

<b>Translation</b>		
<p>The following document is China's national strategy for "innovation-driven development," issued in May 2016 by the Communist Party Central Committee. The strategy identifies industries that China feels would most benefit from increased indigenous innovation. The document also identifies foreign talent and technology transfer as crucial to China's emerging technology sectors.</p>		
<p><b>Title</b>  <i>Outline of the National Innovation-Driven Development Strategy</i> Issued by the CPC Central Committee and the State Council          中共中央 国务院印发《国家创新驱动发展战略纲要》</p>		
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<p><b>Source</b>          Xinhua News Agency (新华社), May 19, 2016. Xinhua is China's official state press agency.</p>		
<p>The Chinese source text is available online at:  <a href="http://www.xinhuanet.com/politics/2016-05/19/c_1118898033.htm">http://www.xinhuanet.com/politics/2016-05/19/c_1118898033.htm</a>          The footnote on p. 3 is an addition by the translator; the source text contains no footnotes.</p>		
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Recently, the Central Committee of the Communist Party of China (CPC) and the State Council issued the *Outline of the National Innovation-Driven Development Strategy* (the *Outline*) and issued a notice requiring earnest implementation by all regions and departments in light of their actual conditions.

The main contents of the *Outline* are as follows.

The 18th CPC National Congress proposed implementing an innovation-driven development strategy, emphasizing that technological innovation is the strategic support for increasing social productivity and overall national strength, and it must be placed at the core of the nation's development as a whole. This is a significant national development strategy established by the Central Committee in the new phase of development, one that is based on the overall situation, oriented globally and focused on key aspects, and that drives the overall development. This *Outline* has been especially formulated in order to accelerate implementation of that strategy.

### I. Strategic Background

Innovation-driven means that innovation becomes the primary force driving development, combining technological innovation and system innovation, management innovation, business model innovation, business type innovation and cultural innovation, pushing a change in the development approach toward reliance on sustained knowledge accumulation, technological

progress and labor quality improvement, and promoting the evolution of the economy in stages toward a higher-level form, a more sophisticated division of labor, and a more rational structure.

It is the nation's destiny to be innovation-driven. The core support of national strength is technological innovation capability. National prosperity follows from strength in innovation, and national misfortune follows from weakness in innovation. A major cause of China's stagnation in the modern era was that it let previous technological revolutions pass it by, leading to technological and national weakness. To achieve the Chinese dream of the great rejuvenation of the Chinese nation (中华民族), one must truly make good use of science and technology, which is a revolution in the highest sense and a powerful lever.

Being innovation-driven is an irresistible world trend. New global technological revolutions, industrial revolutions and revolutions in military affairs are evolving at an accelerating pace. Scientific exploration is deepening at all scales, from the micro to the cosmic, and technology revolutions characterized by intelligence, greenness, ubiquity and group nature (群体性) will trigger major adjustments in the international division of labor. Disruptive technologies are constantly springing up, and they are reshaping the world's competitive playing field and altering the relative strength of nations. For many countries, being innovation-driven has become the core strategy for pursuing competitive advantage. China faces both historical opportunities for catching up and forbidding challenges from growing gaps. It is only by bravely setting the world trends in technological innovation that a country can gain the initiative in development and make a greater contribution to the advancement of human civilization.

Being innovation-driven is required by our development situation. China's economic development has entered a new normal. Traditional development drivers are growing progressively weaker, and the expansive growth mode (粗放型增长方式) is difficult to sustain. An innovation-driven approach must be relied upon to create new engines of development, incubate new economic growth nodes, continue raising the quality and efficiency of China's economic development, open up new space for it to develop, and achieve the twin goals of medium-to-rapid growth of the economy and advancement toward medium-to-high-end levels for industries.

At present, China's innovation-driven development already has a foundation for acceleration. Following many years of hard work, technology development is entering a period in which to leap from quantity growth to quality improvement. The scientific research system is daily becoming more robust, talent teams are constantly expanding, and our independent innovation capacity in science, technology, engineering and industry is growing rapidly. The transformation and upgrading of the economy, continuous improvement in the standard of living, and modernization of national defense give rise to enormous demand for innovation. Huge-scale markets, well-formed industrial systems, diversified consumer demand and the increased innovation efficiency of the internet age have combined to provide vast room for innovation. The system of socialism with Chinese characteristics can combine the advantages of concentrating power for major undertakings (集中力量办大事) with the market allocation of resources, and has provided basic safeguards for achieving innovation-driven development.

At the same time, it must be recognized that many of our industries are still at the lower-middle end of the global value chain. Some critical core technologies are controlled by

others (受制于人), advanced nations are still clearly ahead at the cutting edge of science and in high-tech fields, and China's reserves of science and technology for supporting industrial upgrading and leading future development are in urgent need of strengthening. Systems and mechanisms adapted to the innovation-driven approach urgently need to be established and improved, corporations have insufficient innovation momentum, the overall performance of innovation systems is not high, and economic development has yet to truly turn onto the track of relying on innovation. Science and technology talent teams are large but not strong, leadership talent and highly skilled talented personnel are in short supply, and the ranks of innovative entrepreneurs must be developed and enlarged. The market environment and social atmosphere for encouraging innovation still needs to be further cultivated and optimized.

At a critical stage in China's accelerated advancement of socialist modernization, and its realization of the "two centennial" objectives (“两个一百年”奋斗目标) [establish a well-off society in an all-round way by the centennial (2021) of the founding of the CPC; establish a rich, strong, democratic, civilized, harmonious modernized socialist nation by the centennial (2049) of the founding of the PRC]<sup>1</sup> and of the Chinese dream of the great rejuvenation of the Chinese nation, it is necessary to steadfastly maintain that to grasp innovation is to grasp development, and to seek innovation is to seek the future. We must make innovation become the will of the nation and the joint action of society, embark upon a new development path from strong talent and strong technology to strong industries, a strong economy and a strong nation, and create a new growth cycle for China's next ten-plus years or more.

## II. Strategic Requirements

### (i) Guiding ideology

We must insist on following the path of independent innovation with Chinese characteristics, taking Deng Xiaoping theory, the important thinking of the "Three Represents," and the scientific development concept as the guide, with in-depth implementation of the spirit of General Secretary Xi Jinping's series of important speeches, and in accordance with the requirements of the "Four Comprehensivelys" strategic arrangement [comprehensively build a well-off society in an all-round way, comprehensively deepen reform, comprehensively govern the country according to law, comprehensively govern the party strictly]. Emancipate the mind, be open and inclusive, and make innovation-driven development the nation's priority strategy. Taking technological innovation as the core for driving comprehensive innovation, using system and mechanism reform to stimulate innovation activity, and with a highly efficient innovation system as the support for building a high-level innovation-oriented country, we must push for a fundamental transformation in momentum of economic and social development, and provide strong momentum for achieving the Chinese dream of the great rejuvenation of the Chinese nation.

### (ii) Basic principles

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<sup>1</sup> The above definition of the "two centennial" objectives is as of the publication of this *Outline* (May 2016). In his report to the 19<sup>th</sup> Party Congress on October 18, 2017, CPC General Secretary Xi Jinping redefined the second "centennial" as follows: "Build China into a rich, strong, democratic, civilized, harmonious, *beautiful* modernized socialist *superpower*" (emphases added by translator).

Adhere to development. Insist on being problem-oriented, oriented toward the world's technological cutting edge, toward the nation's major needs and toward the main battlefield of the national economy, clearly define the main directions of attack for China's innovative development, achieve breakthroughs in key fields as quickly as possible, and strive to form more competitive advantages.

Deepen reform. Insist on having technology mechanism reform and reform in economic and social areas as simultaneous drivers, strengthen the linkages between technology and the economy, adhere to the regular patterns of the socialist market economy and technological innovation, get rid of all mental obstacles and institutional barriers that constrain innovation, and construct a good environment for supporting innovation-driven development.

Strengthen incentives. Insist that the essence of being innovation-driven is being talent-driven, put being people-centered (以人为本) into practice, respect value created by innovation, stimulate the positivity and creativity of all types of talent, and accelerate the coming together of cadre of innovative talent that is large in scale, rationally structured and high in quality.

Expand opening. Insist on planning and promoting innovation with a global vision, properly use global innovation resources to the maximum extent, comprehensively elevate China's position in the global pattern of innovation, and strive for it to become a leader in a number of important fields and a participant in the formulation of important rules.

### (iii) Strategic objectives

These are divided into three steps:

Step one: Enter the ranks of innovation-oriented countries by 2020, basically construct a national innovation system with Chinese characteristics, and strongly support accomplishing the goal of forming a well-off society in an all-round way (全面建成小康社会).

— Initial formation of an innovation-oriented economic pattern. A number of industries enter the high end of the global value chain, with maturation of a group of innovation-oriented enterprises and industry clusters possessing international competitive strength. The contribution of technological progress rises to over 60%, and value added in knowledge-intensive service industries accounts for 20% of GDP.

— Dramatic increase in independent innovation capability. An innovation pattern shall be formed that is oriented toward future development, welcomes technological revolutions, and promotes industrial transformation. Breakthroughs shall be made on the major bottleneck problems constraining economic and social development and national security, and the passive situation where key and core technologies have long been controlled by others shall be reversed, and unique advantages will be formed in a number of strategically contested fields (战略必争领域), providing strategic reserves and strategic space for expansion (扩展战略空间) for the nation's prosperous development. Research and development (R&D) expenditures shall reach 2.5% of GDP.

— Innovation system made collaborative to a high degree. Technology is more smoothly integrated into the economy, innovative entities are full of activity, innovation chains are

organically linked, innovation governance is more scientific, and innovation efficiency is greatly enhanced.

— Further optimization of the innovation environment. Policies and laws and regulations to stimulate innovation shall be established and improved, and protection of intellectual property rights shall be made more rigorous, forming a value orientation and culture that champions innovative entrepreneurship, boldly engages in it and encourages it.

Step two: By 2030, be ranked among the leading innovation-oriented countries (创新型国家), and achieve a fundamental transformation in the driving force of development, with a major increase in economic and social development level and international competitive strength, and lay a firm foundation for building an economic superpower (经济强国) and a society of shared affluence.

— Main industries enter the high end of global value chains. Constantly create new technologies and products, new modes and new business forms, new types of demand and new markets, and achieve more sustainable development, higher quality employment, higher-level incomes, and higher quality lives.

— On the whole, the situation where technological innovation is based on following in others' tracks is reversed. In certain strategic fields, go from being even to being ahead, forming Chinese schools of thought that lead in global scholarly development, and generating original achievements that have important effects on the development of the world's technology and the progress of human civilization. The main bottlenecks constraining national defense technology shall be overcome. Research and development (R&D) expenditures shall reach 2.8% of GDP.

— The national innovation system becomes more complete. In-depth integration and mutual promotion between technology and the economy shall be achieved.

— There is a rich culture of innovation, legal system safeguards are strong, and the entire society forms a lively arena in which all of its innovative vitality is released and the wellsprings of innovation flow continuously.

Step three: By 2050, China shall be established as a world S&T innovation superpower (世界科技创新强国), becoming one of the world's main centers of science and occupying the high ground in innovation. It provides powerful support for building China into a rich, strong, democratic, civilized, harmonious modernized socialist nation, and for achieving the Chinese dream of the great rejuvenation of the Chinese nation.

— Technology and talent will become the most important strategic resources for national strength, and innovation will become a core factor in policy formulation and system arrangements.

— Increases in labor productivity and social productive force (社会生产力) will rely mainly on technological progress and overall innovation, the quality of economic development will be high, energy resource consumption will be low, and the core competitiveness of industries will be high. National defense technologies will reach world-leading levels.

— China will have an array of scientific research institutes, research universities and innovation-oriented enterprises that are among the best in the world, a host of important

original scientific achievements, and world-renowned scientists will have emerged, and it will have become an important gathering place for global high-end talent, innovation, and entrepreneurship.

— The environment for innovation in terms of systems, markets and culture shall be further optimized. Respect for knowledge, championing of innovation, property rights protection, and inclusive diversity will have become the common philosophy and value orientation of the whole society.

### **III. Strategic Deployment**

Becoming innovation-driven is a systemic transformation. Its layout must proceed in accordance with "persisting in a two-wheel drive approach, constructing one system, and promoting six major changes" (“坚持双轮驱动、构建一个体系、推动六大转变”), and a new system shall be built for powering development.

The "two wheels" of the two-wheel drive are scientific and technological innovation on one hand and institutional and mechanism innovation on the other, and they are mutually coordinated and supply power continually. In order to grasp innovation, it is first necessary to grasp scientific and technological innovation, and to make up shortcomings, it is first necessary to make up shortcomings in technological innovation. Scientific discoveries play a decisive guiding role in technological progress, and technological progress strongly propels the discovery of scientific laws. We must clearly specify the directions and key points for supporting development, strengthen scientific exploration and technological problem solving, and build a systemic capacity for sustained innovation. For institutional and mechanism innovation, adjustments must be made to all of the relations of production that are not suited to innovation-driven development, and overall plans must be made for promoting institutional and mechanism reform in the three governance areas of S&T, the economy, and government, so as to unleash innovative vitality to the maximum extent.

"One system" refers to building a national innovation system. We must establish an ecosystem in which innovation entities can collaborate and interact, and innovation elements flow smoothly and are efficiently allocated, and must fashion a practical vehicle for innovation-driven development, along with systemic arrangements and environmental safeguards for it. We shall specify the functional positions of the various types of innovation entities, including corporations, scientific research institutes, universities, and social organizations, build an open and efficient innovation network, and establish a military-civil fusion (军民融合) platform for collaborative innovation in national defense science and technology; we shall improve innovation governance, further clarify the division of labor between the government and the market, and construct overall planning mechanisms for allocating innovation resources; and we shall perfect the policy system for stimulating innovation and the legal system for protecting innovation, construct a social environment for encouraging innovation, and inspire the innovative vitality of the whole society.

The "six major changes" are: (1) a change in the approach to development from expansive growth led by expansions of scale to sustainable development led by quality and efficiency; (2) a change in the elements of development from development led by traditional factors to development led by innovation factors; (3) a change in the industrial division of labor from the

lower-middle end to the high end of the value chain; (4) a change in innovation capability from the current situation in which China is "catching up, pulling even, and taking the lead" but is mainly "catching up," to a situation in which China is mainly "pulling even" and "taking the lead"; (5) a change in resource allocation from being mainly based on research and development links to an overall allocation taking in supply chains, innovation chains and funding chains; and (6) a change in innovation groups from predominantly niche groups of scientific and technological personnel to innovation and entrepreneurial interaction between niche and mass groups.

#### **IV. Strategic Tasks**

While staying centered closely around the core essentials for boosting competitive strength, urgent social development requirements, and major national security challenges, we shall adopt differentiated strategies and asymmetric paths, and strengthen the allocation of tasks in key fields and for essential links.

(i) Promote innovation in industrial technology systems and create new development advantages

Accelerate the in-depth integration of industrialization and informatization (信息化), with digitalization and becoming networked, intelligentized (智能化), and green taken as the basis for boosting the competitive strength of industries; promote cross-cutting innovation of emerging technologies in all fields; build modern industrial technology systems that are rationally structured, advanced and efficacious, open and compatible, independently controllable (自主可控), and that have international competitive strength, using the support of mass breakthroughs in technology to lead the development of emerging industrial clusters, and promoting quality upgrading in industries.

1. Develop a new generation of information network technology and strengthen the informatization foundation for economic and social development. Strengthen research on such technologies as humanlike machine intelligence (类人智能), natural interaction and virtual reality, microelectronics and optoelectronics; promote the R&D and comprehensive application of technologies such as broadband mobile Internet, cloud computing, the Internet of things (IoT), Big Data, high performance computing, and mobile intelligent terminals; expand R&D and promotional efforts for independent hardware and software products and network security technology, such as integrated circuits and industrial controls, providing safeguards for China's economic transformation and upgrading and the protection of national network security (国家网络安全).

2. Develop smart and green manufacturing technology, and promote climbing toward the high end of the manufacturing industry. Refashion the manufacturing industry's technology systems, production modes, industrial forms and value chains, and promote a change in the manufacturing industry from large to strong. Develop technologies like smart manufacturing equipment, accelerate the in-depth application in manufacturing of networked manufacturing technology, cloud computing, Big Data and so on, and promote a change in the manufacturing industry toward becoming automation and becoming intelligentized and service-oriented. Carry out green retrofitting of traditional manufacturing industries across the board, and change from extensive manufacturing to intensive manufacturing. Strengthen fundamental industrial

technology capabilities and establishment of experimental platforms, and raise the level of key common technologies such as basic materials, basic components, basic processes and basic software. Develop large aircraft, aircraft engines, nuclear power, high-speed rail, marine engineering equipment and high-end equipment and products such as high-tech ships and UHV power transmission and transformation equipment.

3. Develop modern agricultural technology that is ecologically green, highly efficient and safe, ensuring that grain is secure and food is safe. With seed industry autonomy as the core, transform the agricultural development approach, break through the constraints posed by too many people on too little land and water scarcity, and take the agricultural development path of production efficiency, product safety, resource conservation and environmental friendliness. Systematically enhance animal and plant breeding and R&D of high-end agricultural equipment; extend over large areas such technologies as those to transform high, medium and low-yield fields; deeply develop R&D of such technologies as water-saving agriculture, circular agriculture (循环农业), organic agriculture and biological fertilizers; develop standardized, large-scale modern breeding technology; and promote quality and efficiency improvement and sustainable development in agriculture. Extend low-cost technologies and modes for preventing agricultural diffused pollution (面源污染) and heavy metals pollution; develop food security safeguard technologies, quality/safety control technologies and safety traceability technologies for the entire supply chain; and establish a full-coverage food safety technology system with a safe environment, clean production and ecological storage and transportation. Push for the integration of primary, secondary and tertiary industries in agriculture, and achieve a transformation in development toward branding and value-adding throughout the entire chain.

4. Develop modern energy technologies that are safe, clean and highly efficient, and press for a revolution in energy production and consumption. Promote a transformation in energy applications toward being clean and low-carbon, with optimization of the energy structure and boosting energy use efficiency as the key points. Break through the technological bottlenecks for the clean and efficient utilization of coal, petroleum, natural gas and other fossil fuels; develop technology for oil and gas mineral resource exploration and extraction under deep-sea, deep-earth and other complex conditions, and carry out comprehensive technology demonstrations of exploration and development of unconventional oil and gas such as shale oil. Accelerate the development of technology and equipment for, and large scale application of, clean and new energy sources such as nuclear energy, solar energy, wind energy and biomass energy; and conquer the key technologies for large-scale supply/demand interaction, energy storage and grid connection. Promote the spread of new energy-saving technologies and products, accelerate retrofitting with energy-saving technology in such industries as steel, petrochemicals, construction materials and nonferrous metals, and promote the R&D and application of technologies like new-energy vehicles and smart grids.

5. Develop efficient resource use and ecological protection technology, and build a resource-saving, environmentally friendly society. Adopt systematic technological solutions, industrial pathways, and develop pollution governance and resource recycling technologies and industries. Establish a technology system for early warning and analysis of severe air pollution, and develop highly precise monitoring and prediction technology. Establish a comprehensive water resource utilization system; launch deep-earth mineral resource exploration, development and utilization, develop remanufacturing and resource recycling industries, and



establish technology systems for urban household waste resource use, renewable resource recycling, comprehensive utilization of industrial solid waste, etc. Perfect the environmental technology administration system; strengthen R&D and application of technologies for water, atmospheric, and soil pollution prevention and hazardous waste treatment and disposal, environmental detection, and environmental emergency response; and increase environmental carrying capacity.

6. Develop advanced and appropriate marine and space technology, and cultivate the marine economy and space economy. Develop appropriate technology for efficient and sustainable marine resource utilization, speed up development of marine engineering equipment, construct a synchronized 3D marine observation system, and promote implementation of China's maritime strategy and development of the blue economy. Vigorously improve technological capabilities for space entry and exploitation, perfect space infrastructure, promote technology development and application of satellite-based remote sensing, communications, navigation, positioning services, etc., and perfect the innovation chain for satellite applications.

7. Develop smart cities and digital society technology, and promote people-centered new urbanization. Rely on new technology and management innovation to support new urbanization and modern urban development and public services, innovate social governance methods and measures, accelerate progress on informatization for comprehensive governance of public security, and advance the establishment of a safe China. Develop standardized, digitized and intelligentized technology for municipal infrastructure such as transportation, electrical power, communications and underground pipe networks, and promote large-scale application of key technologies in such fields as green architecture, smart cities and eco-cities. Strengthen research of major technologies and products in disaster response and prevention areas such as major disasters and public safety.

8. Develop advanced, effective, safe and convenient health technology, and address the challenges of major diseases and aging of the population. Foster technology integration in multiple fields such as life science, Chinese and western medicine, and bioengineering, and increase technological safeguarding capability for major disease control and prevention, public sanitation, reproductive health, etc. Research and develop innovative drugs, new types of vaccines, advanced medical equipment and biotherapy technologies. Promote modernization of traditional Chinese medicine. Promote Big Data research in genomics and healthcare, develop precision medicine, research and develop genetic screening technology for genetic and chronic disease susceptibility, and raise the level of diagnostic technology for cardiovascular disease, malignant cancer, chronic respiratory disease, diabetes and other major diseases. Develop digitalized and remote medical treatment technology, promote networking and customization of social services such as prevention, treatment, rehabilitation, health maintenance and elderly care, develop new models of integrated healthcare services, significantly boost capabilities in population health protection, and strongly support establishment of a "Healthy China."

9. Develop modern service technology to support business model innovation, and drive upgrading of economic forms. Using new-generation information and network technology as support, actively develop modern service industry technology infrastructure, expand emerging service industries like digital consumption, e-commerce, modern logistics, Internet banking and

online education, and promote the fusing of technological innovation and business model innovation. Speed up promotion of integrated development of industrial design, cultural creativity and related industries, and boost China's innovative design capabilities in key industries.

10. Develop disruptive technology to lead industrial transformation, and constantly give birth to new industries and create new jobs. Pay close attention to disruptive technologies with the potential to "reset" (“归零”) existing investment, talent, technology, industries and rules, put in place a forward-looking technology R&D layout for the frontier of emerging industries, and strive to achieve "overtaking at the turn" (“弯道超车”). Develop mobile Internet technology, quantum information technology and aerospace technology; promote development of additive manufacturing equipment, intelligent robots, driverless vehicles, etc.; emphasize such technologies as genomics, stem cells, synthetic organisms, and regenerative medicine with profound impact on the fields of life science, biological breeding, and industrial biology; develop hydrogen energy, fuel cells, and other new-generation energy technologies; and fully leverage the role of technologies like nanotechnology and graphene in leading the development of the new materials industry.

(ii) Strengthen original innovation and enhance sources of supply

Steadfastly combine national strategic needs with scientific exploration goals, enhance the research deployment on scientific questions of global relevance, strengthen original innovation capability, raise the overall level of China's scientific discovery, technology invention and product-industry innovation, and support industry transformation and safeguarding of national security.

1. Strengthen basic cutting-edge and high-technology research directed at national strategic needs. Centered around the "stranglehold" problems involving long-term development and national security, strengthen the forward-looking layout of basic research; expand basic research in the space, marine, network, nuclear, materials, energy, information and biological fields, and increase strategic high-technology research efforts; and achieve security, independence and controllability (安全、自主、可控) in key core technologies. Specify stage-by-stage objectives, integrate cross-disciplinary and interdisciplinary superiorities, hasten key breakthroughs, and accumulate original resources for technological progress in industries.

2. Strongly support the free exploration of basic research. Strengthen innovation directed toward cutting-edge science, strive to set the direction of the world's scientific research in more fields, and increase China's contributions to mankind's scientific exploration. Focus on supporting major technological breakthroughs, promote transformative research, aggressively engage in new ways of thinking, new discoveries, new knowledge, new theories and new methods, and bolster sources and reserves. Promote balanced and coordinated development of academic curricula, strengthen interdisciplinary work and integration, emphasize support for a group of non-consensus projects (非共识项目), and foster emerging and distinctive disciplines.

3. Build an array of infrastructure and platforms that support high-level innovation. Adapting to the characteristics of innovation activity in the age of big science (大科学时代), and targeting the nation's major strategic needs, establish a set of national laboratories that have international standards and which feature interdisciplinary work and collaborative

innovation. Accelerate establishment of platforms for large-scale shared experimental facilities, data resources, biological resources, knowledge, patent information services and other basic conditions for science and technology. Research and develop high-end scientific research instruments and equipment, and raise self-sufficiency level in scientific research equipment. Establish digital infrastructure such as supercomputing centers and cloud computing platforms, and form an advanced information network support system based on Big Data.

(iii) Optimize the regional layout of innovation and create regional economic growth poles

Focus on the national regional growth strategy, promote a rational industrial division of labor using concentrations and flows of innovation factors, and propel the overall improvement of regional innovation capabilities and competitive strengths.

1. Construct an innovation development pattern among regions with each having its own unique features. The eastern region shall concentrate on raising its original innovation (原始创新) and integrated innovation (集成创新) capability, accelerate innovation-driven development transformation across the board, and cultivate industry clusters and regional economies possessing international competitiveness. The central region shall follow the path of differentiated and leapfrog style development, flexibly aggregate innovation resources, accelerate the extension and application of advanced appropriate technology, become innovation-led in key fields, and cultivate emerging industries and strong economies with regional characteristics.

2. Integrate innovation resources across regions. Construct cross-regional innovation networks, and promote interregional joint design of innovation topics, interconnection and intercommunication of innovation factors, and joint organization of technology research. Increase the technological innovation capabilities of national strategic regions such as Beijing-Tianjin-Hebei and the Yangtze River Economic Belt, create regional communities for collaborative innovation, and provide coordinated planning and guidance for regionally integrated development. Push advantaged regions such as Beijing and Shanghai to become globally influential centers of scientific and technological innovation.

3. Create leading regional innovation demonstration areas. Optimize the layout of national independent innovation demonstration zones, promote the transformation and upgrading of national high-tech zones in the direction of developing high technology and incubating new industries, conduct regional comprehensive innovation reform experiments, establish innovation-oriented provinces and cities, nurture growth poles for emerging industry development, and enhance the radiating impetus function of innovation development.

(iv) Deepen military-civil fusion and promote interaction for innovation

In accordance with the overall requirements of the military-civil fusion development strategy, take full advantage of the important role played by national defense science and technology innovation, accelerate the establishment and improvement of the integrated military-civil innovation system, and form new patterns of deeply integrated military-civil science and technology development that cover all elements and are multidisciplinary and highly efficient.

1. Improve macro planning mechanisms. Abiding by the regular patterns of economic and national defense development, devise military-civil fusion administrative mechanisms for

providing unified leadership, meeting demands and sharing resources; carry out overall coordination of military-civil science and technology strategic planning, policies, resource requirements, and application of results; and promote military-civil science and technology development that is coordinated, balanced and compatible.

2. Carry out coordinated military-civil innovation. Establish mechanisms for the formation of major scientific research tasks for military-civil fusion, with an integrated design of the innovation chain, from basic research to key technology R&D and integrated applications; devise joint demonstration and implementation modes for military-civil shared technology projects; and establish military-civil technological innovation systems combining production, teaching and research.

3. Promote merging of the basic elements for military-civil science and technology. Propel integration of basic generic military-civil technology and interchangeability of basic materials and parts. Propel in-depth development of military-civil fusion in marine, space, network and other new fields. Carry out formulation and consolidation of general military-civilian standards, promote two-way conversion of military-civilian standards, and encourage integration of military-civilian standards systems. Conduct overall planning for the establishment of major shared military-civil scientific research bases and infrastructure, and promote two-way openness, information interaction and resource sharing.

4. Encourage two-way transfer and transformation of military-civil technology. Promote application of advanced civilian technology in military fields, improve the national defense intellectual property system, perfect the national defense intellectual property ownership and benefit sharing mechanisms, and actively guide the accelerated transformation and application in civilian fields of national defense scientific and technological achievements. Widen access to national defense science and technology fields, increase open competition in the military product R&D and services markets, and guide preeminent private enterprises to enter military product scientific research, production and maintenance fields. Perfect the import administration mechanisms for military-civil dual-use materials and technology.

(v) Enlarge innovation entities and lead in the development of innovation

Specify the functional positions of the various innovation entities at different links in the innovation chain, stimulate the vitality of those entities, systematically boost the innovation capability of various entities, and solidify the foundation for the development of innovation.

1. Incubate world-class innovation-oriented enterprises. Encourage industry-leading enterprises to construct first-rate R&D institutions, form perfected R&D organization systems, and concentrate high-end innovation talent. Guide leading enterprises to join with small and medium-sized enterprises and scientific research units in systematically deployed innovation chains, and provide integrated solutions for industrial technology innovation. Incubate a group of innovation-oriented enterprises that have outstanding core technology capabilities and strong integrated innovation capability, and that lead the development of important industries, and strive to have a batch of enterprises enter the ranks of the world's top 100 innovation-oriented enterprises.

2. Establish world-class universities and curricula. Accelerate establishment of a modern university system with Chinese characteristics, further advance the separation of management,

operation, and evaluation, increase schools' operational autonomy, and perfect the internal governance structures of schools. Guide universities in strengthening their basic research and pursuit of academic excellence, organize interdisciplinary, integrated and cross-over scientific research teams, form a series of strong academic discipline clusters and high-level technological innovation bases, establish a performance-based funding system on the basis of performance capability evaluations, and systematically raise innovation standards with the triad of talent cultivation, curriculum building and science and technology R&D. Build up original innovation capability and the service economy's social development capability, and promote entry by a group of high-level universities and curricula into the world's leading ranks or front ranks.

3. Establish world-class scientific research institutes. Clarify the functional position of scientific research institutes, and enhance their role in basic cutting-edge and industrial key cross-cutting technology R&D. Improve the modern scientific research institute system, and develop corporate governance structures that conform to regular patterns of innovation, embody regional characteristics and implement classified management (分类管理). Centered around the nation's important tasks, effectively consolidate superior scientific research resources, establish comprehensive, top-notch internationalized bases of technology innovation, and in a number of superior fields organize world-class scientific research centers with distinctive features.

4. Develop new types of market-oriented R&D institutions. Centered around the needs of important technologies of a regional or industry-specific nature, carry out diversified investments, diversified models and market-oriented operations, and develop an array of different institutions for R&D, transformation of S&T achievements into commercial products (成果转化), and industry incubation of advanced technologies.

5. Construct a professionalized technology transfer service system. Develop various types of technology services such as those for R&D design, pilot maturation, entrepreneurial incubation, intellectual property, and inspection, testing and certification. Perfect the nationwide market system for technology trading, and develop standardized, specialized, market-based and networked platforms for trading technology and intellectual property. Scientific research institutes and institutions of higher education shall establish specialized technology transfer organizations and teams of professional technology transfer talent, and smooth technology transfer channels.

(vi) Implement significant scientific and technological projects and engineering works, and make key leaps ahead

In key fields relating to national security and long-term development, deploy a series of major technology projects and engineering works.

Looking toward 2020, continue to accelerate implementation of the National Science and Technology Major Projects (国家科技重大专项) already laid out; focus on goals and prominent key points; conquer the key core technologies in the areas of high-end general-purpose chips, high-end CNC lathes, integrated circuit equipment, broadband mobile communications, oil and gas fields, nuclear power plants, water pollution control and treatment, new varieties of genetically modified organisms, new drug creation, and infectious disease prevention and

control; develop a number of strategic technologies and products; and foster emerging industries.

Looking toward 2030, while mindful of what must and must not be done according to circumstances, launch major aviation engine and gas turbine projects as quickly as possible; in such fields as quantum communications, information networks, smart manufacturing and robotics, deep-space and deep-sea exploration, key new materials and new energy, brain science and health care, fully demonstrate the arguments, set the right course, specify the key points, and deploy another set of science and technology projects and engineering works that realize China's national strategic intentions.

The major special projects for 2020 and major science and technology projects and engineering works for 2030 shall form a tiered and sequential systematic layout, with rolling adjustment and optimization carried out in a timely fashion based on new advances in international scientific and technological development and new needs of China's economic and social development. We must fully exploit the advantages of the new national system under socialist market economy conditions, concentrate our strength, make coordinated attacks, exert persistent effort, be unrelenting, accelerate breakthroughs in major core technologies, develop important strategic products, and achieve quantum leaps in national strategic priority fields.

(vii) Establish teams of high-level talent and build a foundation for innovation

Speed up the establishment of teams of leading and highly skilled technology innovation talent. Centered around important academic fields and innovation directions, create a host of world caliber scientists, leading science and technology talents and engineers, and high caliber innovation teams; emphasize cultivation of first-line innovation talent and young science and technology talent; open up special support channels for young talent; and support global talent recruitment by colleges and universities, scientific research institutes and corporations. Advocate a professional spirit of reverence for skill and constant refinement, and in industry after industry, cultivate senior technicians, technology workers and highly skilled talent on a large scale. Optimize the environment for talent development, implement more aggressive policies for incentivizing and attracting innovative and entrepreneurial talent, put into practice earnings and stock option incentive systems for science and technology achievements, and allow various entities and innovative talent in different job positions to all make reasonable returns in the process of commercializing science and technology achievements.

Fully exploit the important role of entrepreneurs in innovation and entrepreneurship, vigorously champion the entrepreneurial spirit, establish a social orientation wherein innovation is glorious and innovation leads to prosperity, protect entrepreneurs' innovation income and property rights in accordance with law, cultivate and train a large contingent of innovation-oriented entrepreneurs that dare to innovate and take risks, and establish specialized, market-oriented and internationalized professional management teams.

Promote innovation in education, reform the modes of talent cultivation, and imbue the entire education process with the scientific spirit, innovative thinking, creativity and a sense of social responsibility. Improve the "dual support" (二元支撑) talent cultivation system for

high-end innovation talent and industrial skilled talent, and strengthen links between ordinary education and vocational education.

(viii) Promote innovation and entrepreneurship and stimulate the creative vitality of the whole society

Establish and improve channels for innovation and entrepreneurship, develop a maker economy, and create a dynamic environment of mass entrepreneurship and innovation.

1. Develop makerspaces (众创空间). Relying on modern information technology such as mobile Internet, Big Data and cloud computing, develop new types of entrepreneurial services, establish an array of low-cost, convenient and open makerspaces and virtual innovation communities, establish multiple forms of incubator organizations, construct an entrepreneurial model of "incubation + venture capital", provide work space, network space, social space and sharing space for entrepreneurs, and lower the costs and barriers for public participation in innovation and entrepreneurship.

2. Incubate innovation-oriented small and micro enterprises. Adapt to the new characteristics of miniaturized, intelligentized and specialized industrial organizations, promote distributed and networked innovation, encourage enterprises to engage in business model innovation, guide social capital to participate in building public service platforms for social technology innovation geared toward small and micro enterprises, push small and micro enterprises to develop toward "specialization, refinement, distinctiveness, and novelty" (专精特新), and let a host of small and micro enterprises brimming with innovative vitality spring up continually.

3. Encourage innovation by all. Push the maker culture into schools, establish innovation and entrepreneurship courses and programs, conduct product branding maker activities, and encourage students to take action with hands-on entrepreneurship. Support involvement by corporate employees in process improvement and product design, encourage micro-innovation, micro-entrepreneurship, minor inventions, and small improvements that benefit everyone, and transform fanciful thinking and innovative creativity into real entrepreneurial activity.

## **V. Strategic Safeguards**

To implement the innovation-driven development strategy, it is necessary to bolster safeguards in terms of system reform, environment creation, resource inputs, expanding openness and other aspects.

(i) Reform the innovation governance system

Conform to the new trend of innovation having a diversity of entities, a diversity of activities, and changing paths, promote innovation in government administration, and form a new pattern of innovation governance that features diverse participation and synergies.

Establish a high-level national innovation policymaking consultation mechanism, regularly report to the CPC Central Committee and the State Council on foreign and domestic developments in technological innovation, and propose significant policy recommendations. Transform the government's innovation administration function, and rationally define the functions of government and the market. Strengthen the government's functions, including

strategic planning, policymaking, environment creation, public services, oversight and assessment, and major task implementation. With respect to development of new technologies, new products and new business forms of a competitive nature, decisions should be made by markets and enterprises. Establish innovation governance and social participation mechanisms, and fully leverage the roles played by various industry associations, foundations, and science and technology groups in innovation-driven development.

Rationally determine the functional division of labor among the central government departments, and make full use of the roles played by industry departments in summarizing new innovation demands, organizing and implementing tasks, the extension and application of achievements, and other aspects. Scientifically divide central and local government management authority for science and technology, with the central government's functions focused on the tasks that are overall, fundamental and long-term in nature, and local governments' functions focused on promoting technology development and transformation into applications.

Construct a basic system of national science and technology management. Refashion the science and technology plan management system, improve and optimize the national science and technology plan management process, establish a national science and technology plan management information system, and construct a monitoring and assessment system covering the entire process. Improve the national science and technology reporting system, establish an open sharing system for major national scientific research infrastructure and science and technology basic resource platforms, and promote the opening of science and technology resources to various kinds of innovation entities. Establish a national innovation survey system, and guide different localities in adopting an innovation development orientation.

(ii) Increase innovation investment through multiple channels

Effectively strengthen steady support for basic, strategic and public interest research, and improve mechanisms to coordinate steady support and competition-based support. Reform the management of central government fiscal plans and funds for science and technology, and increase efficiency in the use of funds. Improve preferential policies for encouraging corporate R&D, and guide enterprises to become technology investors.

Explore establishing financial service models that conform to China's national conditions and are suited to the development of science and technology-based startup enterprises. Encourage innovation in financial products by banking/financial institutions, expand the innovation support function of the multi-layer capital market, actively develop angel investment, enlarge the scale of venture capital investment, and utilize Internet finance to support innovation. Thoroughly leverage the role of various funds in supporting the transformation of S&T achievements into commercial products, innovation by small and medium-sized enterprises, incubation of emerging industries and other areas, and guide and drive investment of social capital in innovation.

(iii) Comprehensively promote openness and innovation

Seize the historic opportunities in the accelerating flow of global innovation resources and China's rising economic position, and boost China's ability to allocate innovation resources at the global level. Support deployment of globally oriented innovation networks by corporations,



encourage the establishment of overseas R&D centers, carry out mergers and acquisitions of, and joint venture investment and equity participation in, innovation-oriented enterprises and R&D institutions, and increase operational capabilities with respect to overseas intellectual property. Encourage China's advanced technology and equipment to go global (走出去), with particular focus on satellites, high-speed rail, nuclear energy and supercomputers. Encourage foreign investment in strategic emerging industries, high-tech industries and modern service industries, support establishment of R&D centers in China by multinational companies, and successfully attract a combination of foreign investment, talent, and technology.

Participate in-depth in global governance of technological innovation, proactively set the topics of discussion on global innovation, participate actively in the formulation of major rules on international scientific and technological cooperation, and jointly respond to global challenges such as food security, energy security, environmental pollution, climate change and public health. Enrich and deepen the innovation dialog, focus on the strategic concept of "the Belt and Road" [the Silk Road Economic Belt and the 21<sup>st</sup> Century Maritime Silk Road] and the blueprint for Asia-Pacific connectivity, and cooperate on establishing cutting-edge national bases of technology innovation. Actively participate in and guide Big Science plans and projects, and raise the external openness level of national science and technology plans.

(iv) Improve the evaluation system oriented toward outstanding innovation

Based on the regular patterns and characteristics of different innovation activities, establish and improve the scientific classification-based institutional system for innovation assessment. Promote classification-based evaluation of colleges and universities and scientific research institutes, implement performance evaluation, include the economic and social impact of technology transfer and scientific research achievements among the evaluation indicators, and take the evaluation results as an important basis for government science and technology funding support. Improve the talent evaluation system, further reform and improve the professional title assessment system, and increase employers' autonomy in evaluations. Pursue third-party evaluation, explore establishment of evaluation systems with participation by multiple parties, including the government, social organizations and the public, and expand public (社会化), specialized and international evaluation channels. Reform the national science and technology reward system, optimize the structure, reduce the quantity and increase the quality, gradually change from a reporting-based to a nomination-based system, and reinforce incentives for people. Develop social awards (社会奖项) that have their own brands and credibility. Improve the system of national accounts, gradually explore including R&D spending that reflects innovation activity in investment statistics, reflect the contribution of intangible assets to the economy, and highlight innovation activity investments and results. Reform and improve the state-owned enterprise evaluation mechanisms, and make R&D investment and innovation performance important assessment indicators.

(v) Implement intellectual property (IPR), standards, quality and brand strategies

Speed up the building of an IPR superpower (知识产权强国). Deepen reform in the field of IPR, further implement the IPR strategy action plan, and increase capabilities for the creation, utilization, protection and administration of IPR. Guide support for market entities to create and utilize IPR, use IPR benefit sharing mechanisms as links, and promote turning innovation results into IPR. Give full play to the guiding role of judicial protection of IPR, strengthen

awareness of IPR protection among the whole people, and reinforce the basic safeguard role of the IPR system with respect to innovation. Improve the antitrust review system for preventing abuse of IPR, and establish mechanisms for international investigation of IPR infringement and for overseas rights protection.

Raise the level of China's standards. Strengthen development of basic general standards, improve support mechanisms for technology innovation, patent protection and standardized interaction, and convert advanced technology into standards in a timely fashion. Promote adoption of international advanced standards by Chinese industries, strengthen formulation and implementation of mandatory standards, form standards groups to support industry upgrading, and raise the levels of industry technology standards and industry access across the board. Support Chinese enterprises, associations, and groups in either participating in or leading international standard-setting, and advocate for superior Chinese technologies and standards to become the international standards.

Promote China as a quality superpower (质量强国) and promote Chinese brands. Improve the quality integrity system, and form a host of superior enterprises and industry clusters with outstanding brand image, robust service platforms and first-class quality levels. Formulate international standards for brand evaluation, establish an internationally recognized brand evaluation system, and promote the internationalization of superior Chinese brands.

(vi) Cultivate an innovation-friendly social environment

Improve the legal environment for protecting innovation. Accelerate the progress of legislation on innovation's weak links and areas, amend regulatory documents that do not conform to an innovation orientation, get rid of institutional regulations that inhibit innovation, and construct a comprehensive and nuanced system of legal safeguards.

Foster an open and fair market environment. Speed up the breaking through of industry monopolies and market segmentation. Strengthen the guiding role of demand-side innovation policies, establish a government procurement system that conforms to international rules, utilize first piece or set (首台套) ordering, preferential taxation, insurance and other policy measures, lower enterprises' innovation costs, and enlarge the market space for new products and services. Push forward market reforms of factor price formation mechanisms, strengthen rigid energy resource and ecological constraints, increase the weight given to science and technology, talent, and other innovation factors in product prices, and allow those who are good at innovation to reap greater competitive advantages.

Create a cultural environment that reveres innovation. Vigorously publicize the patriotic dedication, inspirational success stories and lofty spirit of science and technology workers, create throughout the society an innovation culture that encourages innovation and the pursuit of excellence, and push for innovation to become an important part of the national spirit. Advocate an academic culture of letting a hundred schools of thought contend (百家争鸣) and respecting scientists' personalities, and reinforce their confidence to innovate—to dare to be first, take risks and question boldly. Emphasize the value of trial and error exploration in scientific research, and establish fault tolerance and error correction mechanisms to encourage innovation and tolerance of failure. Create a relaxed scientific research atmosphere, and safeguard the academic freedom of science and technology personnel. Strengthen the building

of scientific research integrity, guide all science and technology workers to scrupulously adhere to academic ethics, and uphold social responsibilities. Strengthen science education, enrich the content and forms of science education, and stimulate young people's interest in science and technology. Strengthen the popularity of science and technology, raise the science literacy of the whole people, and fashion a spirit of scientific rationality throughout society.

## **VI. Organization of Implementation**

Implementing the innovation-driven development strategy is an important historic mission of our Party in the new period. The entire Party and nation must be united in their thinking, Party committees and governments at all levels must effectively strengthen their sense of responsibility and urgency, coordinate overall planning, deploy systematically, organize carefully, and progress firmly.

**Strengthen leadership.** In accordance with the unified arrangements of the CPC Central Committee and the State Council, the State S&T Structural Reform and Innovation Structural Construction Leading Group (国家科技体制改革和创新体系建设领导小组) shall be responsible for the specific organization and implementation tasks of this *Outline*, for strengthening research and review of the major strategic issues of innovation-driven development, and for directing promotion of the *Outline's* implementation.

**Division of labor and coordination of work.** The relevant departments of the State Council and the military, and all provinces (and autonomous regions and municipalities directly under the central government) must formulate specific implementation plans based on this outline, strengthen their overall awareness and awareness of responsibilities, enhance coordination and create synergies.

**Carry out pilot projects.** Strengthen task decomposition, specify the responsible units and progress arrangements, and formulate annual and phase-by-phase implementation plans. Specific plans must be formulated for major reform tasks and key policy measures, and pilot projects shall be carried out.

**Monitoring and evaluation.** Improve assessment mechanisms oriented toward innovation development, make innovation-driven development results an important indicator for assessment, and guide cadres everywhere to adopt the correct view on political achievements (正确政绩观). Strengthen innovation surveys, and establish regular monitoring and evaluation and mechanisms for rolling adjustment.

**Strengthen propaganda.** Handle public propaganda well, with timely propaganda reporting on new advances and achievements in innovation-driven development, make the innovation-driven development concept the consensus throughout society, and mobilize the entire society's enthusiasm for participating in and supporting innovation.

The whole party and society must closely unite around the CPC Central Committee with Comrade Xi Jinping as the general secretary, concentrate efforts from all quarters on innovation-driven development, and fight hard to comprehensively build an innovation-oriented country and to achieve the Chinese dream of the great rejuvenation of the Chinese nation.

