

# **The Role of Standards in National Technology Policy in China**

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## **Introduction**

A standard can be defined generally as a construct that results from reasoned, collective choice and enables agreement on solutions of recurrent problems<sup>1</sup>. Standardization highly increases productivity and accelerates the process of industrialization. Today, technology standards have become important infrastructure that has profound impact on technology-based economy by gaining economies of scales, enhancing the quality reliability of complex products and cutting the cost of manufacture and service. In order to increase domestic enterprises' international competitiveness, many developed countries such as USA (September, 2000), Japan (September, 2001), France (June, 2002) and UK (2003) have set up the national standardization strategy, developing countries such as Korea and Vietnam are making the national standardization strategy. Meanwhile, Researchers discuss why and how government intervenes formulation of technological standards. Gregory Tassej (2000) analyses the impact of standards on innovation, productivity and market structure. Libicki (2000) defines the role of government in the digital economy and discusses the issues concerning standardization and patent protection. However, there are no researchers so far to discuss the role of standards in the national technology policy.

With the Chinese economy system transformation from central planning economy system to socialist marketing economy system, government gradually recognizes that national technology policy and national industrial policy have profound impact on national economy, and tries to intervene through various kinds of policies and regulations so as to promote the diffusion of new technology and restrict obsolete technology.

Standardization in China has experienced three phases development (phase 1:

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<sup>1</sup> Gregory Tassej, Standardization in technology-based markets, Research Policy 29, 2000, pp587-602.

before 1960; phase 2: 1960s-1970s; phase 3: 1980s-2002). Standards play increasingly important role in national technology policy. In 2002 the State Economic and Trade Commission jointly with the Ministry of Finance, the Ministry of Science and Technology and the State Administration of Taxation promulgate the National Industrial Technology Policy<sup>2</sup>, a national technology policy compendium concerning Industries, Agriculture, and Science & Technology Industries for National Defense. According to the National Industrial Technology Policy, government shall further strengthen the system reconstruction, especially the quality system, the standard system, the measurement system and safety monitoring system. However, the National Industrial Technology Policy does not indicate the role of standardization in National Technology Policy.

This paper tries to discuss the role of standardization in National Technology Policy on the basis of analyzing Chinese Technology Standardization System and Technology Policy System, and finally to give a briefly conclusion and its policy implication.

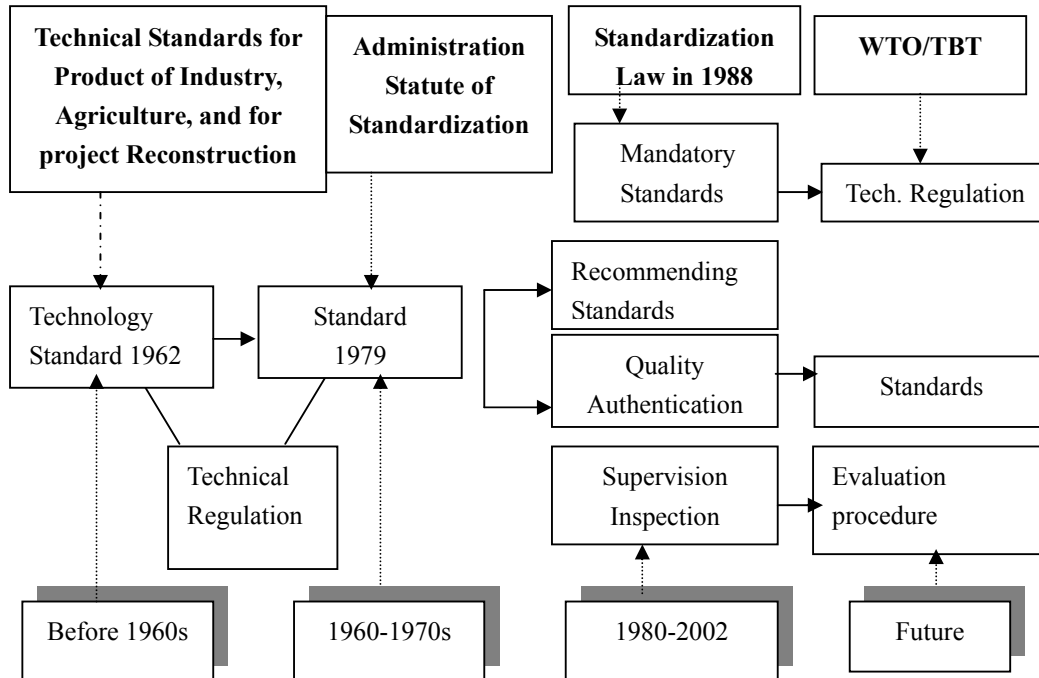
## **I. Historic Review of Chinese Standardization System**

### **1.1 Evolution of Chinese Technology Standardization System**

Standardization in China can be traced to ancient China, at least to the Qin Dynasty. Modern standard system in China was formed in 1930s. China formally established the Committee of Industry Standards on December 29, 1931. In September 1943, the Committee of Industry Standards was confirmed as national institution of standards to attend all kinds of international meetings concerning standards and took over all the standard drafting commissions affiliated to the National Metrology Bureau. China promulgated its first *Standard Law* in September 1946 and established the “Central Standard Bureau” based on the National Metrology Bureau and the Commission of Industry Standards in March 1947.

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<sup>2</sup> The State Economic and Trade Commission Document No. 44 { GuoJinMao Jishu (2002) 444 hao }: Message about Distributing “National Industrial Technology Policy” (Guanyu Yinfa <Guojia Jishu Chanye Zhengce de Tongzhi>).



Since 1949, China had gradually established the central planning economy system introduced from former Soviet Union. In 1957, the Standard Bureau of the State Commission of Science and Technology was founded. During the long period afterwards, the scope of the technology standard management was confined to the development and implement of technology standards in industry and agriculture production and project construction. Generally speaking, the standardization system built in 1950s and 1960s, basically adapted to the central planning economy system, which benefited the development of state-owned economy. In 1962 the State Council promulgated the Administration Statute of Technical Standards for Product of Industry, Agriculture, and for project Reconstruction, which indicates the three level of technical standard system including the national standard, the Ministry standard and the enterprise standard<sup>3</sup>. Standard systems in all kinds of industries came into being, but seriously destroyed during the ten years Great Culture Revolution, only 400 national standards were in act during 1966-1976.

Since late 1970s, the role of standards in regulating R&D and production has been gradually recognized. China was accepted by the International Organization for Standards (ISO) as formal member since September 1, 1978, and elected as the

<sup>3</sup> The State Council: the Administration Statute of Technical Standards for Product of Industry, Agriculture, and for Project Reconstruction (gongnongye chanpin he gongcheng jianshe jishubiao zhun guanlibanfa), Nov. 1962, article 14.

member of the ISO Council in 1982. The State Council promulgated “the Administration Statute for National Standardization” on 31 July 1979, “the Administration Statute for Adopting International Standards (probation)” in 1982 and “the Administration Statute for Adopting International Standards” in 1984. This means that China has set up a new three level of technical standard system including the national standard, the trade (industrial) standard and the enterprise standard<sup>4</sup>.

The State Council Approved and promulgated the Report on Accelerating to Adopt the International Standards presented by the State Commission for Economic and Trade in 1984. This implicated that China insists on the **doubly adopting policy**, namely carefully studied and actively adopted foreign advanced standards so as to improve domestic technology capability. The policy has a very positive impact on the standard development and resulted in a rapid growth of the national standards, from 1700 units in 1978 to 13892 units in 1988<sup>5</sup>.

In July 1988 the State Council approved to establish the State Bureau of Technical Supervision on the basis of former State Bureau of Standard, the State Bureau of Metrology and the State Bureau of Quality.

In order to strengthen the management of industrial standard, the Fifth Meeting of the Standing Commission of the Seventh National People’s Congress approved the Standardization Law in December 1988, which was implemented since April 1, 1989<sup>6</sup>. The Regulation for Implementation of the Standardization Law was promulgated in 1990. The Standardization Law played a very important role in upgrading industry during the period of national economy systems reformation, especially when former State Bureau of Quality and Technical Supervision insisted on managing standardization with administrative measures.

Since 1990, China has promulgated several Regulations and measures for standardization administration. The Regulation on National Standard Administration, the Regulation on National Standardization Directive Technical Documents Administration, the Regulation on National Technical Committees of Standardization, the Regulation on Enterprise Standardization Administration, the Regulation on Local Standard Administration, the Regulation on Trade Standard Administration and the Regulation on Energy Standardization Administration were in act in 1990. The

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<sup>4</sup> The State Council: the Administration Statute for National Standardization, 31 July 1979, Chapter 6.

<sup>5</sup> Li Chuntian (ed.): Conspectus of Standardization, Beijing Renmin University of China 1995, P.29.

<sup>6</sup> The Standardization Law further confirmed the doubly adopting policy in standardization.

Regulation on Agriculture Standardization Administration (in 1991); the Circular on Further Strengthening the Administration of Reporting for Record of Trade Standards (in 1996), the Regulation on Standard Publication Administration (in 1997) and the Regulations on Tryout of Convention Compulsion about Compulsive Standards (in 2000) were in act respectively.

The current standardization in China emphasizes adopting international standards and foreign advanced standards so as to promote production and export. China has established a complete standard system consisted of the national standard, the industrial standard, the local standards and the enterprise standards, and related management system as well as operation mechanism. The standards can be classified into two categories, namely Compulsive Standards and Recommending Standards.

The government Agency, instead of non-government organizations such as ANSI of American, DIN of Germany and AFNOR of France, administrates the standardization in China. Japanese government administrates standardization, but its supreme powerful institution “Japanese Commission of Industry Inquiry” consists of manufacturers, vendors, consumers and officials. In China, National Standardization Administration affiliated to State General Administration for Quality Supervision and Inspection and Quarantine, is totally a government organization. Therefore, current standardization system in China is not able to meet the requirement of the development of technology standards in the socialist market economy system.

## **1.2 The Status quo of Chinese Technology Standards**

China adopted the administration system of technology standards coupling with central planning economy system in 1950's. The technology standard administration model has no substantial change since then. The Standardization Law of China already fulfilled its functions in the initial stages of economic system reform, and could not adapt to the Chinese socialist market economy system. The existing administration system of standardization has resulted in some problems as following:

Enterprises have not yet become the principal part of standardization. Standardization is not the demand of enterprises themselves, but the request of the government. From the point of view of enterprises, the standardization in developed countries is voluntary. The Chinese government thinks that standards are

recommendatory. In fact, the National Standardization Administration in China is still one of the government agencies, and has no rights to stand for the interests of enterprises and consumers.

The process of presentation, development and amendment of standards lacks of transparency, which may become a tool of monopoly and harm the development of market economy. Unreasonable standard systems result in a rapid growth of standard quantity instead of the improvement of standard quality. Unreasonable factors in the standardization process make it impossible to gradually eliminate those standards that does not adapt to the market needs.

The Standardization Law prescribes the dominant position of central government in the standardization process, in which Article 5 prescribes: “The department of standardization administration under the state Council shall be in charge of the unified administration of standardization throughout the country. Competent administrative authorities under the State Council shall, in line with their respective functions, be in charge of standardization in their respective departments and trades. The departments of standardization administration of provinces, autonomous regions and municipalities directly under the Central Government shall be in charge of the unified administration of standardization within their respective administrative areas.” Article 6 prescribes: “National standards shall be formulated by the department of standardization under the State Council. The trade standards should be developed through competent administrative authorities under the State Council. Local standards shall be formulated by departments of standardization administration of provinces, autonomous regions and municipalities directly under the Central Government.” National Standardization Law confirms the government’s absolute authorities and dominant status in standardization. Government is responsible for formulating and amending all standards, including national standards, trade standards and local standards, except enterprise standards.

Subordinate to State General Administration for Quality Supervision and Inspection and Quarantine, National Standardization Administration administrates national standardization and takes charge of presentation, coordination, examination,

approval and promulgation of the national standards. National Standardization Administration supervises 243 technical committees of standardization, most of which affiliated to industrial administration sectors such as Ministry of Information Industry, Ministry of Reconstruction, Ministry of Agriculture, etc. The guilds have no power to develop industrial standards on behalf of the enterprises. According to Standardization Law, Chinese standards can be classified into four levels, namely national standards, industrial standards, local standards and enterprise standards. Standardization Law also confirmed the rule for registration of the enterprise standards and the mandatory status of national standards.

The Chinese Technical Committees of Standardization mainly consist of scholars from research institutions, with very few experts from enterprises. Most standard items come from technical committees of standardization. During the formulation process of standards, there is no wide opinion consulting process and no effective demonstration on the needs of enterprises and markets. That is to say, there is no effective mechanism to guarantee the standard items really come from the needs of enterprises and markets.

The development procedures of national standards are usually under the control of the standard drafting group (Most members come from research institutions, very few from enterprises), or the secretariats of the technical committees. Also there is no effective mechanism to guarantee that the procedures be transparent to enterprises, users and consumers.

In recent years, enterprises have become active in some technical committees. They hope to participate in the standard development and would like to pay if their names can be listed in the drafters of standards. Usually, the more the enterprise pay, the higher priority the enterprise has in listing drafters of standards and the more possibility to dominate the technical indexes of the standards. However, there are no concrete prescriptions about the charge in standardization fields. The incompleteness of game rules leads to the practical imparity among the enterprises.

As for doubly adopting policy, when technical committees adopt international standards in national standard formulation, they often do some simple translation and

make sure some terms, but seldom test and validate the technical contents, or the adaptability of the standard in China. In practice, standards are right only when they match with the industry development level. Adopting advanced international standards does not automatically strengthen industrial competitiveness. What enterprises think about is how to make money from investment in standardization, either to increase their international market share, or decrease the cost of production. Generally speaking, Chinese enterprises have no technology capability to join in the formulation process of standards.

China lacks of high-level standard talent. With transformation from central planning economy system to socialist market economy system, standard technology institutions have experienced great change. Some institutions still exist, but have to make money instead of making standards; others have been transformed into enterprises. These problems result in lots of talent drop out of standard institution.

Most of national R&D programs have nothing to do with national standardization. On the one hand, standards have not become key goals or factors in selection of technology development projects; on the other hand, and the selection of technology industrialization project takes no account of related standard contents of the technology to be industrialized. Therefore, the Ministry of Science and Technology puts forward the standardization strategy in 2001.

National standard copyright is ambiguous. Standards Press in China has the imprimatur to issue the standards, but no obligation to support national standardization with the profit from standard issue. Without the copyright permission from Standardization Administration of China, the other standard information service institutions cannot offer the whole-length national standard information service to the society. In some regions (e. g. Shanghai, Shenzhen), the standard information service industry is booming.

Up to now, China has not played the role that a large country should play in the International Organization for Standards. Currently there are 13000 ISO standards and 4800 IEC standards, while China is responsible for drafting only 13 international standards and leads only 8 secretariat of international standard drafting group.

The ISO /IEC Secretariats Undertaken by Developed Countries and by China:

	USA	France	UK	Germany	Japan	China
ISO	131	85	109	132	32	6
IEC	31	31	25	25	10	0

## II. Evolution of the National Technology Policy in China

### 2.1 National Technology Policy –concept and function

Science and technology are playing increasingly more important role in promoting economic growth. As an instrument to promote the development of science & technology and to strengthen the linkage between technology and economy, technology policy attracts more and more attention from Chinese government. Since 1986, China has issued a series of national technology policy based on a series of large-scale survey and research. These technology policies have strongly promoted the progress of science & technology and the economic development.

Technology policy is the guideline followed in the development of technology and economy, focuses on promoting economy development through technology progressing. Technology policy is different from and has some relationship with industrial policy and economic policy. Industrial policy is trans-industrial, mainly deals with economic layout, industrial structure and proportion of industries. Economic policy mainly discusses the price, finance, and trade, etc. The technology policy does not involve the issues directly related to economic policy and industrial policy <sup>7</sup> Technology policy concerns the issues integrating technological, economical and social factors. Thus, technology policy becomes the development policy followed both in R&D activity and in economic reconstruction.

Generally, technology policy includes: (1) development goals; (2) industrial structure; (3) technology selection; (4) approaches, measures and ways to promote the technology progress.

Technology development goals should adapt to the economic development goals,

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<sup>7</sup> The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.1), Science Technology Literature Publishing House, 1986, p29.

the world technology development and the Chinese technology capability and related economic and social conditions.

The industrial structure consists of technology structure, production structure and manufacture structure. It is necessary to analyze the productivity, the technology level, the technology capability and the social needs of productions so as to determine the reasonable proportion, scales, layouts, development speed and schedule, technology composition of all kinds of production, and the development direction of main production.

In essence, the technology selection is to decide what kind of technology should be adopted, what kind of technology should be developed, and what kind of technology should be restricted or eliminated. The issue is how to make the decision. Usually the integration of economic and social efficiency is given highest priority in selecting technology. Of course, the advancement of technology is an important factor, but it must adapt to technology capability, natural, economic and social condition in China. Therefore, it is necessary to generally evaluate the technology advancement and its economic and social rationality so as to select suitable technology with high potential in promoting national technology progress.

## **2.2 The Evolution of National Technology Policy in China since 1980**

China pays more attention to economic policy-making than science and technology policy-making. China has issued a series of science and technology polices concerning technology development and selection since 1949. However, it is until 1986 that Chinese government began to issue special national technology policy.

In the early 1980s, new technology revolution has changed the world in many aspects. Meanwhile, China was experiencing profound economic system reform and encountered great challenge in national economy development.

To confront this challenge and grasp the opportunity, in January 1983, the State Commission of Science and Technology, the State Commission for Planning and the State Commission of Economic and Trade organized over 2000 experts to make the technology policies in the fields of energy, transportation, environment,

communication, agriculture, machinery, materials, consumable, construction materials, urban reconstruction, suburban construction, house industry, 12 industries in all. They put forward the technology development direction and the goals for technology selection on the basis of the development status and industry condition in China and science and technology trends in the world. The State Council promulgated technology policies for 12 fields based on the research in May 1986. After that, the State Commission of Science and Technology, the State Commission for Planning and the State Commission of Economic and Trade made the technology policies of information technology and bio-technology that were promulgated by the State Council in 1988. By then, 14 technology policies constituted the national technology policy system.

In March 1988, the State Commission of Science and Technology and the State Commission for Planning together called all the ministries, provinces, municipalities, and the cities directly under the central government to inspect the implementation status of the 12 technology policies completely. The inspection shows that the technology policies were well implemented. In general, 90% of them were in work; 70% of them were in their early stage; less than 5% of them were not put into force. However, there were still some problems including inefficient communications and coordination between interrelated policies. National Technology Policies were evaluated again in 1996. The assessment results further confirm that the national technology policies play significant and positive role in upgrading industries and promoting economic development.

With speeding up of knowledge-based economy and the process of globalization, international competition is becoming increasingly more drastic. Technology standard becomes one of key targets of competition. As Deming<sup>8</sup> said, “if you control an industry’s standards, you control that industry lock, stock, and ledger”. In order to strengthen industrial technology capability and corporate competence, the State Commission of Economic and Trade jointly with Ministry on Finance, Ministry of Science and Technology and State Taxation Administration promulgated National

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<sup>8</sup> W. Edwards Deming: “Out of the Crisis,” Published by the Center for Advanced Engineering Study, MIT, 1986.

Industrial Technology Policy in June, 2002, which is a market directive document involving the fields such as industry, agriculture and national defense industry of science and technology, etc.

National Industrial Technology Policy firstly analyses competitive environment affected by the factors such as economic globalization, China access to WTO, technology progress and reconstruction of market system. It then reviews the problems of industrial technology development and gap existed. China has formed complete production technology systems with full categories and large scales based on long-term technology import, technology R&D. But still, there is a big gap between China and developed countries. On the one hand, technology capability of traditional industry is very weak, over 90% of technology bought by large and medium-sized enterprises come from abroad; on the other hand, hi-tech industries are still very weak in technology, and to some extent are assembly of hi-tech product; industries in general lack of technological innovation capability, and even assimilating and absorbing capability of technology.

National Industrial Technology Policy points out the strategy goals of industrial technology development, namely: to make critical breakthrough in key industries, enterprises, products, and important techniques & equipments by 2005, some industrial technology reaches to international advanced level. The development of some high and new technologies keeps the pace with that of international advanced technology, while key technologies of important production sectors basically reach international advanced level by 2010. The policy points out the key aspects of industrial technology development, namely: (1) to develop high technology and make it industrialization in the fields of information technology, biology engineering technology, advanced manufacturing technology, new materials technology, aviation and space technology, new energy technology, and ocean engineering technology; (2) to rebuild traditional industries with high and new technology so as to upgrade their technology level.

The policy finally puts forwards three parts of policy measurements, including: (1) to make full use of the fundamental function of market in allocating science &

technology resources; further to improve market mechanism so as to lead social investment in technology innovation; (2) to establish national technology innovation systems with enterprises as principal bodies; to set up open technology innovation service systems relying on cities, to build industry technology development base relying on large corporations and transformed research institutes, to establish risk-sharing coordination mechanism among industries, universities and institutes; (3) to speed up the building of innovative policy environment; to formulate and implement national technology innovation program for the “10<sup>th</sup> five-year plan”, to strengthen taxation and finance policy support for technology innovation; to develop industry technology policy and the consultation-discussion system for key technology projects; to establish talent motivating mechanism so as to push optimization allocation of talent resources throughout the country.

### **III. The Role of Standards in National Technology Policy**

#### **3.1 The Impact of Technical Standards on National Technology Policy**

Technical standards plays increasingly important role in modern society and have increasingly important impact on national technology policy in China. Therefore, it receives more and more attention from both Chinese government and researchers. Technology standards are an important infrastructure for social economy and technology<sup>9</sup>, and an institutional arrangement for reducing transaction costs.

From the point of view of technology policy, standards are playing increasingly important role in the national technology policy, mainly embodied in following three aspects: (1) technology standards are the bases to determine industry structure, producing structure and production structure; (2) technology standards are the bases to decide which technology to be adopted, which technology to be developed, which technology to be restricted and which technology to be eliminated; (3) technology standards are important approaches and measures to promote technical progress.

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<sup>9</sup> Gao Shiji: ”Standard, standardization and public Policy”, Annual Research Report on China Science and Technology Development --Made in China and Science & Technology Innovation, Beijing Economic Management Publishing House, 2002, pp84-96.

The formulation processes of technology standards, in nature, are the R&D processes of new products. One standard system usually covers a set of patents. The formulation of core standards has not only profound impact on the directions of technology development, but also affects the entry barrier of industries, the industry efficiency and social welfare. Thus, the fact that standard strategies reinforce technology policy one another, can be in favor of the formulation of standards and R&D of core technology. In many cases, enterprises with the effective supports of government are very active in R&D competition with a view of formulating standards, while market determines what technology can be standards.

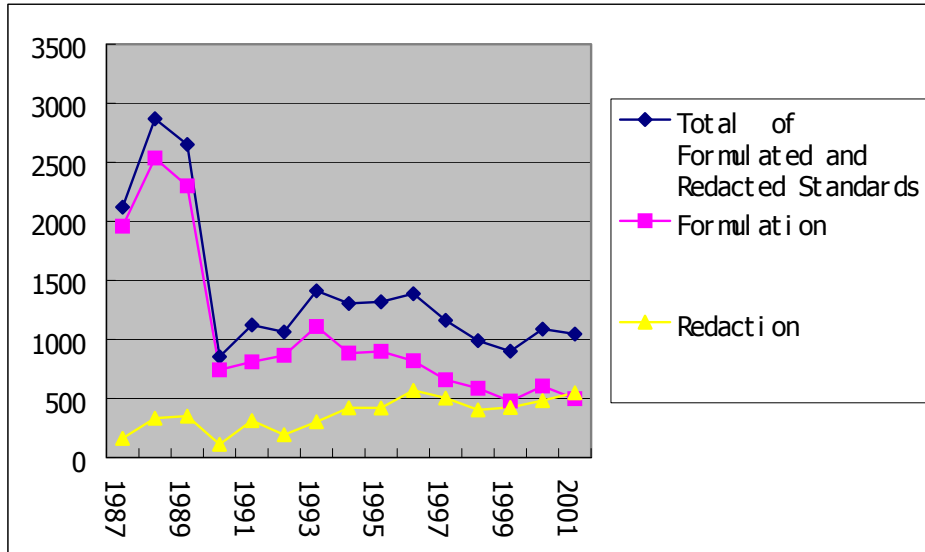
In the evolution of technology policy, the importance of standards was gradually realized in Chinese technology policies. The National Technology Policy promulgated in 1986 advocated “the principles of standardization, serialization and generalization”<sup>10</sup>, but standardization as a policy approach was not confirmed in detail. After that, China adhered to this principle in making technology policy and gradually emphasized the role of standards in technology policy. “The Outlines of Computer Technology development Policy” promulgated in 1988, points out “...to speed up to adopt international standards and advanced foreign standards, to study and analyze relevant international standards of computer and information, actively to adopt international standards and advanced foreign standards, to speed up to formulate Chinese national standards in accordance with Chinese practice.” “The Outlines of Microelectronic Technology Policy”<sup>11</sup> pointed out, “...to apply international standards, to insist on standardization, serialization and generalization”<sup>4</sup>. It is the series of technology policies that emphasized the importance of standards step by step, and greatly improved the standardization level in all industries in China.

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<sup>10</sup> The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.1), Science Technology Literature Publishing House, 1986, p29.

<sup>11</sup> The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.3), Science Technology Literature Publishing House, 1989, p67.

<sup>12</sup>The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.3), Science Technology Literature Publishing House, 1989, p73.



**Chart 2 The Status of Formulated and Redacted Standards**

The technology policy becomes so compelling by adopting technology standard measures that it can prescribe industry technology level and thus determine industry structure, production and product structure. On the one hand, technology standard is fixed indicators in technology policy that can prevent enterprises with backward technology from entering Chinese market; on the other hand, it can extrude low-level competitors, especially those with backward technology or high polluting technology, from Chinese market.

Technology policy can directly prescribe the level of the technology by adopting technology standard measures that enterprises may employ so as to restrict out of date technology and encourage them to employ advanced technology. What's more, it can influence the direction and level of new technology R&D investment, which can determine government R&D funding policy and guide enterprises to increase investment in new technology. For example, government issued “technology policy on control of pollution emission of diesel vehicle” in 2003<sup>13</sup>. According to the policy, those diesel vehicles or diesel motors will not be allowed to manufacture, sell and use if they do not meet the standards concerning pollution emission.

<sup>13</sup> The State Agency for Environment Protection, the State Commission of Economic and Trade and the Ministry of Science and Technology: “technology policy on control of pollution emission of diesel vehicle”, 2003

Technology standards have profound impact on national funding policy for technology development, especially on national science and technology planning. In the case of digital TV technology standards, Chinese government encourages enterprises, research institutions to cooperate and compete at the same time. On the one hand, the government supports several enterprises and research institutions to set up a work team for digital TV technology standards, members of the team mainly come from the China HDTV Task Force, the China Industry Alliance for digital TV, and the Research Institute for Broadcasting and TV; on the other hand, the government allows other enterprises and research institutions to cooperate in developing technical standards of digital TV. Through cooperation and competition, the Chinese experts get four technology standards, three of which are developed with government support<sup>14</sup>.

Technology standard is an important policy instrument that has been recognized by Chinese government. For example, National Industry Technology Policy, promulgated in 2002, points out that China should do followings: (1) further enhancing the reconstruction of quality, standard, metrology and safety inspection systems, that adapt to industrial technology development and access to WTO; (2) improving quality management, strengthening quality supervision, promoting quality authentication; (3) actively adopting international standards, speeding up formulation and implementation of industrial technology standards; (4) setting down technology standards so as to restrict the out of date and high polluting technology & products to enter into Chinese market, and promoting Chinese enterprises to enhance their ability to compete with foreign firms so as to support domestic infant industries.

Standardization strongly promotes industry development, especially industrial technology competitiveness. The industries with high level of standardization usually develop much faster than the others. For example, Chinese electronic and information industry has strengthened its technology capability by positively carrying out standardization and through continuously competition in the world market.

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<sup>14</sup> Li Jizhen: Studies in Science of Science (kexuexue yanjiu), vol.21, No.1 Feb. 2003, pp47-49

Meanwhile, a batch of corporations such as Haier, Huawei, ZTE (Zhongxing Telecommunication Equipment) and etc. have successfully implemented their internationalization plan. Datang Telecom Technology and Industry Group independently developed TD-SCDMA technology standard, which has become one of the three major standards in the 3rd generation of mobile communication. On the contrary, industries with low level of standardization usually lack of competitiveness. For example, Chinese pharmacy industry, with poor foundation, small scales and deficient R&D investment, fell far behind those of the developed countries. GPM standard has been carried out more than 10 years in China, but still not widely adopted.

### 3.2 The Impact of National Technology Policy on Technical Standards

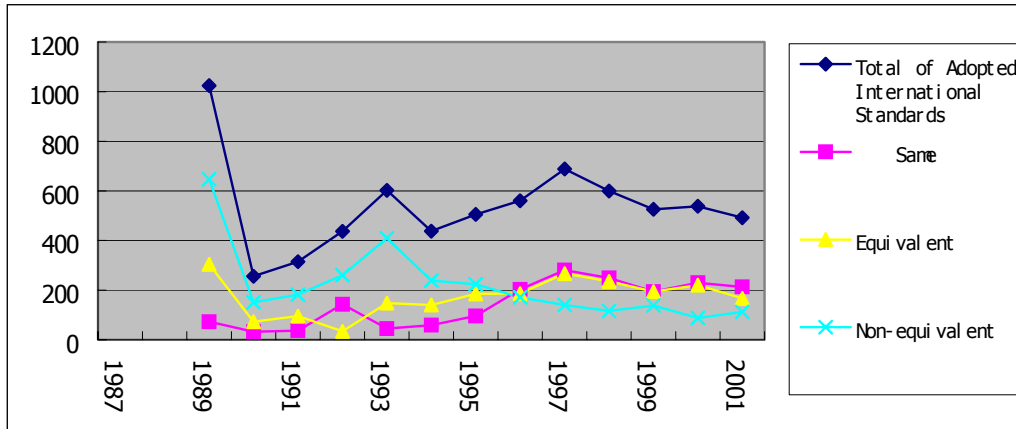
National technology policy also has profound impact on the formulation and redaction of standards, and the adoption of international standards. China gradually emphasized the improvement and applicability of standards through national technology policy. The total number of formulated and redacted standards increased very fast from 1987 to 1989, which could result from implementation of national technology policy issued in 1986 and 1988. The number of formulated standards decreased from 2536 units in 1988 to 2300 units in 1989 and 742 units in 1990, and to 497 units in 2001, while the number of redacted standards increased from 162 units in 1987 to 548 units in 2001.

**Table2 Chinese Standard Status Statistics Table (1987—2001)** <sup>15</sup>

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Total of F&amp;R*</b>	2121	2869	2651	853	1122	1063	1411	1304	1319	1387	1162	990	900	1087	1045
#Formulation	1959	2536	2300	742	810	865	1109	883	899	818	658	587	477	605	497
#Redaction	162	333	351	111	312	193	302	421	420	569	504	403	423	482	548
<b>Total of int. std.**</b>			1024	256	315	437	602	438	505	560	688	600	526	538	492
#Same			73	32	37	143	45	59	96	203	281	249	194	230	213
#Equivalent			304	73	95	34	148	140	185	186	267	235	194	220	167
#Non-equivalent			647	151	182	260	409	239	224	171	140	116	138	88	112

\* F&R: Formulation and Redaction      \*\*int. std: International standard

<sup>15</sup> China Statistic Yearbook of Science and Technology 1992-2002.



**Chart 3 The Status of Adopted International Standards**

National technology policy can promote standard development and the internationalization of Chinese standard system, and improve the standard quality continuously. The development and formulation of standards has become important tasks of the national innovation systems and key issues in National Industry Technology Policy. In 1986, China promulgated national technology policy for the first time, in which the role of technology standards was emphasized. The national technology policy promulgated in 1988, definitely advocated to speed up adoption of international standards and advanced foreign standards, which led the number of adopted international standard reach the historic peak point, increased sharply from zero to 1024 units in 1989 (referred to Table 1). The proportion of non-equivalent international standards adopted tends to be smaller, with only a few exceptions. For example, the proportion is 63% in 1989, and 23% in 2001.

It is worthwhile to point out that both national technology policy system and technology standard system are not able to meet socialist market economy development. On the hand, there is no an effective mechanism for making and revising national technology policy. The State Commission of Science and Technology has issued 14 fields of national technology policies without revised version in 1980s that can not reflect rapidly developed technology even if the State Commission for Economy and Trade issued a new national industrial technology policy in 2002. On the other hand, the speed of adoption and redaction of Chinese standards is too slow to meet the requirement of industrial upgrading. By the end of

2001, China had issued 19,744 national standards, including 8,621 units adopted international standards and foreign advanced standards. Over 7,000 standards were issued ten years ago, and are not suitable for using in industrial technology policy.

The national technology policy has no direct impact on funding guideline of the national science and technology planning, for example, to increase funding for cooperation between research institutes and universities in patent and standard development. Further more, there is no effective national industry policy system in China although automobile industry policy was published in 1994.

In macro-level, there is also no an integrated consideration of the national standard system, the national technology policy system and the national industry policy system. At present, national standardization administration, affiliated to the State General Administration for Quality Supervision and Inspection Quarantine, is responsible for national standardization work such as drafting and revising national standard laws and regulations as well as policies concerned. The national technology policy is usually made by the Ministry of Science and Technology, while the State Commission for Development and Reform determines the national industry policy. It is very difficult to integrate national standard, the national technology policy and the national industry policy so as to increase innovation efficiency.

## **VI. Conclusion and Its Policy implication**

Technology standard is a technology system that has profound impact on industry development, and reflects the technology level of a nation. During the past 20 years, the Chinese government gradually recognizes the importance of standards in national technology policies. On the one hand, national technology strongly promotes national standardization activities and results in a tremendous growth of the national standards; on the other hand, the national standards strengthen the compulsion of national technology policy. However, there are still many problems to be solved. First of all, existing national technology policies are too old to reflect the new progress of technology development; secondly, the existing administration system of

standardization, especially the Standardization Law of China, need to be revised so as to adapt to the Chinese socialist market economy system; thirdly, there is no effective coupling mechanism between technology standard development and technology innovation system, that reflect in the insufficient coordination between government national administrations for standardization and for science and technology, and in ineffective participation of enterprises; fourthly, there are no sufficient talents for standardization and advanced talent training base.

In order to solve above problems, government, enterprises and research institutes as well as universities should reconsider their position in the national standardization strategy and enter into commitment in following aspects:

(1) To evaluate the national technology standard system so as to revise the Standardization Law of China, to update and make national standards; to evaluate the national technology policy system so as to make new national technology policy system and to integrate the national technology policy system with national standard strategy and national talent strategy as well as national patent strategy.

(2) To set up an adjusting and correcting mechanism of national technology policy and of national standards so as to make technology policy to adapt rapid development of technology and standards. On the one hand, technology adaptation to the market instead of technology level should be highly emphasized in the process of standard development; on the other hand, the major function of standards should be changed from serving production to serving trade.

(3) To adjust national standardization system and strengthen compulsive laws and regulations so as to form a new recommendatory standardization system with three levels, namely national standards, consortium standards and enterprise standards. The existing industry standards shall be transformed into national standards or consortium standards while local standards shall be gradually canceled while compulsive standards shall transform into national or regional laws & regulation.

(4) To speed up training of advanced talents and encourage cooperation and competition of research institutes, universities, industries and governments in standardization process, and to set up new mechanism for share of standard resources

so as to encourage enterprises to participate in the standard development, especially developing international standards.

**References:**

1. W. Edwards Deming: “Out of the Crisis”, Published by the Center for Advanced Engineering Study, MIT, 1986.
2. The State Agency for Environment Protection, the State Commission of Economic and Trade and Ministry of Science and Technology: “technology policy on control of pollution emission of diesel vehicle”, 2003
3. China Statistical Yearbook on Science and Technology 1992-2002
4. The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.1), Science Technology Literature Publishing House, 1986, pp28-29.
5. Li Jizhen: Studies in Science of Science (kexuexue yanjiu), vol.21, No.1 Feb. 2003, pp47-49
6. The State Commission of Science and Technology: A Guide to Science & Technology Policy of China (White Paper on Science and Technology NO.3), Science Technology Literature Publishing House, 1989, pp67-73.
7. Gregory Tassej: Standardization in technology-based markets, Research Policy 29, 2000, pp587-602
8. Gregory Tassej, 1997. The Economics of R&D Policy, Quorum Books, 88 Post Road West, Westport, CT 06881 pp166-187.
9. Martin C. Libicki,. The Role of Technological Standards in Today’s Society and in the Future. RAND, Santa Monica, 2000, CA90407-2138
10. Gao Shiji: ”Standard, standardization and public Policy”, Annual Research Report on China Science and Technology Development --Made in China and Science & Technology Innovation, Beijing Economic Management Publishing House, 2002, pp84-96.
11. Neil Gandal, Oz Shy: Standardization Policy and International Trade. Journal of International Economics 53(2001) pp.363-383.
12. Wang Chunfa: “China Strategy for Technology Leapfrog, Annual Research Report on China Science and Technology Development -- China Strategy for Technology Leapfrog, Beijing Economic Management Publishing House, Beijing 2001.

13. The State Commission for Economic and Trade, Document No. 44 [GuoJinMao Jishu (2002) 444 hao]: Message about Distributing “National Industrial Technology Policy” [Guanyu Yinfa “Guojia Jishu Chanye Zhengce de Tongzhi”].

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