according to the data of China Electronics Society, in the first half of 2019, the global robot market scale reached 14.4 billion US dollars, of which the scale of Chinese robot market reached 4.25 billion US dollars, accounting for 29.5%, which still plays an important role in the world.



Output and growth rate of industrial robots in China from 2012 to 2019  
(unit: 10000 sets, %)

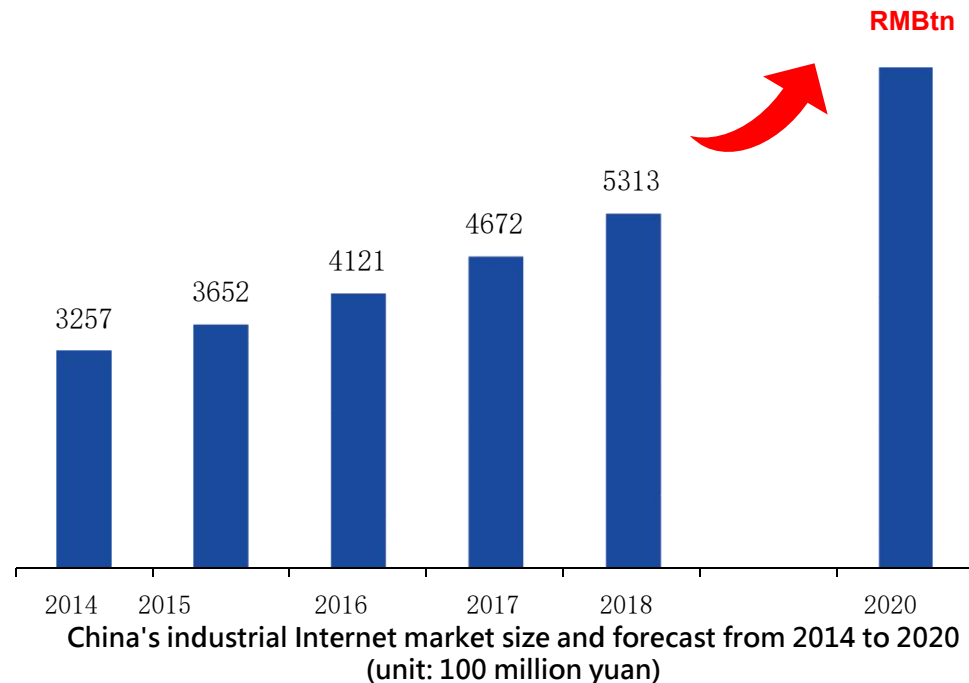


Market size of China's industrial robots in 2013-2019 (unit: US \$100 million)

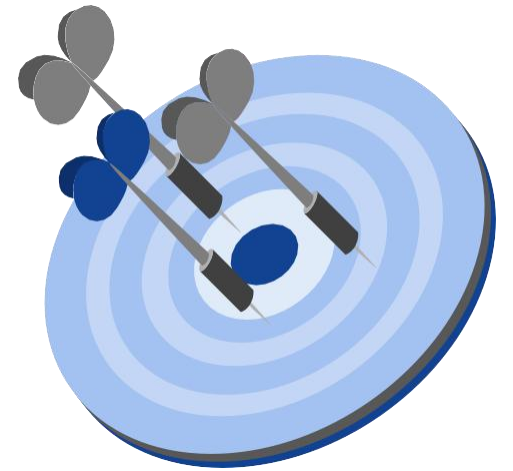
Source: compiled by the Ministry of industry and information technology, National Bureau of statistics, IFR, China Electronics Society prospective industry research institute

### 3.2.1 industrial Internet -- the key infrastructure to realize "intelligent manufacturing"

Intelligent manufacturing can realize the intelligence of the whole manufacturing value chain, and the industrial Internet is the key infrastructure to realize the intelligent manufacturing. On June 12, 2018, the Ministry of industry and information technology announced the "industrial Internet innovation and development project to support projects in 2018", indicating that the industrial Internet has entered a substantial development stage. In 2018, the scale of China's industrial Internet market will reach 531.3 billion yuan. According to the calculation of China Industrial Internet industry alliance, the market scale is expected to reach trillion yuan by 2020.



- 
**Enterprise decision making**  
 Application innovation carrier of enterprise intelligent decision
- 
**Industrial data**  
 The explosive growth of industrial data requires new data management tools
- 
**Interactive means**  
 New manufacturing mode needs updated business interaction means



Intelligent manufacturing puts forward new requirements for industrial Internet

### 3.2.2 all kinds of enterprises step up the layout and seize the commanding height of development



As an important starting point to promote the integrated development of manufacturing industry and Internet, the concept and importance of industrial Internet platform are gradually recognized by the industry. Various industrial entities around the world actively layout industrial Internet platform to seize the commanding height of development. Driven by policy, technology and other factors, a number of industrial Internet platforms have emerged in China, and the industrial system has been initially improved.

**FOXCONN**



Beacon platform

**Haier**



Cosmoplat platform

 **SANY**



Root cloud platform

 **XCMG**



Xrea platform

 **航天云网**  
**CASICloud**



Indics platform

**用友**  
yonyou



Smart platform

**BONC**  
东方国信

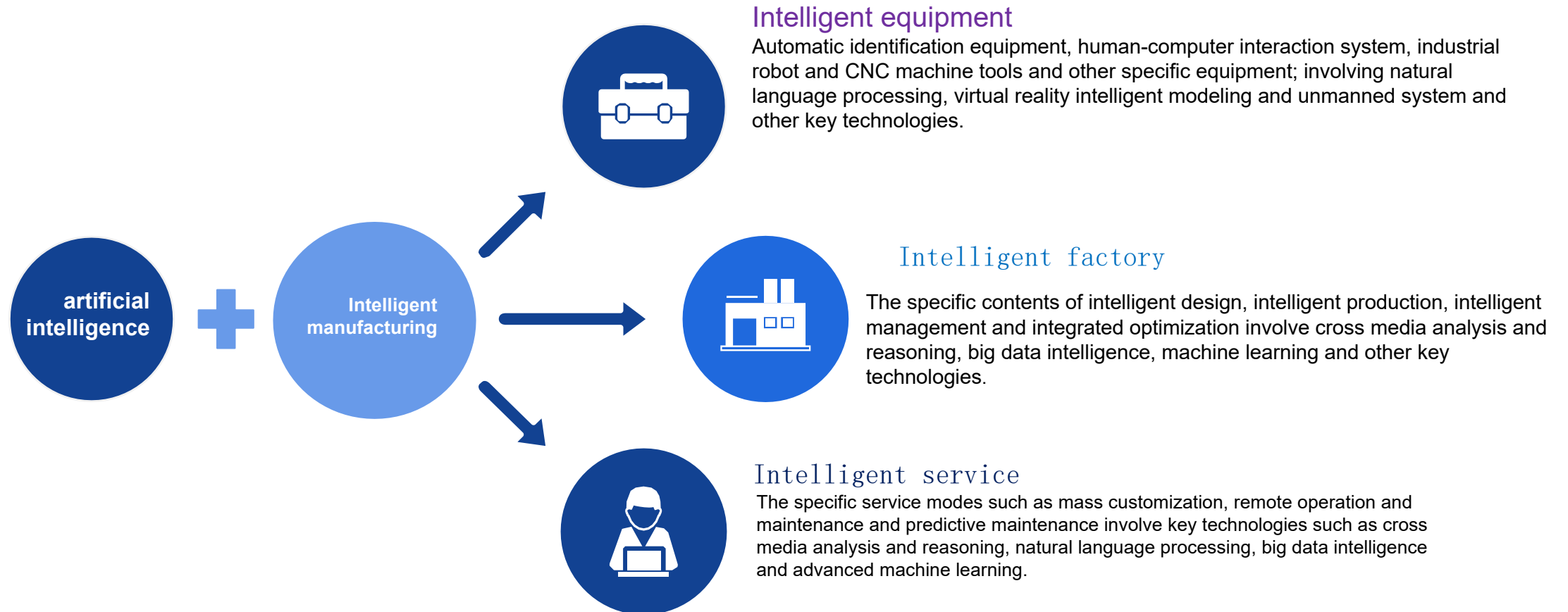


Cloudiip platform



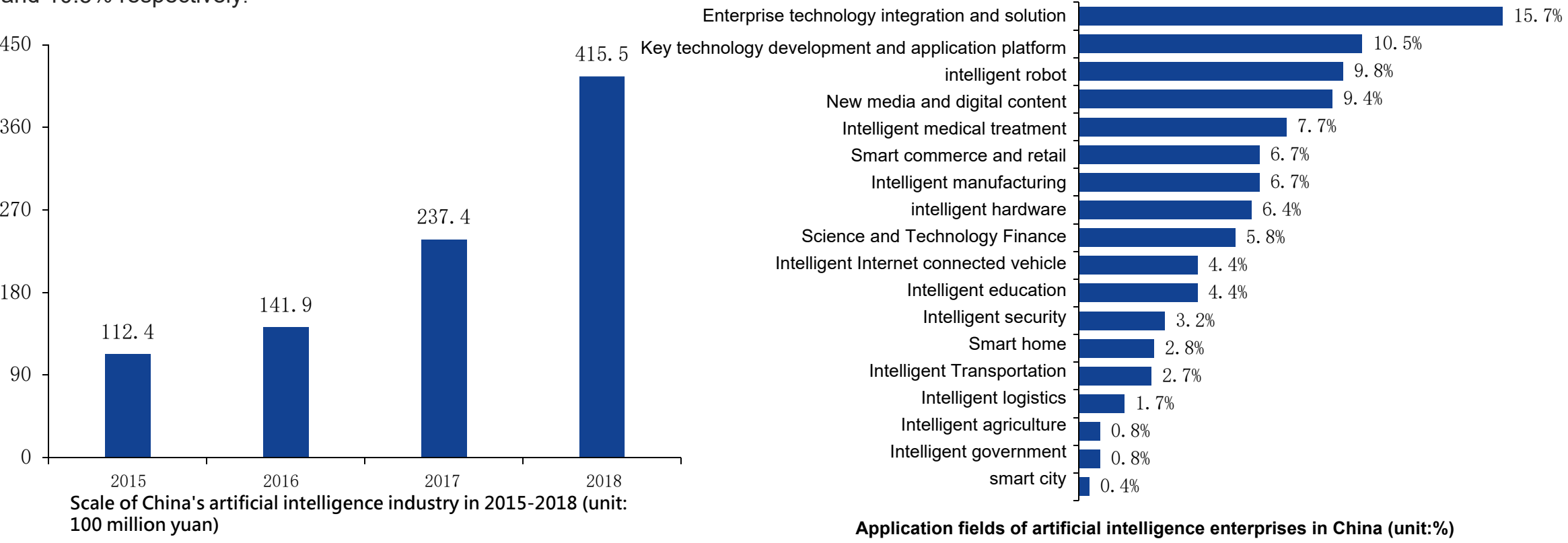
### 3.3.1 artificial intelligence + manufacturing industry: creating a new business form of "intelligent manufacturing"

China's artificial intelligence has entered the 2.0 stage, marked by a set of huge intelligent systems linked together through the Internet. From the perspective of intelligent manufacturing industry, artificial intelligence technology is deeply transforming the manufacturing industry. The deep integration of the new generation of artificial intelligence technology and the real economy of the manufacturing industry has become a bright spot in the application market. It has spawned application scenarios such as intelligent equipment, intelligent factory and intelligent service, and created some new demands, new industries and new formats of automation.



### 3.3.2 the scale of China's AI industry exceeds 40 billion

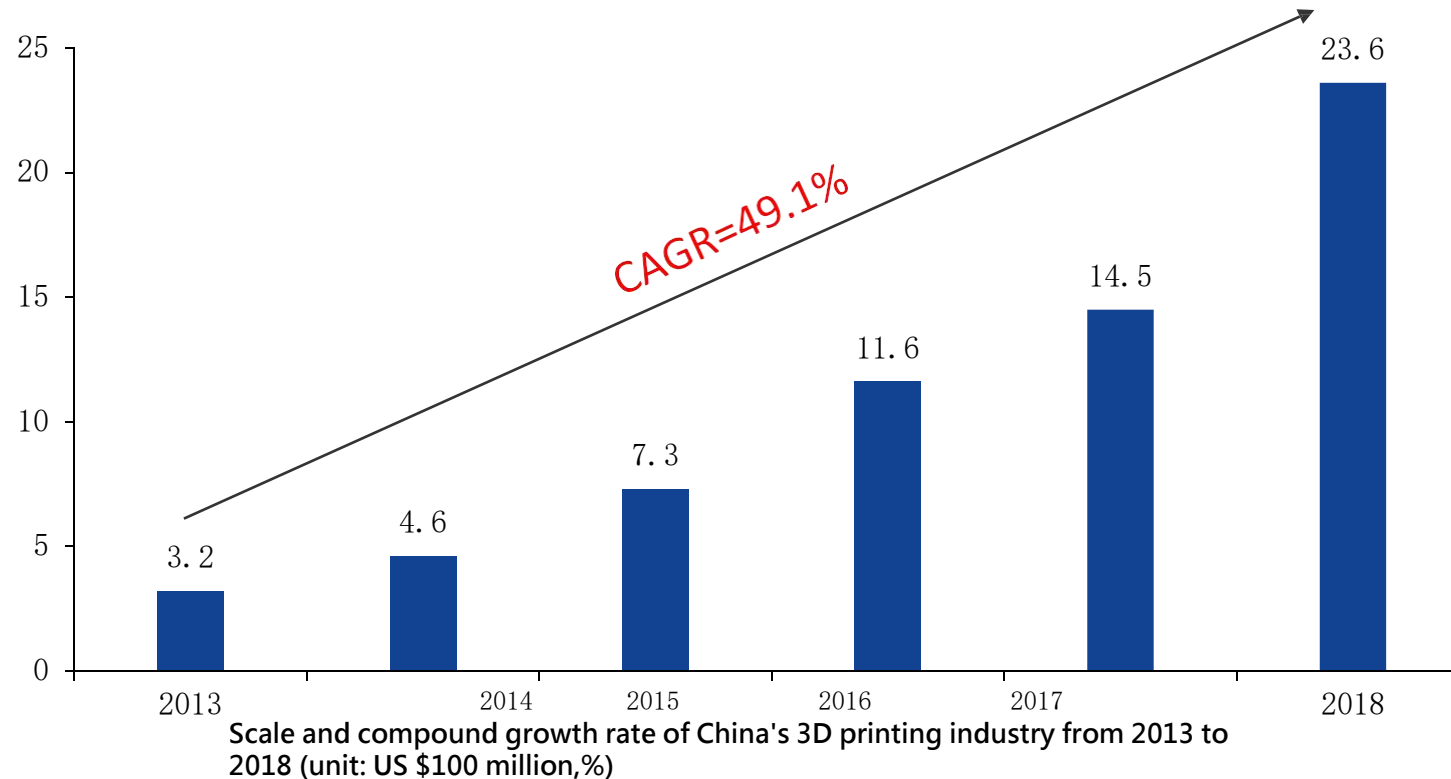
In recent years, China's artificial intelligence industry has developed rapidly. According to the data of China Academy of communications and communications, the compound average growth rate of China's artificial intelligence industry scale from 2015 to 2018 was 54.6%, higher than the global average level (about 36%). In 2018, the market scale of China's artificial intelligence industry has reached 41.55 billion yuan. Among them, enterprise technology integration and solution provision, key technology research and development and application platform are developing rapidly. According to the "China new generation artificial intelligence technology industry development report (2019)" released by China new generation artificial intelligence development strategy research institute in May 2019, as of February 2019, artificial intelligence enterprises are widely distributed in 18 application fields, and the number of enterprises in the above two fields accounts for the highest proportion, reaching 15.7% and 10.5% respectively.



Source: the left picture is from the China Academy of communications and communications, and the right is from the prospective industry Research Institute of China new generation artificial intelligence development strategy research institute

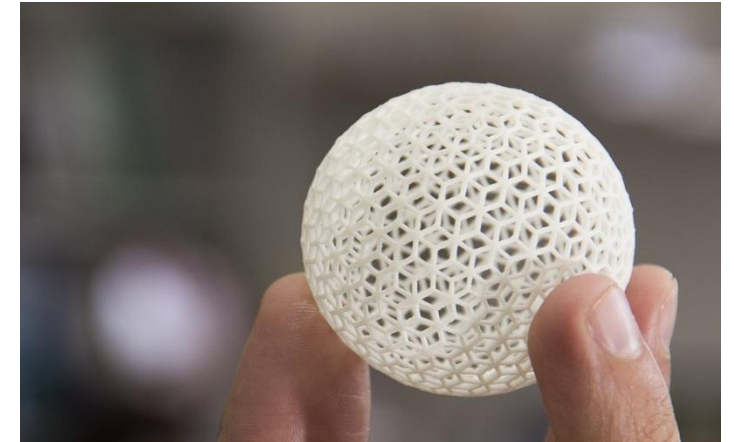
### 3.4.1 3D printing: the rising intelligent manufacturing mode

3D printing is not only a cool cutting-edge technology, but also a "potential stock" that is expected to innovate the manufacturing industry. It combines the advantages of high efficiency of mass production and flexibility of manual production. 3D printing can be introduced into the whole process of manufacturing industry, which can achieve high efficiency and low cost of manufacturing process, and represents the future development direction of intelligent manufacturing. In recent years, China's 3D printing industry has developed rapidly, from a market scale of US \$320 million in 2013 to US \$2.36 billion in 2018, with a compound growth rate of 49.1% in five years.



### 3.4.2 the core parts of 3D printing depend on import, and domestic enterprises have much room for improvement

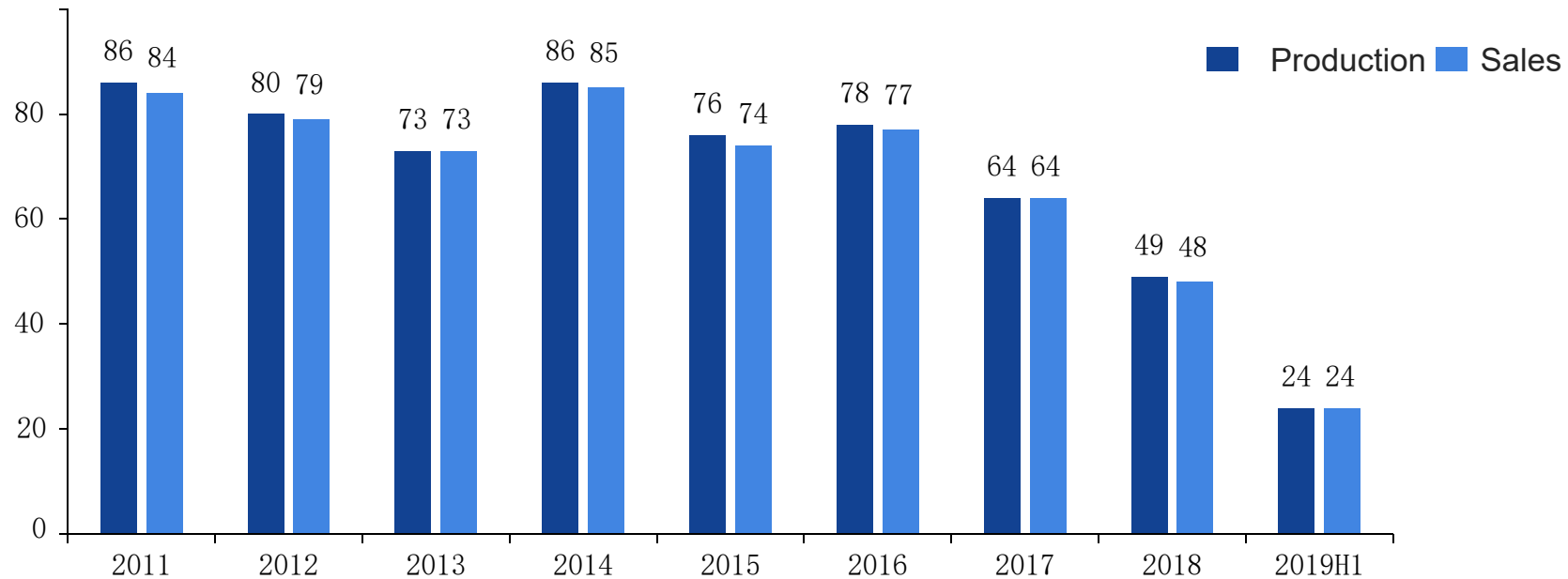
In recent years, with the technical progress of aerospace and automobile industry, the structure of its components is more and more complex, and the performance requirements of components are also higher. The traditional metal cutting methods are facing severe challenges. Compared with the traditional reduction manufacturing method, 3D printing can realize the one-time forming of complex parts, which is a representative subversive technology in the manufacturing field. However, domestic 3D printing started late, the number and scale of enterprises are relatively small, printing special new materials and core parts are heavily dependent on imports, and the key technologies are controlled by people. In 2018, the revenue of Xianlin 3D printing industry ranked first in China was 363 million yuan, which was only 7% of STRATASYS, an international giant. There is still a lot of room for improvement in import substitution.



### 3.5.1 laser cutting machine instead of traditional metal cutting machine



Metal cutting machine tool is the mainstream machine tool product at present, and the global sales volume accounts for 52.48% of all machine tools. Metal cutting machine tools can not only be used in electric power, shipbuilding, aerospace and other fields, but also can be used in the automation equipment manufacturing of electronic, automobile, new energy, textile and other industries. After experiencing the shock and fluctuation from 2011 to 2017, affected by the decline in the prosperity of automobile, 3C and other major downstream industries and the continued weak growth rate of fixed assets investment, China's machine tool incremental market continued to shrink. In 2018, China's metal cutting machine tool production and sales decreased by 24% and 25% respectively, and in the first half of 2019, the year-on-year decrease was about 10%.



Production and sales of metal cutting machine tools in China  
from 2011 to 2019 (unit: 10000 sets)

### 3.5.2 there is a wide space for laser substitution, which is expected to reach 400 billion yuan

As a high-precision and high-efficiency material processing method, laser processing is widely used with the improvement of laser equipment technology. The replacement rate of traditional tool type metal cutting machine tool is expected to continue to improve. Assuming that the efficiency of laser cutting is three times higher than that of traditional metal cutting machine tools, the upper limit of the total number of laser is about 3.25 million. Assuming that the permeability reaches 15%, 25% and 50% respectively, the average price of a single laser is 26g13/65000 yuan. It is estimated that the total market space capacity of lasers for metal cutting can reach up to 400 billion yuan.

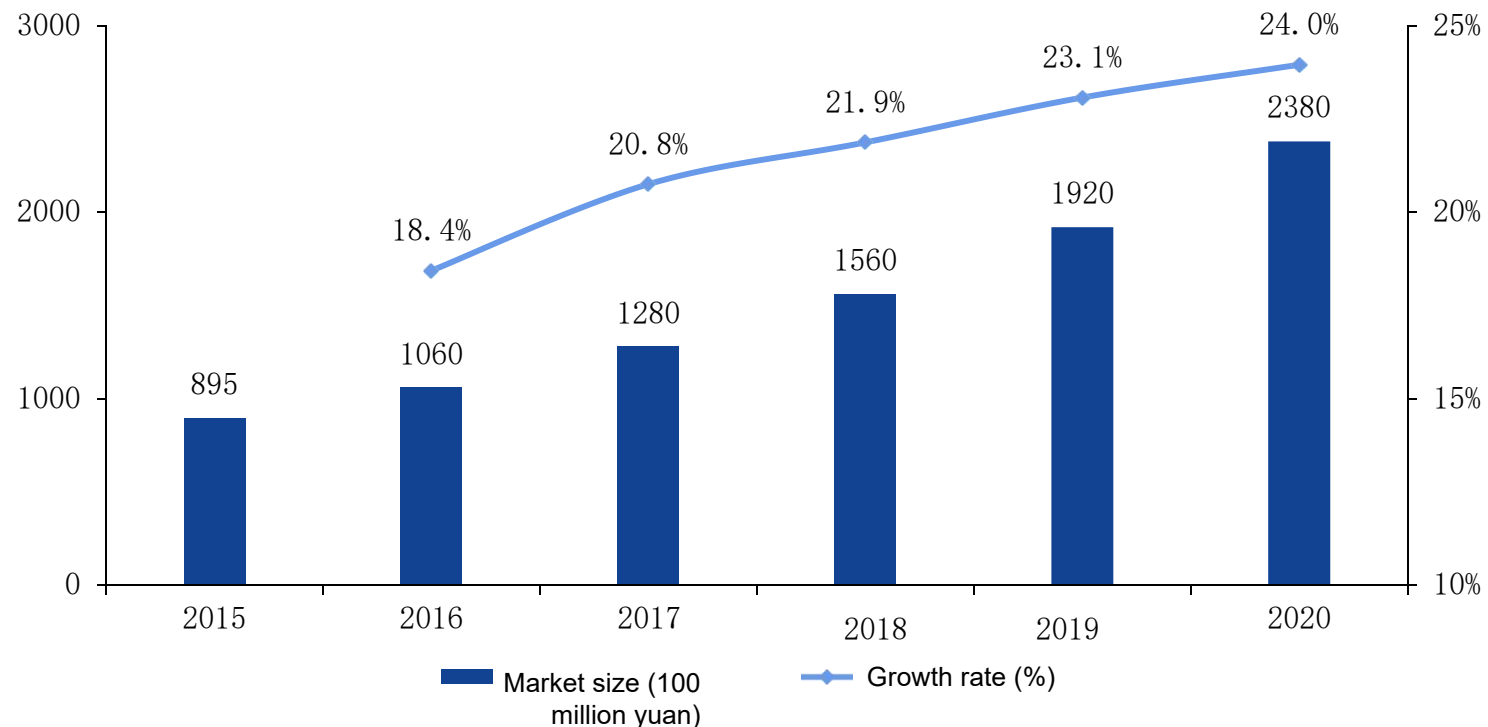
Market capacity calculation of laser cutting machine tools (unit: 10000 sets, 10000 yuan / set, 100 million yuan)

Permeability	Laser quantity (10000 sets)	Unit price of laser (10000 yuan / set)	Market space (100 million yuan)
15%	49	26.0	1268
	49	13.0	634
	49	6.5	317
25%	81	26.0	2113
	81	13.0	1056
	81	6.5	528
50%	163	26.0	4225
	163	13.0	2113
	163	6.5	1056



### 3.6.1 the market scale of intelligent manufacturing system solutions exceeds 100 billion

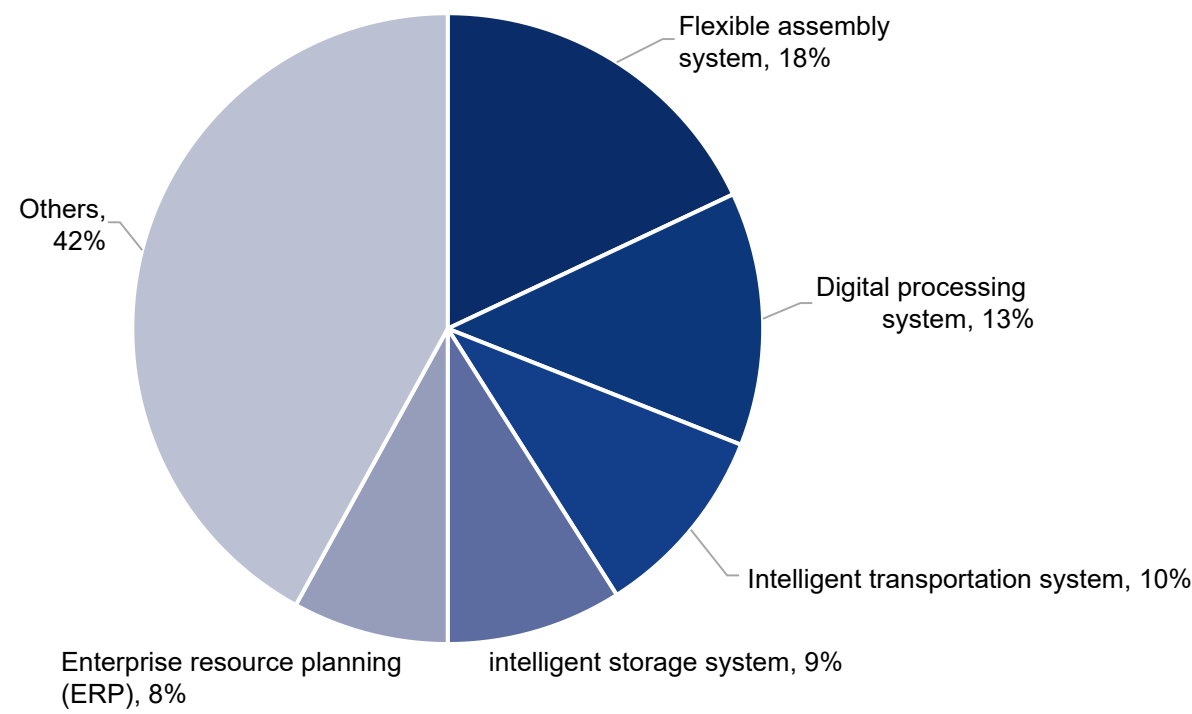
The solution provider of intelligent manufacturing system plays an important role in the promotion of intelligent manufacturing. Since the implementation of intelligent manufacturing project for three years, China's top-level planning, pilot demonstration and standard system construction have been effectively promoted, and the atmosphere of Intelligent Manufacturing in the whole society has gradually formed. In 2017, the market scale of China's intelligent manufacturing system solutions reached 128 billion yuan, with a year-on-year growth of 20.8%; in 2018, the market scale was about 156 billion yuan, with a year-on-year growth of 21.9%.



Market scale, growth rate and forecast of China's intelligent manufacturing system solutions market from 2015 to 2020 (unit: 100 million yuan, %)

### 3.6.2 the application proportion of intelligent manufacturing system solutions in digital construction related links continues to increase

Benefiting from the continuous promotion of user digital construction, intelligent manufacturing system solutions for R & D, logistics, service and other links are also strengthened, and the application proportion of intelligent manufacturing system solutions in related links has increased. The top five intelligent manufacturing system solutions are: flexible assembly system, digital processing system, intelligent transportation system, intelligent storage system and enterprise resource planning (ERP), accounting for 18%, 13%, 10%, 9% and 8% respectively.



**China intelligent manufacturing system solutions market segment (unit:%)**

Source: China intelligent manufacturing system solution supplier Alliance

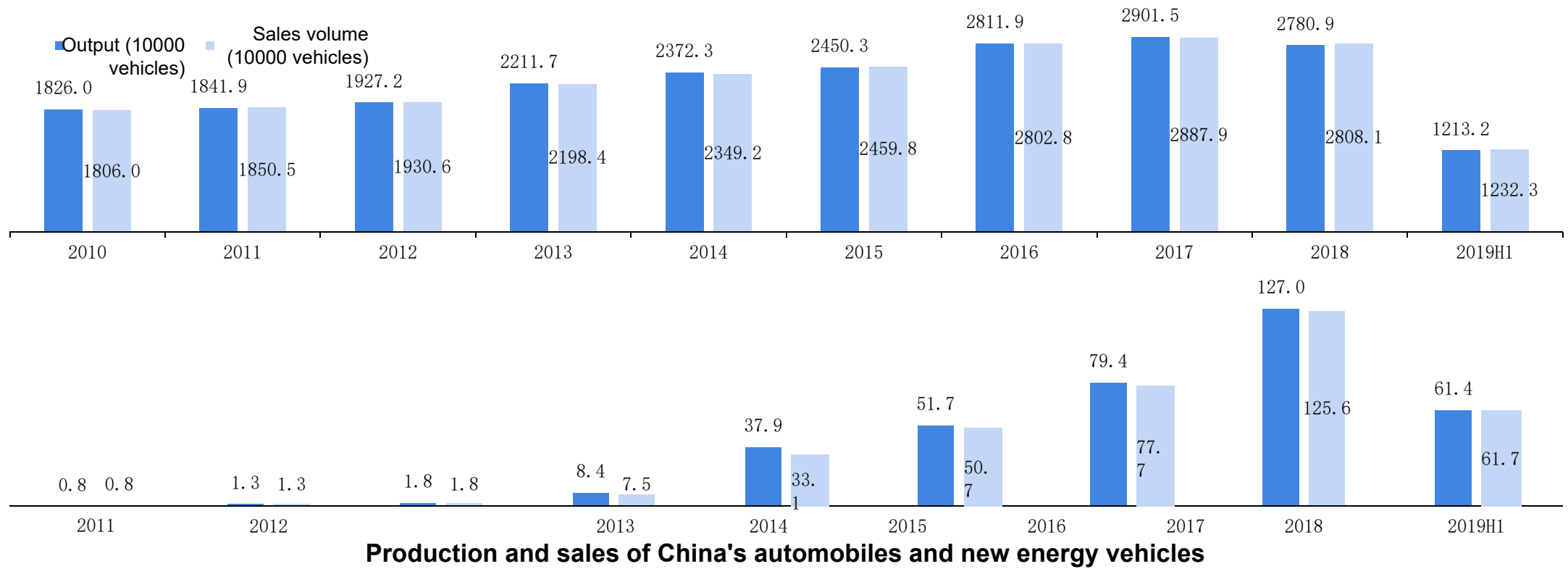
# 04

## Analysis of typical implementation of Intelligent Manufacturing in China

- Intelligent manufacturing of automobile manufacturing industry
- Intelligent manufacturing in textile industry

# 4.1.1 automobile has gone through the period of rapid growth and entered the stage of technological innovation

Since 1953, China's automobile manufacturing industry has experienced a very high growth stage. Before 2010, the growth rate of the automobile industry reached 24%, and from 2010 to 2018, it was in the process of growth decline, with an average annual growth rate of only 5.7%. Since 2018, China's automobile industry has seen its first decline in 28 years. At the same time, new energy vehicles are developing rapidly, with annual sales of 1.27 million and 1.256 million in 2018. On the whole, the development of automobile has entered the substantial stage of intelligent vehicle technology innovation.



# 4.1.2 SAIC Volkswagen MEB new energy automobile factory -- building intelligent and green factory

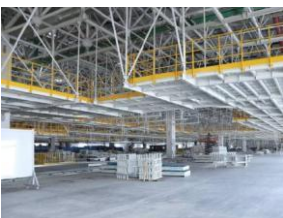
On August 23, 2019, only 10 months after the foundation laying of SAIC Volkswagen MEB new energy automobile factory, the main construction of the plant has been basically completed. The new MEB factory of SAIC Volkswagen is benchmarking industry 4.0. It adopts the latest production and automation technology and 27 environmental protection and energy-saving technologies. It is a modern green benchmarking factory integrating intelligent manufacturing, energy conservation and environmental protection.



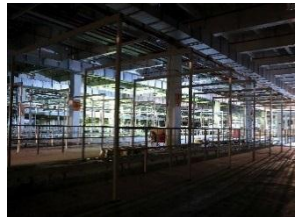
**The automation rate of Battery Workshop reached 88%**  
 There are 90 robots in the workshop, and there are only 20 workers. Its annual production capacity is 300000, which can be used every minute  
 The automation rate reaches 88%.



**High performance battery module**  
 MEB platform is fully known as "electric vehicle modular platform", with a maximum range of more than 550 km, and the fastest acceleration of 100 km within 6 seconds; it can fill 80% of the power in 15-30 minutes.



**More than 800 robots**  
 In the production area of more than 70000 square meters, there are more than 800 robots and only 103 direct workers. The feeding is automatically pushed by the material box instead of most manual feeding.



**Paint workshop capacity doubled**  
 As the world's first high-capacity paint shop, the production capacity of monomer paint workshop increased from 60jph to 120jph, meeting the annual production capacity of 300000 vehicles in MEB plant.



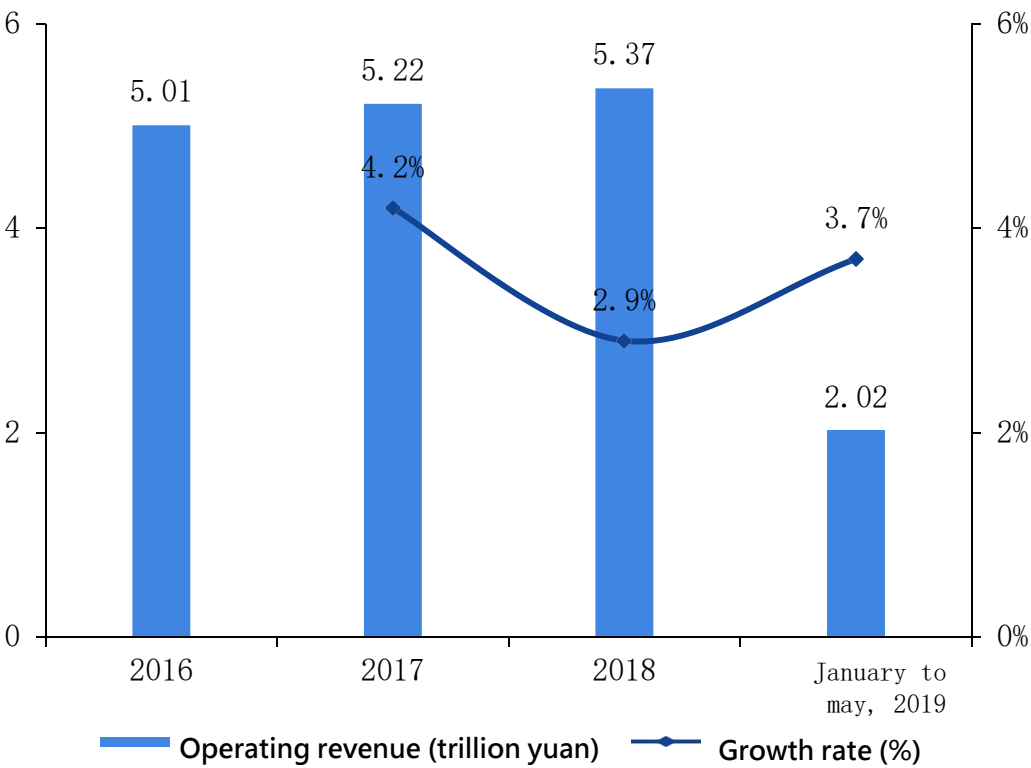
**Efficient use of land by factories**  
 MEB plant covers only 40% of the original standard factory of SAIC Volkswagen, but its construction area is larger. Through the design of two-story workshop, the corridor connects the factory across the municipal road.



**Auto Body Shop automation rate reaches 83%**  
 The biggest difference between the body shop and the existing factory body shop is that all processes are automatic, and the welding gun is changed from pneumatic welding gun to electric servo welding gun, which is more efficient, and the automation rate reaches 83%.

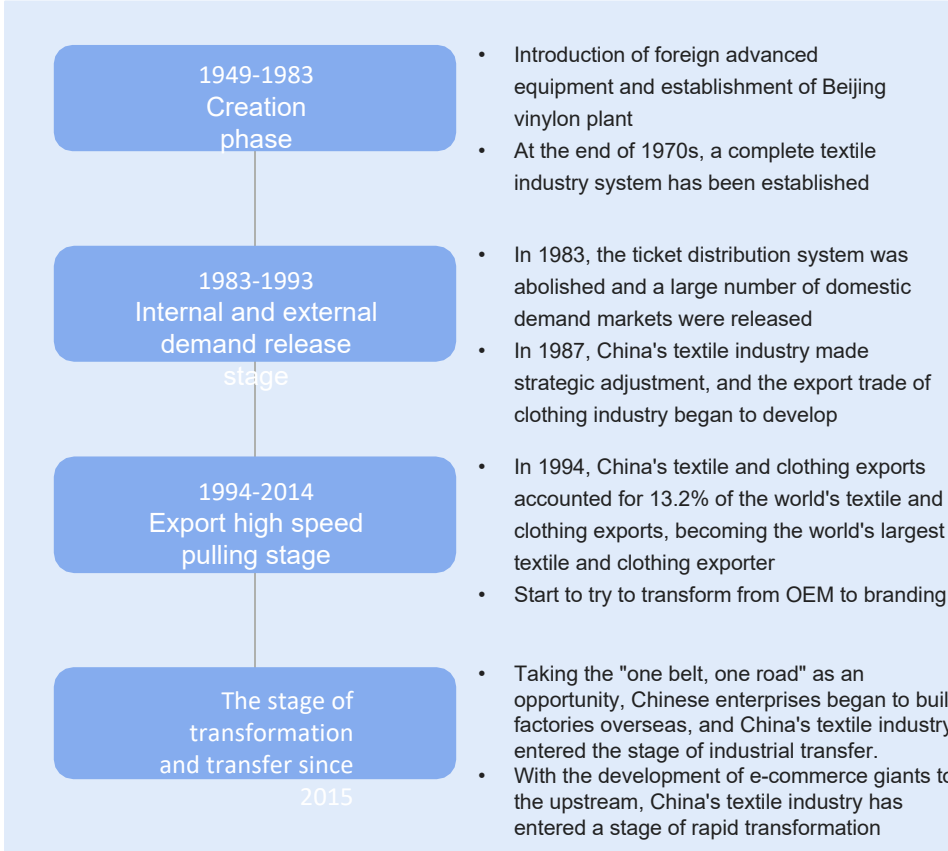
# 4.2.1 China's textile industry has entered a stage of rapid transformation due to its huge volume

Since 1949, China's textile industry has gone through four stages of development. At the end of 1970s, China has established a complete industrial system, and now China has become a world clothing factory. In 2018, China's textile industry enterprises above Designated Size had accumulated operating income of 5.37 trillion yuan, a year-on-year increase of 2.9%, with a huge volume. As a traditional industry in China, textile industry can become an advanced manufacturing industry if it can get rid of the disadvantages of "high pollution and high emission" through technological upgrading and technological innovation.



Business income and growth rate of Enterprises above Designated Size in China's textile industry from 2016 to 2019 (unit: trillion yuan,%)

Source: National Development and Reform Commission prospective industry research institute



The development of China's textile industry



## 4.2.2 industrial process automation of China's textile industry

As an important carrier of textile technology, digital and intelligent textile factory will be an important development direction of textile industry in the future. From the perspective of textile machinery, intelligent textile machinery is based on the original mechanical and electrical integration equipment, through digital and computer technology, integrating sensor technology, information science, artificial intelligence and other new ideas and methods to simulate human intelligence. In China, digital technology has been widely used in cotton spinning machinery, such as the digital workshop jointly built by Jingwei Textile machinery, Jiangsu Dasheng, Ningxia Ruyi and YUDAHUA enterprises in the future.

Intelligent unit equipment

Workshop data acquisition and monitoring system

Intelligent logistics and handling system

Intelligent data processing and analysis system

Blowing carding unit



Winder



Automatic dyeing equipment



Automatic cutting machine



Automatic packing system



Automatic mechanical equipment

Intelligent flexible logistics warehousing system



Automatic equipment management system

Network monitoring and management system for cotton spinning equipment



# 05

## Analysis on the development path of Intelligent Manufacturing in China

- Development path of intelligent manufacturing
- Key areas of intelligent manufacturing

# 5.1.1 development path of factory Intelligent Manufacturing: process automation → production line automation → intelligent factory

past times



Workers transport stamping parts



Welding by workers



Workers painting



General assembly of workers

Now?



Stamping automation production line



Welding automation production line



Painting automation production line



Assembly automation production line

future



Intelligent factory

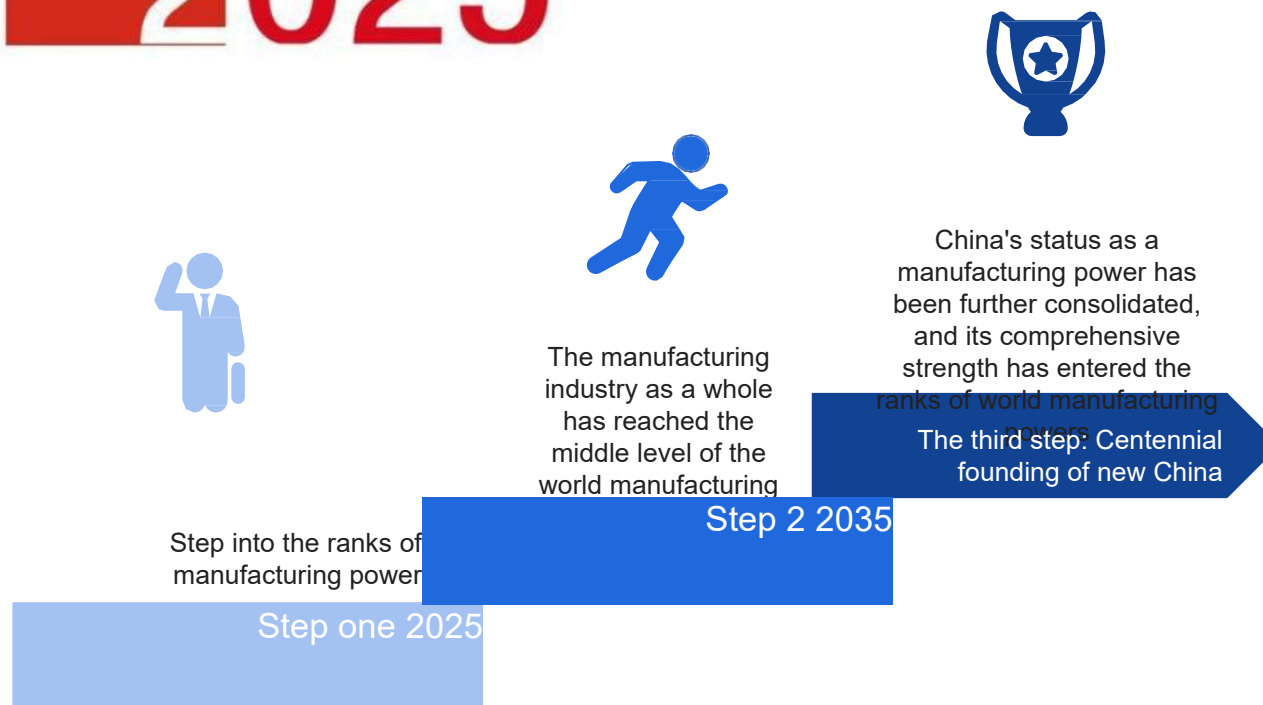
## 5.1.2 China's intelligent manufacturing is divided into three steps



"Made in China 2025" proposes to realize the strategic goal of manufacturing power through "three steps": the first step is to step into by 2025 In the second step, by 2035, China's manufacturing industry as a whole will reach the middle level of the world's manufacturing power camp; the third step, when the people's Republic of China is 100 years old, China's status as a manufacturing power will be more consolidated, and its comprehensive strength will enter the forefront of the world's manufacturing powers.

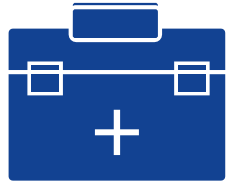


通过“三步走”实现制造强国战略  
Realize the strategy of strengthening the country through "three steps"





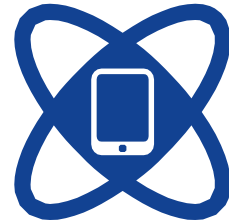
## 5.2 top 10 key areas of Intelligent Manufacturing in China



**Biomedicine and high performance medical devices**



**High grade CNC machine tools and robots**



**Electrical equipment**



**Advanced rail transit equipment**



**New materials**



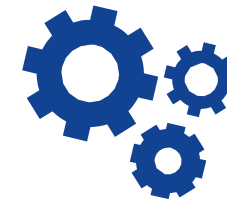
**Marine engineering equipment and technology ship**



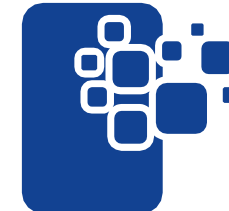
**Aerospace equipment**



**Energy saving and new energy vehicles**



**Agricultural machinery equipment**



**New generation information technology industry**

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