2009
中国创新发展报告

The Report on Innovation and Development in China 2009

中国科学院创新发展研究中心 著

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内 容 简 介

《2009 中国创新发展报告》是中国科学院创新发展研究中心计划发布的第一个年度报告。本报告提出了国家创新发展的概念，阐述了创新型国家的内涵，并从创新发展和创新能力两个角度细化了创新型国家的表述。本报告从国家创新发展、国家创新能力、知识产权发展、技术标准发展、制造业创新能力、区域创新能力和企业创新发展等方面全面分析了中国建设创新型国家面临的机遇与挑战，研究评估了中国创新发展与能力建设的进展和发展趋势，提出了中国创新发展思路和政策框架。

本报告有助于各级决策部门和公众了解国家创新发展与创新能力演进，可供各级领导干部、企业高级经理和相关领域专家学者及社会公众参考。

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序

把握创新发展方向 建设创新型国家

中国的现代化是人类现代化进程中的大事件、大变革。新中国成立 60 年特别是改革开放 30 年来，我国经济社会发展取得了举世瞩目的成就，国际地位显著提升，科技在推进现代化建设和维护国家安全中做出了重要的历史性贡献。要让十三亿人过上更高水平的小康生活，实现中华民族的伟大复兴，迫切需要用创新的思维谋划未来发展，发挥中华民族的聪明才智，走出一条中国特色创新发展道路。

2006 年，国务院颁布实施《国家中长期科学和技术发展规划纲要（2006—2020 年）》，明确提出到 2020 年进入创新型国家行列的宏伟目标，并从经济、社会和科技发展全局出发，做出了一系列战略部署，领导全国人民迈开了建设创新型国家的步伐。几年来，我国自主创新能力已经显著提升，创新支撑经济社会发展的作用不断增强。实践证明建设创新型国家是一项伟大而艰巨的任务，是一项系统工程，涉及到政治、经济、社会、科技、教育和文化等各个方面，需要把握创新发展方向，加快推进创新型国家建设。

一是要深化对创新型国家内涵的认识。准确把握创新型国家的内涵是建设创新型国家的基本前提。要把握创新型国家发展驱动力的演进，把握创新型国家“创新体系健全、创新效率高、创新效益好、创新环境优良”等特征，并在实践中总结深化和不断丰富对中国特色创新体系特点、规律和动力的认识，提出建设创新型国家的新思路和新举措。

二是要建设运转高效的国家创新体系。企业是技术创新的主体，高等院校和科研院所是知识创新的主体。未来相当长一段时间内，我国需要大力提升各主体的创新能力，尤其是要尽快提升企业的创新能力。同时，要大力破除产学

研合作的体制机制障碍，促进经济、科技和教育的紧密结合，形成各司其职、适度交叉、开放合作、创新奋进的创新格局。

三是要切实提高创新的投入产出效率。合理配置创新资源是提高创新效率的基础。要加强科技发展战略研究，把握科技发展方向，加强科技能力建设的远中近纵深布局，引导社会资源将有限的创新资源配置到最需要、最有效率的地方。同时要切实改革科技评价制度，用正确的导向引导创新活动的方向，提高创新活动的效率。

四是要提高自主创新的经济社会效益。面对日趋激烈的国际竞争局面和国内人口资源环境等约束，我国必须立足基本国情，着力提高自主创新能力和经济社会效益，着力推进创新产业和战略性新兴产业发展，着力推进产业结构优化升级，着力解决生命健康、生产生活安全等重大民生问题，转变发展方式，为建设富强、民主、文明、和谐的社会主义现代化强国提供有力支撑。

五是要大力营造创新友好的发展环境。要加强国家自主创新政策研究和实施情况监测，不断优化完善相关的法律法规和政策，加强执法监督，加大财税、金融、政府采购等政策支持和知识产权保护力度，形成支持创新、激励创新和保护创新的社会文化环境，加速创新要素向企业集聚，分担和降低企业自主创新风险，引导全社会走中国特色创新发展道路。

研究出版《中国创新发展报告》，是监测创新型国家建设进程，识别突出问题的一次有益尝试。希望中国科学院创新发展研究中心不断深化对建设中国特色创新型国家规律的认知，不断深化对我国国情的研究和认知，不断深化创新发展和创新能力演进的动力机制研究，为提高国家自主创新能力做出更大贡献。

2009 年 9 月

序

加强创新监测，服务政府决策

党的十七大明确要求，把提高自主创新能力、建设创新型国家作为国家发展战略的核心和提高综合国力的关键，把增强自主创新能力贯彻到现代化建设的各个方面。近年来，国务院颁布实施了《国家中长期科学和技术发展规划纲要（2006—2020 年）》及配套政策和实施细则，促进自主创新成果产业化、数字电视、软件集成电路等产业创新政策，激励企业创新的财政、金融、税收等专项政策，初步形成了中国激励自主创新的政策体系，进一步增强了创新发展后劲，以企业为主体的技术创新能力正在逐步提升。中国的国际科技论文、国内专利申请和授权、国际专利申请、高技术产业规模等已居世界前列。自主创新对经济社会发展的支撑作用明显增强。

在经济全球化背景下，发达国家纷纷调整创新战略和政策，提高创新资源配置效率，进一步强化竞争优势。发展中国家不得不面对更加激烈的人才竞争以及越来越高的技术壁垒，创新发展的门槛不断提高。中国作为发展中大国，在经济社会转型期如何通过有效的政策调整来增强自主创新能力，缩小与发达国家的创新能力差距，实现跨越式发展，是需要深入研究的问题。

创新监测是创新战略和创新政策制定的重要基础。欧美发达国家十分重视创新监测的研究工作，形成《欧洲创新记分牌》、《构建创新型欧洲》、《逐鹿高端》、《创新美国》等报告，对有关政策调整产生了重要影响。中国正处于创新发展的关键时期，如何结合国情，探索科学有效的创新监测体系和方法，服务于创新政策调整和制定，显得尤为迫切。

《2009 中国创新发展报告》是目前国内系统研究创新发展的一次重要尝试，通过构建指标体系，监测中国创新发展水平、国家创新能力、区域创新能力、制造业创新能力、企业创新能力等方面的演进情况，比较分析中国与主要国家在创新发展水平和创新能力方面的差距，结合全球化发展趋势和创新型国家建设的现实需要，提出推进中国创新型国家建设的初步政策思路，对于政府决策和政策调整具有一定的参考价值。

《2009 中国创新发展报告》属首次公开出版，在创新监测体系和方法等方面还有许多值得探索的地方。衷心希望中国科学院创新发展研究中心继续开展相关理论和方法研究，不断深化创新发展监测分析，为政府调整和制定创新政策提供决策参考，为社会各界全面了解国内外创新进展情况提供更多有益的借鉴。

2009 年 4 月

前言

21 世纪头 20 年，是我国推进发展方式转变和自主创新能力建设的重要战略机遇期，是奠定全球科技、经济大国地位及实现全面建设小康社会目标的关键时期。面对经济和科技全球化引发的复杂多变的国际竞争格局，面对日益严峻的人口、资源和环境压力，中国创新发展必须坚定不移地把提高自主创新能力作为国家发展战略的核心，把握跨越发展机遇，全面推进创新型国家建设，走出一条有中国特色的创新发展道路。

《2009 中国创新发展报告》是中国科学院创新发展研究中心计划发布的第一个年度报告。本报告提出了国家创新发展的概念，阐述了创新型国家的内涵，并从创新发展和创新能力两个角度细化了创新型国家的表述。本报告从国家创新发展、国家创新能力、知识产权发展、技术标准发展、制造业创新能力、区域创新能力和企业创新发展等方面全面分析了中国建设创新型国家面临的机遇与挑战，研究评估了中国创新发展与能力建设的进展和发展趋势，提出了中国创新发展思路和政策框架。

《中国创新发展报告》研究组组长穆荣平研究员负责本报告的总体设计、重要概念确定和研究统稿组织工作。《中国创新发展报告》研究组成员连燕华、任中保、宋河发、陈芳、赵朝义、刘海波、曲婉、樊永刚等执笔有关章节，刘建兵、张洪石、魏诗洋、温珂、郭雯等参与了本报告部分起草过程或提交了相关研究报告，其他专家参与了本报告构思和讨论。本报告中有关创新发展水平、创新能力评价的指标体系和方法是《中国创新发展报告》统稿组集体智慧

的结晶，凝聚了中国科学院创新发展研究中心研究人员长期研究积累和 2 年多的辛勤劳动与汗水，汇集了本报告撰写特别邀请的国内著名专家学者的智慧。在本报告研究起草过程中，得到了国家发展和改革委员会、中国科学院有关领导的亲切指导和热情帮助，中国科学院路甬祥院长、国家发展和改革委员会张晓强副主任审阅了报告并作序。国家发展和改革委员会高技术产业司有关领导听取了《中国创新发展报告》研究组的专题汇报，并对本报告定位、内容和形式提出很好的建议。

本报告是探索中国创新发展道路的有益尝试。由于本报告涉及问题复杂多变、涉及学科较多等原因，特别是限于《中国创新发展报告》研究组的知识水平和能力，本报告一定有许多问题值得进一步深入研究和探讨。我们希望与国内外有志于国家创新发展和创新能力演进机理研究的学术界同行及政府管理部门、企业的专家一起，丰富创新发展理论研究，推进创新发展实践。

中国科学院创新发展研究中心

2009 年 9 月

Executive Summary

The Report on Innovation and Development in China 2009

Chinese government has issued the Outline on National Medium- and Long-term Plan for Science and Technology Development (2006 - 2020) in February 2006, with a very ambitious goal to become innovation-driven country by 2020. In order to strengthen the research on national innovation policy and strategy, NDRC and Chinese Academy of Sciences (CAS) has established the CAS Center for Innovation and Development (CID) with support of National Development and Reform Commission (NDRC) on 14 February 2007. The main tasks for CID are to conduct theoretical studies on innovation and development, to monitor the effectiveness of innovation policy by survey and the progress in building innovation-driven country by establishing indicators system for evaluation of innovative development level and innovation capacity, and to provide scientific evidence-based policy recommendations to decisionmakers.

The purpose to publish the Report on Innovation and Development in China is to identify key issues concerning innovation development in China and provide some foresighted recommendations for decisionmakers. The report consists of many important issues such as national innovative development, national innovation capacity-building, manufacturing innovation capacity-building, regional innovation capacity-building, IPRs development and technical standards development as well as the enterprises' innovative development in China.

Building Innovative China by Holding Strategic Opportunities in Globalization Era

Globalization has become important driving force for innovation-driven development. Globalization accelerates the flow of innovation resources, promotes global cooperation in the fields of science & technology (S&T) and innovation as well as economy, and results in global competition for resources and markets, which makes most countries try to catch the development opportunities by overcoming the challenges related. Meanwhile, the globalization has raised the threshold for developing countries to catch up.

During past four years, many countries and international organizations have issued numerous important reports and laws & regulations aiming to strengthen their innovation capacity and competitiveness by holding strategic opportunities in globalization era. For example, the American Innovation and Competitiveness Act of 2006 issued by US Congress, the Creating an Innovative Europe issued by Europe Communities in 2006, the Race to the Top: A Review of Government's Science and Innovation Policies issued by UK's Lord Sainsbury of Turville in 2007, the Innovation 25 issued Japanese Abe administration in 2006, and the National Innovation Act of 2008 issued by India government. Furthermore, many countries have strengthened the strategic management of innovation so as to build innovation capacity and competitiveness by adjusting governments' role in innovation management and implementing key initiatives of science & technology and innovation.

Chinese government promotes to build innovation-driven China by taking lots of measures during past three years. Chinese government has issued the Supportive Policies for Implementing the Outline on National Medium- and Long- term Plan for Science and Technology Development (2006 - 2020) in February 2006. Thereafter, Chinese governments have issued 78 detailed document policies and regulations. Meanwhile, China has revised the Law of the People's

Republic of China on Science and Technology Progress and the Patent Law of the People's Republic of China, issued the Outline of the National Intellectual Property Strategy, which play important role in building innovation-friendly environment in China. Besides, Chinese government has taken many measures to promote the regional innovation development and sectoral innovation development.

The capacity building for innovation has become the core of national development strategies in China, and results in a fundamental change in national innovation strategy and related policies, which have played important role in encouraging innovation, especially in attracting enterprises to increase their R&D expenditures. In 2008, total R&D inputs of China reached 457 billion RMB, about 1.52% of GDP. Enterprises' R&D expenditures reached 268.2 billion RMB in 2007, about 72.28% of the total R&D expenditures in China. However, there are still lots of problematic factors that constrain the capacity building for innovation and the innovation-driven development, including low productivity in science & technology and innovation in terms of IPRs and economic & social development, increasingly bigger gap among east, middle and west regions in science & technology and innovation as well as social & economic developments. Therefore, it is necessary to develop effective methodologies for monitoring China's progress in innovative development and capacity-building for innovation and to measure the gap between China and main countries so as to adjust national innovation strategy and related policies. This report mainly focus on issues such as national innovative development, national innovation capacity, the development of national IPR and technical standardization, the innovation capacity for manufacturing, the regional innovation capacity, and enterprise innovation capacity in China.

National Innovative Development of China

Innovative development means a development driven by innovation, which

concerns the effectiveness, efficiency and efficacy of innovation activities. The level of national innovative development could be influenced by progress in five aspects, namely: the industrialization with more consideration on resource-saving and environment-protecting, the informationization, the urbanization, the education and health, and the science & technology and innovation, which reflects not only the social & economic development driven by innovation, but also the development of science & technology and innovation. The National Innovative Development Index (NIDI) consists of 5 sub-indexes and 19 indicators. 34 countries① are selected for comparative studies.

China's NIDI experienced a fast growth, with an average annual growth rate of 5.31% from 2000 to 2006. However, there is still a big gap between China and developed countries in NIDI. China's NIDI only reached 20.94, far behind that of Sweden (67.01), ranking the 32nd in 2006. The 5 sub-indexes (industrialization, informationization, urbanization, education and health, and S&T and innovation) ranked the 34th, 33rd, 33rd, 28th, 30th among 34 countries respectively in 2006. China's average annual growth rates of 5 sub-indexes of innovative development index from 2000 to 2006 are 5.88%, 27.93%, 7.48%, 2.76% and 12.97% respectively, and ranking the 30th, 4th, 1st, 3rd and 3rd.

In order to increase the innovative development level, this report put forwards five tasks, namely: to cultivate and attract top scientists, investors, entrepreneurs for innovation and entrepreneurship; to enhance investment in building innovation infrastructure and facilities; to develop lots of crucial technologies and to integrate advanced technologies so as to accelerate the optimization of industrial structure and the industry upgrading; to increase education

① 34 countries include Switzerland, Japan, Sweden, Norway, US, Finland, UK, Netherlands, Germany, France, Belgium, Ireland, Austria, Australia, Canada, Korea, Italy, Spain, Portugal, Slovenia, Greece, Czech, Hungary, Argentina, Poland, Slovakia, Mexico, Brazil, Russia, Turkey, Romania, South Africa, India and China

and health inputs greatly; and to create innovation-friendly environment. China's NIDI will rank in top 20 countries by 2020 if China makes great progress in industrialization, urbanization, and informationization.

National Innovation Capacity of China

National Innovation Capacity is the ability of a country to conduct scientific discovery, technological innovation and related commercialization activities. In a broad sense, it is the ability of a country to integrate innovation resources so as to transform them into fortune, an integrative capacity to promote social & economic development, which means that it is necessary to describe National Innovation Capacity from four aspects, namely: innovation input, innovation output, innovation condition, innovation performance. National Innovation Capacity is determined not only by the efficiency & intensity & density of innovation, but also by the scale of innovation activity. Therefore, the national innovation capacity is described by two concepts, namely the innovation strength and the innovation effectiveness. National Innovation Capacity Index (NICI) consists of two sub-indexes and 25 indicators. 38 countries① are selected for comparative studies.

China's NICI increased remarkably from 6.96 in 2000 to 19.59 in 2007, mainly resulting from the scale expansion of innovation activities instead of the efficiency, effectiveness and efficacy of innovation activities. The strength index of national innovation of China has increased from 8.60 in 2000 to 29.06 in 2007, while the effectiveness index of national innovation of China increased from 5.32 in 2000 to 10.12 in 2007. However, there is still a big gap between China and developed countries in NICI. China's NICI was only 29.25% of that

① Thirty eight countries include United States, Japan, Germany, Sweden, United Kingdom, France, Israel, Netherlands, Finland, Canada, Iceland, Luxemburg, Singapore, Norway, Australia, Austria, Ireland, Belgium, New Zealand, Italy, Spain, Portugal, South Africa, Greece, Hungary, Korea, Russia, Brazil, India, Mexico, Slovenia, Czech Republic, Slovakia Republic, Poland, Argentina, Turkey, Romania, and China

of US, ranking the 17th in 2006. During 2000 to 2006, China experienced the fastest growth of national innovation capacity among all the 38 countries, with an annual growth rate of nearly 16%.

China's NICI will rank in top 2 countries by 2020 if China makes great progress in innovation input, innovation output, innovation condition, and innovation environment, especially the improvement of innovation policy and environment as well as infrastructure. However, the effectiveness index of national innovation of China will be still lower than that of many developed countries by 2020.

Development of Intellectual Property Rights in China

China has established an advanced legal system for IPRs. The capacity to create, utilize, protect and manage IPRs has been dramatically enhanced. The State Intellectual Property Office of China (SIPO) had received 4,028,520 applications for invention, utility model and industrial design patent by 2007. The number of invention patent applications received by SIPO increased from 8,558 pieces in 1985 to 245,161 pieces in 2007. China has become the largest country in terms of trademark applications and registrations in the world since 2002. China has joined in 17 of the total 31 international IPR treaties, conventions or agreements so far. China has issued a series of laws and regulations on IPRs so as to enhance the capacity for innovation and IPRs development, such as Law on Science and Technology Progress, Government Procurement Law, Enterprise Income Tax Law, and Anti-monopoly Law.

National Capacity Index for IPR Development (NCIID) of China consists of 14 indicators. 38 countries[①] are selected for comparative studies. China's

① Thirty eight countries include United States, Japan, Germany, Sweden, United Kingdom, France, Israel, Netherlands, Finland, Canada, Iceland, Luxemburg, Singapore, Norway, Australia, Austria, Ireland, Belgium, New Zealand, Italy, Spain, Portugal, South Africa, Greece, Hungary, Korea, Russia, Brazil, India, Mexico, Slovenia, Czech, Slovakia, Poland, Argentina, Turkey, Romania, and China

NCIID increased from 3.39 in 2000 to 10.92 in 2007, with an average annual growth rate of 18.21%, mainly resulted from the scale expansion of innovation activities. The strength index of IPRs development increased from 2.68 in 2000 to 15.33 in 2007, with an average annual growth rate of 28.30%, while the effectiveness index of IPRs development increased from 4.09 in 2000 to 6.51 in 2007, with an average annual growth rate of 6.85%. China ranked the 11th in 38 countries in terms of NCIID in 2006, the first in terms of average annual growth rate of NCIID from 2000 to 2006. Therefore, China will list in world powerful countries in terms of NCIID by 2020 if China could keep such a high growth rate of NCIID in the future.

Development of National Technical Standards in China

The technical standard system of China comprises national standards, industry standards, local standards and enterprise standards. China had 21,569 units of national standards in use by the end of 2007, 3,136 of which were mandatory standards, accounting for 14.53% of the total. China had accumulated 36,589 units of industry standards registered and 12,003 units of local standards registered by the end of 2007. These standards have played important role in improving the quality of products, reducing the production cost and promoting the development of economy. Among the 21,569 units of national standards in use, 10,024 of which belonged to the adoption of international standards and foreign advanced standards, accounting for 46.47% of the total national standards in use. Among the adopted national standards, 5,157 units from ISO, 2,184 units from IEC, 319 units from ISO/IEC, 50 units from ITU, 2,314 units from others by the end of 2007.

The Standardization Administration of the People's Republic of China is in charge of the unified management of the national standardization work. There were 702 technical organizations of national standardization in China by the end of 2007, including 295 national standardization technical committees (TC), 403

subcommittees (SC) and 4 standardization working groups (WG), which are in charge of organizing the development, modification and maintenance of national standards. 72.54% of secretariats of TC and 63.52% of secretariats of SC affiliated at research institutes by the end of 2007.

China undertook the secretariat work of 20 TC/SC of ISO, and participated in 80% secretariat work of 743 TC/SC of ISO by the end of 2007, while undertaking the secretariat work of 4 TC of IEC, and participating in the secretariat work of all 173 TC/SC of IEC at the same period. China submitted 111 international standard proposals to ISO and IEC, 56 of which have become the international standards published, and 55 of which have been in the process of development.

According to the 11th Five-year Development Plan for Standardization issued in 2006, four tasks have given high priorities, including: to innovate the mechanism of standardization, to strengthen standardization of key fields, to enhance the standardization level by strengthening the scientific and technological research for standardization, and to participate substantially in international standardization activities.

Manufacturing Innovation Capacity of China

Manufacturing Innovation Capacity is the capability of manufacturing to carry out technology development, diffusion, application and other innovation activities so as to achieve social & economic performance under certain conditions. In broad sense, manufacturing innovation capacity is a wide range of the capability of manufacturing enterprises to integrate innovation resources so as to transform them into wealth. Therefore, manufacturing innovation capacity is described from three aspects such as innovation input, innovation output, and innovation performance. Manufacturing Innovation Capacity Index (MICI) consists of two sub-indexes (the strength for innovation and the effectiveness for innovation) and 27 indicators. 29 industries of Chinese manufacturing are se-