Research on Building Distributed R&D Network

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Abstract: Based on defining distributed R&D and distributed R&D network, the influencing factors of distributed R&D network are analyzed among the different aspects such as driving forces, restraining forces and environment. The motivations of building distributed R&D network are studied along 5 dimensions. The differences being compared between distributed R&D network and traditional R&D organizations, the conditions and approaches are advanced in building distributed R&D network. Utilizing the resources including R&D base resources, distributed R&D network can be built effectively and has been shown some characteristics of sixth generation of R&D.

Keywords: Distributed R&D network, Organizational model, Distributed R&D, R&D base

1. Introduction

At present, distributed R&D hasn’t been defined commonly. In this paper, it refers to R&D activities on common network platform in different regions based on resource optimization and resource sharing in an enterprise or among enterprises. The characteristics of distributed R&D are as follows: different spatial, collaborative, heterogeneous, and complementary. And distributed R&D network shows some characteristics of sixth generation of R&D.

Distributed R&D network is an organic system in which network nodes such as the R&D organizations in the enterprise or among enterprises connect each other. In general, the trend of R&D is that domestic R&D activities are translated into overseas dispersive ones. At last, global R&D network of dispersive research and dispersive development has emerged.

2. The Motivations of Building Distributed R&D Network

2.1 Influencing factors of distributed R&D network

Influencing factors of distributed R&D network include demand factors, supply factors, environment factors and some restraining forces factors (Table 1). Demand factors involve some aspects as follows. It is necessary to build local R&D institutions supporting manufacturing, technology transfer and production procedure innovation. Meanwhile, flexible enterprise’s distributed R&D network can supply multiple market demands. Dispersive R&D activities and distributed R&D network can disperse risks of R&D effectively and increase success rate of R&D activities. Supply factors include technology factors and efficiency factors. Environment factors and some restraining forces factors follow table 1.

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2.2 The motivations of building distributed R&D network

Whether building distributed R&D network or not depends on the comparison between the benefit and cost of enterprise distributed R&D network. Many companies have built R&D branches in homeland and overseas just because the benefit is higher than the cost. For example, many successful companies such as Huawei Technologies Co., Ltd. and ZTE Corporation in China have established distributed R&D network. In 2007, Huawei Technologies Co., Ltd. ranked No.3 getting sales revenue 65.88 billion yuan, but it earned profit 4.14 billion yuan as same as ten times profit of Lenovo Holding and Huawei paid tax 7.34 billion yuan.

The motivations of building distributed R&D network involve as follow.

(1) Flexible R&D can expand and lead market. Building R&D institution in different regions and overseas, companies are going to understand and meet local market directly with flexibility and rapid respond of distributed R&D network.

(2) Another motivations is to support producing. The factories distributed in different regions need local R&D branch to design products and production procedures to meet local market. Local R&D branch can localize the techniques of parent company with the enough technology capability of parent company.

(3) It is another motivation to acquire technologies and other resources. Getting or tracking local advanced technologies is important motivation in building R&D branch. Some multinational companies built R&D branches overseas, so they can catch new information in world and develop new technologies and products with information windows overseas. Meanwhile, local R&D branch can obtain technology talents or other resources of low cost and high quality.

(4) Distributed R&D network can disperse risks of R&D and increase success rate. In 2006, with analyzing R&D activities of 469 firms in Finland, American professors Aija Leiponen and Constance E. Helfat illustrate that owning multiple R&D locations leads to greater innovation success. Any positive association between multiple locations of R&D activity and innovation success reflects access to a larger number of different knowledge sources outside of the organization.

(5) Distributed R&D network helps to increase the whole management ability of enterprise. Distributed R&D network, manufacture network and market network together make up the whole developing system of enterprise. This will increase the whole management ability.

In addition, the motivations of R&D activities vary from industry to industry and establishing R&D institution relates to accessibility of important market, the amount of competitors and local collaboration of R&D.

2.3 Current situation of R&D branch

Many successful Chinese companies such as Huawei Technologies Co., Ltd. and ZTE Corporation have built R&D branches. Huawei has established R&D branches in America, Sweden, India and Russia; domestic R&D branches locate in Beijing, Shanghai, Shenzhen, etc. Meanwhile, many famous multinational companies such as IBM, Intel, Panasonic, Microsoft, etc. have built R&D branch in China.

3. Building Distributed R&D Network

The development of R&D organization have undergone the follow stages as the absolutely centralized center-edge model, multi-center decentralized model, multiplex star schema model and distributed R&D network.

Comparison between distributed R&D network and other R&D organizations

(1) Absolutely centralized center-edge model. R&D center of enterprise headquarters controls and harmonize R&D branches overseas and technology alliance in this model. Enterprise headquarter centralizes innovation resources. R&D center of enterprise headquarter is the main executive of innovation, producing main new technologies and products and then diffusing technologies to R&D branches. The main responsibility of R&D branches is to track technology development. Innovation information passes between R&D branches and center of enterprise headquarters. R&D center of enterprise headquarters is absent from sensitivity of local market overseas, and centralization of decision to headquarters also frustrates creativity of R&D branches. Then the enterprise isn’t adaptive to environment well.
(2) Multi-center decentralized model. The characteristic of this model is that there are parallel centers and each decentralized independent R&D branch joins alliance together without company headquarters R&D center’s supervision. R&D branch has self-determination power and the information flow with company headquarters R&D center is limited. The strength of this model is sensitive to local market and the weakness of it is low efficiency.

(3) Multiplex star schema model. Enterprise headquarters R&D center is center of strategic decision, R&D activities disperse, R&D branch has self-determination power to a degree. R&D activities are centralized in domestic, meanwhile obtaining technologies overseas and other resources.

(4) Distributed R&D network. It is an advanced R&D organization model. It transforms traditional centralized control of company headquarters to dispersing framework of R&D network. Either inner network among R&D institutions in enterprise or outer cooperative network among different enterprises is built. (Figure 1) Enterprise headquarters R&D center isn’t main center of centralization control yet and depends on other R&D branches. With cooperating system and communication channels, cooperating flexible efficient system network will be built. Enterprise headquarters R&D center is only a R&D institution as other branch. Each branch is good at own specialty. The prerequisites which this model takes effect with are the perfect information foundation facilities. Information shares and flows along multi-direction; employees flow across R&D branches in enterprise. Multinational companies recruit new members in world. It increases efficiency of R&D to integrate dispersing R&D units and enhance communication among R&D units.

Figure 1 Distributed R&D Network

Conditions building distributed R&D network
Conditions of building distributed R&D network involve strong management competence, solid technology foundation. To multinational companies, international market is same important as domestic one, even more important. In network, products, resources, information and labors can flow freely, but it is difficult to build this network and management cost is high. Advanced management ideas, super management art and perfect decision are needed to run this model successfully.

Information should flow among R&D units with enough technologies such as internet technology, network database technology and standardization technology.

Approaches to build distributed R&D network
Distributed R&D network shows such form as R&D strategic alliance, region R&D network, R&D network made up of government, enterprise, university and institute, multinational company global R&D network, etc. Approaches to build distributed R&D network include:
(1) According to the situation of market, manufacture and acquiring technology and talents, enterprise
chooses the location of R&D branches then builds enterprise distributed R&D network.

(2) Lasting trust is also basis of building distributed R&D network. Enterprises tend to establish steady relation from longer period. Building network relies on slow process of building loyalty. For example, an investigation showed that more than 70% in Austria and about 60% in Denmark cooperation companies regard trust and faith as the basis of cooperation.

(3) Real-time effect information flow is important prerequisite of ensuring innovation efficiency of R&D network. Information technology is basis of information communication among nodes of R&D network. Building strong information network, information flows rapidly and knowledge shares. It is possible to improve efficiency of R&D network.

(4) R&D strategic alliance, R&D team work and virtual organization are several forms of R&D network developing rapidly. Company alliance in OECD and America grows rapidly in order to induce R&D cost and increase technology level. To shorten development cycle of product and reduce cost, enterprise tends to develop around projects and integrate specialists from different departments with team work.

(5) Utilizing all kinds of resources including R&D base resources, distributed R&D network can be built effectively and has been shown some characteristics of sixth generation of R&D. As important distributed R&D network node, R&D base can offer office space, funding, facilities, human resource and basic services. It can especially give company preferential access to a network of potential partners. As to sixth generation of R&D, it has been one generation re-focusing the research part connecting to loosely tied multi-technology research networks. The bases for this new set of approaches are a broader multi-technology base for high-tech products and a more distributed technology-sourcing structure. Distributed R&D network has been shown some characteristics of sixth generation of R&D.

It is necessary to be pointed out that such questions deserve further research as how to communicate effectively in each R&D network, how to allot the benefit among nodes in R&D network, etc.

4. Conclusion

Distributed R&D network is an organic system in which network nodes connect each other. It can increase business capabilities and success rate of research and development activities for companies to build distribute R&D network. Approaches to build distribute R&D network are discussed. Utilizing all kinds of resources including R&D base resources, distributed R&D network can be built effectively and has been shown some characteristics of sixth generation of R&D.

References