

技术竞争情报的 应用与最佳实践

技术创新与技术竞争情报国际会议论文集 (2010)

APPLICATION AND BEST PRACTICE OF COMPETITIVE TECHNICAL INTELLIGENCE

Proceedings of International Conference
on Technological Innovation and
Competitive Technical Intelligence '2010

谢新洲 李永进 主编

Xie Xinzhou Li Yongjin



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Preface

Technological competition has become the main theme of international competition around the world today. To confront with new challenges posed by international technological competition, China decided to adopt a strategic policy of finding a way of self-dependent innovation with Chinese characteristics, as well as building an innovation-oriented country, and self-dependent innovation thus became a national strategy. Building national innovation system is the core task to realize the building-an-innovation-oriented-country strategy, and is also a significant support to promote the sustainable development of China's technological economy. However, drawing up the innovative strategy while putting it into effect is the point of building the national innovation system. Competitive technical intelligence (CTI) provides information services and counseling for technological competition by collecting, integrating, concluding and analyzing the technological intelligence needed by innovation units, and then promotes the efficiency of technological innovation.

In the condition that innovation environment is increasingly complex and innovation has become more and more difficult, especially the time when innovation investment grows continuously and the competition and cooperation relations between international innovation subjects become complex, technological innovation urgently needs CTI to provide information in competition environments, competitors and technology itself, so as to improve the innovation decision-making. The development of innovation format requires practice for technological competitive intelligence studies. In order to propel the CTI studies, broaden the employment of CTI in all disciplines, and accelerate the construction of technological innovation system in China, Peking University jointly held the first Technological Innovation and Technological Competitive Intelligence International Conference with Beijing Science and Technology Research Institute in 2008, and received very good and positive social influences.

To better boost China's innovation system construction, and display the latest achievements on the practice of CTI at home and abroad, Peking University and Beijing Science and Technology Research Institute held the second Technological Innovation and Technological Competitive Intelligence International Conference on 3-5 December, 2010. The conference received extensive attention and far-ranging support from all walks of life. The paper calling opened up to higher education institutes, research institutions, enterprises, technological intelligence service providers and so on and got more than 70 papers. Through prudent review, about 50 papers finally got into the conference. The conference invited more than 30 renowned experts in the fields of technological innovation and technological management, competitive intelligence research, business competitive intelligence consulting service from University of Pittsburgh, Shizuoka University in Japan, Institute for Competitive Intelligence Deutschland, Japan University of Economics, James Madison University, Université Paul Cézanne, Aix-Marseille 3, Georgia Institute of Technology, Peking University, Chinese Academy of Sciences, Wuhan University, Nanjing University, Sun Yat-sen University, Nankai University, Central China Normal University, Shandong Science and Technology Intelligence Institute, Hunan Science and Technology Information

Research Intelligence to submit papers, attend the conference and make keynote speeches. The conference also got full support from CNKI, VIP Information and Springer.

Papers presented in the conference cover 8 fields, which are CTI and information consulting service, CTI for enterprises and international competition, competitive intelligence analysis method and information technology, technological innovation management and enterprises' competitiveness, CTI and industry competition service, information service in industry and industry intelligence service, the application and practise of CTI, the method and technologies for CTI.

To enhance the international academic communication on technological innovation and CTI, display the latest research achievements in the related area, push forward the theoretical research and practical application of CTI, and contribute to the construction of national innovation system as well, the conference committee decided to publish the selected papers for readers' references.

To guarantee the quality of the collected papers, the committee appointed professionals to modify the spelling and grammar of all the papers without making any substantial changes to contents. Here, we express our sincere thanks to all those who have contributed in the paper-calling, proofreading, revise, composing and publishing process.

Xinzhou Xie
Professor, School of Journalism and Mass Communication
President, China Center for Competitive Intelligence and Competitiveness Research
Peking University

Aug, 2010

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Session 1
主 题 一

**Method and Technique of Competitive
Technical Intelligence**
技术竞争情报的方法与技术

Research on Patent Analysis Framework for Enterprise Technology Innovation

Ma Feicheng^①, Wang Yanling^②, Nie Jin^③

Abstract The process of enterprise technology innovation includes the following stages: technology selection, research and development, manufacturing and commercialization. For each specific period of enterprise technology innovation needs to implement different analysis methodology. Based on the analysis for mechanism of patent (formulation→) formation during the process of enterprise technology innovation, this paper demonstrated our research on the patent analysis outline for the whole procedure of enterprise technology innovation.

Keywords Processes of technology innovation, Patentability, Patent analysis

Market-oriented technology innovation is a consistent, comprehensive, technological, organizational and commercial process which includes innovation of new products, technique, gaining new resources of raw material, establishing new enterprise organization, etc. Technology innovation includes the following categories: (a) Technology selection; (b) Research and development; (c) Production and commercialization. The significance and function for each period of patent analysis is different, we need to apply unique research methodology to every procedure. This paper explored our research systematically on the application of patent analysis at different stages of enterprise technology innovation. At the end of the paper we demonstrated the patent analysis framework we generated.

1 The mechanism of patent formation in the process of enterprise technology innovation

The mechanism of patent formation is the process of enterprise technology innovation which forms the patent rights relying on external and internal comprehensive influences. The mechanism of patent formation includes not only requirements of a firm's patent rights but also the technological invention to generate the patent rights and the legal, environmental infrastructure.

The mechanism of patent formation reveals the motivation and conditions for a technological achievement to be transferred into patent, and reveals the inner connection of patent and technology innovation.

The generally accepted mechanism of patent formation in the process of technology innovation is:

- Legally regulated category of technological achievement for patent application;
- Enterprises possess the property right of technological achievements;
- The technological achievement possesses the novelty and originality with which an

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invention patent characterized;

- The firm's internal demanding of the transition from technology achievement to patent;
- The legal procedure regulation requirements for patent application.

The specific mechanism of patent formation is the property to earn monopoly profits by patent right. It bases on;

- The patent is the most important or, in other words, the dominating outcome of technological innovation. Although not all technological pursuits end up with patents, most of them will apply for patent rights.
- The patent is the most important part of technological innovation, and the majority of successful innovative pursuits will be consummated in the application for patent rights.
- The patent is different from innovation itself. The technologies associated with patents are not acquired by technological innovation. There is a logical relationship between a patent and technological innovation.
- The predecessors of the majority of innovations are inventions. Patent rights are applied for in the case of most inventions, but only those inventions containing core and key technology can be granted patent rights.

2 The patent analysis framework of technology selection

2.1 The stage of technology selection

At the technology selection stage, an enterprise should make a selection based on the strength of its resources, including technology, manpower, platform of research and development, etc. The market demand and technological infrastructure are also considered at the selection stage. At this stage, patent analyses help enterprises to search for technology, discover technology opportunity and to select the R&D project. The purpose of patent analysis is to help enterprises analyze the status of current technological development, plot the evolution of technologies, estimate the stage of technology to explore merging of technology and to organize research and development on the targeted technology. Patent analyses help enterprises to exclude repeated research, avoid unnecessary R&D expenditure, and evade existing-patents.

Enterprise investment on research and development is dependent on technology selection. A good technology selection will be the one which can utilize an enterprise's resources thoroughly and the manufactured product can be commercialized easily and successfully. The patent analysis of technology selection for enterprise is the process in which patent analysts provide the maximum information on technology background, technology prediction, technology development opportunity for the decision maker. It offers in depth the technology research information. The emphasis of this process is the technology itself.

The primary preparation for this stage is the IPC classification and the conversion of technology.

From the perspective of patent classification, at the stage of technology selection, the patent analysis emphasis on the basic patent is formed from the emerging technology until it reaches maturity.

At the stage of technology selection, patent analysis is carried on from the separate aspects of technology distribution on a time series, terrain, and subject and technological environment. The content of it is more complicated and multi-leveled than the other two stages.

2.2 Chronological patent analysis

The quantity changing chronologically is an important characteristic of patent data. For patent analysis should start with different stages of technology, analyze the life cycle, include technology trend forecasting, and search for and analyze technology opportunities.

2.2.1 Technology life cycle

There has been a great deal of research done on technology life cycle from the patent analysis perspective. Most of the research has been focused on analyzing the characteristics of patent distribution based on the stage of technological development. However, while starting with the technology demand derived from innovation, an enterprise may analyze the stage of technology through the technological characteristics presented by patents. And it is very important to judge whether the enterprise should enter this technology domain. Combined with the patent analysis indicator, the technology life cycle analysis can quantify the characteristics of different stages of technology life cycle so as to analyze at which stage the technology lies in the whole process of the technology evolvement.

In the emerging stage of technology, the enterprise should concentrate on research and development for technological innovation, the goal being to reach the most advanced technology and prepare for the core patent application.

At the growth stage of technology and with the expansion of the R&D groups, enterprises should be cautious about entering core technology innovation fields. If the enterprise has the technological foundation for a basic patent application, it can rely on the basic patent and take effective action on both forecasting and supplementary technological innovation activities. The enterprise needs to establish the foundation for both the innovation and application of the patent.

At the maturity stage, the basic patent innovation is limited. There is a greater focus on auxiliary or peripheral technological development. A firm can rely on its own features to set the newest, applicable product and technology as an innovation project, undertaking short term and effective innovative activities.

As for dated technologies, the firm should continue to focus on the manufacture of other products, and new firms should avoid falling into dated technology.

Table 1 Patent Analysis on Technology Lifecycle for Enterprise Technology Innovation

Technology Lifecycle	Characteristics	Patent Search	Classes of Patent	Patent Indicator
Emerging Technology	Patents are concentrated; 1. A small amount of patents; 2. Few patentees; 3. Patents are almost all inventive patents and core inventive patents;	1. Classify technologies by IPC; 2. Patents in China, USA, Europe, and Japan.	Inventive Patents	New technology index
Ascent Technology	Distribution of patents expands; 1. Patents increase, mainly inventive patents 2. Patentees increase sharply 3. Patents technologically correlated with the technology in bleeding edge increase.		Inventive Patents Utility Model Patents	Technology growth rate
Mature Technology	The number and scope of patents hold steady; 1. Patents increase slowly or remain constant; 2. Patentees increase slowly; 3. Periphery technologies related with core patents emerge, which is indicated by the sharp increase of improved inventive patents and utility model patents of auxiliary technologies.			Technology maturity rate
Dated Technology	The number and scope of patents shrinks; 1. Patents decline; 2. Patentees decline; 3. Core patents decline and utility model patents decline.			Technology senescence rate

2.2.2 Technology trend forecasting

(1) Analyzing technological trends based on number of new patents over a specific period of time.

By analyzing patent applications and granted patents distribution periods, we can observe the frequency and quality of R&D activities, as well as speculate on economic and political influences. The number of patents is plotted on the x axis and time in years on the y axis in Figure 1. It illustrates the development of technology during different phases. It shows the patent applications of RFID change with time as a bell distribution curve.

(2) The evolution trend of the number of patents classified by IPC.

The yearly change of patents classified in IPC in a specific domain shows the hot-spot of technologies. Some patents dominated through all the process, some disappeared, and some appeared. Within a particular technology domain, different kinds of technologies in-

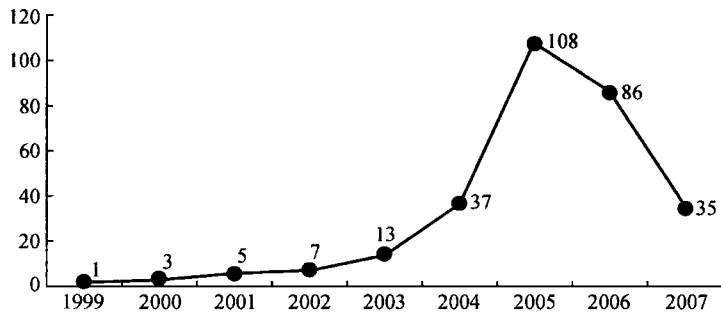


Figure 1 Yearly RFID Disclosure and Publication Patent Applications Distribution^[3]

creased and decreased. It shows the evolution of core technology and can be used for forecasting the orbit of technological development.

In Table 2, the trend of patent numbers in IPC is showed. It is a part of the table of classification of Chinese patents by IPC from 1999 to 2007. We will look for important correlations in the yearly distribution of patent numbers in IPC. In 2004, there was a patent in H04M, which became the technology blank (or technology cold spot) during 2003 to 2006. Patents in H04Q, H04L, H04B, H01Q and H01L increased apparently after 2003, and they did not appear before 2003. These IPC classifications became the hot spots. This is an experimental case for dynamic characteristics of technology development.

Table 2 Chinese Patents Classified with IPC in RFID During 1999-2007(A Part)

Number	IPC	Total	1999	2000	2001	2002	2003	2004	2005	2006	2007
—	Total	295	1	3	5	7	13	37	108	86	35
1	G06K	157	1	2	4	5	7	13	60	48	17
2	G08B	11		1				5	5		
3	H04M	2			1						1
4	H05B	1						1			
5	H04R	1						1			
6	H04Q	4					1	1	2		
7	H04L	13						2	7	3	1
8	H04B	6						3	2	1	
9	H03K	1								1	
10	H01Q	13					1	5	5	1	1
11	H01L	7					1	1	3	1	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
43	10-5	2								2	
44	14-3	2							1	1	
45	14-2	1								1	

2.2.3 Exploiting the hot spots and cold spots of technology

“Cause & Effect” matrix analysis studies the characteristics of technology functions and contents of technological themes indicated by patent literature, and reveals the relationship between them. The analysis phases of Cause & Effect matrix includes: “classifying the contents of a technological theme, classifying technology by functions, in-

duction, inference, analysis and synthesis.”[6]

The patent Cause & Effect matrix helps enterprises discover hot and cold spots of technology. After the analysis of the stages and trends of technology, exploring which technology domain is crowded and which is untouched is very important for an enterprise. This information is heavily relied upon for later analysis and the eventual definition of R&D direction.

Figure 2 is the non-matrix illustration of Cause & Effect Matrix—Fishbone Diagram. This diagram shows main and supporting technologies of Information Transport System (ITS). The long horizontal arrow centered in the diagram is ITS. The upper 3 diagonal arrows directed to ITS represent 3 main technology classifications, which are Electronic Payment System and Electronic Toll Collection (EPS&ETC), Commercial Vehicle Operations (CVO) and Advanced Transport Management System (ATMS). Horizontal arrows parallel to ITS connected to EPS & ETS represent the supporting technologies for technologies indicated by diagonal arrows. For example, the supporting technologies for EPS & ETS up to down separately are Vehicle Positioning System, Video Enforcement System, Automatic Vehicle Classification, and Automatic Vehicle Identification. Technology domain, main technology and supporting technologies are displayed with a systematic and visual means just like fishbone. Some Cause & Effect Matrixes shows the causes and effects of technologies in different periods, the change of them, and the evolution of them.

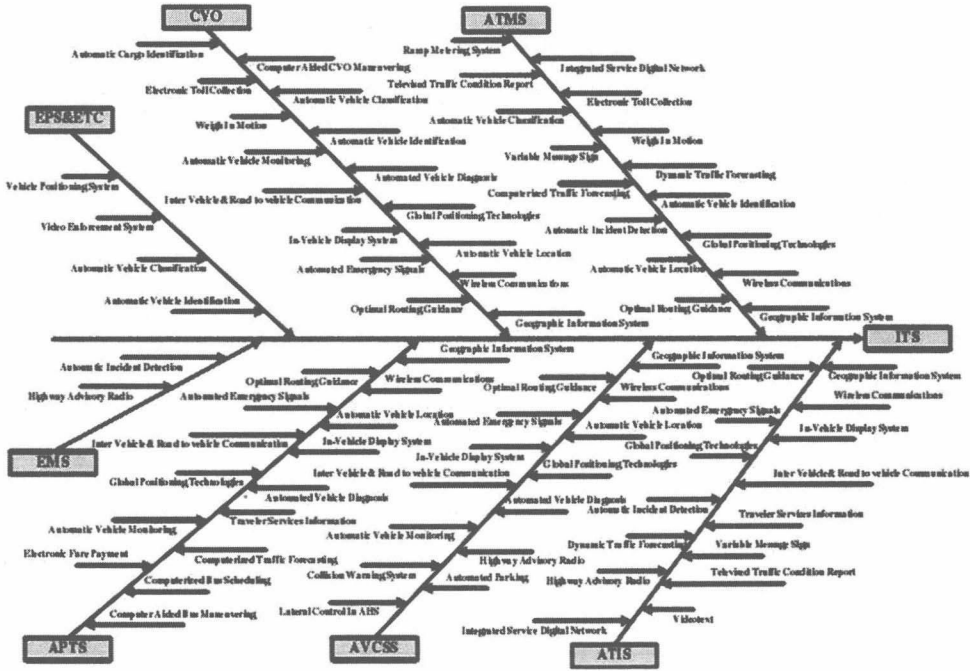


Figure 2 Cause & Effect Fishbone Diagram

Figure 3 is a practicable process diagram displaying technology trend forecasting. In the process of technology trend forecasting, number of patents is the main content for analysis. Combining this number and time, we can analyze the evolution of technology. Under the classification of time, combing IPC with the number of patents, we can analyze