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## Research on forming mechanism of innovation system of electronic information industry in China

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### ABSTRACT

As one of three main basic high-and-new technology industries, electronic information industry plays more and more obvious functions of infiltrating, integrating and supporting. Its innovation capability has become an important reflection of comprehensive national power and commanding height of international competition. China considers it as an important developing object as well and makes it the biggest industry in China. As international technology competition becomes increasingly furious, independent innovation capability is thought as an embodiment of core competitive power of a country. China already entered a critical period in which we have to rely on improvement of technology and independent innovation to promote economical development. Although scale of electronic information industry in China is in world front ranks, its sustained development and innovation abilities are not strong yet. This is why China is still a world's workshop now. Innovation system is extremely complicated. It is a social system in which government acts as a guiding factor, basic function of managing market resources is fully played, all kinds of technology innovation main bodies relate to each other closely and interact efficiently at the same time. This research started with discussing condition of electronic information industry in China, analyzed current status and main problems of electronic information industry innovation system in China, dissect formation mechanism of the system, studied existing problems in process of innovation, and put forward new thoughts and tragedies about how to improve the system.

### KEYWORDS

Independent innovation capability; Core competitive power; Electronic information industry; Innovation system; Formation mechanism.



## INTRODUCTION

In 2008, total income of electronic information industry in China reached 0.63 billion RMB, increased 0.149 billion RMB and 14.6% higher than last year. 5% of GDP was increase value of electronic information industry which had become the top pillar industry and the biggest industry in China<sup>[1]</sup>. In order to continuously improve independent innovation capability, increase technology level, break foreign countries' monopolization on core techniques, master key technology and promote core competition, innovation system of electronic information industry becomes a core problem which affects success and failure.

### RELATIVE SUMMARY OF ELECTRONIC INFORMATION INNOVATION SYSTEM.

Electronic information industry innovation system not only is a component of electronic information industry, but also is the most significant part in national technology innovation system. Its influence on China is shown in TABLE 1. I combined information in TABLE 1, theories and current status of innovation system, searched for main operation mechanism and development law, and laid a foundation for full and systematic research on innovation system.

**TABLE 1 : Influence of electronic information industry innovation system on China**

Development trend	Influence analysis	Influence on China	
		Opportunities	Challenges
Original foundation innovation is still the critical driving force of electronic information technology.	Current industrial structure and product structure might be overturned.	Improve technology innovation system and mechanism, guide enterprises to spontaneously form an industrial foundation innovation union and realize leap-forward development.	Original foundation innovation is weak, core techniques and standards are in short, technical gap is possible to get bigger.
Electronic information safety will still draw much attention.	How far does Safe Technology Award think electronic information industry can go?	It has obvious advantages in China. It should improve its independent innovation and walk into the world.	There are not enough world-class brands. It is difficult for it to catch up or surpass under such weak conditions.
Width of electronic information technology is broadened and depth is strengthened.	Existing everywhere electronic information technology brings unlimited development and upgrade to electronic information industry.	Opportunities for product upgrading, product updating and improving industry scale.	Transformation from paste the sign manufacturing into independent innovation can not be realized overnight.
Modularization and platform of technology and products.	Complexity of system designing is reduced while efficiencies of designing and manufacturing are increased. Cost is decreased and industrialization process will be greatly promoted.	It is good for to transform and integrate. It will promote industrialization process.	Current international division system and game rules strictly limit joining of new partners.
Intellectualization technology will be developed fully.	It not only is a pure technology issue, but also it will influence largely on policies, regulations, ideologies, cultures, traditions and other aspects. At the same time, it is an important symbol of independent innovation as well.	Independent innovation provides direction for efforts and new motivation for industry development.	It is far behind international advanced level and its foundation innovation capability is weak. It will always stay at the end of industry chain if it does not prepare for long-term development.

### Innovation system theories

Home and abroad explanations and definitions of innovation system are different and various. At present, the understanding which is agreed by the most scholars at home and abroad is: It should be able to realize commercial application. Innovation system is an essentially activity in which economic goal can be achieved through technology. We combined and summed scholars' researches and conducted definition of innovation system as follows: A network of creative organization, institution and system, which creates new knowledge and technological achievements; spreads and applies them; within a certain range, government departments and private units play promoting roles.

**Current status and characteristics of electronic information industry in China**

Presently, a four-relying-angles innovation system of government, enterprises, science departments, colleges and technology innovation supporting service system was formed. Scientific technology system reform pays attention on promoting cooperation between scientific technology and economic; it considers strengthening scientific technology innovation, developing transformation and industrialization of scientific achievements as its targets; it focuses on adjusting structures and transforming mechanism; it gains significant breakthrough and substantial progress. However, the system still needs to be improved further. Moreover, government functions should be played more powerfully and more efficiently<sup>[1]</sup>; or innovation system will be limited by government system.

On the whole, main developments of electronic information industry innovation system in China are reflected in three following aspects:

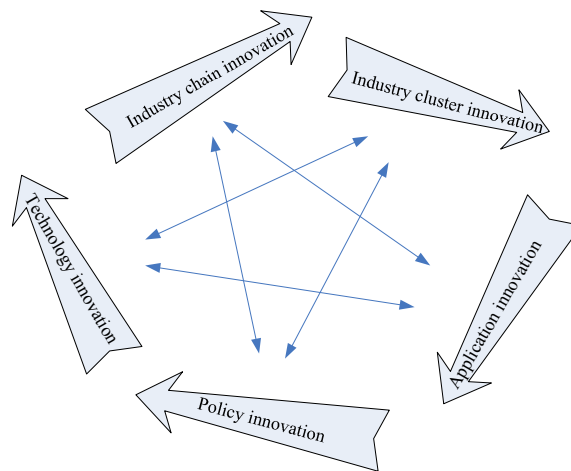
Through importing, digesting and absorbing foreign advanced techniques, electronic information industry scale in China was extended, complete and comprehensive supporting system of electronic information industry was built, industry scale was rapidly extended after reform and open up, domestic market needs were satisfied and comprehensive strength of electronic information industry was improved.

Through integration and innovation, development needs of electronic information industry which could not be fulfilled by single technology breakthrough were solved; industrialization of electronic information was accelerated.

On basis of original innovation work, industrialization of products with independent intellectual property rights -- like the third-generation mobile communication TD-SCDMA -- was realized, many patents and core techniques were mastered by Chinese, and the distance to international advanced class was shortened.

**ANALYSIS ON FORMING MECHANISM OF ELECTRONIC INFORMATION INDUSTRY INNOVATION SYSTEM**

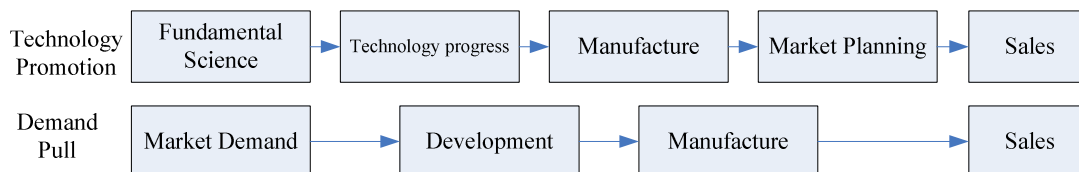
Developments of electronic information industry in China are reflected in five aspects: technology innovation, industry chain innovation, industry cluster innovation, application innovation and policy innovation. The relationships among these five innovation systems are shown in Figure 1.



**Figure 1 : Relationships and functions of elements in electronic information industry innovation system**

**Model of innovation process**

Complete model of technology innovation can be described according to innovations and inspirations showed in Figure 2 and Figure 3. When coming across problems during innovation process, we usually try to solve them with current knowledge; if we failed, then further research and development would be necessary for realizing a broader scientific technology system.



**Figure 2 : "Technology promotion" model and "demand pull" model**

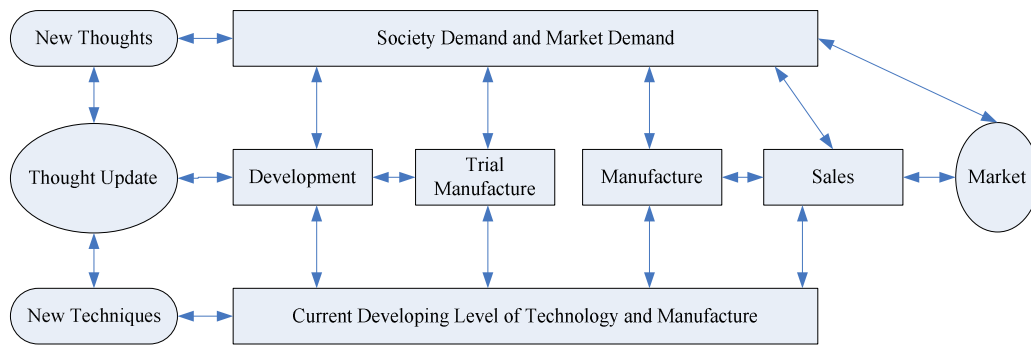


Figure 3 : Interactive model of technology innovation process

**Development stages of electronic information industry**

From characteristics of development stages of electronic information industry shown in TABLE 2<sup>[2-3]</sup> we can specifically see that electronic information industry in China is still on a primary development stage. Mainly because it started developing late, economic development lags behind, transforming system of scientific research achievements is not complete, transforming rate is low and development of electronic information industry is restricted seriously.

TABLE 2 : Development stages and their characteristics of electronic information industry

Development stages	Leading sub-industry	Investigation structure	Characteristics of innovation	Characteristics
Primary stage	Information industry	Infrastructure lags behind.	Researching and developing capability is weak, dependency of core techniques is high, and storage of knowledge and techniques is short.	Capital Intensive Type
Middle stage	Information service industry	Infrastructure is well improved.	Index of rich social information resources is high. Country and enterprises invest more in research and development. Scientific achievements transformation speed is faster. Capability of original innovation and integrated innovation is strong.	Technology Intensive Type
Advanced stage	Information developing industry	Infrastructure is advanced.	Main elements of technology innovation system interact well. Innovation system operates efficiently.	Intelligence Intensive Type

Japan, England, Germany and Canada are all on middle stage of electronic information industry development. Most countries on middle stage belong to European Union which considers electronic information industry as its strategic industry. Start with resources sharing; scientific research forces were combined into a complete and mutual beneficial unity. Moreover, European Union developed its electronic information service market completely so that competition became more and more intensive<sup>[4]</sup>.

Groups like America are on advanced stage. They own improved innovation system. Their basic research, advanced technology and market development are on leading positions. American electronic information industry is an industry with high technical contents and high added value. It cooperated with more advanced industry structure, innovation system and maintained development speed with high technology and high quality.

**Problems of electronic information industry innovation system in China**

According to analyzing structures of electronic information industry development stages and current status of electronic information industry in China, comparing with other information, we can see existing problems as follows:

- (1) Researching and developing capability is weak; percentage of investment is small; transforming rate of scientific achievement is low;
- (2) Added values of products are low; reliability of industrial key techniques is great;
- (3) Development speed, scale and economic efficiency are incongruous; most products are processed with materials; products with independent knowledge rights are numbered;
- (4) Building on infrastructure need to be improved; basic conditions lag behind;
- (5) Fund is short; no efficient risk investment system;
- (6) Industrialization chain is not improved; supporting functions are not enough.

## IMPROVEMENT MEASURE OF ELECTRONIC INFORMATION INDUSTRY INNOVATION SYSTEM IN CHINA

China had always been insisting on electronic information industry as a representative of priority development. Through introducing relative supporting policies, electronic information industry development was fastened and strengthened. Both scale and level of the industry was improved greatly. The industry could integrate into each social aspect by applying innovation. Its capability in paying attention on users' demands and satisfying them with innovation form had become a core competitive power<sup>[5-6]</sup>. We carried out full, systematic and accurate analysis on whole innovation system with SWOT analyzing method, composed complete development strategies and improved plans. China will be built into a powerful electronic country and powerful telecommunication country.

### Set strategic goals

Medium-short-term strategic goals:

- (1) Establish brand-new innovation system with positive innovation elements; continuously improve relationship network of enterprises, government, research institutions and intermediary agencies;
- (2) Promote diverse thoughts and ideas in electronic information industry; improve innovation capability with more power;
- (3) Index of electronic information industry reaches above 0.5 and enters middle development stage.

Long-term strategic goals: Become a powerful country of electronic information and technology resources; Index of electronic information industry reaches above 0.8, fasten development of electronic information industry in China and promote it onto advanced stage.

### Measure and suggestions

Scientific development concept should be fully conducted in electronic information industry innovation system, so that leap-forward development can be realized.

(1) Establish complete government supporting policy for electronic information industry<sup>[7]</sup>, introduce specifications of relative policies, carry out implement work and promote speedy development of the industry. Develop new generation of electronic information technology industry with great power and adjust industrial structure of electronic information industry;

(2) Solve problems about separation of colleges, scientific research institutions and enterprises in order to increase conversion rate of scientific research. Improve their relationship through union; transform academic research results into competitive techniques of enterprises; encourage large enterprises act like dragon head; establish different technology unions and combine manufacture and research. Government should start with managing mechanism, actively guide them to cooperate with each other; combine achievements conversion and performance of researching staffs in colleges.

(3) Fasten group constructing of electronic information industry; provide necessary and basic service facilities; in order to satisfy demands of industry groups, government needs to build more public service institutions, like Electronic Information Industry Incubation Center, New Technology Promoting and Applying Platform and etc. By guiding enterprises to form industry unions, increase integral competition capability, cooperate and develop in great scientific research projects. Promote industry chain development model of cooperation between small and medium-sized enterprises and large-scaled important enterprises; drive high-speed development of electronic information industry chain.

(4) Deepen tax reform; form a more powerful tax system; guide enterprises to invest in scientific researches from more channels and in more layers through tax policies; quicken process of independent innovation. At the same time, break different policy standards in different regions; break current status of unfairness and unreasonable tax; decrease burdens and costs in innovation process for enterprises; fasten development of industrialization.

Import full-aspects talents; enlarge supporting power of importing talents by building entrepreneurship environment which is good for gathering talents. Improve household register, housing and education; create environment which can strongly attract talents. Besides, set up and improve specific talent intermediary institutions and archive in order to arrange talents more reasonably and more efficiently.

## CONCLUSION

Setting electronic information industry is an extremely complicated and huge system project. Involved external and internal elements are comprehensive. Compared relative researches, we can see that in order to fully play functions of electronic information industry innovation system in China, innovation capability of core techniques should be maintained and complete supporting facilities should be constructed; improved innovation capability of industry chain is necessary; capabilities of independent innovation and continuous development should be improved. Industry innovation is the important belt to relate enterprise innovation with the country, promote innovative country process through innovation system. Our electronic information industry formed five innovation mechanisms through innovation system: technology innovation, industrial chain innovation, application innovation, policy innovation and industry group innovation. Whole innovation will become a system with self circulation and self development; innovation capability of long-term continuous development will be built.

## ACKNOWLEDGEMENT

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