Research on the Application of Implicit Knowledge Diffusion in the Mode of Industry University Research Cooperation

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Abstract. In order to improve the efficiency of industry university research cooperation and enhance the flow of knowledge among the main subject of industry university research, this paper focuses on the application of implicit knowledge which is difficult to flow in the diffusion between the parties of industry university research, and proposes three processes of implicit knowledge diffusion, namely, externalization stage, explicit implicit integration stage and socialization stage.

Overview of Basic Theory

The Concept of Implicit Knowledge

Compared with explicit knowledge, implicit knowledge refers to knowledge that we know but can't say. Different from mathematical formulas, charts, words, languages and other symbols, implicit knowledge includes informal and difficult to express skills, experience and secret of success, as well as epistemic implicit knowledge, such as insight, intuition, perception, values, mental model, tacit understanding of the team and organizational culture.

The Concept of Implicit Knowledge Diffusion

The diffusion of implicit knowledge includes the spread of implicit knowledge and the spillover of implicit knowledge. The spread of implicit knowledge is the reproduction of knowledge, while the spillover of implicit knowledge is the reconstruction of knowledge. Among them, knowledge spillover process has chain effect, imitation effect, communication effect, competition effect, driving effect and incentive effect.

The Significance of Implicit Knowledge Diffusion in Industry University Research Cooperation

For enterprises, the diffusion of explicit knowledge is only to make up for the lack of innovation caused by the lack of research and development, while the diffusion of implicit knowledge can enable participants to obtain implicit knowledge from others without using language, just like interns can learn craft only by experience, imitation and practice, and enterprise personnel can also get the University's implicit knowledge from interns. The implicit knowledge of formal employees and college interns is the core of new knowledge production, so effectively stimulating the implicit knowledge of individuals will affect the level of new knowledge production of the company.

For university, the diffusion of implicit knowledge can transfer the advanced thoughts, technologies, ideas and experiences of enterprises to the minds of teachers and students in the form of teaching and practice, greatly improving the quality of personnel training. Then use this knowledge for scientific research, improving the scientific research ability and social service ability of universities by studying horizontal scientific research projects.

For research institutions, the diffusion of implicit knowledge is the first step of research. Because market research, as a source of research data, is a kind of diffusion of implicit knowledge.

Mode of Industry University Research Cooperation

For the research on the mode of industry university research cooperation, scholars at home and

abroad have carried out many researches, generally summarized as "sharing mode, project team mode, strategic cooperation mode, base mode, etc.". The purpose of these models is to develop the local economy, promote the development of enterprises, enhance the teaching ability of university and improve the scientific research level of research institutions.

Research Status at Home and Abroad

Research Status of Implicit Knowledge Diffusion

According to Peter Drucker, implicit knowledge can not be explained by language. It can only be demonstrated that it exists, mainly from experience and skills. The only way to learn is to comprehend and practice.

According to Romer's theory of knowledge spillover, knowledge is the product of profit-making firms' investment decision-making. The difference between knowledge and common goods is that knowledge has spillover effect. Romer's model describes the relationship between the stock A and output Y of implicit knowledge [1].

Yu Xiaoyan put forward four measures to promote the generation, transformation and sharing of implicit knowledge, and reduce the limited impact of the generation and transformation of implicit knowledge in the natural state [2].

Nonaka and Takeuchi think that the process of interaction and transformation between implicit knowledge and explicit knowledge in the process of enterprise innovation is actually the process of knowledge creation, and further summarize the SECI model of knowledge transfer.

The experience of Saxony in Silicon Valley, Boston and other places in the United States shows that the importance, stability and reliability of social networks in geographical regions are conducive to the exchange of scientific and technological personnel, and promote the spillover and diffusion of knowledge.

Because tacit learning plays a key role in implicit knowledge acquisition, scholars at home and abroad have made a lot of breakthroughs in the fields of implicit perception, implicit memory, implicit learning and implicit social cognitive level.

Research Status on the Mode of Industry University Research Cooperation

According to Christoph and Katrin, there are formal and informal cooperation modes. The formal cooperation is based on the signing and agreement of relevant legal documents. The informal cooperation mainly relies on consultation, commitment and oral consultation. They have different characteristics in the transfer of patents or technologies, and they can complement each other. Only by combining the two methods can the expected goal be achieved [3].

Shi Huoxue divides the domestic cooperation mode of Industry University Research into six modes: the mode of industry university cooperation education, the mode of continuing engineering education, the mode of Engineering Research Center, the mode of enterprise postdoctoral workstation, the mode of combination of industry university research in school and the mode of university science and technology park, and comments on each mode combined with specific cases[4].

Gao Xiaosheng studies the cooperation mode of production, university and research from the perspective of knowledge production transformation; research and innovation of learning and research cooperation in the application scene; decentralized knowledge management; integrated production, university and research cooperation mode with knowledge exchange as the platform [5].

The Application Research Status of Implicit Knowledge Diffusion in the Mode of Industry University Research Cooperation

Foreign academic circles think that the standard of successful industry university research cooperation is the ability of all parties to create knowledge and the ability of knowledge flow and diffusion. For example, koshatzky (2002) thinks that the key to the cooperation of industry university research cooperation is to manage knowledge scientifically. Antonio (2011) pointed out that

knowledge complementation and sharing of all parties involved in industry university research cooperation are the key to the cooperation process.

Wang Yan, Zeng gang and Wang Hao pointed out that the essence of industry university research cooperation is actually a kind of knowledge transfer activity, and the difference of its mode depends on the transfer mode between explicit knowledge and implicit knowledge [6].

From the above research status, it can be seen that scholars at home and abroad have relatively mature research on the transfer of implicit knowledge and the mode of industry university research cooperation, but the research on the diffusion of implicit knowledge and the application process of implicit knowledge in the mode of industry university research cooperation lacks systematicness. Under this background, this paper holds that the diffusion of implicit knowledge in the mode of industry university research cooperation should include four processes.

The Diffusion Process of Implicit Knowledge

One of the most efficient ways of implicit knowledge diffusion is to "turn implicit knowledge into explicit knowledge ", because the diffusion of explicit knowledge is relatively easy, but the rest of the non-transformed implicit knowledge should be integrated with the explicit knowledge for diffusion, and finally all the implicit knowledge and the explicit knowledge should be socialized together[7]. Therefore, this paper divides the diffusion process into three stages: externalization, implicit and explicit integration and socialization.

Externalization stage is the process of expressing implicit knowledge into explicit knowledge.

Implicit and explicit integration stage is the process of combining the residual implicit knowledge and explicit knowledge to form a more complex and systematic knowledge system.

Socialization stage is the process of spreading and spillover from individual implicit knowledge to another individual implicit knowledge.

The Application of Implicit Knowledge Diffusion in the Mode of Industry University Research Cooperation

Externalization Stage

Establish Incentive Mechanism for Externalization of Implicit Knowledge of All Parties Involved in Industry University Research.

Whether it's enterprises, universities or research institutions, externalization needs to express the non-diffusion implicit knowledge into the diffusion explicit knowledge, which costs a lot. The externalists expect the cost recovery, so all parties need to make incentive policies to improve the enthusiasm of externalists, promote the cost recovery, and make more implicit knowledge become explicit knowledge.

The Externalization Process of Implicit Knowledge of All Parties in Industry University Research Should Be More Specific.

From the perspective of enterprises, the methods used include enterprise experts form work experience into industry standards and connect with university syllabus; enterprise experts form work content into work specification and connect with curriculum teaching plan; enterprise experts form employment standard into system documents and connect with university talent training program.

From the perspective of universities, the methods used include practice report not only as the basis for evaluation of practice results in universities, but also as the first-hand information for enterprises to find problems; the content of practice report should not only include practice content, practice experience, but also the problems and solutions of enterprises.

From the perspective of research institutions, research teams should be formed among researchers, because scholars have found that "Research-based Learning" is an important way to realize the

externalization of implicit knowledge. The atmosphere of the research team contains a wealth of implicit knowledge, including individual skills, operation process, cooperation and communication. These implicit knowledges will form consensus and tacit understanding among members after a long period of running in. This invisible force promotes the growth of implicit knowledge.

Implicit and Explicit Integration Stage

Because implicit knowledge is highly individualized, practical, dynamic, Situational laziness and hard to code [8], externalization can only code implicit knowledge that can be coded. The knowledge that is difficult to be coded cannot be spread and utilized through formal channels, nor can it be explained by language. It can only be demonstrated to prove its existence. In order to realize the flow and sharing of implicit knowledge among various groups of industry university research, learning this skill can be achieved through recall, chat, storytelling, introspection, etc. By increasing the frequency of personnel communication, increasing the time of communication, and expanding the scope of communication, all parties of industry, university and research should make the coded implicit knowledge and the non-coded tacit knowledge integrate.

Socialization Stage

The socialization stage is a process in which the implicit knowledge of all parties in the industry, university and research are supplemented and promoted after the end of the explicit and implicit integration stage, and then the integrated knowledge is spread and overflowed within their respective organizations. Communicable explicit knowledge is diffused by information technology, non-communicable implicit knowledge is diffused by internal communication and learning organization. Teacher apprentice and communication forum are typical forms of personal sharing implicit knowledge. At the same time, the explicit knowledge will also be transformed into the implicit knowledge of each member of the organization. For example, when knowledge is spread among employees, they can use the new knowledge to work and create new implicit knowledge; Similarly, after receiving these knowledge, teachers and students in universities will apply it to teaching and future learning, expanding knowledge and enriching their knowledge structure, which is the spread and overflow of knowledge, and also the diffuse of knowledge. In this way, the diffusion of implicit knowledge has formed the phased growth of knowledge in all aspects of production, university and research.

In a word, the diffusion process of implicit knowledge can promote the cooperation and exchange between the Industry, University and Research Institute, and let more knowledge that cannot be coded spread. Form a step-up process of externalization, integration, socialization, continuous externalization, continuous integration and continuous socialization. However, the research on the way of implicit knowledge diffusion is not deep enough in this paper, and the key direction of the follow-up research should be the choice of diffusion way.

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