

国家自然科学基金“八五”重大项目研究成果专著

技术创新研究

第一辑

技术创新研究项目办公室 编

邓寿鹏 主编

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内 容 简 介

本书共收集有关技术创新研究中、英文论文 37 篇,内容涉及技术创新的机制与模式(7 篇)、技术创新与经济发展的关系(6 篇)、技术创新的区域研究(5 篇)、技术创新政策与政府管理(11 篇),另有英文论文(8 篇)。各篇论文独立一题,但又互相关联,这些论文反映了我国技术创新研究的理论取向、产业实践、区域状况和政府管理等诸多方面。读者从中可获得比较清晰的技术创新研究总体概貌。本书可供从事技术创新研究开发人员、高校师生、各级政府管理干部、企事业管理人员参考。

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前 言

本世纪初叶,约·阿·熊彼特(J. A. Schumpeter, 1883—1950)提出创新(Innovation)一词,自此以后,创新的含义随着时代的进步有了新的发展。创新不只是在技术与经济之间的某种联系,而是在经济、科技、社会诸多领域中都有广泛的意义。从全社会的广视角观察:创新是指由构想新概念到形成生产力并成功地进入市场的全过程。创新包括观念创新、运作创新、绩效创新三个环节,环环相扣,构成由新的“观念”指导下的新的“运作”和取得新的“绩效”的链式结构。每个链节上都开展创造性的综合活动,同时取得反馈信号对运作进行调控,从而不断改善创新过程,谋求最佳的创新成果和效益。

当代的创新具有思维性、创造性、阶段性、风险性、效益性、周期性、社会性、国际性等8大基本特点。创新已不局限于某些个人、群体和社区,也不局限于工艺、产品 and 市场等环节,而是在世界范围内运作一切生产要素和社会资源,进行广域的技术创新、组织创新、制度创新和市场创新活动,为科技进步和经济发展提供不竭的动力和源泉。今天,各国都在谋求通过持续的创新提高综合国力和国际竞争力,使自己占有国际社会中的一席之地。在这个意义上,创新已成为一个国家在竞争加剧的国际环境中赖以生存和发展的基础,是关系国家强弱盛衰的命脉,自然引起了各国学术界、产业界、管理界的高度重视。

70年代末期,产业和企业的创新活动逐步成为各国政府和国际组织关注的热点,技术创新研究成为管理学科领域的前沿课题。许多发达国家和发展中国家以及有影响的国际组织,先后开展了技术创新理论的探索和实证调查。在此基础上,各国纷纷制定和实施了促进创新的政策、法律和组织措施,推动了产业的技术进步和经济高质量增长,取得了明显的经济效益和社会效益。

鉴于技术创新理论和实践的深化以及它对国家发展的重大作用,1989--1992年期间,中国国家自然科学基金委员会(NSFC)率先连续支持中国学者在这一领域的25项专题研究,为组织具有规模的系统性纵深研究打下了基础。经过5年的酝酿、准备、预研和竞标,NSFC将《技术创新研究》列入“八五”期间管理科学唯一的重大项目。1993年3月,正式启动,按预定计划,应于1997年3月完成。

本项目《技术创新研究》的主题是广义的技术创新,其范围涉及创新构想到获得实际应用,产生经济、社会效益的商品化及产业化等有关活动。这些活动主要包括:新产品、新工艺、新服务的创造和改进;新生产方式、新组织体制和新管理系统的建立和运行;新资源(人、财、物)的开发和利用;新需求、新市场的开拓和占领。研究工作针对上述活动的若干具有典型意义的事件和现象进行实证分析和理论发掘,以期揭示科学技术创新与经济社会发展的基本规律,阐明经济社会发展需求与科学技术创新供给之间的协同机制,探索促进中国技术创新及其扩散,提高经济增长质量与速度的有效途径,为中国管理科学的理论发展和学科建设,为建立中国的国家创新体系奠定基础。

《技术创新研究》自启动以来,在NSFC管理科学部和本项目学术领导小组的指导下,从创新理论、创新模式、创新实证、创新政策四个方面并行展开研究工作,通过参研人

员的共同努力已取得一批阶段性研究成果。这批成果中的某些观点和建议,在国内的内部或公开的传媒上发表后,引起了各主管部门和当地政府的重视,扩大了 NSFC 重大项目的影 响,促进了企业、行业和区域的技术创新活动。由于技术创新是当前国际管理科学界十分活跃的研究领域,每年在世界各地都举行许多重要的国际会议进行研讨,本项目参研人员已分 别在北京、澳门、东京、岩手、迈阿密、墨西哥等地举行的国际会议上应邀作大会报告或宣读论文,沟通了与有关国家和地区的研究合作,传播了中国技术创新研究的新近成果,获得了国际同行的支持和好评。

为了更广泛地与国内外有关专家、学者、企业领导人和政府官员交流、切磋,现从本项目第一研究年度(1993.3—1994.2)产出的 55 篇中文、英文论文中精选 37 篇汇编为本书——《技术创新研究·第一辑》。本书所选辑的论文包括技术创新的机制与模式(7 篇),技术创新与经济发展的关系(6 篇),技术创新的区域研究(5 篇),技术创新政策与政府管理(11 篇),另有英文论文(8 篇)。各篇论文独立一题,但又相互关联,由此,读者可以窥见中国技术创新的理论取向、产业实践、区域状况和政府管理等诸多侧面,从而获得比较清晰的总体概貌。

本项研究及其成果,体现了贯彻经济体制由传统的计划经济体制向社会主义市场经济体制转变,经济增长方式由粗放型增长向集约型增长转变的方针,为企业和政府推进技术创新活动提供了总体思路和政策建议,受到了各方面的欢迎和重视。在本书出版之际,项目主持人致函国务院副总理吴邦国同志,全国人大副委员长王光英同志,国务委员、国家科委主任宋健院士,全国政协副主席、中国工程院院长朱光亚院士,国家自然科学基金委员会主任张存浩院士汇报研究进展及出版意义,请求为本书题词。五位领导同志在国务、公务百忙中都欣然命笔,为本书做了题词。这些题词传达了他们对技术创新研究的热情指导和支持,对参研人员是极大的鼓舞和鞭策。对此,谨向他们致以衷心地感谢!全体参研人员决心以此为动力,在现有研究的基础上,继续深入研究,争取更多更好的成果。

本书的编辑、出版得到了本项目各课题负责人傅家骥教授、许庆瑞教授、贾蔚文研究员及主要参研人员姜彦福、雷家骥、王伟强、吴晓波、马 驰、汤世国、鲍 克、冯 飞等中青年学者的积极配合;得到了 NSFC 政策局吴述尧局长、楼兆美副局长、陈晓田处长的大力支持。通过以上各方的通力合作,本书才得以问世。在此,我谨向他们致以敬意和谢意,并请各界读者对本书及本文中的疏漏、不当之处提出批评、指正。

《技术创新研究》项目主持人
国务院发展研究中心技术经济部部长

邓 寿 鹏

1995 年 10 月于北京

PREFACE

Since J. A. Schumpeter (1883—1950) created the concept “innovation” in the beginning of this century, the meaning of innovation has been further developed with progress of time. Innovation is not only means relationships between technology and economy, but also has more implications in many fields such as economy, technology and society. From the point of view for the whole society, innovation is the whole process that is from generating new ideas, realizing production and to entering market successfully. Innovation has three phases, i. e. concepts innovation, operation innovation and efficiency innovation, and the front phase links the next. Innovation is the chain structure which is operated with new manner and got new efficiency guided by new concepts. In each phase, comprehensive activities for creation are carried out, meanwhile the operation is adjusted by feedback signal. The creative process is improved continuously, in order to get the best innovative progress and efficiency.

Today innovation has the following eight natures, thinking nature, creation nature, phase nature, risk nature, efficiency nature, circle nature, society nature, international nature. Innovation is not limited in personnel, group and community, and not limited in production process, products, market and others too. Innovation is activities of technology innovation, organization innovation and system innovation with all productivity factors and social resource in the world, to provide the resource and power for technology progress and economy development. Now every country makes efforts to raise the national comprehensive and competitive capability via sustained innovation, to get good position in the world. From this opinion, innovation has been the foundation for nation's existence and development in the globe with more sharp competition, and crucial factor related with nation's powerful or not. Therefore innovation is paid much more attention by researchers, industrial sectors, management and administrative people.

In the end of 70's, innovation activities in industrial sectors and enterprises became key issue paid close attention by governments and international organizations gradually. The study on innovation became the advantage research topic in the management science. Many developed and developing countries and the important international organizations studied the technology innovation theory and finished some case study. In this basis, many countries drew up the policies, laws and measures for innovation, to promote technology progress in industrial sectors and economy development with high quality. The obvious economic and social efficiencies were derived.

Due to the innovation theory, further practice and its important influence to national development, Nature Science Fund Committee in China (NSFC) supported 25 projects in

this research field during 1989—1992. The work laid foundation for large scale and systematic research. Through discussion, preparation, preresearch and bidding for 5 years, NSFC took “study on technology innovation” as sole key project in management science research field during the “Eighth Five-Year-Plan” period. In March 1993, this project began, and will be finished by March 1997 according to the plan.

This project (i. e. study on technology innovation) is concerned on the generalized technology innovation, the research field covers related activities from innovation concepts to application in practice, and commercialization and industrialization with economic and social benefit. These activities include, creating and improving of new product, new production process and new service, establishing and operating of new production mode, new administrative system and new management system, developing and applying of new resources, developing and occupying of new demands and market. Research work is concentrated on case study and theory through significant events and phenomena, in order to find out the basic pattern of technology innovation and economic growth, the coordination system between demands during economic and social development and supplying of technology innovation, to explore significant way to promote technology innovation in China and diffusion for raising quality and speed of economic growth. The research will be set up foundation for theory development in management science in China, and for establishing national innovation system in China.

Since the beginning of this project, researchers made best efforts in research involving innovation theory, innovation mode, innovation case study and innovation policy guided by the department of management science in NSFC and the project leading group, and got some phased achievements. Some opinion and suggestion of achievements published on inner materials or public journals were paid more attention by administration ministries and local governments. The influence of NSFC's key project was expanded. Technology innovation in enterprises, industrial sectors and regions was promoted. Because research on technology innovation is the most active research topic in the world, there were many important conferences in the world every year. Researchers in this project participated some international conferences held in Beijing, Macao, Tokyo, Miami, Mexico City, etc. respectively, and gave speeches in these conferences. They exchanged their research result with people from other countries and regions, expanded new achievements in technology innovation research in China. Researchers in other countries appreciated these research results.

In order to further exchange with experts inside and outside China, enterprisers and officials, we collect 37 papers to make this collection (Study on Technology Innovation, Volume I) from 55 Chinese papers and English papers in the first research year of this project (March 1993—Feb. 1994). Among papers collected in this book, 7 papers are to study mechanism and mode of technology innovation, 6 papers are to study technology innovation and economic development, 5 papers are to study regional cases, 11 papers are

to study innovation policy and government management, 8 papers are in English version. Every paper has individual research topic, and connects each other. From this book, you can get some knowledge about technology innovation theory, industry practice, regional situation and government management.

This research progress is benefit for the completion of economic system transformation from the plan system to market system, and economic growth mode transformation from the extensive mode to intensive mode, also supplies thinking and policy suggestions to promote technological innovation for enterprises and government. So this research is devoted much attention by people all over the fields. During publishing this book, the project manager wrote letters to report research progress to Wu Bangguo, Vice Premier, Wang Guangying, vice chairman of the National People's Congress Standing Committee, Song Jian, State Councillor and the president of State Science and Technology Committee, Zhu Guangya, the vice chairman of the National Committee of the Chinese People's Political Consultative Conference and the president of the Chinese Academy of Engineering, Zhang Cunhao, the president of the Nature Science Fund Committee. All of 5 leaders were pleasure to give the inscriptions although pretty busy. They supported and guided enthusiastically this research, and encourage researchers. Therefore express our heartfelt thank to them. All of researchers will make best efforts to get the more and better achievement based on the existing progress.

Subproject managers Prof. Fu Jiaji, Prof. Xu Qingrui, Prof. Jia Weiwen, and main researchers Jiang Yanfu, Lei Jiasu, Wang Weiqiang, Wu Xiaobo, Ma Chi, Tang Shiguo, Bao Ke, Feng Fei, etc. and director of Policy Bureau NSFC Mr. Wu Shuyao, deputy director Mr. Lou Zhamei, chief of division Mr. Chen Xiaotian gave much help for edition and publication of this book. This book can be supplied to readers through efforts from every side. I give my best respect and many thanks to them. Welcome readers to point out mistakes in this book.

Deng Shoupeng

Project Manager of Study on Technology Innovation

Director General

Bureau of Tech-Economics Development Research Centre
the State Council of P. R. China

Oct. 1995, Beijing

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**技术创新
的
机制与模式**

技术扩散研究概述

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一项技术创新能否广泛推广和应用,带来经济效益,不仅关系到技术创新项目自身价值的实现,而且对促进产业结构的合理化、高级化,对提高我国科技投入的经济效益,有效地将科技产品扩散到行业、部门、其他领域,改善地区、行业间的不平衡,对扩大技术引进的效益,促进经济发展和社会进步等都具有实际意义。但是,长期以来,我国技术创新却扩散缓慢,扩散的效率和效益都不理想,而技术扩散的研究更是落后于形势。为此,本文对国内外技术扩散研究状况及其未来发展方向进行了初步探讨。

一、国内外研究状况及其存在问题

技术扩散的最早研究可追溯到本世纪初。1903年,法国的社会学家和社会心理学家 Gaariel Tarde 出版了扩散的代表作“*The Laws of Imitation*”,这里的 imitation 就是现在的 adoption。该书中指出:应用的比率呈 S 形,起飞开始于系统中领袖人物采用新思想时。20 年代,出现了一批英国和德、奥扩散学家,他们从人类学角度研究扩散,是传统学派的开拓者。以后,研究者们又从不同角度(人类学、早期社会学、地域社会学、教育学、一般社会学、公共卫生和医学、传播学、营销学、地域学)展开对技术扩散的研究,形成了扩散研究的所谓九大学派。尽管其内容很庞杂,但主要可概括为以下几点:系统成员对创新认识的早期阶段;社会系统中不同创新的使用速度;系统成员的创新性;扩散中的领袖人物;扩散网络中的内部联系;不同社会系统中的创新应用速度;传播渠道的应用;创新结果等。但直到 60 年代以前,各派之间的界限没有打破,扩散研究各自为阵,相互缺乏渗透,系统的、一般的扩散研究尚未形成。60 年代至今,扩散研究日趋兴旺并逐步走向成熟。这期间各派相互借鉴,研究的广度和深度加大。研究的主要内容有如下几个方面:

1. 技术扩散的概念

(1) 传播论

E. M. Rogers: 扩散是创新在一定时间内,通过某种渠道,在社会系统成员中进行传播的过程。

傅家骥等:技术创新扩散是创新的推广、辐射与接纳相统一的过程。

朱李鸣:技术扩散是指国内技术的时空传播和各种技术之间、专门技术与其他技术领域之间发生的渗透、交叉作用的运动。

(2) 学习论

E. Mansfield: 技术扩散就像创新本身一样本质上是一个学习过程。

(3) 效益论

方新:技术扩散是企业或机构为挖掘创新的经济利益而采取的各种行动,是日积月累