

# Research on Competitive Intelligence Analysis and Service Mode for Supply-Demand Docking of Scientific and Technological Achievements

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**Abstract:** Proceeding from analysis of the problems and risks about supply-demand docking of scientific and technological achievements, this paper studies the role of competitive intelligence in supply-demand docking of scientific and technological achievements, as well as the needs of competitive intelligence. It further explores the service mode of competitive intelligence applied to supply-demand docking of scientific and technological achievements, including analysis and service process, service content and implementation paths. Finally, it sums up the competitive intelligence analysis and service in supply-demand docking of scientific and technological achievements, and presents prospects.

## 1. Introduction

In recent years, industrial and economic revolutions triggered by innovations in technology, finance, market, business model and resource allocation, have been sweeping through the world. All countries increasingly depend on the marketization of scientific and technological achievements to promote industrial upgrade and development. China has entered a new normal in economic development, and Beijing has put on agenda the building of a world-class innovation center. In the future, innovation will be one of the core engines of driving economic development. As the most feasible path of innovation-driven development under the new normal, accelerating the transformation of scientific and technological achievements is one of the important ways of building a global innovation center and enhancing Beijing's scientific and technological radiation capacity, and also an effective means to achieve coordinated development of regional economy.

Transformation of scientific and technological achievements is a systematic project, involving the suppliers (universities, colleges, and research institutes), the demanders (enterprises), and scientific and technological service intermediaries. Covering multiple stages such as research and development, productization and commercialization, it also involves economic market, social culture, governmental policy, legal norms and other external environments.

Supply-demand docking of scientific and technological achievements is an important link of transformation of scientific and technological achievements. Take the industrialization of new products for example. A scientific and technological achievement matured in the lab (including patent application and pilot test) is usually sold to an enterprise for commercial application, which is a process of supply-demand docking or trading of scientific and technological achievements, and also an important link for initiating and completing industrialization.

## **2. Supply-Demand Docking of Scientific and Technological Achievements and Related Risks Analysis**

### **2.1 Problems in Supply-Demand Docking of Scientific and Technological Achievements**

The main problems in supply-demand docking of scientific and technological achievements are as follows:

#### **2.1.1 Deviation between government policy environment and internal law of transformation of scientific and technological achievements**

In recent years, governments at all levels have promulgated a series of policies, laws and regulations to support the achievement transformation and technology transfer, particularly including *the Law of the PRC on Promoting Transformation of Scientific and Technological Achievements*, and the Action Plan for Promoting the Transfer and Transformation of Scientific and Technological Achievements. Such documents lay a solid foundation for removing policy barriers of achievement transformation, accelerating the transformation of scientific and technological achievements and improving the success rate of transformation.

However, implementation effects of the above laws and Action Plan have not been shown nationwide. At present, the ecology of scientific and technological innovation is still imperfect. For example, substantial improvement is needed in terms of talent cultivation for transformation of scientific and technological achievements, establishment of achievement information platforms, and integration of transformation service capabilities. In macro-control, governments at all levels still have such problems as responsibility offside, dereliction or dislocation. Transformation of scientific and technological achievements involves multiple links, processes and participants, which is complex and individualized. Existing policies are not effective for overall transformation of scientific and technological achievements.

#### **2.1.2 Imperfect service system for transformation of scientific and technological achievements**

At present, it is necessary to further improve the market-oriented public service system and unblock supply-demand docking channels for scientific and technological achievements. Due to lack of specialized service personnel familiar with scientific research and industry, and also specialist agencies that provide market-oriented services, it is weak in key service links such as venture capital consulting and technological credit, and many problems of legal and cultural differences may occur in the process of transnational technology transfer.

In addition to the aforesaid macro problems, there are still many specific problems in supply-demand docking of scientific and technological achievements.

#### **2.1.3 At the early stage of supply-demand docking, the most common problem is the evaluation of scientific and technological achievements**

Does a scientific and technological achievement have any use value? Can it bring any value increment to the transferee? Is the transferee willing and capable to transform it? All these require evaluation and identification by the third party and even the fourth party. At present, there are very few specialized professional evaluation agencies and practical evaluation methods, which affects the final signing of contracts on transformation of scientific and technological achievements. It is necessary to formulate specific procedures and administrative rules for valuation of scientific and technological achievements, disposal of scientific and technological achievements in stock, selection of evaluation agencies, and adoption of valuation results, to promote the implementation of *the Law of the PRC on Promoting Transformation of Scientific and Technological Achievements*.

At the early stage of technology docking and trading, there might exist some specific problems, such as confirmation of key points together with the supplier and the demander, or whether the persons in charge of SMEs can be directly consulted.

#### **2.1.4 At the middle stage of supply-demand docking, it is very common for enterprises to have insufficient capacity to undertake**

As the carriers for transformation of scientific and technological achievements, SMEs have no software and hardware facilities for industrialization of advanced technologies, thus affecting the transformation of scientific and technological achievements. SMEs even cannot raise the specific technical needs for upgrading technologies or developing new products.

An important task of information service for supply-demand docking of scientific and technological achievements is to help the demander (enterprise) find the appropriate supplier. To identify the suitable promotion targets and ultimately find the right demander, a “perfect” technical proposal is required. Of course, it is not easy. In particular, SMEs could hardly conclude technology transactions with the suppliers due to price factors. Practical solutions should be found to solve all these problems.

#### **2.1.5 At the late stage of supply-demand docking, it is prone to have disputes between the both sides of supply and demand**

Disputes will be likely to arise at the late stage of supply-demand docking of scientific and technological achievements, mainly due to lack of professional services. For example, clauses of contracts on technology docking may be not rigorous enough, or the demander may be dissatisfied at the supplier’s scientific and technological achievements after partial payment of contractual amount.

### **2.2 Risks of Supply-Demand Docking of Scientific and Technological Achievements**

#### **2.2.1 Macro-Environment Risks**

Macro-environment risks refer to possible huge losses to the supplier and the demander arising from social, political, economic and natural environment changes during transformation of scientific and technological achievements. The following aspects are included:

##### **(1) Economic Environment Risk**

Economic environment risk refers to the possible loss to technology trading subjects due to deterioration of national economic environment. The economic environment is closely related to supply-demand docking and trading of scientific and technological achievements. The level of social and economic development, and the macro-economic situation, directly affects day-to-day operations of target enterprises. The target enterprises may go bankrupt due to deterioration of national economic environment, thus making it impossible to realize normal industrialization of scientific and technological achievements.

##### **(2) Policy and Regulatory Risk**

Policy and regulatory risk refers to the possible losses to the supplier and the demander due to any adjustment of policies and regulations on transformation of scientific and technological achievements.

##### **(3) Market Environment Risk**

Market environment risk refers to the risk incurred by the inconsistency of new technologies and new products with market demand and the changes of market environment. Market environment risk is one of the core risks that decide the success or failure of supply-demand docking of scientific and technological achievements. Market environment risk is specifically represented by: 1) uncertainty of market acceptance degree; 2) uncertainty of market acceptance time; 3) uncertainty of competitor's response.

#### **2.2.2 Risks from Valuation**

Many uncertainties in valuation of scientific and technological achievements may affect the actual valuation results. Too high or too low valuation is not conducive to supply-demand docking and industrialization of scientific and technological achievements.

### **2.2.3 Supplier Risks**

The supplier's risks mainly come from its wrong selection of scientific research project and technology, which may lead to the failure of supply-demand docking and industrialization of scientific and technological achievements at the late stage.

### **2.2.4 Demander Risks**

The demander of scientific and technological achievements usually refers to the target enterprise responsible for transformation. The target enterprise's risks mainly include:

#### **(1) Moral Risks**

Moral risks mainly lie in that the target enterprise might conceal or falsify the truth to the supplier or investor. Moral risks will mislead them in investment decision-making, and further affect the investment returns and industrialization of scientific and technological achievements.

#### **(2) Technical Risks**

Technical risks of the target enterprise mainly refer to the supporting technology risks. Supporting technologies are often required for transformation of scientific and technological achievements. If supporting technologies are immature, industrialization of scientific and technological achievements will be hindered.

#### **(3) Talent Risks**

Besides advanced technologies, talents are the most important for an enterprise's long-term, promising development. Core technical talents also lay an important foundation for development and update of technologies.

## **3. Competitive Intelligence Demand Analysis for Supply-Demand Docking of Scientific and Technological Achievements**

### **3.1 Role of Competitive Intelligence in Supply-Demand Docking of Scientific and Technological Achievements**

Competitive intelligence refers to any intelligence research related to competitors, competitive environment, situation and strategy of competition carried out by the intelligence subject to maintain its competitive advantages. Based on the aforesaid problems and risk analysis of the supply-demand docking of scientific and technological achievements, competitive intelligence plays the following role in the supply-demand docking process:

#### **3.1.1 Addressing Information Asymmetry**

Competitive intelligence aims to help the intelligence subject gain competitive advantages through intelligence research. The competitive intelligence research aims to address the information asymmetry of the intelligence subject against rivals, environment, situation and strategy of competition. The application of competitive intelligence research to demand analysis, docking plan making and analysis of industrialization prospects, will effectively address information asymmetry problem of the intelligence subject (enterprise).

#### **3.1.2 Solving Service Agencies' Problem of Talent Shortage Relying on the Interpersonal Intelligence Network**

The interpersonal network is a relatively stable dynamic system composed of interpersonal exchange networks established for specific purposes. The interpersonal network is particularly important for supply-demand docking of scientific and technological achievements. First, more technical needs and supply information can be obtained through interpersonal networks of the supplier and the demander. Second, a comprehensive service network for supply-demand docking of scientific and technological achievements in the entire process can be established through extensive cooperation with intellectual property service agencies, financial institutions and various advisory

service agencies. Through the interpersonal intelligence network, intelligence service agencies can effectively solve the problem of talent shortage.

### **3.1.3 Resolving Legal and Cultural Differences in Transnational Technology Docking through Transnational Technology Brokers**

In the supply-demand locking process of scientific and technological achievements, competitive intelligence service personnel (technology brokers) responsible for transnational technology docking can help the users learn about the legal and cultural differences that need to be urgently understood, and organize transnational investigations and researches, technology docking negotiations, and follow-up intelligence consulting and services after technology transfer.

### **3.1.4 Improving Docking Efficiency by Integrating Docking Resources of Scientific and Technological Achievements**

Technological competitive intelligence researches and services such as technical search, technical analysis and technology evaluation, facilitate full understanding of target technology, technology owner and the market. Regarding the development of industrial competitive intelligence research and services, the needs of individual enterprises can be transformed into the needs of regional industrial development, so that limited supply-demand docking resources of scientific and technological achievements can be applied to a group of enterprises in those key industries. Technological and industrial competitive intelligence researches and services are conducive to integrating docking resources of scientific and technological achievements and improving the docking efficiency.

## **3.2 Intelligence Needs for Supply-Demand Docking of Scientific and Technological Achievements**

The transformation of scientific and technological achievements is a complex and systematic engineering, and the supply-demand docking of scientific and technological achievements is an important part of it. Many factors need to be considered, and massive information is required. In general, competitive intelligence needs for supply-demand docking of scientific and technological achievements mainly include the following information.

### **3.2.1 Market Demand Information**

Market demand information refers to the market situation and related factors of certain industry or product, including market size, market forecast, market share, development trend, sales prospects, industry development changes and other market information.

### **3.2.2 Technical Information**

Technical information refers to the information related to technology and technology assessment, including novelty, feasibility, development cycle, maturity, technology application trend, and technical innovation trend.

### **3.2.3 Industrial Environment Information**

Industrial environment information refers to the overall situation of economy, policy, laws and regulations, and social culture, etc., which includes but not limited to: 1) Macro-economic information, including current GDP, national income, employment, inflation, interest rate and other relevant economic variables; 2) policies and regulations, including preferential policies, particularly those in tax; 3) social and cultural information, including social freedom, openness, innovation, competition, tolerance and other social culture factors.

### **3.2.4 Competitor Information**

The competitor refers to an enterprise that produces or sells similar products or delivers similar services to the same or similar target market. The competitor may be existing or potential. Competitor information mainly refers to the competitor's competitive strategy, basic situation of core

researchers, technical innovation trend, technology level, products, users, markets, and financial information, etc.

### 3.2.5 Intellectual Property Information

Intellectual property information refers to any information related to intellectual property rights, which reflects the features of intellectual property subject, object, law, economy and technology, such as the information of patent applicant and patentee, patent technology, patent law, patent economy, trademark right holder, trademark status, copyright holder, copyright content and copyright law.

## 4. Analysis on Service Mode of Competitive Intelligence for Supply-Demand Docking of Scientific and Technological Achievements

### 4.1 Process of the Supply-Demand Docking of Scientific and Technological Achievements

Supply-demand docking of scientific and technological achievements is vital to transformation of scientific and technological achievements, and is much more complicated than imagined.

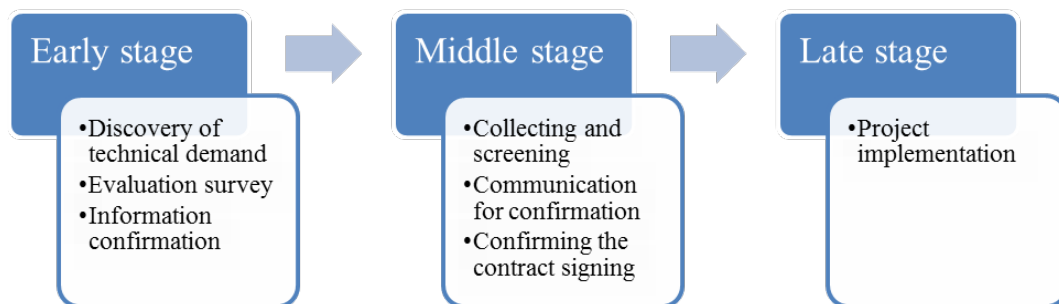


Figure 1. Three Stages of Supply-Demand Docking of Scientific and Technological Achievements

Supply-demand docking of scientific and technological achievements usually goes through three stages (early stage, middle stage and late stage), each of which involves several steps. Concrete steps of the three stages are as follows: Discovery of technical demands, technology evaluation and confirmation; subsequent docking ideas and operations according to existing technologies or requirements, and contract signing; project implementation after successful docking.

### 4.2 Competitive Intelligence Analysis and Service Process for Supply-Demand Docking of Scientific and Technological Achievements

Competitive intelligence analysis and service process for supply-demand docking of scientific and technological achievements is shown in Figure 2.

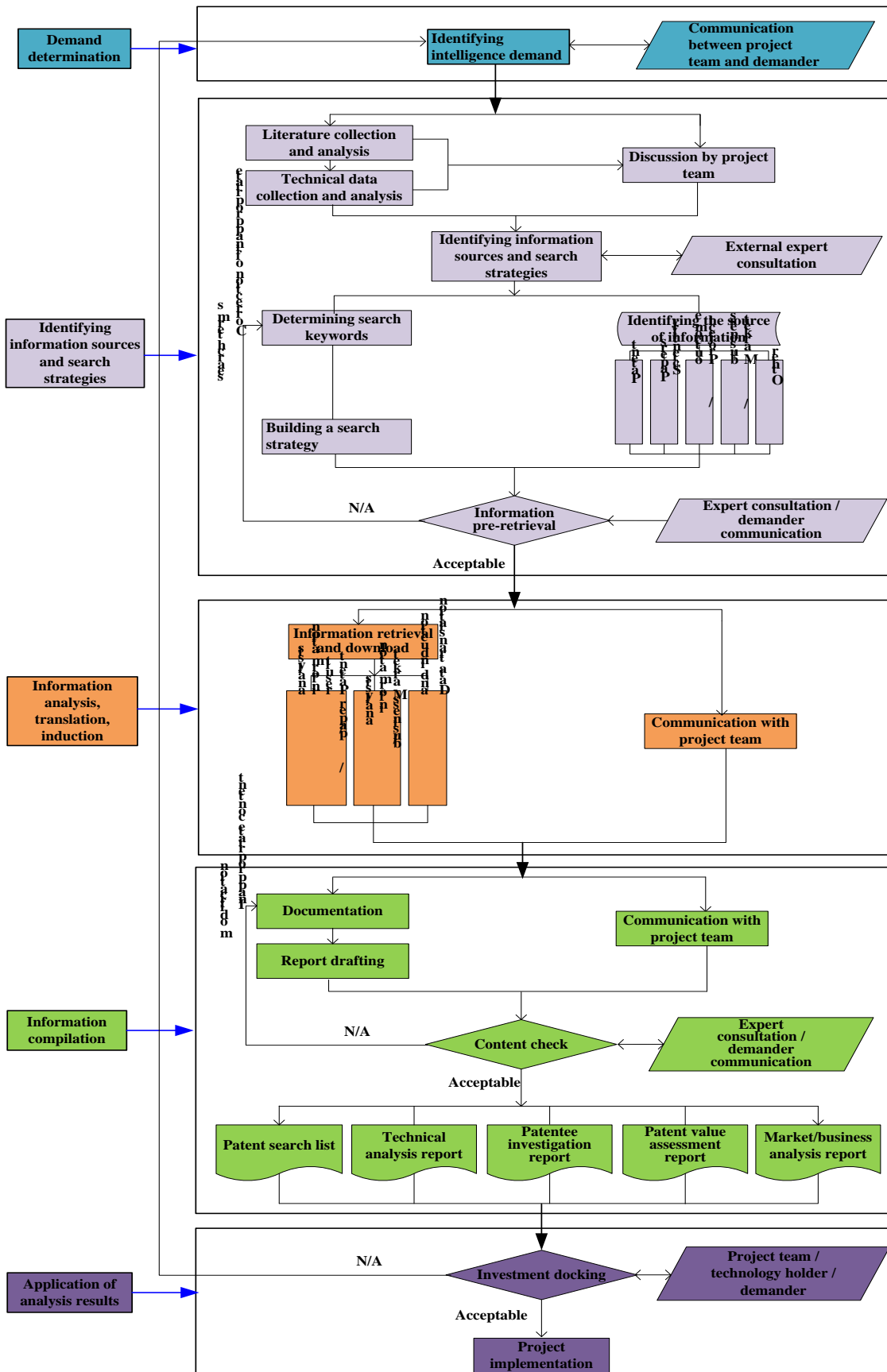


Figure 2. Competitive Intelligence Analysis and Service Process for Supply-Demand Docking of Scientific and Technological Achievements

The normative documents to be submitted for demand determination include: The demand list, including technology and its subdivisions (technology division should be as refined as possible).

The normative documents to be submitted for identifying information sources and search strategies include: Search strategy (introduction to technology and its subdivisions, Chinese search terms, English search terms, strategy of combined search in Chinese and English); a list of information sources.

The normative documents to be submitted for information analysis, translation and induction include: Patent/paper/results dataset, patent/paper/ results analysis draft; market/business dataset, market/business analysis draft; summary and preliminary collation of other materials.

The normative documents to be submitted for information compilation include: Patent search list; technical analysis report; patentee investigation report; patent valuation report; market/business analysis report.

The normative documents submitted for application of analysis results include: List of alternative technologies/projects; list of alternative technologies/project holders.

### **4.3 Competitive Intelligence Services at Different Stages of Supply-Demand Docking of Scientific and Technological Achievements**

The competitive intelligence services of supply-demand docking of scientific and technological achievements mainly include technical search, technical analysis, market analysis, competitor analysis, and docking of scientific and technological achievements.

#### **4.3.1 Technical Search**

Data sources: Patent data, results data, project data.

Analysis contents: List of technologies to be made as needed.

Deliverable results: Technical search list (including entries, abstract, full text)

#### **4.3.2 Technical Analysis**

Data sources: Patent data, paper data, achievements data, project data.

Analysis contents: Technology life cycle, key patent technology, technology development trend, major competitor, patent region distribution, patent R&D team, core patent, key technology development path, blank technology, intellectual property risk, project, and achievements.

Deliverable results: Technical analysis report, patent valuation report.

#### **4.3.3 Market Analysis**

Data sources: Business/market data, industry data, internet information, survey information.

Analysis contents: Market size, target customers, user's buying behavior, internal and external market influencing factors, market structure.

Deliverable results: Market/business analysis report.

#### **4.3.4 Competitor Analysis**

Data sources: Patent data, paper data, financial data, business/market data, industry data, Internet information, survey information.

Analysis contents: Competitor's development dynamics, technology level, competitive strategy, product type, product performance, market positioning, market share, partners, user group, and financial condition.

Deliverable results: Competitor analysis report.

#### **4.3.5 Docking of Scientific and Technological Achievements**

The alternative technologies and technology owners can be identified through collection and analysis of relevant information of technology, market and competitors. Technology brokers can arrange the docking and communication between the technology demander and the technology owner.



#### 4.4 Path for Competitive Intelligence Application to Supply-Demand Docking of Scientific and Technological Achievements

Seen from service contents, competitive intelligence is applied to supply-demand docking of scientific and technological achievements, mainly in the following four ways. First, technological competitive intelligence analysis can be made according to technical demands of the target enterprise. Second, industrial competitive intelligence analysis can be made to improve the efficiency in supply-demand docking of scientific and technological achievements. Third, an interpersonal intelligence network can be established according to the process of supply-demand docking of scientific and technological achievements. Fourth, activities organized for the supply-demand docking of scientific and technological achievements.

At present, non-profitable science and technology information institutions mainly offer information services of supply-demand docking of scientific and technological achievements to individual enterprises and regional industries. Despite little familiarity with the competitive environment of enterprises, non-profitable science and technology information institutions enjoy certain advantages in information collection, analysis methods and information resources. On the basis, the provide feasible and effective information services for supply-demand docking of scientific and technological achievements, the paths for the application of competitive intelligence to the realization of supply-demand docking of scientific and technological achievements can be decomposed as follows.

##### 4.4.1 Technological Competitive Intelligence Analysis

To target enterprises, the purpose of technology introduction is to obtain or consolidate their technological competitive advantages. This requires an understanding of the current technology overview, technology development trends, technological hotspots and technological blanks, major technology participants, etc., thus to provide reference for technology introduction.

To investment institutions or investors, this requires technological competitive intelligence research and services such as technology search, technological analysis, and technology evaluation for the target technological field, to provide users with a comprehensive understanding of the technologies to be invested, technology owners and overview of market.

##### 4.4.2 Industrial Competitive Intelligence Analysis

The purpose of carrying out industrial competitive intelligence research is to improve the concentration of the supply-demand docking of scientific and technological achievements, and to improve the efficiency of supply-demand docking services. The process of industrial intelligence analysis is shown in Figure 3.

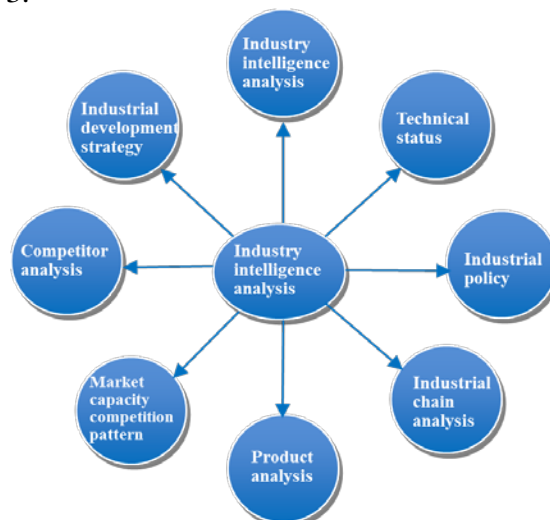


Figure 3. Key Points of Industrial Intelligence Analysis

Details are as follows:

- (1) Project demand analysis: project objective, analysis scope, customer technology status, market and R&D planning, and industry resources.
- (2) Background investigation: status quo of industrial development and technology development, distribution of major competitors and technologies, products and markets.
- (3) Research on the status quo and trend of industrial development: overall situation of the industry, development process, and macro-environment (politics, economy, society, and technology), etc.
- (4) Research on the status and trend of technology development: regions and fields of technology, major institutions, development trends, etc.
- (5) Industrial policy research: domestic and foreign industries and supporting policies.
- (6) Industrial chain analysis: upstream and downstream links of the industry chain, core positions, and core enterprises.
- (7) Product analysis: specific products and technical advantages based on the industrial chain.
- (8) Analysis of market capacity and market structure: market capacities and market structures in different subareas.
- (9) Analysis of major competitors: competitor's technologies, products, market layout and competitive strategy.
- (10) Strategies and suggestions for industrial development.

#### **4.4.3 Establishment of Interpersonal Intelligence Networks**

Three major interpersonal intelligence networks should be established. First, an interpersonal intelligence network of supply-demand information should be established to get more supply-demand information. Second, another interpersonal intelligence network for supply-demand docking services should be established according to the service chain of supply-demand docking, which covers the whole process, including intellectual property service agencies, financial institutions, advisory bodies, technical experts, etc. Third, a broker service network for transnational technology docking should be formed to cope with the differences in foreign laws and cultures.

Without demand for or supply of technology, pure service agencies provide the services for supply-demand docking of scientific and technological achievements, only through an interpersonal intelligence network based on supply-demand information, which is mainly composed of interpersonal networks of both the demander and the supplier. Since a large number of high-tech enterprises are distributed in high-tech parks, a network of corporate technical demand collection can be established through cooperation with the management committees of high-tech zones. Given that a large number of technology suppliers are mainly distributed in universities and colleges and research institutes, a technology supply network can be established through cooperation with their scientific research management departments or specialized departments for supply-demand docking of scientific and technological achievements.

Since supply-demand docking of scientific and technological achievements involves multiple links, each of which requires different professionals. Of course, it is almost impossible for any service agency for supply-demand docking of scientific and technological achievements to reserve so many top talents. To solve the problem of talent shortage, they can establish the interpersonal network for supply-demand docking services through two ways. On one hand, memorandums of cooperation can be signed with top talents, in which the ways and remunerations for engagement in the supply-demand docking activities of scientific and technological achievements can be agreed upon. On the other hand, they can establish or join the associations for supply-demand docking of scientific and technological achievements, keep in contact with experts of various services for supply-demand docking of scientific and technological achievements, and enter into cooperation agreements with such experts for specific projects, clarifying their respective rights and responsibilities wherein. The two interpersonal intelligence networks above will serve both individual enterprises and industries in supply-demand docking of scientific and technological achievements. The service agencies for supply-demand docking of scientific and technological

achievements can provide individual enterprises with the information of the technology suppliers, and assist them in contact and communication. It is also possible to provide individual enterprises with the contact information of the service agencies (talents) engaging in the supply-demand docking of special scientific and technological achievements, or cooperate with them to provide specialized supply-demand docking services for such enterprises. Meanwhile, expert resources are available for the industrial competitive intelligence research, and supply-demand resources and service resources are available for industrial supply-demand docking of scientific and technological achievements.

With regard to transnational supply-demand docking services of scientific and technological achievements, there exist many problems of differences in laws, business habit and culture. To solve such problems, a broker service network for transnational supply-demand docking services should be set up. At present, the project team has established such a broker service network through cooperation with a number of technology transfer or intelligence experts from different countries such as the US, the UK, Germany, France and Japan.

#### **4.4.4 Organizing Supply-Demand Docking Activities of Scientific and Technological Achievements**

Specific supply-demand docking activities should be carried out on a regular basis. Integrating the aforesaid technological competitive intelligence analysis and interpersonal intelligence networks, industry-oriented supply-demand docking services of scientific and technological achievements also give full play to the role of industrial competitive intelligence research, allowing centralized use of limited supply-demand docking resources for regional industrial development. As a result, the efficiency of supply-demand docking of scientific and technological achievements is improved.

### **5. Conclusions and Prospects**

Making a focused research on competitive intelligence analysis and service assurance for supply-demand docking of scientific and technological achievements, this paper, on the basis of analyzing how the problems and risks in supply-demand docking of scientific and technological achievements are resolved through competitive intelligence research, as well as the intelligence needs for supply-demand docking of scientific and technological achievements, presents a competitive intelligence service mode for supply-demand docking of scientific and technological achievements, including competitive intelligence analysis and service processes, competitive intelligence services at different stages, and the paths for the application of competitive intelligence to the supply-demand docking of scientific and technological achievements.

Due to limitations in cognition of competitive intelligence and supply-demand docking of scientific and technological achievements, there might be some omissions and mistakes in this paper. The authors intends to better combine supply-demand docking practices with the current research, summarize the innovative service mode of competitive intelligence and supply-demand docking of scientific and technological achievements, and improve and optimize the competitive intelligence service system, so as to maximize the role of competitive intelligence in supporting and securing the supply-demand docking of scientific and technological achievements.

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