Patent Collaborative Development Mode and Platform Construction of Supply Chain Enterprises*

Liu Jieming , He Fang
School of Arts & Law Wuhan University of Technology, Wuhan, 430070, P.R. China
(E-mail:liujieming@whut.edu.cn, hforever699@yahoo.com.cn)

Abstract: This paper proposes three patent development modes of supply chain enterprises which are independent development, chain development and collaborative development, and makes a comparative analysis of the three modes. The analysis suggests that patent collaborative development mode can help supply chain enterprises to realize resources sharing and complementary advantages and coordinate operation between the supply chain enterprises can generate significant synergistic effects. Then this paper builds "three-floor-four-pillar" three-dimensional development platform for supply chain enterprises' patent collaborative development in order to provide guidance for the supply chain enterprises' patent collaborative development.
Key words: Supply Chain Enterprises; patent; Collaborative development; Benefit analysis

1 Introduction

As the mainstay of technological innovation, enterprise is one key to the successful implementation of the national intellectual property strategy and innovative country. The strategic competitions in 21st century happen between individual enterprises and among supply chains as well. Therefore, patent development research should not be made only from individual enterprise aspect but from supply chain aspect. The so-called supply chain refers to the procurement of raw materials to achieve from the beginning to intermediate products and final products are made, the final product by the sales network to reach consumers, and thus focus on core business, through the supply and demand of suppliers, manufacturers, distributors, retailers, logistics providers, service providers and other enterprises and end users together into an overall functional network chain structure[1][2]. "Supply chain" is specific to all the nodal enterprises in a particular supply chain, which is also known as the supply chain business, including its supply chain, suppliers, manufacturers, distributors, retailers, logistics providers, consulting agencies, research firms, design companies, intermediary companies, research institutes, universities and other enterprises and institutions. The concept of "supply chain" in this paper underlines the practice of the supply chain among the node enterprises need extensive and deep cooperation to the creation of patent , design, develop new products together. However, in this cooperation process, the enterprises in supply chain are still relatively independent economic entities, which also own "private interest" thus a lot of conflict must exist in the cooperation. In order to improve the quality and speed of patent development in supply chain enterprise, we particularly need to strengthen the research on the problem of the patent collaborative development of supply chain enterprises.

2 Main Patent Development Mode of Supply Chain Enterprisis and Its Comparative Analysis

According to the extent of collaborative, the main mode of supply chain can be divided into three categories: independent, chain, and collaborative.

2.1 "Independent" patent development mode

"Independent" patent development model refers to single enterprise independently finishing the whole patented process, including technology development project, the start of project, allocation of resources, technology development, and patent application process etc. As shown in figure 1, the supply chain enterprises which adopt "independent mode" to enjoy patent rights of the patent on its own, to get the full benefit of the patent on its own. The patent technology is easy to be confidential and also not need to undertake the additional costs due to outsourcing. However, according to a single supply chain technology, equipment and human resources are limited, coupled with the complexity of patent development and the require for professional technology in the patent development process, making this patent development model has the long development cycle, low efficiency, high rate of failure.

* This work is supported by key Laboratory of Electronic commerce and Modern Logistics, Chongqing Education Commission

There are shortcomings as reduplication and waste of material. "independent mode" patent development is adapted to the supply chain enterprises which has strong comprehensive power, and able to bear the entire supply chain patent research and development .it's more often used in the situation that with high confidentiality requirements for patent technology and technology secret.

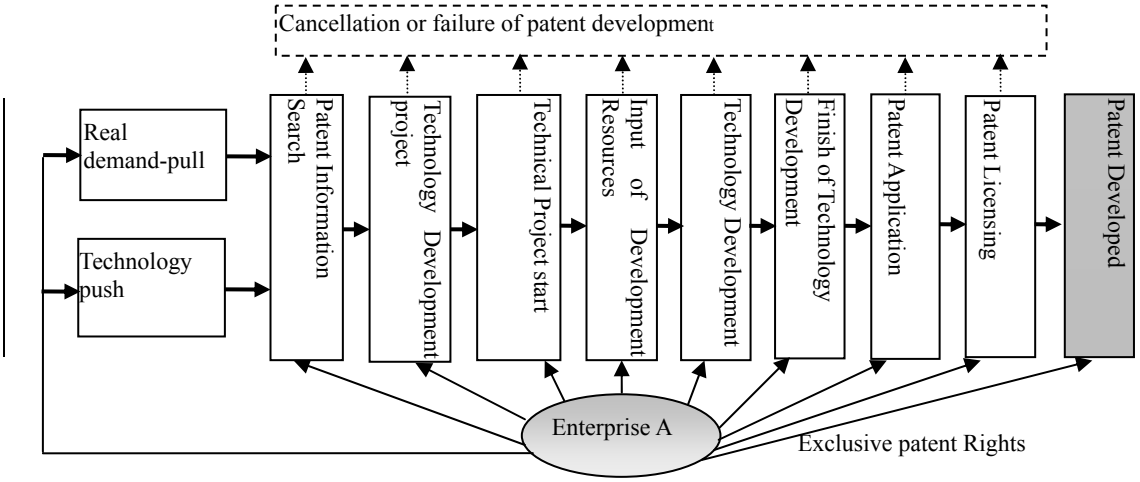

Figure 1 supply chain enterprise "independent" patent development mode

2.2 "Chain" patent development mode (also called "outsourced" patent development mode)

"Chain" is a mode that supply chain enterprises outsource or multi-outsource part of the patent development to other professional supply chain by the way of contract, in order to jointly complete the development of patent, which is shown in Figure 2. The main advantages of this patent development model are as follows. First, selectively outsourcing some parts of the patent development to other supply chain enterprises will contribute to make full use of external resources to achieve optimal allocation of resources, and reduce reduplication of investment and waste. Second, it will obviously shorten the patent development cycle and improve the success rate of patent research and development. Third, the model is taking a one-time payment of patent development to proceed the collaborative development of patent, the patent right of this development will be unique to the core enterprise. It will conducive to increase the number of independent intellectual property owned by the core business and improve the capacity of self-development of the core business.

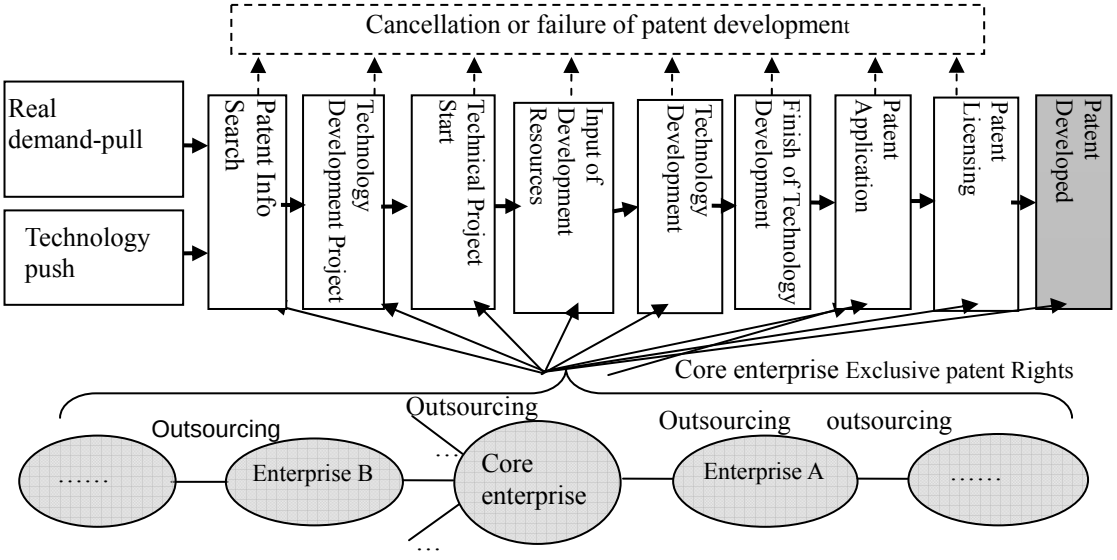

Figure 2 supply chain enterprise "chain" patent development mode

On the other hand, this kind of patent development model usually decides the needed technology of patent development by the core enterprise of supply chain. Therefore, the core enterprise needs to

undertake the high costs of outsourcing, and also bears the risks of outsourcing specifically as well, which could include the following risks: to undertake the moral hazard of the project failure result from the supply chain enterprises which are responsible for the task of patent technology development and not hard to complete the outsourcing; to undertake the risk of the supply chain enterprises which are responsible for the task of patent technology development illegally disclose the patent information, resulting in reducing the value of the patent for self-interest; if patent development fails, the core businesses will lose all the investment risks of development costs and the risks of outsourcing business of illegal use of patents and patent infringement.

2.3 "Collaborative" Patent Development Mode.

"Collaborative" patent development mode is a mode that the supply chain enterprise takes the whole supply as a starting point, to take the share of resources and complementary advantages as the prerequisite, to take the collaborative development as a means under the guidance of clear collaborative goal, abide by the rules of collaborative development and complete together within the agreed period, as shown in Figure 3.

The main features of the model are that the supply chain enterprises which joint participate in it can form a cooperative interaction mechanism to build a platform for collaborative development of patent. In order to achieve operational synergies, The patent collaborative development at least need these conditions: 1) a unified strategy with clear objectives to ensure that the strategic collaboration among supply chain enterprises; 2) It can provide a wide range of information sharing, to ensure the information synchronization, unity and coordination; 3) It can achieve the synergy of distribution design and a unified decision-making; 4) It can achieve real-time dynamics exchange and communication among the supply chain enterprises. “Collaborative "patent development model is the patent development mode that has the common input, common participation, common risk, and common share. The patent ownership developed by this mode is mainly in two forms: first, the fully shared type.

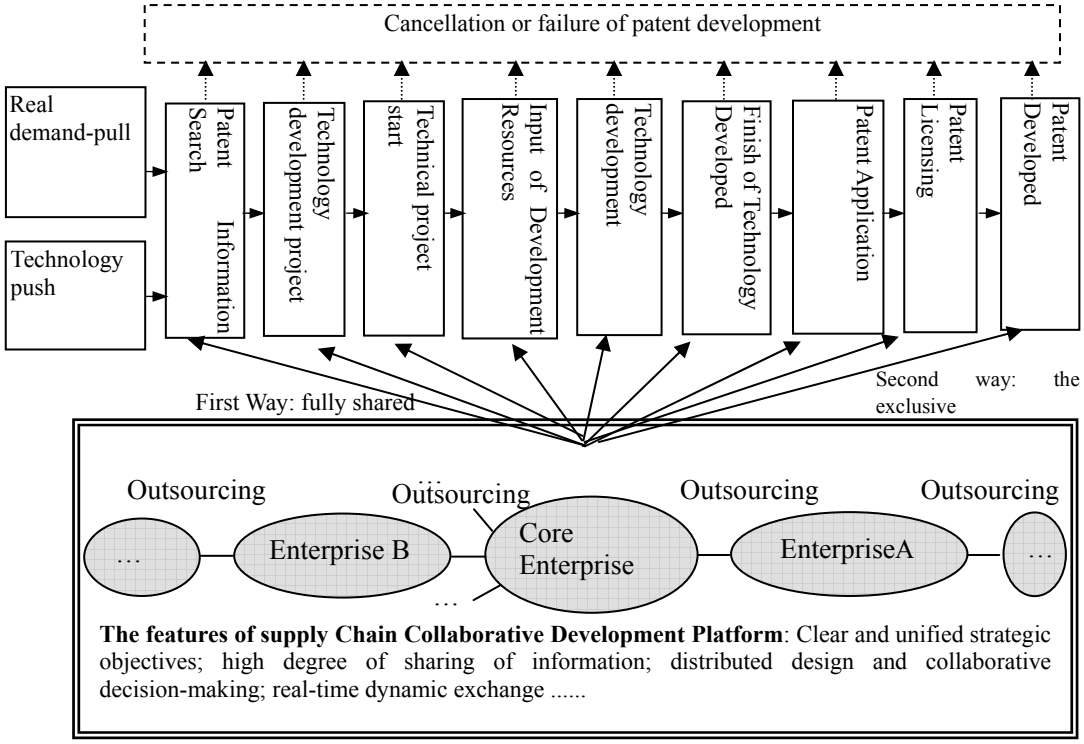

Figure 3 Supply Chain "collaborative" development model patent

That is all supply chain companies involved in collaborative development, which will share all the patent information and resources to jointly bear all risks, after the completion of patent development they will have revenue sharing, and own jointly the patent rights, second, the exclusive supplier and patent the exclusive type. It is that the core patent development enterprises will outsource the part of work to other companies to complete the supply chain, and promise this supply chain enterprise will become a permanent sole supplier of the patent product. But the core business shall exclusively own the patent right.

The core business will share the benefits of the paten rely on the agreed contracts through this way of exclusive supplier and patent the exclusive type.

3 Benefit Aanalysis of the Patent Collaborative Development Model

In today's society, science and technology are increasingly competitive, the complexity of technological innovation, agility , and comprehensiveness are continuous to be improved, leading to the rise of difficulty level of technological innovation and resource demands. Faced with lack of technical resources, the faster technology changes, increasing technical difficulty and technical talent shortage, A single enterprise has been unable to meet the increasing requirements of scientific and technological innovation, then, the way that through the collaboration between supply chain development model for significant technological innovation and patent development has become the inevitable choice and development trends of supply chain enterprise innovation. The supply chain enterprise taking the mode of patent collaborative development can better realize a good sharing of resources and complementary advantages. It will generate great synergies effect through collaboration operations among the supply chain enterprises. Specifically, it will bring the following benefits:

3.1 Share advantages of resources to achieve optimal allocation of resources

Supply chains enterprises are often in different areas of expertise, and have the stronger competitiveness in this area of enterprise, which determines the supply chain have different resources and professional technical advantages. Such as the dealers of supply chain companies has rich marketing network resources; Production company has strong technical resources.

Logistics companies have strong planning and distribution capabilities; suppliers have stronger advantage of raw materials resources and so on. These resources can often play an important role in the different stages of the process of patent collaborative development, forming a complementary whole. In the process of the patent collaborative development in supply chain enterprise, the advantage resources owned by the companies will be shared, integrated, integration and optimization, in order to ensure supply chain is a "powerful combination" of the economic entity, and realize resource sharing and optimization configuration.

3.2 To effectively save cost

Collaborative development of supply chain cost savings of patents mainly in three aspects: first, to avoid duplication of investment. Supply chain enterprises in the process of collaborative patent development can widely share other supply chain enterprises with the resources and they don’t need to invest or build by themselves, in this way they not only save the cost of investment, but also save the time required for investment and construction. Of course, sharing resources of supply chain enterprises have to pay certain costs, but, it’s much less relative to their investment. In addition, supply chain enterprises can also exchange their own resources with others, to achieve the free of charge of each other. Second, it can save the transaction costs generated by repeated negotiation.

As patent collaborative development of supply chain enterprises often takes the long-term cooperation contract methods, namely , the supply chain enterprises will establish long-term stable strategic cooperative partnership , on the basis of sharing resources , conduct long-term cooperation of patent and technology development, total risk, shared interests, this will save the transaction costs generated by the repeated negotiations . Third, in the process of patent collaborative development, the companies involved in the development of supply chain implement parallel development on the basis of sharing the information, which helps to reduce the conflict between patented technology and the market, the conflict between design and manufacturing, reduce the rework in the development process, modify and re-design, to avoid the waste caused by duplication of non-manufacturing changes.

3.3 To improve the success rate of conversion of the patent

In the patent collaborative development of supply chain enterprises, the supply chain enterprises participating in the development include the development enterprise which have the technical resources advantage , but also manufacturing enterprises with rich experience in manufacturing, meanwhile including retailer know the market information and customer’s demand and suppliers with experience of development of raw materials and broad participate in it.

Therefore, the collaborative development of the patent from the project, choosing of the cooperate development enterprise, the resource to the essential research on the patent technology, the experimental, small experimental, media experimental and volume of production all have experienced supply chain enterprises take their duties, through the depth cooperation they can ensure that patented technology developed by the practicality, effectiveness, and manufacturability of advanced.

The success rate of patent technology can be guaranteed naturally and significant increased.

3.4 To expand the spillover effects. in the process of collaborative development

The supply chain enterprise extensively exchange and share information with each other, making all kinds of explicit knowledge and tacit knowledge needed in the patent development rapid spread among the supply chain enterprises, resulting in overflow effect. Meanwhile, the collaborative development of patented technology will be widely used by supply chain enterprises, which also enhances the spillover effects. In addition, the collaborative development of the supply chain between the patent are often highly complementary, which greatly enhanced the learning ability and absorbability of the enterprises, through mutual learning and the collision of thinking , the innovation capacity of supply chain enterprise obtain improvement and further expand the technology spillover effect.

3.5 To reduce the r & d and patented products to market

Co-development model in the patent involved in collaborative development of the supply chain are strong competitive forces of the professional fields of enterprises, which operate through parallel development and collaboration, can significantly shorten the research and development of patented products to market.

3.6 To enhances supplies chain's agile ability (i.e. market fast response ability)

When the supply chain enterprise adopts the patent collaborative development pattern, each supply chain enterprise participates in the collaborative development is the cooperation which carries on through the contract way, the cooperation often take the project as the link and launches, then form a loose development organization, member enterprise in this organization participate the coordination patent developmental item, still maintain the independent enterprise boundary, the member enterprise may makes the nimble adjustment quite easily along with the complete or change of the project. Therefore, the patent collaborative development mode of the supply chain enterprise can maintain a high degree of agility. Supply chain core business can make quick adjustment to the collaborative development projects and participation in collaborative development of the supply chain according to market changes. At the same time, the supply chain enterprise in the process of the patent collaborative development form rapid information sharing and communication mechanisms and it will be better to ensure the enterprises make rapid, agile response to market

3.7 Reduce development risk. shorten the life cycle of new products

Improving complexity of research and development process and, increasing competition lead to the rising risk of technological innovation and patent development of enterprises. Through the cooperation with other supply chain enterprises in research and development, patent development risks involved in collaborative development of the supply chain for effective sharing between enterprises, it will reduce the relative risk of a single supply chain. Meanwhile, patent research and development activities in the division of labor between supply chain partners to form a powerful combination of research and development organization, is conducive to breakthroughs in R & D resources and technical capacity of the bottleneck and improve the success rate of patent research, patent research and development to reduce the overall risk.

3.8 Quickly upgrade the ability of integrated innovation, sharing costs of R&D

Along with social progress and the continuous improvement of technology. The difficulty of technology development is increasing. The human, financial, and material resources needed by patented technology developing increase dramatically, the development cost is rising. Sometimes single enterprise can not innovate technology and do the patent development without depending on external resources. Collaborative development model can rapid increases technology innovation the success rate of patent development in the case of integration of external resources. Patent development also needs to share the investment in R & D costs. For example, a new program-controlled switching device development costs as high as 10 billion U.S. dollars, a new engine cost more than 1.5 billion, so non-individual enterprises can independently undertake such high R & D costs , and there is no need for collaborative development model to independently take on. It is not only good for sharing development costs, but also well for the rapid proliferation of patents and the cost of rapid recovery [3].

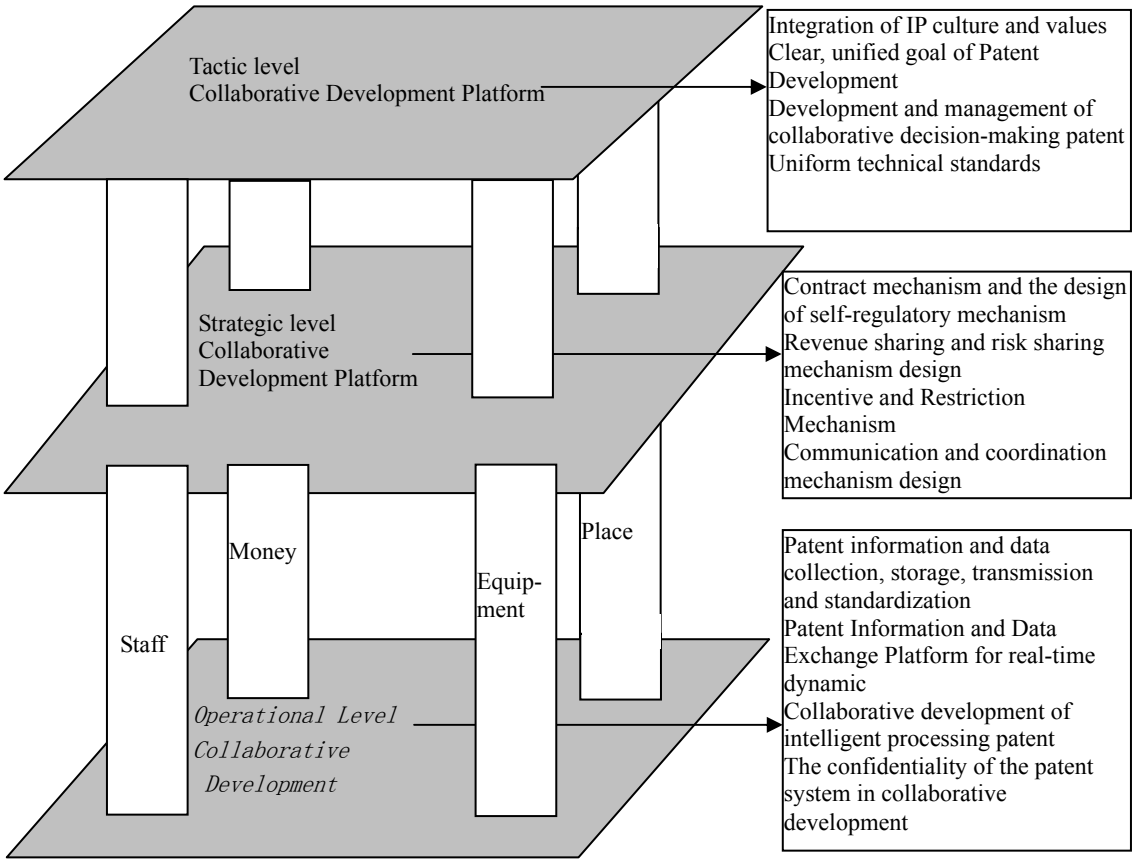

Figure 4 Supply Chain Co-developed patented "three four-post" Development

4 Patent Collaborative Development Platform Construction of Supply Chain Enterprisis

Patent collaborative supply chain development platform should mainly start from the three levels, tactic level, strategic level and operational level, from three levels ,the supply chain enterprises can do the design and construction in collaborative development platform. Three levels will be supported by the four pillars of staff, funds, equipment and places , therefore, constitute the supply chain as is shown in Figure 4. It's the patent collaborative development of the "three-four-post" solid development platform.

4.1 Tactic level of collaborative development platform

Tactic level collaborative development platform is a strategic level to solve the problem of patent co-development, mainly including: 1) Supply chain integration and value intellectual property culture. It will establish a respect for intellectual property between enterprises in the supply chain, attention to intellectual property, protection of intellectual property rights conscious culture and values, and this atmosphere is the formation of collaborative supply chain basis for the development of enterprise patent and fundamental security. 2) Defining a unified, clear patent goals. A clear, unified collaborative supply chain development objectives patent guidelines to clear the direction of supply chain efforts, patent development is conducive to collaborative work. 3) Development and Management of patenting collaborative decision-making. The realization of collaborative supply chain development model need the collaborative decision-making of patent development and management implement, because only the collaborative decision making, supply chain, companies can really play the main sense to be able to raise awareness of the consistency of decision-making, can improve the consistency of decision-making reaction, then the implementation of collaborative development and management of the patent operation. 4)The adoption of uniform technical standards. Uniform technical standards for supply chain co-development between the patent provides a unified "dialogue language" and common evaluation criteria.

4.2 Strategic level of patent collaborative development platform

Patent collaborative development platform strategy level in the strategic level is under the direction of collaborative development platform for collaborative development of the patent to make arrangements and deployment strategies, specifically including: 1) Contract mechanism and the design of self-regulatory mechanism. The implementation of patent collaborative development between supply chain, contract arrangements and design of the mechanism are the basis for supply chain. Contract mechanisms are general mechanisms in the collaborative development. Whether the contract mechanism design is complete and reasonable directly determines the specific behavior of chain in the process of patent collaborative development. Patents in the supply chain collaborative development process, to promote the progress with the development of internal and external environment, great changes can occur, bringing a high degree of uncertainty, therefore, supply chain contract mechanisms for collaborative development and the patent need for a comprehensive long-term contracts and short-term use Compact, flexible use of standard, formal contract and temporary, short-term or even an oral contract. On the other hand, the contract can not be fully complete, therefore, also need to contract on the basis of the mechanism, the establishment of collaborative supply chain development process patented self-regulatory mechanism. 2) Revenue sharing and risk sharing mechanism design. Enterprises to participate in collaborative supply chain development is a fully patented market behavior, therefore, the design and build a fair and reasonable revenue sharing and risk sharing mechanism is the development of supply chain coordination necessary for the patent. 3) Incentive and restrictive mechanism design. To encourage the implementation of supply chain enterprises active in the patent co-development strategies to prevent acts of collaborative development hinder the patent, the patent needs during the development of supply chain collaboration between a proper incentive and restraint mechanisms. 4) Communication and coordination mechanism design. Even for the best relationship, the contradictions and conflicts still inevitably arise, therefore, during the development of the patent collaboration between supply chain enterprises also need to establish a smooth communication and efficient coordination mechanism, through communication and dialogue, to avoid contradictions and conflicts excitation, the contradictions and conflicts in the bud stage to be addressed.

4.3 Operational level of patent collaborative development platform

Collaborative development platform and operational level is the specific means and methods of implementation in the patent proprietary co-development , specifically including: ① Patent information and data collection, storage, transmission and standardization. The purpose of standardization is to enable the collection, storage and transmission of proprietary information and data between enterprises in the supply chain can be smoothly, quickly and easily implement communication, interaction, sharing and learning.②Patent information and data exchange platform for real-time dynamic structures. In order to achieve data sharing and interaction with the fast, real-time and dynamic, it needs to rely on information technology, development of specialized software systems, structures and interaction platform for sharing of patent information.③ Patent collaborative development of intelligent processing. In the process of patent collaborative development, we may encounter a variety of situations at any time, in order to achieve these rapid, agile response, we need to be able to do the intelligent processing to the variety issues in the process of patent collaborative development.④The confidentiality of the patent system building collaborative development. In the process of patent collaborative development, the confidentiality issue has become critical issue due to the extensive information, in-depth sharing and the expand and depth of cooperation. This requires the establishment of strict confidentiality, ensure information security, such as the door into the security establishment inspection system, data security classification management system, network access classification system and the hacker and firewall systems.

5 Conclusions

It is rapid tendency that supply chain enterprises make more and more cooperation’s in patent research, based on the development of science, technology and corporate division of the increasingly close collaboration. According to the analysis of the three patent development modes of supply chain enterprises, the study draws results as follows: collaborative supply chain model can make improvement in developing resource sharing and complementary advantage, and can make great synergic effect between supply chain collaboration. Based on the above study results, the paper make further construction of the supply chain collaborative development of patented "three four-post" solid development platform, which provided guidance to supply chain synergy.

References

[1] Christopher Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Services etc [M]. London: Pitman Publishing, 1992

[2] Ma Shihua, Lin Yong, Chen Chih-hsiang. Supply Chain Management [M]. Beijing: China Machine Press, 2000:3-12 (In Chinese)

[3] Feng Lin, Chen Hongbing. China's High-tech International Joint Ventures in the Economic Globalization Advantages and Disadvantages of [J]. Chongqing University of Posts and Telecommunications (Social Sciences), 2004 (3): 54 (In Chinese)

[4] Chen Chih-hsiang, Ma Shihua. Enterprise Integration Systems Methodology - the Systemic Supply Chain, Coordination and Action Paradigm [J]. Systems Engineering Theory and Practice, 2001, (4) :92-98 (In Chinese)

[5] Daniel Frey, Tim Stockheim. Integrated Multi-agent-based Supply Chain Management [A]. Proceedings of the Twelfth IEEE International Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprise, 2003