Translation

*The following document is "*Made in China 2025*," one of China's most important industrial policies.* Made in China 2025*, formulated in 2015, sets milestones for China to reach by 2020 and 2025 in service of its goal of upgrading the PRC manufacturing sector. The* Made in China 2025 *strategy aims both to increase the competitiveness and global market share of the Chinese manufacturing industry and to reduce China's dependence on foreign manufactured goods.*

Title
Notice of the State Council on the Publication of "Made in China 2025"
国务院关于印发《中国制造2025》的通知

Author
PRC State Council (国务院). The State Council is the executive branch of the PRC central government.

Source
Website of the Central People's Government of the People's Republic of China. The notice is dated May 8, 2015 and was uploaded to the website on May 19, 2015.

The Chinese source text is available online at:
http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm
An archived version of the Chinese source text is available online at: https://perma.cc/9PA3-WYBA
U.S. $1 ≈ 6.3 Chinese Yuan Renminbi (RMB), as of March 8, 2022.

Translation Date	**Translator**	**Editor**
March 8, 2022	Etcetera Language Group, Inc.	Ben Murphy, CSET Translation Manager

Notice of the State Council on the Publication of *Made in China 2025*

(2015) No. 28

To the people's governments of all provinces, autonomous regions, and municipalities, and all ministries and commissions of the State Council and their respective agencies: *Made in China 2025* is hereby printed and distributed. Please implement it meticulously.

State Council
May 8, 2015

(This document has been abridged)

Made in China 2025

Manufacturing is the mainstay of the national economy, the basis on which the nation is established (立国之本), an instrument of rejuvenation, and the foundation of a

world power.[1] Since the beginning of industrial civilization in the middle of the 18th century, the history of the rise and fall of world powers and the history of the struggle of the Chinese nation has repeatedly proved that without a strong manufacturing industry, there will be no country and no nation. Building an internationally competitive manufacturing industry is the only way China can enhance its comprehensive national strength, ensure national security, and build itself into a world power.

Since the founding of New China [in 1949], especially since the beginning of reform and opening up [in 1978], China's manufacturing industry has continued to develop rapidly. A complete, independent, and whole industrial system has been built, which has firmly promoted the process of industrialization and modernization, significantly enhanced comprehensive national strength, and supported China's status as a great power (大国) in the world. However, China's manufacturing industry is still large but not strong compared with globally advanced levels, with significant gaps in independent innovation (自主创新) capabilities, resource utilization efficiency, industrial structure level, degree of informatization, and quality and efficiency. The tasks of transformation, upgrading, and development by leaps and bounds (跨越发展) are urgent and daunting.

At present, the new round of S&T revolution and industrial transformation has formed a historical intersection with the accelerated transformation of China's economic development model, reshaping the international industrial division of labor. We must firmly seize this great historical opportunity. Per the "four comprehensivelys"[2] strategic layout, we must implement the manufacturing powerhouse (制造强国) strategy, and strengthen overall planning and forward-looking deployment. After three decades of hard work and by the 100th anniversary [2049] of the founding of New China, build China into a manufacturing powerhouse that leads the development of the global manufacturing industry. Lay a solid foundation for realizing the Chinese Dream (中国梦) of the great rejuvenation of the Chinese nation.

Made in China 2025 is a program of action for the first ten years of China's implementation of the manufacturing powerhouse strategy.

1. Development situation and environment

(1) The structure of global manufacturing faces major adjustments:

[1] Translator's note: This translation renders the Chinese word 强国 qiángguó—which literally means "strong nation"—in English in two different ways, depending on context. Where the translator judges that qiángguó is used in the general geopolitical sense, it is translated as "world power." Where the translator judges that the text refers to a specific flavor of qiángguó, it is translated as "powerhouse," as in the phrase "manufacturing powerhouse" (制造强国). For a more thorough discussion in English of the Chinese word qiángguó, see: https://www.newamerica.org/cybersecurity-initiative/digichina/blog/lexicon-wangluo-qiangguo/.

[2] Translator's note: The "four comprehensivelys" (“四个全面”) are: comprehensively establish a well-off society (小康社会), comprehensively deepen reform, comprehensively govern the country according to law, and comprehensively govern the party strictly.

The deep integration of new generation information technology and manufacturing trigger far-reaching industrial changes, forming new production methods, industrial forms, business models, and economic growth points. All countries are intensifying S&T innovation and promoting breakthroughs in 3D printing, mobile internet, cloud computing, big data, bioengineering, new energy, and new materials. Smart manufacturing based on cyber-physical systems, such as intelligent equipment and smart factories, is leading the transformation of manufacturing methods; network crowdsourcing, collaborative design, mass customization, precise supply chain management, total life cycle management, and e-commerce are reshaping the industrial value chain system; smart terminal products such as wearable smart products, smart home appliances, and intelligent vehicles continue to expand into new fields of manufacturing. The transformation, upgrading, innovation, and development of China's manufacturing industry are ushering in a major opportunity.

The pattern of global industrial competition is undergoing major adjustments, and China faces enormous challenges in this new round of development. After the international financial crisis, developed countries have implemented the strategy of “re-industrialization” one after another, reshaping unique competitive advantages in the manufacturing industry and accelerating a new round of global trade and investment. Some developing countries are also speeding up their planning and deployment, actively participating in the re-division of global industries, undertaking industrial and capital transfers, and expanding the international market space. China's manufacturing industry faces the severe challenge of a "two-way squeeze" from developed countries and other developing countries. It must look to the world, step up strategic deployment, focus on building a manufacturing powerhouse, shore up its roots, and turn challenges into opportunities to seize the commanding heights of a new round of competition in the manufacturing industry.

(2) China's economic development environment has undergone significant changes:

With the simultaneous advancement of new industrialization, informatization (信息化), urbanization, and agricultural modernization, the potential for ultra-large domestic demand has been continuously released, providing a broad space for developing China's manufacturing industry. The new equipment needs of various industries, the unique consumption needs of the people, the new livelihood needs of social management and public services, and the new security needs of national defense building all require the manufacturing industry to rapidly improve its level and capability in major technological equipment innovation, consumer product quality and safety, supply of public service facilities and equipment, and defense equipment support. Comprehensively deepening reform and further opening up will continuously stimulate the vitality and creativity of the manufacturing industry and promote the transformation and upgrading of the manufacturing industry.

China's economic development has entered a new normal, and the development of the manufacturing industry is facing new challenges. Constraints on resources and the environment continue to grow, the cost of factors of production (生产要素) such as

labor continues to rise, and the growth rate of investment and exports has slowed significantly. To form a new driving force for economic growth and create unique advantages in international competition, the focus is on the manufacturing industry, the difficulty lies in the manufacturing industry, and the way out is also through the manufacturing industry.

(3) The task of building a manufacturing powerhouse is arduous and urgent:

After decades of rapid development, the scale of China's manufacturing industry ranks first in the world, and a complete, independent, and whole manufacturing system has been established, which has become an important cornerstone to support China's economic and social development and an essential force for promoting global economic growth. Continuous technological innovation has dramatically improved the comprehensive competitiveness of China's manufacturing industry. Breakthroughs have been made in manned spaceflight, manned deep diving, large aircraft, Beidou satellite navigation, supercomputers, high-speed rail equipment, million kilowatt-class power generation equipment, 10,000-meter deep-sea oil drilling equipment, and other major technological equipment, forming several well-positioned industries and key enterprises with international competitiveness, giving China the foundation and conditions for building itself into an industrial powerhouse (工业强国).

However, China is still in the process of industrialization, and there is still a major gap compared with advanced countries. The manufacturing industry is large but not strong. The capacity for independent innovation is weak, and key and core technologies (关键核心技术) and high-end equipment are highly dependent on foreign countries. The manufacturing innovation system with enterprises as the mainstay is not perfect. Product quality is not high, and there is a lack of world-renowned brands. The efficiency of resource and energy utilization is low, and the problem of environmental pollution is more pronounced. The industrial structure is unreasonable, and the development of high-end equipment manufacturing and producer services lags behind other countries. The level of informatization is not high, and the depth of integration with industrialization is insufficient. The degree of industrial internationalization is not high, and the globalization of enterprises is inadequate. To promote the construction of a manufacturing powerhouse, we must focus on solving the above problems.

To build a manufacturing powerhouse, we must firmly seize this rare strategic opportunity, actively respond to challenges, strengthen overall planning, highlight innovation drivers, formulate special policies, give full play to institutional advantages, mobilize the whole of society to work hard, rely more on Chinese equipment and depend on Chinese brands, realize the transformation from Made in China (中国制造) to Created in China (中国创造), the transformation of Chinese speed to Chinese quality, the transformation of Chinese products to Chinese brands, and complete the strategic task of growing Chinese manufacturing from big to strong.

2. Strategic directive and objectives

(1) Guiding ideology:

Fully implement the spirit of the 18th Party Congress and the Second, Third, and Fourth Plenums of the 18th Central Committee and adhere to the path of new-style industrialization with Chinese characteristics. With the theme of promoting the innovation and development of the manufacturing industry, be centered on improving quality and efficiency. Take the deep integration of new generation information technology and manufacturing as the main thread, and take promoting smart manufacturing as the main thrust. To meet the needs of economic and social development and national defense construction for major technical equipment, strengthen basic industrial capabilities, and improve the level of comprehensive integration. Improve the multi-level and multi-type talent training system and promote industrial transformation and upgrading. Cultivate a manufacturing culture with Chinese characteristics and realize the historical leap of manufacturing from big to strong. The basic approach is:

– Be innovation-driven: Adhere to placing innovation at the core of the overall development of the manufacturing industry, improve the institutional environment conducive to innovation, promote cross-field and cross-industry collaborative innovation, make breakthroughs in a number of key general purpose technologies in critical areas, promote a digitalized, networkized (网络化), and intelligentized (智能化) manufacturing industry, and follow the path of innovation-driven development.

– Quality comes first: Adhere to quality as the lifeline of building a manufacturing powerhouse, strengthen responsibility for enterprise quality, strengthen quality technology research, and incubate independent brands. Build a system of legislation and standards, a quality supervision system, and an advanced quality culture, create a market environment for honest operations, and take a development path of winning through quality.

– Green development: Adhere to sustainable development as an important focus of building a manufacturing powerhouse, strengthen the promotion and application of energy-saving and environmental protection technologies, processes, and equipment, and fully implement clean production. Develop a circular economy, improve resource recycling efficiency, build a green manufacturing system, and take the development path of ecological civilization.

– Structural optimization: Adhere to structural adjustment as a key link in building a manufacturing powerhouse, vigorously develop advanced manufacturing, transform and upgrade traditional industries, and promote the transformation of production-oriented manufacturing to service-oriented manufacturing. Optimize the industrial layout, incubate a group of industrial clusters and enterprise groups with core competitiveness, and take the development path of improving quality and efficiency.

– Be talent-centered: Adhere to treating talent as the foundation of building a manufacturing powerhouse, establish and improve a scientific and reasonable mechanism for selecting, employing, and educating people, and speed up the training of professional and technical personnel, management personnel, and skilled personnel

who are urgently needed for the development of the manufacturing industry. Create an atmosphere of mass entrepreneurship and innovation, build a manufacturing talent team with high quality and a reasonable structure, and take the talent-led development path.

(2) Basic principles:

Let the market lead with government guidance. Comprehensively deepen reform, give full play to the decisive role of the market in resource allocation, strengthen the mainstay status of enterprises, and stimulate enterprise vitality and creativity. Actively transform government functions, strengthen strategic research and planning guidance, improve relevant support policies, and create a sound environment for enterprise development.

Be grounded in the present, but look to the long term. Aiming at the bottlenecks and weak links that restrict the development of the manufacturing industry, accelerate transformation and upgrading, improve quality and efficiency, and effectively improve the core competitiveness and sustainable development capabilities of the manufacturing industry. Accurately grasp the trends of the new round of S&T revolution and industrial transformation, strengthen strategic planning and forward-looking deployment, lay a solid foundation, and occupy the commanding heights in future competition.

Overall progress and key breakthroughs. Persist in combining developing the entire nation's manufacturing industry as one game of chess (全国一盘棋) and providing categorized guidance (分类指导). Implement overall planning and rational layouts. Clarify the direction of innovation and development, promote the in-depth development of military-civil fusion (军民融合), and accelerate the improvement of the general level of the manufacturing industry. Focusing on the major needs of economic and social development and national security, integrate resources, highlight key points, and implement several major projects to achieve breakthroughs.

Independent development (自主发展) and open cooperation. In the basic, strategic, and overall fields related to the national economy and the people's livelihoods and industrial security, focus on mastering key and core technologies, improving the production chain, and forming independent development capabilities. Continue to expand opening up, actively utilize global resources and markets, strengthen the global industrial layout and international exchanges and cooperation, develop new comparative advantages, and improve the level of open development in the manufacturing industry.

(3) Strategic goals:

Based on national conditions and reality, strive to achieve the strategic goal of becoming a manufacturing powerhouse through the "three steps to take" (“三步走”).

Step 1: Strive to enter the ranks of the manufacturing powerhouses over the course of the next 10 years.

By 2020, basically achieve industrialization, further consolidate our status as a manufacturing industry power (制造业大国), and significantly improve the level of manufacturing informatization. Master several key and core technologies in important areas, further enhance competitiveness in areas China already has an advantage in, and greatly improve product quality. Make significant progress in the digitalization, networkization, and intelligentization of the manufacturing industry. Significantly reduce energy consumption, material consumption, and pollutant discharge per unit of industrial added value in key industries.

By 2025, greatly improve the overall quality of the manufacturing industry, significantly enhance innovation capabilities, significantly improve the labor productivity of all employees, and bring the integration of industrialization and informatization to a new level. Reach a globally advanced level in energy consumption, material consumption, and pollutant discharge per unit of industrial added value. Form a group of multinational companies and industrial clusters with strong international competitiveness and significantly improve their status in the global industrial division of labor and global value chain.

Step 2: By 2035, China's manufacturing industry as a whole must join the middle ranks of the world's manufacturing powerhouses. Our capacity for innovation must be greatly improved, major breakthroughs must be made in the development of key areas, and our overall competitiveness must be significantly enhanced. Our well-positioned industries (优势行业) will be led by innovation at a world-class level, and China will fully achieve industrialization.

Step 3: By the 100th anniversary of the founding of New China, the country's status as a manufacturing industry power must be consolidated, and its comprehensive strength must enter the forefront of the world's manufacturing powerhouses. The main areas of the manufacturing industry must be innovation-led with obvious competitive advantages, and we will build a world-leading technology system and industrial system.

Key Manufacturing Indicators for 2020 and 2025

Category	Indicator	2013	2015	2020	2025
Innovation abilities	Proportion of internal expenditure on R&D expenditure of manufacturing industry above a certain size in main business income (%)	0.88	0.95	1.26	1.68
	Number of effective invention patents per 100 million Chinese yuan Renminbi (RMB) of main business income of manufacturing industries above a certain size[3] (patents)	0.36	0.44	0.70	1.10

[3] The number of effective invention patents per 100 million yuan of main business income of manufacturing enterprises above a certain size = the number of effective invention patents of manufacturing enterprises above a certain size / the main business income of manufacturing enterprises above a certain size.

Quality and efficiency	Manufacturing quality competitiveness index[4]	83.1	83.5	84.5	85.5
	Manufacturing value added rate increase	-	-	This is an increase of two percentage points from 2015.	This is an increase of four percentage points from 2015.
	Growth rate of total labor productivity in manufacturing industry (%)	-	-	Around 7.5 (the average annual growth rate during the 13th Five-Year Plan period [2016-2020])	Around 6.5 (the average annual growth rate during the 14th Five-Year Plan period [2021-2025])
Integration of information technology and industrialization	Broadband penetration[5] (%)	37	50	70	82
	Penetration rate of digital R&D design tools[6] (%)	52	58	72	84
	Computer numerical control ratio of key processes[7] (%)	27	33	50	64
Green development	Decrease in energy consumption per unit of industrial added value above a certain size	-	-	Down 18% from 2015	Down 34% from 2015
	Decrease in CO2 emissions per unit of industrial added value	-	-	Down 22% from 2015	Down 40% from 2015
	Decrease in water consumption per unit of industrial added value	-	-	Down 23% from 2015	Down 41% from 2015
	Comprehensive utilization rate of industrial solid waste (%)	62	65	73	79

3. Strategic tasks and priorities

To achieve the strategic goal of becoming a manufacturing powerhouse, we must persist in being problem-oriented, make overall plans, and focus on key points. We must build a consensus throughout the whole of society, accelerate the transformation and upgrading of the manufacturing industry, and comprehensively improve the quality of development and our core competitiveness.

(1) Improve national manufacturing innovation capabilities:

Improve the system of manufacturing industry innovation that combines taking enterprises as the mainstay, being oriented toward the market, and involving government, industry, academia, research institutes, and users (政产学研用). Deploy the innovation chain around the industrial chain. Allocate the resource chain around the

[4] The manufacturing quality competitiveness index is a comprehensive economic and technological index that reflects the overall quality of China's manufacturing industry. It is calculated from a total of 12 specific indicators in terms of quality and development capabilities.
[5] The broadband penetration rate is represented by the fixed broadband household penetration rate, and the fixed broadband household penetration rate = the number of fixed broadband household users / the number of households.
[6] The penetration rate of digital R&D and design tools = the number of enterprises above a certain size that use digital R&D and design tools / the total number of enterprises above a certain size (relevant data comes from 30,000 sample enterprises; the same below).
[7] The computer numerical control (CNC) ratio of key processes is the average of the CNC ratio of key processes of industrial enterprises above a certain size.

innovation chain. Strengthen key and core technology research, accelerate the industrialization of S&T achievements, and improve innovation capabilities in key links and key areas.

Strengthen research and development of key and core technologies. Strengthen the mainstay status of enterprises in technological innovation, support enterprises that improve their innovation capabilities, promote the construction of national technological innovation demonstration enterprises and enterprise technology centers, and fully absorb enterprises to participate in the decision-making and implementation of national S&T plans. Aiming at the country's major strategic needs and the commanding heights of future industrial development, routinely research, formulate, and release roadmaps for technological innovation in key areas of manufacturing. Continue to implement major national S&T projects without delay and support key and core technology R&D through national S&T plans (special projects, funds, etc.). Give full play to the leading role of industrial backbone enterprises (行业骨干企业) and the basic role of institutions of higher education and scientific research institutes. Establish a group of industrial innovation alliances and carry out collaborative innovation by government, industry, academia, research institutes, and users. Achieve breakthroughs in a number of key general purpose technologies that have an overall impact and strong driving force on the overall improvement of industrial competitiveness, and accelerate the conversion of S&T achievements into practical applications (成果转化).

Improve innovative design capabilities. Carry out innovative design demonstrations in key fields such as traditional manufacturing, strategic emerging industries, and modern service industries, and comprehensively promote the application of advanced design technologies characterized by eco-friendliness, intelligence, and collaboration. Strengthen the research and development of general purpose core technologies in the design field, achieve breakthroughs in general purpose technologies such as informatized design, process integration design, and complex process and system design, develop a batch of key design tools and software with independent intellectual property rights (IPR), and build and improve the innovative design ecosystem. Build a number of innovative design clusters with global influence, incubate a group of professional and open industrial design enterprises, encourage original equipment manufacturer (OEM) enterprises to establish research and design centers, and shift to designing products for others and exporting independent brand products. Develop various types of innovative design education formats, establish national industrial design awards, and stimulate the enthusiasm and initiative of the whole of society for innovative design.

Promote S&T achievement industrialization. Improve the operating mechanism for the conversion of S&T achievements into practical applications, study and formulate guidelines for promoting the conversion and industrialization of S&T achievements, establish and improve the information release and sharing platform for S&T achievements, and improve the technology transfer and industrialization service system centered around technology trading markets. Improve the incentive mechanisms for the conversion of S&T achievements into practical applications,

promote the reform of the use, disposal, and income management of S&T achievements in public institutions,[8] and improve the scientific evaluation and market pricing mechanisms for S&T achievements. Improve the collaborative promotion mechanism for the conversion of S&T achievements into practical applications, guide government, industry, academia, research institutes, and users to strengthen collaboration in accordance with the laws of the market and the laws of innovation, and encourage enterprises and social capital[9] to establish a number of pilot bases for technology integration, maturation, and engineering. Accelerate the conversion and industrialization of national defense S&T achievements and promote the two-way transfer and conversion of military and civilian technologies.

Improve the national innovation system for the manufacturing industry. Strengthen top-level design, accelerate the establishment of a manufacturing innovation network around innovation centers, supported by public service platforms and engineering data centers, and establish a market-oriented innovation direction selection mechanism and a risk-sharing and benefit-sharing mechanism that encourages innovation. Make full use of existing S&T resources, focus on the major common needs of the manufacturing industry, adopt new mechanisms and new models such as government-society cooperation and strategic industry innovation alliances across government, industry, academia, research institutes, and users to form a number of manufacturing industry innovation centers (industrial technology research bases), and carry out key general purpose major technology research and industrial application demonstrations. Build a number of public service platforms that promote collaborative innovation in the manufacturing industry, standardize service standards, and carry out specialized services such as technology R&D, inspection and testing, technology evaluation, technology trading, quality certification, and talent training, and promote the conversion, promotion, and application of S&T achievements. Build manufacturing engineering data centers in key domains to provide enterprises with open sharing services for innovative knowledge and engineering data. Facing the key general purpose technologies of the manufacturing industry, build a number of major scientific research and experimental facilities, improve the system integration capabilities of core enterprises, and promote extension to the high end of the value chain.

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[8] Translator's note: "Public institutions" (事业单位) are organizations created and led by PRC government departments that provide social services. Unlike state-owned enterprises (SOEs), public institutions do not create material products and do not generate income. Public institutions are not considered government agencies, and their employees are not civil servants. Most public institutions are fully or partially government-funded, but some fully privately funded (but still government-led) public institutions exist. Public institutions typically provide services in areas such as education, science and technology, culture, health, and sanitation.

[9] Translator's note: The Chinese term 社会资本, translated literally as "social capital," and its synonyms "social funding" (社会资金), "social investment" (社会投资), and "social financing" (社会融资), refer to any source of funding outside of government budget outlays. These terms encompass investment by private individuals and private institutions. However, investment from state-funded entities such as state-owned enterprises (SOEs), including state-run banks, also falls under the umbrella of "social capital."

Box 1 Manufacturing Industry Innovation Center (Industrial Technology Research Base) Construction Project
Focusing on the transformation and upgrading of key industries and the major common needs of innovation and development in new generation information technology (IT), smart manufacturing, additive manufacturing, new materials, biomedicine, and other fields, a group of manufacturing industry innovation centers (industrial technology research bases) will be formed, focusing on the development of industry foundations and general purpose key technology R&D, industrialization of achievements, personnel training, and other such work. Formulate and improve the standards and procedures for the selection, assessment, and management of manufacturing industry innovation centers. By 2020, focus on forming about 15 manufacturing industry innovation centers (industrial technology research bases) and strive to form about 40 manufacturing industry innovation centers (industrial technology research bases) by 2025.

Strengthen the construction of the standards system. Reform the standards system and standardization management system, organize the implementation of the manufacturing standardization improvement plan, and carry out comprehensive standardization work in key areas such as smart manufacturing. Give play to the important role of enterprises in the formulation of standards, support the establishment of standards promotion alliances in key areas, build standards innovation research bases, and coordinate product development and standards formulation. Formulate group standards to meet the needs of the market and innovation and establish a self-declaration disclosure and supervision system for enterprise product and service standards. Encourage and support enterprises, scientific research institutes, and industry organizations that participate in the formulation of international standards and accelerate the process of the internationalization of China's standards. Fully promote the adoption of advanced civilian standards for national defense equipment and promote the transformation and application of military technical standards to civilian fields. Excel in the publication and implementation of standards and fully promote the implementation of standards.

Strengthen the application of IPR. Strengthen the intellectual property (IP) reserves of key and core technologies in important manufacturing fields and build an industrialization-oriented patent portfolio and strategic layout. Encourage and support enterprises that use IPR to participate in market competition, incubate a group of well-positioned enterprises (优势企业) with comprehensive IPR, support the establishment of IP alliances, and promote the coordinated use of IPR by market players. Steadily promote the decryption and market application of national defense IPR. Establish and improve IP review mechanisms, encourage and support industry backbone enterprises and specialized institutions that cooperate in patent evaluation, acquisition, operations, and risk early warning and response in key areas. Build a public service platform for the comprehensive use of IPR. Encourage cross-border IP licensing. Research and formulate policies and measures to reduce the cost of IP application, protection, and for rights protection for small and medium-size enterprises.

(2) Promote the deep integration of informatization and industrialization:

Accelerate the promotion of the integrated development of new generation IT and manufacturing technology, taking smart manufacturing as the main line of attack in the deep integration of IT and industrialization; concentrate on developing intelligent equipment and intelligent product manufacturing, promote intelligentized production processes, incubate new production methods, and comprehensively improve the level of intelligentization in R&D, production, management, and services.

Research and formulate a development strategy for smart manufacturing. Formulate a development plan for smart manufacturing and clarify development goals, key tasks, and major layouts. Accelerate the formulation of technical standards for smart manufacturing and establish and improve the management standards system for smart manufacturing and the integration of industrialization and informatization. Strengthen the pulling force of applications (应用牵引), establish a smart manufacturing industry alliance, and collaboratively promote smart equipment and product R&D, system integration innovation, and industrialization. Promote the integrated application of the industrial internet, cloud computing, and big data throughout processes and production chains of enterprise R&D, design, production and manufacturing, operation management, sales, and services. Strengthen the cybersecurity assurance capacity building of smart manufacturing industrial control systems and improve comprehensive security systems.

Accelerate the development of smart manufacturing equipment and products. Organize the research and development of high-end CNC machines, industrial robots, additive manufacturing equipment, and other smart manufacturing equipment and smart production lines with deep perception, smart decision-making, and automatic execution functions, and make breakthroughs in new sensors, smart measuring instruments, industrial control systems, servo motors, and intelligent core devices such as drives and reducers to promote engineering and industrialization. Accelerate the intelligentized upgrading of production equipment in industries such as machinery, aviation, ships, automobiles, light industry, textiles, food, and electronics and improve precision manufacturing and agile manufacturing capabilities. Coordinate the layout and promote the R&D and industrialization of products such as smart modes of transportation, smart construction machinery, service robots, smart home appliances, smart lighting appliances, and wearable devices.

Promote manufacturing process intelligentization. Pilot the construction of smart factories and digital workshops in key areas. Accelerate the application of technologies and equipment such as human-machine intelligent interaction, industrial robots, smart logistics management, and additive manufacturing in the production process. Facilitate simulation optimization, digital controls, real-time monitoring of status information, and adaptive controls for manufacturing processes. Accelerate the promotion and application of product life cycle management, customer relationship management, and supply chain management systems, and promote the integration of key links such as group management and control, design and manufacturing, the integration of production, supply, and marketing, and business and financial connections to achieve smart management and control. Accelerate the construction of smart inspection and

supervision systems for key industries such as civilian explosives, hazardous chemicals, food, printing and dyeing, rare earths, and pesticides and improve the level of intelligentization.

Deepen the integrated application of the internet in the manufacturing field. Formulate a roadmap for the integrated development of the internet and manufacturing, and clarify the development direction, goals, and paths. Develop internet-based personalized customization, crowdsourcing design, cloud manufacturing, and other new manufacturing models and promote the formation of R&D, manufacturing, and industrial organization methods based on dynamic perception of consumer demand. Establish an open industrial ecosystem with complementary advantages and win-win cooperation. Accelerate the development and application demonstration of Internet of Things (IoT) technology and cultivate new industrial internet applications such as smart monitoring, remote diagnosis management, and whole-production-chain traceability. Implement pilot projects for innovative applications of the industrial cloud and industrial big data, build a number of high-quality industrial cloud services and industrial big data platforms, and promote the open sharing of software and services, design and manufacturing resources, and key technologies and standards.

Strengthen internet infrastructure construction. Strengthen the planning and layout of industrial internet infrastructure construction and build an industrial internet with low latency, high reliability, and wide coverage. Accelerate the deployment and construction of fiber-optic networks, mobile communication networks, and wireless local area networks in manufacturing agglomeration areas, realize the broadband upgrading of information networks, and improve the broadband access capabilities of enterprises. According to the network R&D and application requirements of cyber-physical systems, organize the development of smart control systems, industrial application software, failure diagnosis software and related tools, and sensing and communication system protocols, and realize real-time communication, accurate identification, effective interaction, and intelligent control of people, equipment, and products.

Box 2 Smart Manufacturing Projects

Closely focus on the key links in key manufacturing fields and carry out integrated innovation and engineering applications for the fusion of new generation IT and manufacturing equipment. Support joint research across the government, industry, academia, research institutes, and users, develop smart products and self-controllable smart devices, and realize industrialization. Relying on well-positioned enterprises, focus on the intelligentization of key processes, the replacement of robots in key positions, the smart optimization and control of production processes, and the optimization of supply chains, and build smart factories and digital workshops in key areas. In key regions, industries, and enterprises with good basic conditions and urgent needs, differentially implement pilot demonstrations and application promotions for process manufacturing, intermittent manufacturing (离散制造), smart equipment and products, new business formats (新业态) and new models, smart management, and smart services. Establish a smart manufacturing standards system and an information security assurance system and build a smart manufacturing network system platform.

By 2020, significantly improve the level of intelligentization in key manufacturing fields, reduce operating costs for pilot demonstration projects by 30%, shorten the production cycle for products by

30%, and reduce the rate of product defects by 30%. By 2025, achieve full intelligentization for key areas of the manufacturing industry, reduce operating costs for pilot demonstration projects by 50%, shorten the production cycle for products by 50%, and reduce the rate of product defects by 50%.

(3) Strengthen basic industrial capabilities:

Weak industrial basic capabilities such as for core basic components, advanced basic techniques (基础工艺), key basic materials, and basic industrial technology (hereinafter collectively referred to as the “four basics”) are the crux of China's manufacturing innovation development and quality improvement. It is necessary to adhere to the principles of being problem-oriented, integrating of production and demand, collaborative innovation, and making key breakthroughs, and to strive to resolve bottlenecks restricting the development of key industries.

Coordinate and promote the development of the “four basics.” Formulate an implementation plan for strengthening the industrial base and clarifying key directions, main objectives, and the implementation path. Formulate the industrial “four basics” development guidance catalog, release the industrial strong basics (强基) development report, and organize the implementation of industrial strong basics projects. Coordinate dual-use military and civilian resources, carry out joint military and civilian dual-use technology research, support the effective use of military and civilian technologies, and promote the integrated development of basic fields. Strengthen the construction of standards and measurement systems in basic fields, accelerate the implementation of benchmarking, and improve the quality, reliability, and life of basic products. Establish a multi-departmental coordination and promotion mechanism for guiding various factors of production to gather in foundational fields.

Strengthen the construction of innovation capabilities in the four basics. Strengthen cutting-edge basic research and focus on solving [problems with] key general purpose technologies that affect the performance and stability of core basic components. Establish a basic technique innovation system, use existing resources to establish key general purpose basic technique research institutions, carry out joint research on key manufacturing techniques such as advanced molding and processing; and support enterprises that carry out technique innovation and incubate technique professionals. Increase the research and development of basic special materials and improve the self-sufficiency assurance capabilities and level of preparation technology for special materials. Establish a national industrial base database and strengthen the collection, management, application, and accumulation of test data and measurement data of enterprises. Increase support for technology R&D in the fields of the “four bases” and guide industrial investment funds and venture capital funds to invest in key projects in the fields of the “four basics.”

Promote the coordinated development of complete-machine (整机) enterprises and “four basics” enterprises. Pay attention to demand-side incentives, combine production and utilization, and collaboratively tackle key problems. Relying on national S&T plans (special projects, funds, etc.) and related projects in key fields such as CNC machines, rail transit equipment, aerospace, and power generation equipment, guide and link the production of and demand for complete-machine enterprises and “four

basics” enterprises, institutions of higher education, and scientific research institutes, establish industry alliances, form new models of collaborative innovation, industry-user integration, and market-driven development of basic industries, improving the level of independent controllability (自主可控) of major equipment. Carry out demonstration applications of industrial strong basics, improve the policies for first sets and first batches (首台（套）、首批次), and support the promotion and application of core basic components, advanced basic techniques, and key basic materials.

Box 3　Industrial Strong Basics Projects

Carry out demonstration applications, establish reward and risk compensation mechanisms, and support the first-batch or cross-field applications of core basic components, advanced basic techniques, and key basic materials. Organize key breakthroughs, aiming at the urgent need for key technologies and products for major projects and key equipment, support well-positioned enterprises that carry out joint research across government, industry, academia, research institutes, and users, and break through the bottlenecks of engineering and industrialization of key basic materials and core basic components. Strengthen platform support, deploy and set up a number of "four basics" research centers, create a number of public service platforms, and improve the basic technology system for key industries.

By 2020, achieve independent assurance (自主保障) of [the supply of] 40% of core basic components and key basic materials, gradually easing the situation in which such components are controlled by others (受制于人). Popularize and apply advanced manufacturing processes for core basic components and key basic materials urgently needed by industry, such as aerospace equipment, communication equipment, power generation, transmission, and switching equipment, construction machinery, rail transit equipment, and household appliances. By 2025, achieve independent assurance of [the supply of] 70% of core basic components and key basic materials, promote and apply 80 iconic advanced technologies, with some achieving world-leading levels, and build a relatively complete industrial technology basic services system to gradually form an industrial innovation and development pattern of coordinated interaction between the pulling power of complete machines (整机牵引) and foundational support.

(4) Strengthen quality brand building.

Improve quality control technology, improve quality management mechanisms, consolidate the quality development foundation, optimize the quality development environment, and strive to achieve a substantial improvement in the quality of the manufacturing industry. Encourage enterprises to pursue outstanding quality, form brand-name products with independent IPR, and continuously improve the brand value of enterprises and the overall image of Made in China.

Promote advanced quality management techniques and methods. Build a standard conformity certification platform for key products and promote the technology and safety standards of key products to reach internationally advanced levels in an all-round way. Carry out quality benchmarking and leading enterprise demonstration activities, popularize advanced production management modes and methods such as performance excellence, Six Sigma, lean manufacturing, quality diagnosis (质量诊断), and continuous quality improvement (CQI). Support enterprises that improve quality online monitoring, online control, and product life cycle quality traceability capabilities. Organize and carry out technique optimization actions in key industries to improve the control level of key techniques. Carry out the demonstration and promotion of mass quality management activities such as quality management groups (质量管理小组) and

on-site improvements. Strengthen the quality management of small and medium-size enterprises and carry out quality and safety training, diagnostics, and counseling activities.

Accelerate improvements to product quality. Implement an action plan for improving the quality of industrial products, targeting key industries such as automobiles, high-end CNC machines, rail transit equipment, large-scale complete sets of technical equipment, construction machinery, special equipment, key raw materials, basic components, and electronic components. Organize to achieve breakthroughs in a number of key general purpose quality technologies that [resolve problems that] have long plagued product quality improvements. Strengthen the development and application of reliability design, testing, and verification technology and promote the adoption of advanced molding and processing methods, online testing devices, and intelligent production and logistics systems and testing equipment. Ensure that the performance stability, quality reliability, environmental adaptability, service life, and other indicators of key physical products reach the international advanced level of comparable products. Implement quality management, quality self-declaration, and quality traceability systems covering the entire life cycle of products in food, pharmaceuticals, baby products, home appliances, and other fields to ensure the quality and safety of key consumer goods. Resolutely improve the quality and reliability of national defense equipment and enhance the actual combat capabilities of national defense equipment.

Improve quality supervision systems. Improve product quality standards systems, policy planning systems, and quality management laws and regulations. Strengthen the management of industry access and market exit in key areas such as those related to the people's livelihoods and safety. Establish a compulsory reporting system for product accidents at consumer goods production and operation enterprises, improve the quality credit information collection and release system, and strengthen the responsibilities of enterprises for quality. Take quality violation records as an important part of corporate integrity ratings, establish a quality blacklist system, and strengthen the crackdown on and punishments for quality violations and counterfeit brands. Establish regional and industry quality and safety early warning systems to prevent and resolve product quality and safety risks. Strictly implement the "three guarantees" [10] for products, product recalls, and other systems. Strengthen supervision, inspection, and accountability and effectively protect the rights and interests of consumers.

Consolidate the foundation for the development of quality. Formulate and implement manufacturing quality, safety, hygiene, environmental protection, and energy conservation standards that are in line with international advanced levels. Strengthen measurement technology foundations and cutting-edge technology research, establish a batch of high-precision and high-stability measurement basic

[10] Translator's note: The "three guarantees" (“三包”) apply to many categories of consumer retail products in China. They guarantee, within a certain amount of time after buying a defective product, that the consumer can demand either (1) free repair of the product, (2) exchange for a replacement product of comparable value, or (3) return of the product in exchange for a full refund.

standards that are urgently needed for the development of the manufacturing industry, and improve national quantity and traceability indicators related to the manufacturing industry. Strengthen the construction of national industrial metrology and testing centers and build a national metrology S&T innovation system. Improve the inspection and testing technical support system, build a number of high-level industrial product quality control and technical evaluation laboratories and product quality supervision and inspection centers, and encourage the establishment of professional testing technology alliances. Improve the management model for certification and accreditation, improve the effectiveness of compulsory product certification, promote the healthy development of voluntary product certification, improve the level of management system certification, and steadily promote international mutual recognition. Support industry organizations that issue self-discipline norms or conventions and carry out quality and reputation promise activities.

Promote manufacturing industry brand building. Guide enterprises in formulating brand management systems, focus on the whole process of R&D innovation, manufacturing, quality management, and marketing services, improve internal quality, and consolidate the foundation for brand development. Support a group of professional service institutions for brand cultivation and operations and carry out services such as brand management consulting and marketing. Improve the administrative system for registering collective trademarks and certified trademarks. Create a group of regional brands of industrial clusters with distinctive characteristics, strong competitiveness, and good market reputation. Build brand culture, guide enterprises to enhance brand awareness with quality and reputation as the core, establish brand consumption concepts, and enhance brand added value and soft power. Accelerate the process of internationalization of China's brand value evaluations, give full play to the role of various media, increase the promotion of Chinese brands, and establish a good image of the Made in China brand.

(5) Fully implement green manufacturing.

Increase the research and development of advanced energy-saving and environmental protection technologies, techniques, and equipment, and accelerate the green transformation and upgrading of the manufacturing industry. Actively promote low-carbon, recycling, and intensification to improve the efficiency of resource utilization in the manufacturing industry. Strengthen the green management of the product life cycle, and strive to build a high-efficiency, clean, low-carbon, and circular green manufacturing system.

Accelerate the green transformation and upgrading of the manufacturing industry. Comprehensively promote the green transformation of traditional manufacturing industries such as iron and steel, non-ferrous metals, chemicals, building materials, light industry, and printing and dyeing. Fully develop and promote waste heat and waste pressure recovery, water recycling, heavy metal pollution reduction, replacement of toxic and harmful raw materials, waste residue recycling, desulfurization, denitrification, and dust removal as well as other green technology and equipment, and accelerate the application of clean and efficient casting, forging, welding, surface

treatment, cutting, and other processing techniques to achieve green production. Strengthen the research, development, and application of green products and promote lightweight, low-power-consumption, easily recycled, and other technical processes. Continue to improve the energy efficiency of end-use energy products such as motors, boilers, internal combustion engines, and electrical appliances, and accelerate the elimination of outdated mechanical and electrical products and technologies. Actively lead the green development of emerging industries from a high starting point. Greatly reduce energy consumption from the production and use of electronic information products and their restricted substance content. Build green data centers and green base stations. Fully promote the green and low-carbon development of new materials, new energy, high-end equipment, and the biotech industry.

Promote efficient resource recycling and utilization. Support enterprises that strengthen technological innovation and management, enhance green and lean manufacturing capabilities, and significantly reduce energy consumption, material consumption, and water consumption. Continue to increase the utilization ratio of green and low-carbon energy, carry out the construction of distributed green and smart microgrids in industrial parks and enterprises, and control and reduce the consumption of fossil fuels. Fully implement the circular production (循环生产) method and promote symbiosis, mutual supply of raw materials, and resource sharing among enterprises, parks, and industries. Promote the standardized and large-scale development of the resource recycling industry, strengthen support for technical equipment, and improve the comprehensive utilization level of bulk industrial solid waste, scrap metal, and waste electrical and electronic products. Fully develop the remanufacturing industry, implement high-end remanufacturing, smart remanufacturing, and in-service remanufacturing (在役再制造), promote product certification, and promote the sustainable and healthy development of the remanufacturing industry.

Actively build a green manufacturing system. Support enterprises that develop green products, implement ecological designs, significantly improve the energy-saving, environmental protection, and low-carbon levels of products, and guide green production and green consumption. Build green factory buildings that can achieve intensification, produce harmless raw materials, achieve clean production, the recycling of waste, and produce low-carbon energy. Develop green parks, promote industrial linkages in industrial parks, and achieve near-zero emissions. Build a green supply chain, accelerate the establishment of a resource-saving and environmentally friendly procurement, production, marketing, recycling, and logistics system, and implement an extended producer responsibility system. Strengthen green enterprises and support enterprises that implement green strategies, green standards, green management, and green production. Strengthen green supervision, improve energy conservation and environmental protection regulations and standards systems, strengthen energy conservation and environmental protection supervision, implement corporate social responsibility reporting systems, and carry out green evaluation.

Box 4 Green Manufacturing Projects
Organize the implementation of special technical transformations such as energy efficiency improvements, cleaner production, water conservation and pollution control, and recycling for

traditional manufacturing industries. Carry out demonstrations of major energy conservation and environmental protection projects, the comprehensive utilization of resources, remanufacturing, and the industrialization of low-carbon technologies. Implement planning to improve the level of cleaner production in key areas, river basins, and industries and solidly promote the prevention and control of air, water, and soil pollution sources. Formulate a standards system for green products, green factories, green parks, and green enterprises, and conduct green evaluations.

By 2020, build 1,000 green demonstration factories and 100 green demonstration parks, achieve a turning point in the energy and resource consumption of certain heavy chemical industries, and reduce the emission intensity of major pollutants in key industries by 20%. By 2025, achieve a globally advanced level of the green development of the manufacturing industry and the unit consumption (单耗) of main products and fundamentally establish a green manufacturing system.

(6) Energetically promote breakthrough development in key fields

Aim at strategic priorities such as new generation IT, high-end equipment, new materials, and biotech and pharma, guide the gathering of various resources from society, and promote the rapid development of well-positioned and strategic industries.

1. New generation IT industry:

Integrated circuits and special equipment: Focus on improving the level of integrated circuit design, continuously enrich IP cores and design tools, achieve breakthroughs in the core general purpose chips that are related to the development of national information security and cybersecurity and the electronic complete machine industry, and improve the application adaptability of domestic chips. Master high-density packaging and 3D micro-assembly technology and improve our independent development capabilities in the packaging industry and for testing. Form supply capabilities for key manufacturing equipment.

Information communication equipment: Master core technologies such as new computing, high-speed interconnection, advanced storage, and systematic security assurance, achieve comprehensive breakthroughs in 5G technology, core routing and switching technology, ultra-high-speed and large-capacity intelligent optical transmission technology, and "Future Network" core technology and architecture, and actively promote the development of quantum computing and neural networks. Research and develop high-end servers, large-capacity storage, new routing and switching, new smart terminals, new generation base stations, cybersecurity, and other equipment and promote the systematic development and large-scale application of core information communication equipment.

Operating systems and industrial software: Develop core industrial software, such as operating systems for the security field. Achieve breakthroughs in the core technologies of high-end industrial software such as smart design and simulation and associated tools, manufacturing IoT and services, and industrial big data processing, develop independently controllable high-end industrial platform software and application software for key fields, and establish and improve industrial software integration standards and safety evaluation systems. Promote the systematic

development and industrial application of independently developed industrial software.

2. High-end CNC machines and robots:

High-end CNC machines: Develop a batch of precision, high-speed, high-efficiency, flexible CNC machines and basic manufacturing equipment and integrated manufacturing systems. Accelerate the research and development of cutting-edge technologies and equipment such as high-end CNC machines and additive manufacturing. Focus on improving reliability and accuracy retention, develop high-end CNC systems, servo motors, bearings, gratings, and other major functional components and key application software to accelerate industrialization. Strengthen user technique verification capacity building.

Robotics: Focusing on the application needs of industrial robots, special robots such as for automobiles, machinery, electronics, dangerous goods manufacturing, national defense and the military industry, chemical industry, light industry, as well as medicine and health care, family services, education, and entertainment, actively develop new products, promote the standardization and modular development of robots, and expand market applications. Achieve breakthroughs in the technical bottlenecks of key components such as robot bodies, reducers, servo motors, controllers, sensors and drivers, and system integration design and manufacturing.

3. Aviation and aerospace equipment:

Aviation equipment: Accelerate the development of large aircraft, initiate the development of wide-body passenger aircraft in a timely manner, and encourage international cooperation in the development of heavy-duty helicopters. Promote the industrialization of trunk liners and regional aircraft, helicopters, unmanned aerial vehicles (UAVs), and general purpose aircraft. Achieve breakthroughs in the technologies of high thrust-to-weight ratios and advanced turboprop (turboshaft) engines and turbofan engines with large bypass ratios and establish an independent industrial system for engine development. Develop advanced airborne equipment and systems to form an independent and complete aviation product chain.

Aerospace equipment: Develop a new generation of carrier rockets and heavy-duty launch vehicles to improve the ability to enter space. Accelerate the construction of national civilian space infrastructure, develop new satellites and other space platforms and payloads and space-to-ground broadband internet systems, and form long-term, sustainable, and stable satellite remote sensing, communication, navigation, and other space information service capabilities. Promote manned spaceflight and lunar exploration projects, and develop deep space exploration as appropriate. Promote the transformation of space technology and the application of space technology.

4. Offshore engineering equipment and high-tech ships: Resolutely develop deep-sea exploration, resource development and utilization, marine operation support equipment, and key associated systems and special equipment. Promote the

development and engineering of deep-sea space stations (深海空间站) and large floating structures. Form comprehensive testing, assessment, and identification capabilities for marine engineering equipment to improve the level of marine development and utilization. Achieve breakthroughs in design and construction technology for luxury cruise ships, comprehensively enhance the international competitiveness of high-tech ships such as liquid natural gas (LNG) tankers, and master the core technologies of integrated, intelligentized, and modular design and manufacturing of key supporting equipment.

5. Advanced rail transportation equipment: Accelerate the application of new materials, new technologies, and new processes, focus on making breakthroughs in systematic safety assurance, energy conservation and environmental protection, and digitized, intelligentized, and networkized technologies, and develop advanced, reliable, and applicable products and lightweight, modular, and full-lineage (谱系化) products. Research and develop a new generation of green, intelligent, high-speed, and heavy-duty rail transit equipment systems, provide users with overall solutions around the entire life cycle of the system, and establish a world-leading modern rail transit industry system.

6. Energy saving and new energy vehicles: Continue to support the development of electric vehicles and fuel cell vehicles, master the core technologies of low-carbon, informatized, and intelligentized automobiles, improve the engineering and industrialization capabilities of core technologies such as starter batteries, drive motors, high-efficiency internal combustion engines, advanced transmissions, lightweight materials, and intelligent controls, form a complete industrial system and innovation system from key components to complete vehicles, and promote the integration of energy-saving and new energy vehicles with independent brands at internationally advanced levels.

7. Electrical equipment: Promote the industrialization and demonstration applications of large-scale, high-efficiency, and ultra-clean coal-fired power units and further improve the manufacturing level of super-capacity hydropower units, nuclear power units, and heavy-duty gas turbines. Promote the development of new energy and renewable energy equipment, advanced energy storage devices, power transmission and transformation for smart grids, and user-end equipment. Achieve breakthroughs in the manufacturing and application technology of key components and materials such as high-power electronic devices and high-temperature superconducting materials and form industrialization capabilities.

8. Agricultural machinery and equipment: Focus on the development of advanced agricultural machinery and equipment used in the main production processes of grain, cotton, oil, sugar, and other bulk grains and strategic commercial crops, and related breeding, farming, planting, management, harvesting, transportation, and storage. Accelerate the development of high-end agricultural equipment and key and core components such as large tractors and their compound task machines and tools, as well as large and efficient combine harvesters. Improve the information collection, smart decision-making, and precise operation capabilities of agricultural machinery and

equipment and promote the formation of informatized overall solutions for agricultural production.

9. New materials: Focusing on the development of special metal functional materials, high-performance structural materials, functional polymer materials, special inorganic non-metallic materials, and advanced composite materials, accelerate the research and development of key technologies and equipment for the preparation of new materials such as advanced smelting, coagulation casting, vapor deposition, profile processing, and high-efficiency synthesis, strengthen basic research and system construction, and achieve breakthroughs in the bottlenecks of industrial production. Actively develop special new materials for military and civilian use, accelerate the two-way transfer and transformation of technology, and promote the integration of military and civilian development in the new materials industry. Pay close attention to the impact of disruptive new materials on traditional materials and excel in the advance layout and development of strategic cutting-edge materials such as superconducting materials, nanomaterials, graphene, and bio-based materials. Accelerate the upgrading of basic materials.

10. Biotech, pharma, and high-performance medical devices: Develop new chemical medicines, traditional Chinese medicines (TCM), and biotech medicines for major diseases, focusing on new mechanisms and new target chemical drugs, antibody drugs, antibody-drug conjugates (ADC), protein and polypeptide drugs with completely new structures, new vaccines, innovative TCM with outstanding clinical advantages, and personalized therapeutic drugs. Improve the innovation capabilities and level of industrialization of medical devices and focus on the development of high-performance diagnosis and treatment equipment such as imaging equipment and medical robots, high-value medical consumables such as fully degradable vascular stents, and mobile medical products such as wearables and remote diagnostic and treatment devices. Achieve breakthroughs and applications for new technologies such as 3D bioprinting and induced pluripotent stem cells.

Box 5 High-End Equipment Innovation Projects

Organize and implement a number of special projects and major projects for innovation and industrialization for large aircraft, aircraft engines and gas turbines, civilian aerospace, intelligent green trains, energy-saving and new energy vehicles, marine engineering equipment and high-tech ships, complete sets of equipment for smart grids, high-end CNC machines, nuclear power equipment, and high-end medical equipment. Develop a batch of iconic and highly transformative key products and major equipment, improve the level of independent design and system integration capabilities, achieve breakthroughs in general purpose key technologies and bottlenecks in engineering and industrialization, organize application pilots and demonstrations, and improve innovation and development capabilities and international competitiveness to seize the commanding heights of competition.

By 2020, achieve independent research, development, and applications for the above-mentioned fields. By 2025, greatly increase the market share of high-end equipment with independent IPR, significantly reduce China's dependence on foreign core technologies, significantly enhance basic supporting capacity, and bring equipment in important fields to internationally leading levels.

(7) Deep promotion of structural adjustments to the manufacturing industry:

Promote the development of traditional industries to the mid-to-high-end, gradually resolve excess capacity, promote the coordinated development of large enterprises and small and medium-size enterprises, and further optimize the layout of the manufacturing industry.

Continue to promote the technological transformation of enterprises. Clearly support the policy direction of technical transformation of strategic major projects and high-end equipment, stabilize the scale of the central government's guidance funds for technological transformation, and establish a long-term mechanism to support the technological transformation of enterprises through discounts and other methods. Promote legislation related to technological transformation, strengthen incentive and restraint mechanisms, and improve the policy system for promoting the technological transformation of enterprises. Support key industries, high-end products, and key links that carry out technological transformation, guide enterprises to adopt advanced and applicable technologies, optimize product structures, comprehensively improve the level of their designs, manufacturing, technology, and management, and encourage the high-end development of the value chain of industries such as steel, petrochemicals, construction machinery, light industry, and textiles. Research and formulate investment guidelines for the technological transformation of key industries and key project-oriented programs, attract participation by social capital, and optimize the industrial investment structure. Focusing on the transformation of traditional fields such as the integration of industrialization and informatization, energy conservation and consumption reduction, quality improvement, and safe production, promote the application of new technologies, new processes, new equipment, and new materials and improve the production technology level and efficiency of enterprises.

Steadily resolve the contradictions of overcapacity. Strengthen and improve macro-controls, follow the principle of “digesting a batch, transferring a batch, integrating a batch, and eliminating a batch,” and implement policies by industry and by category to effectively resolve the contradictions of excess capacity. Strengthen industry norms and access management, encourage enterprises to upgrade the level of their technical equipment, and optimize stock production capacity. Strengthen dynamic monitoring and analysis of industries with severe overcapacity, establish and improve early warning mechanisms, and guide enterprises to voluntarily withdraw from industries at overcapacity. Effectively give play to the role of market mechanisms, and comprehensively utilize legal, economic, technological, and other necessary administrative means to accelerate the elimination of backward production capacity.

Promote the coordinated development of small, medium-size, and large enterprises. Strengthen the dominant position of enterprises in the market, support strategic cooperation among enterprises and cross-industry and cross-regional mergers and reorganizations, improve the level of large-scale and intensive operations, and incubate a collection of enterprise groups with a strong core competitiveness. Stimulate the entrepreneurship and innovation vitality of small and medium-size enterprises and develop a group of specialized "little giant" enterprises with outstanding main business, strong competitiveness, good growth potential, and a focus

on market segments. Give play to the demonstration role of Sino-foreign small and medium-size enterprise cooperation parks and use bilateral and multilateral small and medium-size enterprise cooperation mechanisms to support small and medium-size enterprises that go global (走出去) and bring value back in. Guide large enterprises and small and medium-size enterprises towards establishing a cooperative relationship of collaborative innovation and win-win cooperation through a professional division of labor, service outsourcing, order production, and other methods. Promote the construction of a number of high-level small and medium-size enterprise clusters.

Optimize the development layout of the manufacturing industry. Implement overall national and regional development strategies and main functional area (功能区) planning, comprehensively consider factors of production such as resources and energy, environmental capacity, and market space, formulate and implement key industry layout programs, and adjust and optimize the layout of major productive forces (生产力). Improve the industrial relocation (产业转移) guidance catalog, build a national industrial relocation information service platform, create a number of demonstration parks for undertaking industrial relocation, guide the rational and orderly relocation of industries, and promote the coordinated development of the manufacturing industry in the eastern, central, and western regions. Actively promote the coordinated development of industries in the Beijing-Tianjin-Hebei and Yangtze River Economic Belts. In accordance with the requirements of new industrialization, transform and upgrade existing manufacturing agglomeration areas, and promote the transformation and upgrading of industrial agglomerations to industrial clusters. Build a number of new industrialization demonstration bases with outstanding characteristics and advantages, efficient industrial chain coordination, strong core competitiveness, and a sound public service system.

(8) Actively develop service-oriented manufacturing and producer services:

Accelerate the coordinated development of manufacturing and services, promote business model innovation and business format innovation, and promote the transition from production-oriented manufacturing to service-oriented manufacturing. Resolutely develop producer services closely related to the manufacturing industry and promote the construction of service functional areas and service platforms.

Promote the development of service-oriented manufacturing. Research and formulate guidelines for promoting the development of service-oriented manufacturing and implement service-oriented manufacturing action plans. Carry out pilot demonstrations, and guide and support manufacturing enterprises that extend the service chain and transform from mainly providing product manufacturing to providing products and services. Encourage manufacturing enterprises to increase investment in service links, develop personalized and customized services, implement total life cycle management, and achieve network precision marketing and online support services. Support the transformation of qualified enterprises from providing equipment to providing system integration general contracting services and from providing products to providing overall solutions. Encourage well-positioned manufacturing enterprises to achieve "fission" of their professional advantages and to provide society-oriented (社会

化) and professional services to industry through business process reengineering. Support qualified manufacturing enterprises that establish financial institutions such as corporate finance companies and financial leasing companies and promote financial leasing services such as for large-scale manufacturing equipment and production lines.

Accelerate the development of the producer services industry. Resolutely develop information technology services for the manufacturing industry and improve the program design, development, and comprehensive integration capabilities of information application systems in key industries. Encourage internet enterprises and others to develop innovative models such as mobile e-commerce, online customization, and online-to-offline operations, to actively develop services such as dynamic monitoring of products and markets as well as forecasting and early warning, to realize a seamless connection with manufacturing enterprises, and to create new business collaboration processes and value creation models. Accelerate the development of R&D design, technology transfer, business incubation, IPR, S&T consulting, and other technology service industries, develop and expand third-party logistics, energy conservation and environmental protection, inspection and certification, e-commerce, service outsourcing, financial leasing, human resources services, after-sales service, brand building, and other productive service industries, and improve the ability to support the transformation and upgrading of the manufacturing industry.

Strengthen the construction of service functional areas and public service platforms. Build and upgrade the functional areas of the producer service industry, focus on the development of modern service industries such as R&D and design, information, logistics, commerce, and finance, and enhance radiative capabilities. Relying on manufacturing clusters, build a number of public service platforms for producer services. Encourage enterprises in the eastern region to accelerate the transformation of manufacturing into services and establish production service bases. Support the development of characteristic and competitive producer service industries in the central and western regions, accelerate the construction of the capacity for industrial relocation and complementary service facilities for the receiving locality, and realize the coordinated development of the manufacturing and service industries.

(9) Improve the level of internationalized development of the manufacturing industry:

Make overall use of the two types of resources and two markets,[11] implement a more active opening up strategy, better combine "bringing in" (引进来) and "going global," expand new open fields and spaces, improve the level of international cooperation, promote the internationalized layout of key industries, and guide enterprises to improve their international competitiveness.

Improve the level of foreign capital utilization and international cooperation. Further open up the general manufacturing industry, optimize the open structure, and improve the level of openness. Guide foreign investment in high-end manufacturing

[11] Translator's note: The "two types of resources and two markets" (两种资源、两个市场) refer to Chinese and foreign resources and the PRC and foreign markets.

fields such as new generation IT, high-end equipment, new materials, and biotech and pharma and encourage overseas enterprises and scientific research institutions to set up global R&D institutions in China. Support qualified enterprises that issue stocks and bonds overseas and encourage various forms of technical cooperation with overseas enterprises.

Improve transnational business capabilities and international competitiveness. Support the development of a number of multinational companies, and accelerate the enhancement of core competitiveness through global resource utilization, business process reengineering, product chain integration, and capital market operations. Support enterprises that carry out mergers and acquisitions (M&A), equity investment, and venture capital overseas, and establish R&D centers, experimental bases, and global marketing and service systems. Rely on the internet to carry out collaborative design, precision marketing, value-added service innovation, and media brand promotion online, establish a global product chain system, and improve international management capabilities and service levels. Encourage well-positioned enterprises to accelerate the development of international general contracting and general integration. Guide enterprises to integrate into local culture, enhance their awareness of social responsibility, strengthen investment and business risk management, and improve their overseas localization capabilities.

Deepen industrial international cooperation and accelerate the globalization of enterprises. Strengthen top-level design, formulate an overall strategy for the manufacturing industry to go global, and establish and improve overall planning and coordination mechanisms. Actively participate in and promote international industrial cooperation, implement major strategic deployments such as the Silk Road Economic Belt and the 21st Century Maritime Silk Road, accelerate the construction of interconnection infrastructure with neighboring countries, and deepen industrial cooperation. Give full play to the advantages of opening up along the border and build a number of overseas manufacturing cooperation parks in countries and regions where conditions permit. Adhere to government promotion and enterprise leadership, innovate business models, and encourage the transfer of high-end equipment, advanced technology, and advantageous production capacity overseas. Strengthen policy guidance, promote the extension of industrial cooperation from processing and manufacturing links to high-end links such as cooperative R&D, joint design, marketing, and brand cultivation, and improve the level of international cooperation. Innovate the processing trade (加工贸易) model, extend the domestic value-added chain of processing trade, and promote the transformation and upgrading of processing trade.

4. Strategic support and assurance

To build China into a manufacturing powerhouse, give full play to institutional advantages, mobilize all forces, further deepen reforms, improve policies and measures, establish flexible and efficient implementation mechanisms, and create a good environment. Cultivate an innovative culture and a manufacturing culture with

Chinese characteristics and promote the manufacturing industry as it goes from being large to becoming strong.

(1) Deepen the reform of institutions and mechanisms:

Comprehensively promote administration according to law, accelerate the transformation of government functions, innovate government management methods, strengthen the formulation and implementation of manufacturing development strategies, plans, policies, and standards, strengthen industry self-discipline and public service capacity building, and improve industrial governance. Simplify administrative procedures and delegate authority (简政放权), deepen the reform of the administrative examination and approval system, standardize examination and approval items, simplify procedures, and clarify time limits. Revise the catalog of investment projects approved by the government in a timely manner and realize the mainstay status of enterprises in investment. Improve upon the innovation mechanism of collaboration across the government, industry, academia, research institutes, and users, reform the technological innovation management system and mechanisms, project funding allocations, and achievement evaluation and conversion mechanisms, promote the capitalization and industrialization of S&T achievements, and stimulate the spirit of innovation in the manufacturing industry. Accelerate the market-oriented reform of the prices of factors of production, improve the mechanism in which prices are mainly determined by the market, and rationally allocate public resources. Promote the reform of energy conservation, carbon emission rights, pollution discharge rights, and water rights trading systems, accelerate the ad valorem collection of resource taxes, and promote the shift from environmental protection fees to taxes. Deepen the reform of state-owned enterprises (SOEs), improve the corporate governance structure, develop the mixed-ownership economy in an orderly manner, further eliminate various forms of industrial monopoly, and remove unreasonable restrictions on the non-publicly owned sector (非公有制经济). Steadily advance the reform of the national defense S&T industry and promote the in-depth development of military-civil fusion. Improve industrial security review mechanisms and regulatory systems and strengthen the security review of investment and financing, M&A, and tendering and procurement in important fields of manufacturing that are related to the lifelines of the national economy and national security.

(2) Create a fair and competitive market environment:

Deepen the reform of the market access system, implement negative checklist (负面清单) management, strengthen interim and ex post supervision, and comprehensively review and repeal policies and measures that are not conducive to the construction of a unified national market. Implement a scientific and standardized industry access system, formulate and improve access standards for energy conservation, land and water conservation, environmental protection, technology, and safety in the manufacturing industry, strengthen supervision and inspection of the implementation of national mandatory standards, enforce laws uniformly, and guide enterprises by market-oriented means towards carrying out structural adjustments, transformations, and upgrades. Effectively strengthen supervision, crack down on the

production and sale of fake and shoddy products, severely punish market monopolies and unfair competition, and create a sound production and operation environment for enterprises. Accelerate the development of the technology market and improve mechanisms for the creation, utilization, management, and protection of IPR. Improve policies and measures related to the elimination of outdated production capacity, such as employee placement, debt repayment, and enterprise conversion, and improve the market exit mechanism. Further reduce the burden on enterprises, implement a list system for enterprise-related charges, establish a national enterprise-related charge item database, ban all kinds of unreasonable charges and apportionments, and strengthen supervision, inspection, and accountability. Promote the establishment of a credit system for manufacturing enterprises, build a Chinese manufacturing credit database, and establish and improve the dynamic evaluation of enterprise credit, incentives for keeping promises, and punishment for dishonesty. Strengthen the construction of corporate social responsibility and implement self-declaration and supervision systems for corporate product standards, quality, and safety.

(3) Improve financial support policies:

Deepen reforms in the financial sector, expand financing channels for the manufacturing industry, and reduce financing costs. Actively leverage the advantages of policy finance, development finance, and commercial finance and increase support for key areas such as new generation IT, high-end equipment, and new materials. Support the Export-Import Bank of China in increasing services for the manufacturing industry to go global within its business scope, encourage China Development Bank to increase loans to manufacturing enterprises, and guide financial institutions to innovate products and services that meet the characteristics of manufacturing enterprises. Improve the multi-level capital market, promote the standardized development of regional equity markets, and support qualified manufacturing enterprises that list and raise funds at home and abroad and issue various debt financing instruments. Guide venture capital and private equity investment to support the innovation and development of manufacturing enterprises. Encourage qualified manufacturing industry loans and leased assets to carry out pilot projects for securitization. Support large-scale manufacturing enterprise groups in key areas that carry out pilot projects for the integration of industry and finance and promote the transformation and upgrading of the manufacturing industry through financial leasing. Explore and develop insurance products and services suitable for the development of the manufacturing industry and encourage the development of loan guarantee insurance and credit insurance business. Under the premise of controllable risks and sustainable business, through domestic guarantees and foreign loans, foreign exchange and RMB loans, debt financing, and equity financing, increase the support for manufacturing enterprises to carry out resource exploration and development overseas, and establish R&D centers and other forms of high-tech support for companies and M&A.

(4) Expand fiscal and tax policy support:

Make full use of existing channels, strengthen the support of government fiscal funding for the manufacturing industry, and focus on key areas of transformation and

upgrading of the manufacturing industry, such as smart manufacturing, "four basics" development, and high-end equipment, so as to create a favorable policy environment for the development of the manufacturing industry. Actively use models such as public-private partnership (PPP) to channel social capital into the construction of major manufacturing projects, technological transformation of enterprises, and key infrastructure construction. Create new forms of financial capital support and gradually shift from "subsidized construction" to "subsidized operations," improving the efficient utilization of fiscal funds. Deepen the management reform of S&T programs (special projects, funds, etc.), support S&T research, development, and demonstration applications in key areas of the manufacturing industry, and promote technological innovation, transformation and upgrading, and structural layout adjustment of the manufacturing industry. Improve and implement government procurement policies that support innovation and promote the research, development, and large-scale application of innovative products in the manufacturing industry. Implement and improve the incentive policies for the use of the first sets of major technical equipment and improve the incentive and restraint mechanisms for R&D and user units in product innovation, value-added services, and demonstration applications. Implement tax policies that are conducive to the transformation and upgrading of the manufacturing industry, promote the reform of value-added taxes, and improve the method for calculating and verifying R&D expenses of enterprises, so as to effectively reduce the tax burden of manufacturing enterprises.

(5) Improve the multi-level talent cultivation system:

Strengthen overall planning and categorized guidance for the development of manufacturing talent, organize the implementation of the manufacturing personnel training programs, increase the training of professional and technical personnel, business management personnel, and skilled personnel, and improve the personnel training system from all aspects, including research, development, conversion, production, and management. Focusing on improving the level of modern management and enterprise competitiveness, implement projects to improve the quality of enterprise management talents and the National Milky Way Training Project for Small and Medium-Size Enterprises (国家中小企业银河培训工程) and incubate a group of outstanding entrepreneurs and high-level management talents. Focusing on high-level and urgently needed professional and technical talents and innovative talents, implement the Knowledge Renewal Program for Professional and Technical Talent (专业技术人才知识更新工程) and the Outstanding Engineer Training Program for Advanced Manufacturing (先进制造卓越工程师培养计划), build a number of engineering innovation training centers in institutions of higher education, and build a team of high-quality professional and technical personnel. Strengthen vocational education and skills training, guide a group of general undergraduate institutions of higher education towards transforming into applied technology institutions of higher education, establish a number of training bases, carry out pilot demonstrations of modern apprenticeships, and form a complete and skilled technical talent team. Encourage enterprises to work with schools to cultivate scientific research personnel, technical skills, and hybrid talents (复合型人才) urgently needed in the manufacturing

industry, deepen the reform of the enrollment and training model for graduate students working toward engineering doctorates and master's degrees in related fields, and actively promote the integration of industry, academia, and research institutes. Strengthen forecasting of industrial talent demand, improve various talent information bases, and build an industrial talent level evaluation system and information release platform. Establish a talent incentive mechanism and increase the recognition and awards for outstanding talents. Establish and improve service institutions for manufacturing talents and improve the system and mechanisms for the flow and use of talent. In selecting various types of outstanding talents in various forms, focus on professional and technical personnel who study and train abroad and explore the establishment of international training bases. Increase the intellect recruitment capacity of the manufacturing industry and recruit leading talents and professionals who are in short supply.

(6) Improve policies for micro-, small, and medium-size enterprises:

Implement and improve the preferential fiscal and tax policies to support the development of micro-size and small enterprises and optimize the focus and method of using special funds for the development of small and medium-size enterprises. Give play to the leveraging role of government fiscal funding, attract social capital, and speed up the establishment of a national small and medium-size enterprise development fund. Support qualified private capital (民营资本) in establishing small and medium-size banks and other financial institutions in accordance with the law, encourage commercial banks to strengthen the establishment of specialized institutions for financial services for micro-size and small enterprises, establish and improve the financing assurance system for micro-size and small enterprises, and create new products and services. Accelerate the establishment of a credit investigation system for micro-, small, and medium-size enterprises and actively develop financial leasing, IP pledge loans, and credit insurance policy pledge loans for micro-size and small enterprises. Build and improve entrepreneurship bases for small and medium-size enterprises and guide various venture capital funds to invest in micro-size and small enterprises. Encourage universities, research institutes, and engineering centers to open and share various experimental facilities for small and medium-size enterprises. Strengthen the construction of a comprehensive service system for micro-, small, and medium-size enterprises, improve the network of public service platforms for micro-, small, and medium-size enterprises, and establish an information interconnection mechanism to provide them with specialized services such as entrepreneurship, innovation, financing, consulting, training, and human resources.

(7) Further expand the opening up of the manufacturing industry:

Deepen the reform of the foreign investment management system, establish a pre-access domestic treatment plus negative checklist management mechanism for foreign investment (外商投资准入前国民待遇加负面清单管理机制), implement a management model with filing as the mainstay and authorization as auxiliary (备案为主、核准为辅的管理模式), and create a stable, transparent, and predictable business environment. Comprehensively deepen the reform of foreign exchange management,

customs supervision, and inspection and quarantine management and improve the level of trade and investment facilitation. Further relax market access, revise industrial policies such as for steel, the chemical industry, and shipbuilding, support manufacturing enterprises that introduce advanced technology and high-end talent through outsourced development (委托开发), patent authorization, crowdsourcing, and mass innovation, and promote a shift in the use of foreign capital from focusing on the introduction of technology, capital, and equipment to joint ventures and cooperative development, foreign M&A, and the recruitment of leading talents. Strengthen foreign investment legislation, strengthen legal safeguards supporting manufacturing enterprises in going global, regulate the overseas business behavior of enterprises, and safeguard the legitimate rights and interests of enterprises. Explore the use of industrial funds, state-owned capital income, and other channels to support the globalization of high-speed rail, power equipment, automobiles, engineering and construction, and other equipment and well-positioned industrial capacities, and to implement overseas investment and M&A. Accelerate the globalization of the manufacturing industry to support the construction and improvement of service institutions, establish a public service platform for manufacturing foreign investment and a technical trade service platform for export products, and improve the early warning and coordination mechanism for dealing with trade frictions and major overseas investment issues.

(8) Improve organization and implementation mechanisms:

Stand up a State Leading Group for Building China into a Manufacturing Powerhouse (国家制造强国建设领导小组), headed by leading comrades of the State Council alongside members in charge of relevant departments and units of the State Council. The main responsibilities of the leading group are to coordinate the overall work of building China into a manufacturing powerhouse, to review major programs, major policies, major projects, major issues, and major work arrangements, to strengthen strategic planning, and to guide departments and localities in their work. The office of the leading group, located in the Ministry of Industry and Information Technology (MIIT), undertakes the day-to-day work of the leading group. Establish a Strategic Advisory Committee for Building China into a Manufacturing Power (制造强国建设战略咨询委员会) to study major forward-looking and strategic issues in the development of the manufacturing industry and to provide consultation and evaluation for major manufacturing decisions. Support the construction of multi-level, multi-field, and multi-form new think tanks with Chinese characteristics, including non-government think tanks (社会智库) and corporate think tanks, and provide strong intellectual support for the building of a manufacturing powerhouse. Establish a monitoring and third-party evaluation mechanism for the implementation of the *Made in China 2025* tasks and improve the mechanisms for statistical monitoring, performance evaluation, dynamic adjustment, and supervision and assessment. Establish a mid-term evaluation mechanism for *Made in China 2025* and make necessary adjustments to the goals and tasks in a timely manner.

All regions and departments should fully understand the significance of building China into a manufacturing powerhouse, strengthen organizational leadership, improve working mechanisms, and strengthen departmental coordination and linkages from top to bottom. All regions should study and formulate specific implementation plans based on local conditions, refine policies and measures, and ensure that all tasks are in place. MIIT, together with relevant departments, should strengthen follow-up analysis, supervision, and guidance and report major matters to the State Council in a timely manner.