

Beyond Government Control of China's Standardization System

— History, Current Status and Reform Suggestions

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1. Argument

This Think Piece traces the ancient sprouting of standardization in China, the evolution of the Chinese standardization system including the formation of governmental management system in the planned economy period, the adjustment of the system after the reform and opening-up, the overview of the current standardization system, the evolution of the government-dominated standardization strategy, and its achievements and weaknesses. The paper argues that the top-down, government-centered standardization system was instrumental for China's successful catching-up, now needs to adjust to new challenges.

The current standardization management system of the government primarily formed during the planned economy period and deeply rooted in the Chinese tradition and culture of the long history. The main characteristics of current system are the institutional fragmentation and the multi-decision-making entities of government. The reform measures and the strategy adopted by China's government in the field of standardization have been approved generally successful in the economic development. The technology-following strategy and the standard dual-adoption policy adopted at the initial stages for the reform and opening-up (1980-2000) made the technology transfer function of standard fully played. Standard became a effective channel for the technology spillover effect in the course of trade. In China's rapid economic development period (2000-2010), the strategy of using standard to foster and promote indigenous innovation by the government was also very effective, and weaknesses of system were not obvious during that period. However, after the slowdown in economic growth started (2010-2015), problems caused by the government's role in standardization have been becoming more and more prominent, including excessive governmental intervention, multi-decision-makers discordance and innovation hindering. Government withdrawal in the most part of voluntary standardization management is a prerequisite for cultivating self-organized private standardization.

2. Overview of the Standardization Institution and Strategy

2.1 Historical retrospection

During the long history of China, there is a tradition that the government was always interested in standardization management. Qin Shihuang (秦始皇) - The First Emperor (259 BC - 210 BC) of Qin Dynasty (秦朝), pioneered the use of emperor's authority in the country to unify the written characters (or scripts, which had varied greatly from area to area during the Warring States Period before Qin Dynasty), carriage axle length (for the royal carts therefore being possible to go on the same tracing ruts or grooves on roads), as well as weights and measures. Currency became standardized as a circular copper coin with a square hole in the middle. Unified written characters

and carriage axles made the Emperor's decree be possible to reach and be understood everywhere throughout the whole country. The unified weights and measures and coinage became an important infrastructure for economy development of the Empire (Wang, Ping, 2008). All the later dynasties of imperial governments from Sui Dynasty (隋朝, 581--618) set up a department (工部) for royal architecture construction, water conservancy, and opening up wasteland for growing food grain, etc. (Zhao, Yi, 2002). In addition to the royal project management, the officers also had the responsibility to draft project management guidance, prepare construction budget and technical standards and specifications. Historically, they played a role of standardization officials in a certain extent, compiled some important monographs similar to technical regulations and specifications, e.g., Jun Qi Fa Shi (军器法式), Bing Qi Zong Yao(兵器总要), Ying Zao Fa Shi (营造法式), Gong Cheng Zuo Fa Ze Lie(工程做法则列), etc.¹

Qing Dynasty (清朝) collapsed in 1911. Influenced by the industrial revolution of the West, modern industries and technologies like architecture engineering, railway, textile, steel, shipbuilding, telegraph and telecommunication began to be introduced into China from the West. Driven by the international "rationalization and standardization", in 1931, a Industrial Standard Committee (ISC) was set up by the Ministry of Industry (the predecessor of the Ministry of Economy) of Republic of China, (the Kuomintang government), including the areas of textile, automotive, medicine, machinery, metallurgy, electric power, etc.. The Standard Law was promulgated in 1946. In 1947, the Bureau of Weights and Measures and the ISC merged and became the Central Bureau of Standards, established a standardization management system leading by government again from then on. (Zhong, shaohua, 2012)

2.2 The Planned Economy Period

From the establishment of the People's Republic of China to the Cultural Revolution (1949~1964), China has basically formed a standardization management system which was applicable to the planned economy system and classified according to sectors². Though the standardization management was under the unified leadership of the Central Government, each department and local government under the State Council took the responsibility for its own work. The standard system included national standard, ministerial standard (transferred to sector standard later) and local standard (DENG, Liqun, et al., 1986:36). Such standards were prepared under the organizations of government, and enterprises had no right to independently set technical standards. The function of standard, from the very beginning, was a measure for the government to organize large-scale production in planned economy. Thus enterprises must comply with it. This was also the reason why all standards at that time were mandatory. The government was responsible for

¹ Jun Qi Fa Shi (军器法式) and Bing Qi Zong Yao (兵器总要) are specifications for arms manufacturing and powder formulation from Northern Song Dynasty (960~1126); Ying Zao Fa Shi (营造法式) is an architectural monograph including technical specifications for construction also from Northern Song Dynasty; Gong Cheng Zuo Fa Ze Lie (工程做法则列) is a technical specification for the palace architecture from Qing Dynasty (1734). (See Li, Chuanqing, et al., 2001:26 and Wang, Ping, 2009);

² In this paper, sector departments of government means a department who is in charge of a special sector (industry); Then we have phrases as sector standard (行业标准), sector standardization (行业标准化), which mean the standard issued by it and the standardization organized by it. For the meaning of sector, see: *What is the difference between an industry and a sector?* <http://www.investopedia.com/ask/answers/05/industrysector.asp>

establishing standard projects, organizing technical experts to prepare standards, and publishing standards; all standards were compulsory. Some scientific research institutions had become the main force for preparing standards. By 1963, 32 research institutes and design organizations affiliated with the government had been designated as the core organizations of national standardization (later changed to technical focal points for standardization). (DENG, Liqun, et al., 1986:385).

2.3 The Reform and Opening-up

Along with the acceleration of China's reform and opening-up, the government began to implement "planned commodity economy" and loosen its control on enterprises. Thus, joint venture and capital flow became possible. In this context, the State Council issued the "Standardization Law of the People's Republic of China" in 1989. Though the government still inherited the management system established in planned economy period, it has made three major progresses³: first, standards started to be classified into mandatory ones and recommendatory ones. The relevant requirement was "Those for safeguarding human health and ensuring personal and property safety and those for compulsory execution as prescribed by the laws and administrative regulations shall be compulsory, while others shall be recommendatory". Second, it was specified that TC for standardization shall be established for developing standards. Third, enterprises might independently set standards for themselves. Though this system design was still the standardization under government management, it has made important adjustment on the standardization system. Committee standardization was adopted to get close to the internationally common practice. Meanwhile, mandatory standards in China were greatly reduced, and enterprises began to enjoy certain autonomy in their own standardization.

In 1993, the former State Bureau of Technical Supervision began to promote "Dual-adoption" Policy in the field of standardization - namely international standards (such as ISO, IEC and ITU⁴ standards) and foreign advanced standards (such as ASTM, IEEE, DIN and JISC standards)⁵ should be mainly adopted during the preparation of various Chinese standards. This was proposed under the historical conditions where there was a big gap between the overall technical level and competitiveness of China and those of developed countries. In order to introduce foreign advanced technology, in addition to such policies as attracting foreign investment, market for technology, etc., "dual-adoption policy" was also adopted as an important component of China's technology-following strategy.

After the reform and opening-up, China re-joined international standardization organizations (ISO, IEC and ITU) (Li, Chuanqing, et al., 2001: 189,198,204), developing extensive and friendly communications with standardization organizations of developed countries and establishing favorable standard exchanging relations. Meanwhile, China State Bureau of Technical Supervision (CSBTS) established China Standard Information Centre in 1987. 18 departments (ministries) of the State Council and 23 provinces, autonomous regions and municipalities established standard

³ See: *Law of the People's Republic of China on Standardization* (中华人民共和国标准化法), http://www.npc.gov.cn/wxzl/gongbao/1988-12/29/content_1481259.htm

⁴ ISO is the abbr. for International Standardization Organization, IEC for International Electrotechnical Commission, ITU for International Telecommunication Union

⁵ ASTM is the abbr. for American Society for Testing Materials, IEEE for The Institute of Electrical and Electronics Engineers, DIN for the German Institute of Standardization, JISC for the Japanese Industrial Standards Committee

information research institutes⁶ (Li, Chuanqing, et al., 2001: 593). The country therefore formed a large standard information network, transferring western standard information to TCs for standardization, enterprises, research institutes and etc. throughout the country⁷.

2.4 The Strategy of Standards Supporting Innovation after entering the 21th Century

China has already experienced an important technology accumulation and capital accumulation stage when stepping into the 21th century. The industry experienced a gradual integration into the global economy, the innovation capability was strengthened gradually and the technical standard strategy was significantly changed accordingly. The “Dual-adoption Policy” was gradually diluted. The government began to propose an ambitious standardization strategy to support so called “independent innovation”. The enhancement of economic strength has successively promoted the technological innovation and standardization enthusiasm of industry. Domestic standardization became more and more active. TCs in various fields actively organized domestic experts to participate in international standardization, changing from passive tracking and learning to substantive participation in the preparation of international standards, and sought for more opportunities to turn indigenous technologies into international standards. The academic community has noticed quite a lot cases of standards supporting independent innovation and has made thorough analysis, such as EVD, TD-SCDMA, TD-LTE, AVS, IGRS, GT800, EPA, UOF, WAPI⁸. All these reflected China's efforts to develop independent innovation technologies into national standards and international standards, and the capability to participate in international standardization has also been greatly improved in a short time.

However, the government suffered great pressure from abroad when developing the policy of standard supporting independent innovation. In 2013, Standardization Administration of China (SAC) and State Intellectual Property Office (SIPO) jointly issued the "Interim Management Provisions for National Standards Incorporated with Patents"⁹. The issuance process of this document intensively embodied the government's attempts of supporting independent innovation properly from policy level at the very beginning, but it encountered strong opposition of the MNCs. SAC's original intention was to absorb useful experience from existing patent policies of international standardization organizations and to find a balance between encouraging indigenous innovation and properly protecting intellectual property (Wang, Ping, J. Kwak, H. Lee, 2014: 937). However, the

⁶ China National Institute of Standardization (CNIS), China Electronics Standardization Institute (CESI), China Metallurgical Information and Standardization Institute (CMISI), Communications Standards Research Institute (CSRI), Standard Quota Institute of MOHURD, Beijing Institute Standardization (BIS), Shanghai Institute of Quality and Standardization(SIS), Shenzhen Institute of Standards and technology(SIST), etc., all developed from 80s in the last century.

⁷ This network is still running now. As the application of the IT and internet, it has become very effective distribution platform for standards information .

⁸ EVD is a standard for digital video players; TD-SCDMA and TD-LTE for mobile telephony; AVS for audio–video encoding/decoding; IGRS for home networking ;GT800 for digital trunking; EPA for Ethernet communication tools for the plant automation; UOF for Chinese Office Software Document Format Specification; WAPI for symmetric encryption algorithm in WLAN

⁹ Notice of SAC & SIPO to Release Announcement for “Management Temporary Provisions for National Standards Incorporated with Patents” (国家标准委 国家知识产权局关于发布《国家标准涉及专利的管理规定(暂行)》的公告), http://www.sipo.gov.cn/zcfg/flfg/zl/bmgfxwj/201401/t20140103_894910.html

consultative draft of this policy, since published in 2009, has been criticized by MNCs as too strict, the specified license fee was far lower than the normal one (Willingmyre, G., 2009) and would damage the interests of foreign enterprises. Therefore China was required to comply with international norms to protect intellectual property. SAC has received more than 2000 pages of comments from the United States (Ernst, D., 2011:61). This case also shows the difficulty for the latecomers to support independent innovation with domestic policy in the global economy. Although in specific cases, supporting independent innovation policy can become a powerful leverage, even getting support from MNCs, it makes the government in dilemma while making such general policies (Wang, Ping, J. Kwak, H. Lee, 2014: 937, 939).

2.5 The Current Standardization Institution

The current standardization system of China is totally managed by government, including SAC (under AQSIQ¹⁰) in charge of national standardization, bureaus or ministries under State council in charge of the sector/ ministerial standardization, as well as local governments in charge of the local standardization.

SAC mainly depends on the TCs for standardization in each field to organize standardization actives at the national level. By far, SAC has maintained 537 TCs for standardization¹¹ (subcommittees are not included). Most of these TCs are established jointly with sector department of government . Some secretariats are located in the technical focal points for standardization affiliated to SAC or sector departments.

Sector/ ministerial standardization involves various contents. There are 64 sector (industry/ ministerial) standard codes¹² . In the planned economy era, each code was corresponding to a field of sector standardization of which a government department was in charge of the management. After the reform and opening-up, several sector departments have been canceled. The management responsibilities of corresponding sector/ ministerial standardization are now transferred to the Ministry of Industry and Information Technology (MIIT). Now the MIIT has become a department having the jurisdiction over most sector/ ministerial standards, including 18 sector standard codes. Moreover, some departments responsible for sector (industry) affairs are still independently in charge of the management of sector/ ministerial standardization, including Tourist Administration, Ministry of Housing and Urban-Rural Development, National Railways Administration, Civil Aviation Administration of China, etc..

Local standardization involves 22 provinces, 5 autonomous regions and 4 municipalities. For each local government, the local Technical Supervision Bureau is taking specific charge of the standardization in this region, while specific standardization generally relies on the local Institute of Standardization (like BIS, SIS, SIST, etc.) and local Associations for Standardization.

After reform and opening-up, all levels of government have promoted the establishment of many standardization associations. For example, there are China Association for Standardization

¹⁰ AQSIQ is abbr. Of Administration of Quality Supervision, Inspection and Quarantine

¹¹ See, SAC, Query for Professional Technical Committee, <http://www.sac.gov.cn/SACSearch/search?channelid=61613>

¹² SAC, Management Rules for Sector Standards (行业标准管理办法), 2007, http://www.sac.gov.cn/zwgk/flfg/gnflfg/201012/t20101210_56202.htm

(CAS)¹³ at the national level and standardization associations under each sector departments, such as China Electronics Standardization Association (CESA), China Communications Standards Association (CCSA), China Association for Engineering Construction Standardization (CECS), etc.; all provinces and municipalities at the local level also have their own standardization associations. These associations are generally not really independent social organizations and have a very close relationship with government. Most of them don't formulate their own association standards (association standard is not recognized by the Standardization Law up to now), but mainly help the government to promote the standardization at all levels and do some publicity and training work of standardization.

It's worth noting that technical focal points for standardization in charge of the secretariat of TCs for standardization play a very important role in the standardization of China. Some of them are research institutions of standardization or technical institutions affiliated to different levels of government (such as CNIS, CESI, SIS, BIS, SITS, etc.), and some of them are standardization associations (such as CAS, CCSA, CESA, etc.). In actuality, on one hand, as the think tank of government for carrying out standardization, they provide consultation and suggestion scheme on standardization organization management, policy, industrial priorities, etc. for government; on the other hand, they are in charge of organizing the standardization activities on behalf of the government, hosting the secretariat of standardization committee, planning standardization priorities, providing "public service platform"¹⁴ for different stakeholders, and participating in the international standardization of such organizations as ISO, IEC, etc. on behalf of China.

After entering twenty-first century, the Chinese government began to realize that the contradiction has been existing between the government-controlled standardization system and the market economy pursuance which needs to adopt a more pragmatic approach. Therefore, the Chinese government encouraged the establishment of industrial innovation alliances outside the government management and hoped to breed private sector standardization accordingly.

3. Discussion

China's standardization system is significantly shaped by its history and culture. Completely different from the characteristic of US that the national government is historically uninterested in standardization (Murphy, C. N., and J. Yates, 2009:9), the central government of China has always thought that it shall manage standardization (see 2.1). Many people in academia have noted that the Chinese standardization management is the characteristic of government leading, and in particular, the standardization system of China is similar to that of some Asian countries, such as Japan, Korea, Singapore, India, etc. (Liu, C., & Jayakar, K., 2012; Gao, P., Yu, J., & Lyytinen, K., 2014). The current status of standardization management of Asian governments has a very close relationship with special political culture in the historical development of Asia.

3.1 Positive Role at the Preliminary Stage of Reform (1980 - 2000)

Standard is the effective carrier of knowledge and technical solution. International standard is the technological infrastructure of economic development and has made important contributions to the establishment of global market (Murphy, C. N., and J. Yates, 2009: 20-22). Developed countries

¹³ CAS established in 1979, see: (Li, Chuanqing, et al., 2001: 591)

¹⁴ For instance, the role of CESI in the case of IRGS, see: (Ernst, Dieter, 2011: 89)

continually solidified the mature technologies in industry into international standards in the process of industrialization, which have accumulated over several decades. For the latecomers in the global economy, when the economy and technology are relatively backward and the industrial standardization capability is relatively low, like China at the preliminary stage of reform and opening up (1980-2000), adopting international standards as the policy of rapidly transferring the western advanced technologies to home is a smart choice.

Chinese government adopted the policies of marketization for technology and foreign investment attraction in order to promote the economic development, and adopted learning-based strategy for scientific and technological development to greatly promote technical progress; introduced internationally TC mode for establishing the organization form of standardization and admitted the principle of "openness, transparency and consensus" to try to get more stakeholders into the TCs to prepare standards together and gradually cultivate industrial standardization capability. Such government leading and standardization policy of TCs were very successful at that time. "Dual-adoption" policy (see 2.3) gave full play to the technology diffusion of standard. Advanced western technology was rapidly transferred to every field of relatively under-developed China at that time.

There are two reasons for general technical progress: one is innovation, the other is the technology spillover effect and "learning-by-doing" effect in trade process, and "learning-by-doing" type technical progress is mostly obtained from technology spillover (Zhang, X., 2000). "The development of world civilization is composed of one-tenth originality and nine-tenths transplant" (Reischauer, Edwin O. , 1992). The industrial policy and science and technology policy of Chinese government greatly promoted the technology spillover effect and played a very important role in the scientific and technological progress of China. It was obvious that the standard became one of the important channels of technology spillover effect in this process. After approximately 12 years from enacting the Standardization Law in 1988 to the end of last century, China had completed the transformation from a third world country with backward economy and technology and very low standardization capability to "world manufacturing plant" (labor-intensive industry structure). According to the data released by National Bureau of Statistics, the gross domestic product (GDP) stood at a mere 1.51 trillion RMB in 1988 while it reached 9.98 trillion RMB in 2000¹⁵. The capability of industry participating in national and international standardization had also been improved in a certain extent.

3.2 Promoting or hindering Innovation?

3.2.1 Fostering and Promoting Innovation Period (2000-2010)

China entered into WTO at the beginning of the 21th century and promised to follow the rules of WTO/TBT. From then on, China's economy has gained a new round of rapid development¹⁶. Because the economic strength has improved in a certain extent, how should the industrial structure be transformed and further promote the scientific and technological progress became very important. The academia thought that imitation products were difficult to be competitive, and the

¹⁵ See website of National Bureau of Statistics, <http://data.stats.gov.cn/easyquery.htm?cn=C01>

¹⁶ By the end of 2014, GDP reached ¥63.6 trillion RMB, See website of National Bureau of Statistics, Ibid.

discontinuity of technological trajectory brought innovation space to China (Liu, Xielin, 1997). China was in a sharp adjustment period of industry and capital accumulation phase, so the relative comparative advantages of capital and technology intensive industry were greatly improved; combining the high and new technology with the labor in China through technical innovation was favorable to gradually change labor intensive product into capital and technological intensive product (Li, Xinguang, & Meng, Y., 2006). Entering into WTO was favorable to the transformation of industrial structure; government's policy shall promote the development of technology intensive industry, including high and new technology industry (Guo, Kesha, 2003).

Standardization strategy

The government started strongly supporting indigenous innovation technology under such new situation and the standardization strategy transformation was also started; all levels of government including different departments (such as SAC, NDRC, MOST, MIIT, MOFCOM¹⁷, etc.) of the central government, and local governments, etc. had established standardization strategy to support indigenous innovation in their own jurisdictions (jointly or separately) (Wang, Ping, Y. Wang, J. Hill, 2010). Since the country's opening-up to international economy, substantial changes have been occurred in China's standardization strategy, in its institution and in its management practices. (Ernst, Dieter, 2011:21)

The standardization strategy established by Chinese government is essentially different from that established by private standardization organizations. The strategy considered by a private standardization organization mainly focuses on its status in economy and industry development and proposing the strategy about how to exert standardization function in aspect of new industry field and social demand. In addition, the resources which can be mobilized by private standardization organization are limited. For the standardization strategy priorities considered by the government, not only the standardization strategy may be designed from the aspect of government's policy (e.g. scientific and technological development policy, energy conservation and environmental protection policies, acquisition policy, etc.), but also how to mobilize the resources at government's disposal (government fiscal fund, state-owned enterprises, etc.) may be considered from the aspect of key industry development which is required to be promoted by the government.

Overall, China's strategy was successful from 2000 to 2010. The positive impetus of standardization supporting indigenous innovation strategy dominated by the government and TCs absorbed stakeholders was the most primary in the rapid development process of economy. The innovation and standardization capability of enterprise were in the stage of cultivating, so the standardization strategy of government obviously played a positive role. China also has experienced the trial and error process¹⁸, which sometimes appeared as the incoordination of multiple decision-making bodies of government, however, its negative effect was secondary in the process of economic growth. Dieter Ernst indicated that,

“..... compare to the extended history of standardization of Europe, the United States, and Japan, China is a relative latecomer. The speed of learning and institutional adjustments

¹⁷ SAC is the abbr. for the Standardization Administration of China, NDRC for the National Development and Reform Commission, MOST for the Ministry of Science and Technology, MIIT for the Ministry of Industry and Information Technology, MOFCO for the Ministry of Commerce

¹⁸ Dieter Ernst believes that, “China is not the only country where standards fail. And standards may also fail when the government does not play a role.” See: (Ernst, Dieter, 2011:17)

has been impressive: In a very short time, major standards projects have been initiated in the strategically important ICT industry.Chinese leadership to use standardization as an enabling platform for indigenous innovation(is) not only 'virtually unparalleled among developing countries (Kennedy, Scott, et al. 2008:21)', its scope and depth certainly also goes much further than the standardization strategies in the United States, Europe, and Japan." (Ernst, Dieter, 2011:102)

From the actual cases of innovation supported with standards and the analysis of academia, each case shows different positions in different technical fields and different government's decision-making levels. For example, Richard P. Suttmeier thinks, "the relative importance of techno-nationalism and techno-globalism seems to vary considerably across a spectrum, with WAPI exemplifying the former and AVS and perhaps IGRS the latter. (Suttmeier, Richard P. , et al., 2006)" Dieter Ernst pointed out that, "There is no doubt that the MLP (Medium- and Long-term Plan) contains techno-nationalist notions of self-evidence. This reflects the initial objective of Chinese policymakers to reduce China's dependence on foreign companies' intellectual property and relevant high patent licensing fees." (Ernst, Dieter, 2011:24)

The authors think that the combination of techno-globalism and techno-nationalism (or so-called "neo-techno-nationalism" of Suttmeier) was dominant generally for both government decision-making and specific standardization practice, and narrow techno-nationalism was just a few. The diversity of actual decision-making was derived from different understanding of government's multiple decision-making bodies to indigenous innovation and the integration into the global economy, and also from the specific conditions of decision-makers facing different technology (industry) fields. Chinese enterprises faced enormous pressure from international norms dominated by multinational enterprises and western countries on indigenous innovation problem, including the unfavorable position of their own innovation capability, the winner-take-all competitive strategy of transnational corporations, the actuality of large-scale foreign direct investment (FDI) and patent thicket, insufficient dialogue ability with advanced enterprises from developed countries in standardization organizations, etc.. Like Dieter Ernst described that, "Companies from the emerging economies are thrown into this game without much preparation. The new players are thus experiencing with new approaches to standardization." (Ernst, Dieter, 2011:48) From the analysis of most standardization cases, it can be seen that both the government decision-making and industries' practices were actively to be integrated into the international innovation system and standardization system although there is difference between different cases, namely trying to establish the indigenous innovation technology into national standards and international standards and overall admitting the international patent licensing rules. Only the case involved with information network security shows that the decision-maker wanted to ensure the predominant position of indigenous innovation technology in China. WAPI is indeed a very extreme case.

Industrial alliance

As previously mentioned, promoting industrial alliance standardization has become one of the contents of standardization strategy of China. Some of the relatively successful alliances include IGRS, AVS, TD, CSA, etc.. Many domestic experts have studied the alliance standardization and think that the founding of industrial technology alliances has changed the situations that a company plays alone and encounters the cut-through competition, enabled the effective integration of industrial resources to form a complete industrial chain, and started the transformation from the standards

development completely under the government control to the coexistence of government and private sector standardization. This is of great significance to China in the breakthrough of market economy transition and the improvement of industrial competitiveness. (Wu, G & P. Yan, 2011; Wang, Ping & Z. Liang, 2013).

The standardization system of China has been a historic change. Although some domestic experts think that such alliance doesn't have a real legal status yet, its operation mechanism of standardization is immature, the patent management and intellectual property politics are not perfect (Liang, X. & C. Zhu, 2015), and the test system and certification system in China have institutional exclusion to alliance standard, the change has opened the gate of standardization system reform, the standardization system completely under government management has been broken, and a real sense of private standardization has emerged. "Instead of an exclusive reliance on a top-down approach to standardization led by government, China is now witnessing the emergence of diversity, and often hybrid standardization projects that mix and match elements of industry-led and market oriented approaches with the traditional reliance on government". (Ernst, Dieter, 2011:93).

3.2.2 The Economic Slowdown and Institutional Drawbacks (2010 - Now)

In 2011, China became the world's second-largest economy with GDP reached 48.4 trillion RMB. However, after 2010, the economic development started to slow down; the GDP growth rate was 10.63% in 2010 and dropped to 7.27% in 2014¹⁹. In the meanwhile, the drawback of standardization system under the government control started to appear. Actually, many domestic and foreign scholars have analyzed the drawback of Chinese standardization system and the need for reform from various perspectives and given some reform suggestions.

As previously mentioned, the inside of Chinese government is not monolithic, which is embodied as multi-decision-making bodies in actuality. Every department (ministry or administration bureau) under the State Council has its offices (departments) at the levels of the provinces and municipalities, districts under provinces, and the hundreds of counties. Therefore, the government system is fragmented as "top-down-channels-cut-by-horizontal-levels"²⁰. The standardization under government management is the same, which is a very dispersed system (see 2.5). The difficulty in coordination among government departments has been a long-standing issue. With the gradual enhancement of economic strength and the improvement of innovation capability, its negative effect gradually appears. "China's new Ministry of Industry and Informatization is intended to solve some of these stove-piping problems and bring greater coherence to the national effort to develop the ICT industry and diffuse IT throughout the society.(Kennedy, Scott, et al., 2008:16)" Dieter Ernst argues that, " In fact, China's standards system is overly complex and displays signs of fragmentation. Ambiguity is a fundamental source of such fragmentation. Equally important sources are inter-agency rivalries and turf battles among different ministries and their respective stakeholders. (Ernst, Dieter, 2011: 28) "

¹⁹ See: the website of National Bureau of Statistics, <http://data.stats.gov.cn/ks.htm?cn=C01&zb=A0501>

²⁰ Suttmeier, Yao, and Tan call it as institutional fragmentation (Suttmeier, Richard P. , et al., 2006: 37). Kennedy, Suttmeier, and Su regard it as stove-piping problem (Kennedy, Scott, et al., 2008: 16). The Chinese saying is "条块分割".

Actually, the multiple decision-making bodies of government broke the harmonious system assumed in planned economy period after the rapid development of market economy. In actuality, the sector/ ministerial standard and local standard tend to be stronger than national standard in some cases as the sector and local governments hold more resources and "administrative management measures". The Standardization Administration of China (SAC) is only a subordinate organization in the eyes of those ministerial (sector) organizations. The competent departments of sector government have interest demands of large state-owned enterprises under their control and the local government has the interest demands of local market and local large taxpayer. In this case, the national standards are no longer sacred. Therefore, the standards established by different management bodies of government are in a competitive state. Where the national standards prepared by SAC are inconsistent with sector/ ministerial and local standards, the sector government and local government can go on their own way according to their jurisdiction. Such case aggravates the standardization management confusion, which is disastrous for voluntary standardization, and far from realizing resource allocation function with market mechanism. In order to solve this confusion, there is no better solution under the current system than solving the standardization discordance between ministries and commissions by the State Council. This is also the direct reason for establishing "Coordinated Promotion of Joint Inter-ministerial Meeting System for Standardization" by the State Council in June, 2015²¹.

When investigating the SSL or LED²² industry (2012~2014), the authors found that the existence of multi-decision-making bodies of government management not only caused contradiction among standards issued by government agencies affiliated with different ministries and those at different levels, but also brought adverse effect on the development of private standardization. Because of the importance of LED industry in energy conservation, the condition that all levels of government supported to establish LED standard alliance appeared in society. A dozen similar industrial alliances appeared in LED field in recent years. Every alliance has its own government background and wants to do standardization work. The conditions that not recognizing each other and fighting for authority and interests appeared among them, even shutting the door on the participants of other alliances regardless of the "openness, transparency and consensus" principle of standardization when holding the standardization meeting. During investigation, the authors also found some enterprises and testing organizations complained that some local governments promoted alliance standardization which was considered as local protectionism actually, and even other local governments intended to take measures for retaliation.

The authors think that the primary cause of the excessive intervention of all levels of government in the process of promoting alliance standardization is that the current standardization system allows all levels of government to manage voluntary standardization, forming multiple bodies of government standardization management. All levels of government regard the promotion of voluntary standardization as an "important measure of administration". This is an important cause of various discordance phenomena generated in standardization. The negative effect of system

²¹ *The State Council's official Reply to Agree the Establishment of Coordinating and Promoting Joint Inter-ministerial Meeting System for Standardization*, 2015-06-01, http://www.gov.cn/gongbao/content/2015/content_2883233.htm

²² SSL is the abbr. for Solid State Lighting, LED for light-emitting diode.

drawback starts to enhance so that it obstructs the impetus to standards supporting indigenous innovation.

3.3 Deregulation and Social Self-governance

Most academic researches indicate that the current standardization management system of single government has caused the monopolization of standardization resource by administrative power and the restriction of market operating system, restraining the enterprise enthusiasm for innovation (Wang, Ping, 2003; Xue, Xuetong, 2006). The reform of standardization system is required to adapt to the diversified tendency of the modern social interest, and the diversity of benefit requires open public governance. However, the self-organized social groups in industry shall be the subject of standardization activities in market economy and can play an important role irreplaceable by the government and enterprise.

Andrew L. Russell holds that current standardization has been developed into a more open "private regimes" era, namely "open standard" era. "There emerged further agreement around the paramount importance of well-defined procedures to guarantee public participation in the production of standards and liberal terms of access to allow public use of standardized technologies." (Russell, A., 2014) While assessing the U.S. standardization system, Dieter Ernst holds that, "The potential advantages of decentralized self-government are well established in theories of innovation and organization". "The vision of local self-government finds ample support in the 'collective action' governance theory developed by Elinor Ostrom." (Ernst, Dieter, 2013)

The theory of Elinor Ostrom, the winner of 2009 Nobel Prize in Economics, mainly analyzes the common-pool resources (CPRs) of self-organized system, like marine fishery, public pasture, etc., proposing the analytical framework and eight design principles (Ostrom, E., 1990). Timothy Simcoe holds that inherent symmetry exists between the common problems studied by Ostrom and the anti-common problems in technical standards, thus the analysis method of Ostrom may be extended to studying self-governance in standard setting organizations (SSO). The result of Simcoe's study describes that "many SSOs could go further to define clear boundaries and mechanisms for monitoring and enforcing licensing commitments, and articulating a clear set of principles for interpreting FRAND²³ commitments in the event they must be enforced." (Simcoe, Timothy, 2013)

Our specific question is, what is the prerequisite for self-organized social subject generated in Chinese industry to develop private standardization? Brunsson holds that, "When states 'deregulate', abolishing some of their directives, ideas similar to those inherent in the directives may turn up in standards" (Brunsson, N., et. al., 2000). Therefore, government deregulation is the first condition for implementing the reform of standardization system. The authors hold that, for China, "deregulation" is not only to allow social groups to develop standardization but also to make the government withdrawal from voluntary standardization management, particularly from the management of sector and local recommendatory standards. The current state of multi-entities of government standardization management shall be changed to truly remain space for voluntary standardization of social groups.

One core connotation of modern governance theory is the sufficient expression of stakeholder demand and sufficient participation of governance process; "governance malfunction" would occur

²³ FAND is the abbr. for Fair, Reasonable, and Non-Discriminatory.

where the stakeholders fail to reach an agreement, thus a set of perfect system arrangement is needed for guidance and coordination (Li, Chuanjun, 2003), embodying the "technology democracy" based on the principle of "openness, transparency and consensus" in standardization (Garcia, D. L., B. L. Leickly, S. Willey., 2005). The confused condition occurred to current standardization management is originated from the deviation of government function positioning in standardization activities.

The government needs to develop favorable operating environment for voluntary standardization, establish corresponding supporting policies, and provide financial support for industrial innovation project, particularly for the R&D projects with common industrial technology or demand (e.g. inspection and detection), cultivate industrial innovation capability rather than organizing the preparation of voluntary standard directly. There is another more important thing in standardization governance aspect for the government to do, namely, to achieve the preparation, supervision and implementation of mandatory standard (technical regulation) system in relevant field so as to solve problems in aspects like security of the whole society, human health, environmental protection, resource conservation, etc. This exactly complies with such reform gist of "better exerting the government function while making the market play a decisive role in resource allocation".

If the government can deregulate indeed and leave development space for private standardization in industry, then the rest are tasks for the industry itself. Many people in China hold that, China is not a self-organized society and it is very difficult for it to develop such powerful private standardization organization like developed countries. However, the authors don't agree with such view. Through the CSA investigation in recent years, the authors can obtain opposite conclusion. Even though the government deregulation degree was still very limited²⁴ and the CSA alliance encountered various difficulties during operation, it still got great achievement. An important standard used for LED luminous module interface (CSA 016) was prepared only in one year and one month since March 2012²⁵, which solved bottleneck problems in LED industry. The enterprise participation enthusiasm was unprecedented. Member enterprises not only actively participated in technical scheme design, but also supported necessary experiments and validations. This was hard to be seen in previous standardization led by government during the planned economy period. This standard rapidly entered into industry implementation stage after issuance, after more than one year, more than 30 enterprises begun to produce street light modules complying with the standard. (Wang, Ping, J. Ruan and W. Gao, 2014).

The case of CSA describes that the industry is imbued with great enthusiasm for standardization developed by self-governance; in case that the industry innovation capability is developed to certain level, so long as the government can relinquish the control, the industrial enthusiasm will be automatically inspired to find appropriate organizational form and quickly satisfy the standard demand of industry, and all the costs in the course of the standardization will be borne by the stakeholders themselves, which means that the voluntary standardization will become a self-

²⁴ The private standardization including alliance standardization still lacks of legal position in the Standardization Law; Although alliance standardization is allowed but only recognized as the experimental or the pilot project. Alliances in many provinces cannot be registered to government, therefore they may be regarded as illegal entities.

²⁵ CSA Standard CSA016-2014: Interface Requirements for Application of LED Lighting Street/Tunnel Light Consisting of LED Module with Heatsink and Separated Control Gear

financed process in the market. Of course, such rapid reaction is an instinct of enterprises under market competition environment and shall allow trial and error and competition of industry. This is a process for nourishing and improving industrial standardization capability and conducting self-optimization as well as for optimizing the resource allocation through market mechanism for industrial standardization.

The breeding of self-governance capability of industrial standardization needs a process. If the government can relinquish it, some former endogenous associations for standardization of government administrative system will accelerate the transition, the industry may also generate new associations for standardization, as well as various enterprise standard alliances and consortia; all these organizations shall experience the marketization process, and the industry innovation will become more active. However, the government can't refuse to relinquish on the grounds of lower self-governance capability of industry, it must give the self-organized standardization of industry a process from toddle to grow in strength.

4. Policy Suggestions and Unsolved Issues

China can't copy the standardization modes of developed countries like U.S., Europe, etc., namely it shall not only consider that the government shall quit from a majority of voluntary standardization management but also the historical and cultural development of China. The desire of reform of voluntary standardization system proposed by the authors is the scheme combining the great promotion of private voluntary standardization with the original system in China:

(1) The government shall first totally quit from the sector/ ministerial and local voluntary standardization management to leave space for cultivating the self-governance capability of standardization in industry. The government shall well construct civil standardization operating environment and build supporting policies to ensure the legitimacy of private standardization organization, and shall allow the diversity form of civil standardization organization.

(2) National voluntary standardization shall be in charge of the administration of single government department to change multiple decision-making bodies of standardization into single decision-making body. However, a Standardization Commission with decision-making power should be established besides the governmental standardization administration, that the Commission shall be mainly composed of representatives from industry, consumers, scientific research institutions, and government itself, etc., which means to introduce market selection mechanism in voluntary standardization management. The advantage is: national voluntary standardization is jointly governed by the government and industry, ensuring the communication channel between the industry and government and coordinating the industry selection and government decision-making as possible.

(3) Strongly cultivate and develop industry consensus standardization led by self-organized social groups in the market and taking stakeholders like enterprises, testing organizations, consumers, etc. as subjects in standardization. Increasing private standardization in industry shall become the solid foundation of national standardization to supplement it mutually. Otherwise, national standardization will lack of industry and market foundations.

(4) The practice of sponsoring voluntary national standard preparation with government finance should be changed. The voluntary standard shall be completely formed with self-financing, and a

small amount of government fund may be mainly used for supporting the participation of expert in international standardization.

(5) The reform of voluntary standardization system requires simultaneous marketization of conformity assessment and testing organizations.

A central proposition of the paper is that the reform of China's standardization system must make the vigor of self-organized standardization stimulated in industry themselves. If China can generate private standardization organizations equal to those in US like IEEE, ASTM, or in Europe like CEN, CENELEC, etc., after several years of development, the standardization capability of the industry then will be truly improved; such standardization can truly support industry innovation.

In March, 2015, the State Council issued a notice of "Plan for Furthering the Standardization Reforms"²⁶ (Reform Plan for short). Thereinto, relevant requirements were proposed: "integrating and simplifying the mandatory standards... gradually integrating the current national, sector/ministerial and local compulsory standards into national compulsory standards;cultivating and developing civil group standards; encouraging the society, institution, chamber of commerce, league and other social organizations and industrial technology alliances possessing corresponding capability to set standards jointly with relevant market entities meeting the demands of market and innovation"; "recommended standards prepared under government leadership shall be limited within public welfare."

From the Reform Plan we found that the State Council has a clear cognition on the reform issue, and decides to adopt a more bottom-up approach to substantively reform the standardization system. Doing standardization will open to all the civil organizations, and private standardization will go public totally. However, it is a pity that this plan fails to make sector government and local government completely withdraw from voluntary standardization management. The current government state of multiple decision-making bodies for voluntary standardization management is not broken. Moreover, it is hard to clearly limit the scope of "public welfare" stated in the Reform Plan. The reform seems still on the halfway.

Mandatory standardization system reform is not discussed in this paper. However, the authors hold that the practice to totally integrate mandatory standards at different levels into only national ones, as stated in the Reform Plan, may make the sector and local government more unwillingly to give up the management authority on voluntary standards. Mandatory standards (technical regulations) is an important measure with which the sector government and local government perform their market regulatory responsibilities. Therefore, the correct practice shall be: compulsory standards (technical regulations) shall keep certain leeway for sector government and local government to find their proper position and exert their maximum efficiency in this field. Moreover, compulsory standards shall be transited to technical regulations to change the current mixed state of mandatory standard system and voluntary standard system. The establishment of a favorable and applicable technical regulation system and administrative supervision system, and a mechanism for coordination between technical regulation system and voluntary standard system remains to be the most important but tough task for the government.

²⁶ State Council's Notice for releasing the Scheme of Deepening the Reform of Standardization (2015, #13), http://www.gov.cn/zhengce/content/2015-03/26/content_9557.htm

It may be foreseen that the standardization system reform of the government is confronted with a great challenge. The existing research on administrative management and bureaucratic organization indicates that: every government department has an intrinsic motivation of "authority maximization", and is unwilling to reduce its management authority and function without external pressure (Parsons, Talcott, 1947). As specific to the standardization of China, both the sector competent department and local government are equally unwilling to withdraw from the management of voluntary standardization. Especially in this case, they still have to face the situation that their management authority on compulsory standardization will be weakened according to the Reform Plan. It is conceivable that the management authority of the sector government and local government on voluntary standardization is still remained (though limited) in the "Reform Plan" because the Central Government is difficult to convince those officials to withdraw from the management of voluntary standardization. Therefore, the biggest challenge of standardization system reform comes from the government itself.

Finally, in the future development process, the key to the constant success of standardization strategy to support innovation and economic development of the country will be whether the government can overcome its own obstacles to the reform of standardization system, solve the problems caused by the excessive intervention of government and the institutional fragmentation in a relatively short time. The remaining issue of this paper is, whether the evolution of China's standardization strategy and the system transformation discussed by the authors have any implication to the other developing countries, especially in the innovation network and eco-system of mega-regionalism. This is the need of subsequent study to be aware of.

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