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## Research on factors affecting the university and industry collaboration in open innovation

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### ABSTRACT

The objective of this study is to analyze the factors affecting the university and industry collaboration (U-I collaboration) in open innovation environment in Guangdong province, China. A theory model of key influencing factors was adopted to evaluate the effectiveness of U-I collaboration in Guangdong. The results show that there is an increase of tie networks inside the collaboration in open innovation results in the increase of knowledge and technology transfer. However, the knowledge sharing is also determined by firm absorptive capacity as well as the management efficiency within the network. In addition, the joint responsibility is essential which can reduce the risk of management inefficiency in U-I collaboration.

### KEYWORDS

Open innovation; University-industry collaboration; Technology transfer; Open innovation.



## INTRODUCTION

University and industry collaboration plays an important role in the open innovation environment. University and industry collaboration (U-I collaboration) is a form that university and enterprise can benefit from knowledge and technology transfer within the association, thus resource optimization can be achieved in the collaboration. Open innovation emphasizes the importance of using external sources of knowledge in a company's innovation processes<sup>[1]</sup>. This important form of cooperation under open innovation environment can leverage the knowledge sharing, in which the enterprise can enhance the production<sup>[2]</sup>. Enterprise accessing to external knowledge is an important form of innovation, at the same time scientific research institutions of knowledge resources can achieve the value and promote the effective way of knowledge update. The combination of the system building of technology innovation can accelerate the speed at the same time it can provide a good platform for talents. There has been a great deal of interest and discussion on this topic, but not much research has yet sought to examine the factors affecting the effectiveness of university and industry collaboration in open innovation. Thus this paper seeks to evaluate the effectiveness of the U-I collaboration by observing the effect of its open innovative characteristics on technological innovation. Second, the factors affecting its technological innovation are examined through the Guangdong U-I collaboration practices.

## THEORETICAL BACKGROUND

### Open innovation

The open innovation approach can be considered as an antithesis to the traditional, vertical integrated model of R&D where products are developed internally<sup>[3]</sup>. Socio-economic trends like the growing collaboration between firms and customers, short product life cycles and high market dynamics are the foundation of a new paradigm in innovation management<sup>[4]</sup>. This approach has become more important and the level of awareness of open innovation in larger companies has dramatically risen in the last years. The evidence of open innovation was first discovered in high-tech industries. However, today trade literature suggests that open innovation is increasingly used by all kinds of companies, also in low- and medium-tech industries<sup>[5]</sup>.

### University and industry collaboration

A large number of enterprises may share the similar experiences that the shortage of production innovation talents. In today's competitive environment, many enterprises, realize the success is not only relying on the quality of products, but also need to explore a larger stock for creative, capable talents and professionals which can show long-term and updated acquisition of new skills and competencies. From the university perspective, many of them are conducting leading research programs, but due to the limited experience in market, they are eager to find ways of conducting programs together with enterprises especially in the longer term to develop the shared platform—which can easily access to various parties' information, knowledge, technology. Due to the existence and development needs, university and industry collaboration is adopted to accelerate the business development.

In September 2005, national ministry of education and Guangdong province has took the lead in China—promoted the joint university-industry cooperation network. In September 2008, the ministry of education, the ministry of science and technology jointly issued the "Guangdong plan for independent innovation"; Furthermore, the provincial department cooperation is officially established the pearl river delta region into national reform and development planning Outline (2008-2020), Guangdong province becomes one of important strategy deployment the impetus of the development of the pearl river delta region reform. The plan is aimed at coordinating and combining research leading group and office through the provincial department joint propulsion combining network which includes outstanding research university, research institutions and innovated talents in Guangdong province, together with industry and market advantages organically mix up, to effectively promote Guangdong independent innovation ability, and the competitiveness of the industry of ascension. In the past five years, the provincial department in the combination of construction, Guangdong province achieved finance accumulative total more than \$70 million, more than 300 colleges and universities across the country are associated in Guangdong province U-I collaboration. Enterprise from various sectors conducting various forms of cooperation, including cooperation achievements of more than 20000 patents. Furthermore, U-I collaboration trained more than 74,000 technical management personnel, and directly promote the local development of enterprise. The alliance between scientism makes the combination mechanism rapidly developed economic effects.

However, the effectiveness of university and technology collaboration in the open innovation environment is not obvious comparing to the scheduled plan. Hence, evaluating the factors affecting the open innovation process is key to the U-I cooperation.

## THE FACTORS AFFECTING THE U-I COLLABORATION

### Network

The network between university and industry is important. In particular, a small–medium-sized enterprise with less technical know-how and fewer R&D resources is expected to be more dependent on external knowledge networks. Most existing research supports this. Some researchers found that firm's technology innovation is positively related to network

support, e.g. from university<sup>[6]</sup>, and divided cooperation into exploitive and explorative, and argued that these affected existing product innovation and new technological innovation activity, respectively<sup>[7]</sup>.

### Management efficiency

Management efficiency consists of daily operation management work inside the network. In the case of university and industry collaboration, the management efficiency of knowledge transfer is crucial. For example, the management of intellectual property rights, the signing up of different levels of contracts between university and industry, and other special section to assist the specific management council in each specialized units are consists in the management efficiency. In addition, setting up the technical committee as the league's academic guiding institutions are new trend in managing U-I collaboration in some provinces in China. It is responsible for technical consultation and decision making, review of the alliance of academic and technical research technical activities.

### Joint responsibility

The degree of effectiveness of open innovation in the U-I collaboration is dependent on the joint responsibility of research institutes and companies. As in construction scheme, the U-I collaboration has explicitly pointed out that for the operation of the league is providing funds for the combination of the alliance of project implementation network and industrialization provide conditions, priority in the alliance for universities, research institutes scientific research achievements of industrialization, in the alliance for personnel training provide practice conditions. At the same time it also will be based on win-win principle (enterprise invests money and benefit from the network's knowledge sharing).

### Absorptive capacity

Cohen defines absorptive capacity as evaluation, digestion, and commercial applications external new knowledge. The ability is dependent on corporate R&D activities developed a kind of learning ability, is a derivative product of R&D<sup>[8]</sup>. Absorptive capacity) put forward in the generation mechanism of observation level process dimension and the knowledge type experienced constantly enrich and develop, from the initial R&D products expanded to for R&D organization characteristics and comprehensive knowledge and environment factors combined action result. Thus the absorptive capacity in the U-I collaboration refers to the knowledge transfer to the companies, and this process in the company takes time and effort to evaluate and digest, which is crucial for the success for the open innovation process<sup>[9]</sup>.

Thus the main factors affecting the university and technology enterprise cooperation in the innovation environment are the relationship of networks, the management efficiency of daily operation, joint responsibility and the absorptive capacity of the company as shown on the Figure 1.



Figure : 1 Factors affects U-I collaboration

## IMPLICATIONS OF OPEN INNOVATION OF GUANGDONG U-I COLLABORATIONS

Factors affecting the U-I collaboration are discussed above should be carefully examined in the open innovation environment. At present, U-I collaboration in Guangdong province has shed light on the implication of open innovation process. In which the three major parties are essential in the collaboration, they are government, university/research institutions and enterprise. As the collaboration grow gradually, it is important to study the Guangdong province's experience in U-I collaboration in three different perspectives to examine the effectiveness.

### Based on government perspective

The cooperation involves enterprise, universities, research institutions and government—each party plays a unique role respectively. The practice proved that only all parties take active measures from the system can enhance the cooperation. The cooperation of different professions and different departments involved cooperation, and its development can be guided by the government to promote and natural support in the first place. For example, the primary focus of the U-I collaboration in Guangdong is to develop industrial technology's competitiveness. Hence, the government supports the collaboration by setting up plans to promote the combination of networks. This tie network plan has helped enterprises to reveal and enhance its independent innovation ability in long-term. During the past twenty year, most of the enterprises regard technology innovation in the "short-sighted" manner; therefore, overall innovation ability is weak. Now, by building up the strong

network with university and institutions, government has stood at macro level to plan and provide financial support to guide enterprises, universities in the scientific research programs, which benefit both enterprise and university. The cooperation policy environment can build a cooperative security mechanism. At present, our country need to be promote the cooperation of the relevant policies and management method, and the rights of the parties to the combination of clear, duties, regulating the cooperation of behavior. In order to pursue the healthy development of the combination the networks should be guaranteed.

According to the cooperation of Guangdong province experience of collaboration, it is clear that the establishment of funding plan and use of the national science and technology plan to promote cooperation is a line of the effect of the measures. Our scientific networks should be set up as soon as possible and support the combination as the national science and technology plan. Furthermore, the implementation of these plans should be paid attention to the enterprise, because the enterprise is the main body in the research and development of the collaboration.

### **Based on enterprise perspective**

To encourage enterprises to participate in technology innovation coalition, the main problem should be solved are the absorptive capacity and technology transfer in the collaboration. Joint responsibility and efficient management model in Guangdong province has some implications: firstly, the strong networks are the cornerstones for the enterprise innovation improvement. for example from the country put forward the technical innovation of this new alliance cooperation mode on, the Guangdong province has set up four large industry technology innovation coalition, more than thirty networks has been built up and the main alliances are running in long-term relationship. This has shed lights on the inland provinces that the union can be managed by different parties and has effective transactions in technology, not for a short-term benefit. Many inland provinces in the combination are target for the main research topic for specific technical problem, so called "short-sighted" phenomenon, the enterprise will target in specific technology products and our university-industry cooperation pattern is limited; Secondly, by binding together with the joint responsibility in the U-I collaboration, enterprise will be putting more effort into basic research areas with support by university, and thus the product innovation can be enhanced and technology transfer happens more frequently. Thirdly, the management efficiency is strengthening by setting up the innovation platform and both university and enterprise can share the information and knowledge with no barrier through this platform. Thus, strong networks, joint responsibility and management efficiency can be effectively measured in the Guangdong province' U-I collaboration.

### **Based on university perspective**

University primary focuses on academic research whereas enterprise pursues the technological development and commercialization. In order to balance the cooperation effectiveness, the best way is to strengthen the communication and knowledge sharing<sup>[10]</sup>. The programs focused on this area are undertaken by many universities in Guangdong province. For example, university sends teachers to enterprise to study the product innovation process and also share their knowledge to improve the product quality. In fact in foreign countries, sending university teachers to be enterprise consultants is very popular way in the U-I collaboration. Enterprise develops technical guidance and technical development has formed a long-term system. many of the universities and corporations in Guangdong U-I collaboration have the combination of "advisory cooperative system"—school requires teachers to assist enterprise as a consultant, and no matter the size of the enterprise and the businesses; This will help enterprise to strengthen its absorptive capacity in technology innovation in long term<sup>[11]</sup>.

In addition, establishing and perfecting the technology innovation of the evaluation and incentive mechanism are essential. Improve the internal appraisal system, to engage in teaching, basic research, application technology research and achievements of the classification of different job evaluation must be introduced in the system as well as establishing a technology transfer incentive mechanism. Colleges and universities should establish a special technology transfer structure, which is responsible for examine teachers guidance for enterprise technology research results of the transfer of project. In the future, the evaluation system of university should strengthen the conversion and the achievements in scientific research<sup>[12]</sup>.

## **CONCLUSIONS**

U-I collaboration has gained popularity since 1980s in worldwide<sup>[13]</sup>. China attempts to improve efficiency and management mechanism of U-I collaboration. However, its open innovation progress needs to be accelerated in order to best fit the university and industry needs respectively. Some key factors like joint responsibility, networks, management efficiency and absorptive capacity are essential in designing effective collaboration in the open innovation environment. Guangdong province's experience in setting up efficient U-I strategic alliances has some implications for other provinces, which are the role of government, general aim of fitting enterprise benefit and universities. In addition, support mechanisms such as careful introduction and implementation plan, sufficient communication, supporting program for U-I collaboration and objective evaluation of overall effective of collaboration needs to be carefully designed.

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