

Chinese Ways of Innovation and the Challenges of Understanding Research and Innovation in the 21st Century

(A Whitepaper to the NSF-SBE for Its 2020 Vision)

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1. Chinese Ways of Innovation as Transformative Forces of the New Emerging Global Order

Transformative innovation is the driving force for changes in global political and economical orders. However, innovation processes are not well understood. We believe studying innovation in China presents an opportunity to transform our theoretical understanding of innovation processes and the impacts of these changes on the global political economic system.

In the 21st century, nothing is more *transformative* than the rise of large developing countries such as Brazil, Russia, India and China (BRICs), among which China will likely emerge as a global technological superpower in the next twenty years and is seen as the most immediate challenger of the global political economic order. As a developing country with a large low to middle-income population of consumers, world-class manufacturing capacities including flexible industrial organizations in certain regions, and a well-capitalized central state, the *Chinese Ways of Innovation* appear to be significantly different from those in its predecessors such as the United States, Japan or the Newly Industrialized Economies (NIEs) – economies based either on a relatively wealthy population or foreign markets.

Many government agencies have recognized the need to address issues related to the economic and technological development of these emerging powers. For instance, The German Research Foundation (Deutsche Forschungsgemeinschaft – DFG), has set up a Priority Program 1233 (SPP), “Megacities - Megachallenge: Informal Dynamics of Global Change” that focuses on the development processes in the delta regions of Dhaka in Bangladesh and the Pearl River Delta in China. The recently launched European Commission’s 7th Framework Program contains a specific call for proposals on China’s urbanization. The Japanese Science and Technology Agency has also created a research center to study innovation in China. Despite such efforts, current research on innovation in China has remained fragmented with little coordination from different disciplines.

Therefore, it is time for NSF/SBE to launch an interdisciplinary program with a focus on innovation in China. Analyzing the *Chinese Ways of Innovation* (Figure 1) will not only add greater knowledge to academic understanding of innovation processes as well as national and regional innovation systems (NISs/RISs) (Nelson 1993), but also can lead to great policy insights. To understand the *Chinese Ways of Innovation*, it is imperative to examine the roles of *Enterprises, Science & Technology (S&T) Communities, and the State* as well as the domestic and the global environments. To successfully implement this core mission, we propose that NSF-SBE gives priority consideration to projects on *infrastructure, networking, and talent training*

programs on innovation in China, which will build the capability of analyzing innovation in China as it unfolds.

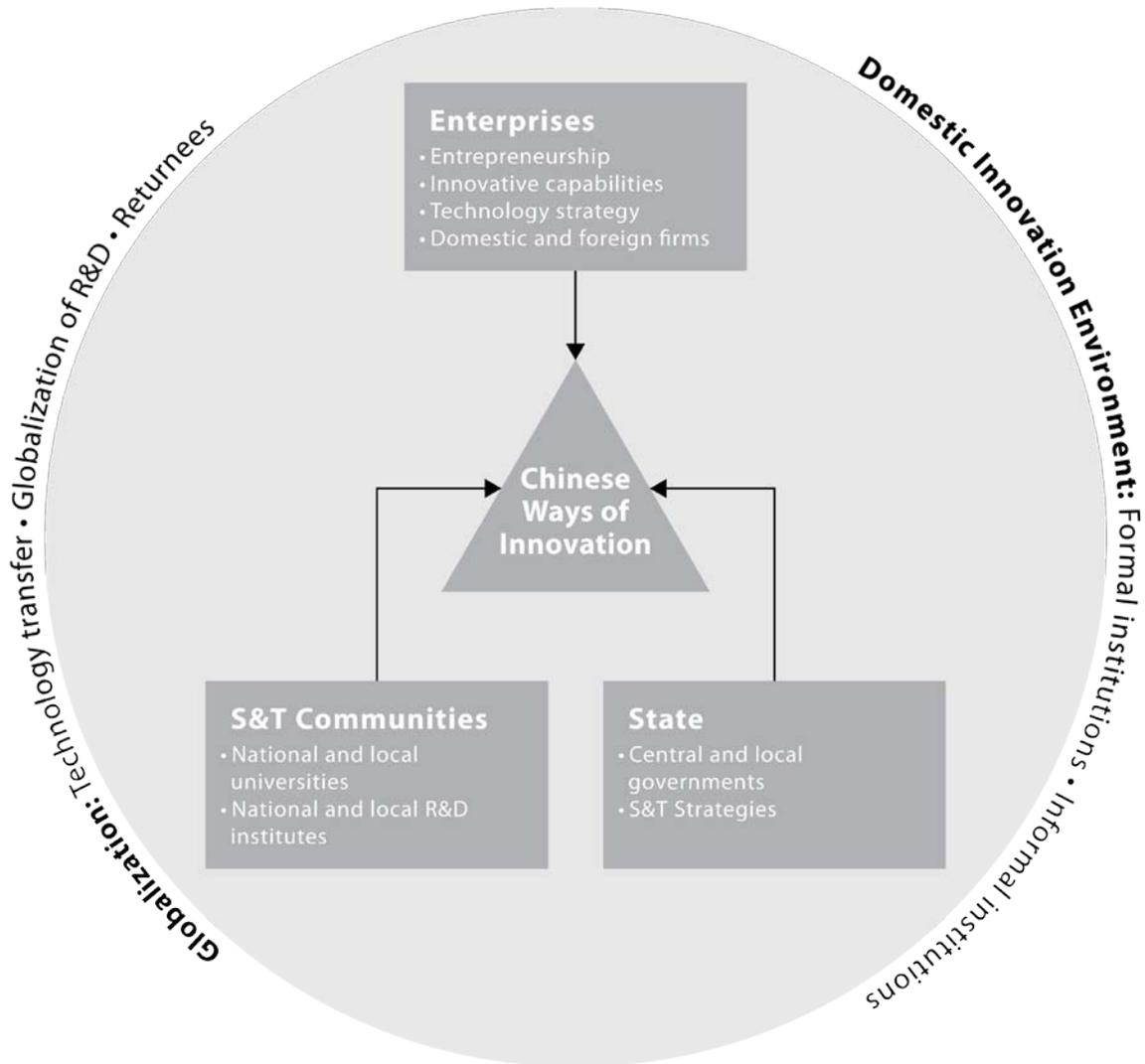


Figure 1: The Chinese Ways of Innovation

2. Strategic Directions of Research on Innovation in China

2.1. The Chinese Ways of Innovation

As argued by the late management scholar C. K. Prahalad, the unique environment in emerging economies such as India and China may enable/require businesses and governments to create new models for innovation, particularly “to create an impossibly low-cost, high-quality new business model” that serves the “bottom of the pyramid” (Prahalad and Hart, 2002). Many firms who have successfully done so; an example is Unilever’s HLL subsidiary that has developed a radically different approach to refrigeration that allows ice cream to be transported

across the country in standard non refrigerated trucks. Similar examples include Huawei, Chery, BYD, the Shanzhai cell phone manufacturers and the high-speed railways (CRH) in China. They do not simply produce inferior versions of the same products in the advanced economies; rather they create affordable products, quickly upgrade and move on to more sophisticated products, thanks to their access to *large, pluralistic and fluid domestic* markets as well as the open foreign markets.

These firms are more ready to encounter new experiences, take quicker actions, be more demanding on efficiency, and rapidly scale-up. The results have been *transformative/disruptive/discontinuous* products, processing, businesses models, and management practices. We need to see how the *Chinese Ways of Innovation* have played out in such challenging environments; how *the Chinese Ways of Innovation* differ from those in other emerging economies, NIEs, or the advanced economies; what the strengths and weaknesses of such models are; and where such models are heading in the future. Research on such questions will generate exciting insights on innovation systems, R&D strategies, and urban and regional development.

2.2. China's Enterprises

China is trying to build an enterprise-centered NIS. Though the nation's overall industrial innovation capabilities are still weak, Chinese firms in different sectors have been adopting different technology strategies so that they can quickly catch up. However, there has been no systematic research on such issues. We need to develop innovative metrics to evaluate China's industrial capabilities and conduct systematic research on technology and R&D strategies in China's different industries to see whether China is following the importation-imitation-innovation path adopted by the NIEs. We also need to examine the implications of weak enterprise innovative capabilities on the configuration of China's NIS.

2.3. The S&T Communities

China's S&T communities including universities and R&D institutes at the national and local levels were the major R&D performers before the reforms. They have experienced dramatic restructuring and expanded their capabilities significantly in recent years. We need to examine China's talent education system, assess their scientific and technological capabilities, identify the centers of excellence in different strategic technological fields, and analyze their linkages with industries.

2.4. State

The developmental State is indispensable for understanding the *Chinese Ways of Innovation*. We need to see interactions among the various agencies associated with the central, regional, as well as local governments, the co-evolution of such relationships, the effects of different ways of interactions on innovation at the local and regional levels. We need to understand the various governmental S&T policies and programs such as technology standards and intellectual property rights (IPR) protection and their impacts on innovation.

2.5. Analyze the Innovation Environment in China

The *Chinese Ways of Innovation* is conditioned upon its unique environment which consists of *both formal and informal institutions*. China's formal institutions are significantly different from those in many other economies: it has the strong legacy from a centrally planned economy where industrial R&D, manufacturing and the markets were separated. China has made great efforts to create a industrial enterprise-centered NIS during the last three decades, and many aspects of its NIS deserve further attention such as the financing of innovation, the linkages between universities and R&D institutes and industries, and the impacts of the enormous, fast-growing, cost conscious and fragmented domestic markets and its highly competitive export sectors on innovation. China's huge geographical size, its great diversity and disparities among the different regions also pose many interesting questions regarding how the NIS articulates with the various RISs. China's *informal institutions*, including its traditions, conventions and norms that encourage collective thinking and hierarchies and emphasize personal relations, also differ significantly from the Western traditions that tend to value individual ventures and legal impartiality. How such traditions affect China's innovative capabilities is unclear. We need research to further our understanding on China's formal and informal institutions and their impacts on innovation in China.

2.6. Globalization

China's innovation is unfolding in a rapidly globalizing world, which is significantly different from the environment when innovation in the advanced economies or the NIEs took off. By mid-2009, over 1,200 foreign R&D centers were reported to operate in China (Sun, von Zedtwitz and Simon, 2008). A growing number of Chinese firms have started R&D operations in the West in the 2000s. The global integration raised many questions on technology transfer, IPR, collaborations between Chinese and foreign parties and the implication for industrial and technological policies in each nation state.

China's rapidly growing flows of returnees make it imperative to assess the roles of such a group of highly competitive and technologically sophisticated talents. We need to study the dynamics of the returnee flow, their roles in building innovative capabilities in China, their integration with scientific and technological communities inside and outside China, and the strategic differences between returnee-founded firms and those founded by home-grown entrepreneurs.

3. Additional Areas for NSF Support on Innovation in China

To successfully implement the research program on innovation in China as outlined above, NSF needs to provide support to such areas as *infrastructure*, *networking*, and *talent training*. A centralized, virtual and open literature library should include statistics, yearbooks, industrial reports, case studies, working papers, as well as a bibliography on innovation in China. *Networking* includes inter-disciplinary networking among academics on innovation in China and other countries, policy makers, and business executives. NSF/SBE should provide support for visits, virtual space, workshops/conferences, and seminars that facilitate such networking activities. The need for such networks can be demonstrated by the success of the Google group on innovation in China that was launched recently by Dr. Sun.

The NSF-SBE should also provide funding to develop a capability in the United States of staying up-to-date on innovation in China. The traditional centers for Chinese studies in the United States have been very *indifferent* to science and innovation issues with the result that we do not have a cadre of scholars who understand Chinese scientific and technological development as well as they should, despite the increasingly important role of S&T in China's development and in US-China relations. Without such a cadre of experts, we will not be able to understand the *Chinese Ways of Innovation*.

4. Who are doing Provocative Research on Innovation in China?

The team we have assembled consists of a group of both senior and junior scholars who are doing provocative research on innovation, particularly in China. Sun, Xue and Du have worked on multinational corporation (MNC) R&D activities and their impacts on innovation in China during the last decade. Sun, Fan, Liefner and Zhou have examined technological upgrading and innovation capability building in China's IT industries. Lazonick has worked on comparative industrial development and economic performance using a "social conditions of innovative enterprise" framework. His current research analyzes the role of financial institutions in supporting or undermining the conditions of innovative enterprise. Li and his colleagues have

proposed a model of strategy which combines response complexity and synthesis simplicity that would enable Chinese firms to compete effectively in a globalized environment. Mu, Suttmeier, and Xue have worked for a long time on China's innovation policies such as technology standards, IPR protection and their impacts on innovation in China; Simon and Cong have analyzed the supply, demand, and globalization of Chinese talent. Sun and Fan have also started projects that examine the role of returnees in China's high-tech industries; Xue recently has worked on projects that analyze the global R&D networks of Chinese firms. Fan, Liefner and Zhou have also examined the roles of governments in China's high-tech industries and in China's Silicon Valley-Zhongguancun, and Zhou has recently launched a project that will examine the green building industries in China. As a group, we are moving from the discovery stage to empirical testing in order to see how the theoretical models of innovation apply to the innovation processes in China and how the Chinese experiences of innovation would contribute to theory-building of innovation.

5. Conclusions

China's S&T and innovation capabilities are rising at a very fast pace and are likely to have *transformative* global impacts. We believe understanding the *Chinese Ways of Innovation* is of critical significance from both the academic and the policy perspectives. The outcomes from the proposed research agenda can add significant value to inter-disciplinary inquiries of innovation processes, and build the infrastructure and capability to understand China as an emerging technological superpower. The failure to do this could lead to ignorance or suddenly hyped anxiety, neither of which is helpful for the long term competitiveness of the United States. We need to *act now* to provide strategic support to research on innovation in China. We believe that studying the *Chinese Ways of Innovation* definitely will add great fuel to the "torch of science" that is emphasized by the National Science Foundation.

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