Knowledge Creation in Different Stages of Organizational Growth: Research Based on A Case Study

Xie Cheng-yang 1, Hu Han-hui 2
1 School of Economic and Management, Southeast University, Nanjing, China
2 Research Center of Industrial Organization, Southeast University, Nanjing, China

Abstract—The general process of knowledge creation for an organization consists of six developmental stages. At each stage, specific knowledge actors conduct particular knowledge activities to complete one or more transitions from implicit to explicit knowledge to perform different functions of knowledge creation. As for organizations, interaction between and integration of internal and external knowledge takes place at every stage of knowledge creation, which creates an abundance of knowledge resources and enhances organizational capacity for knowledge creation. The knowledge creation process evolves with organizational growth. As an organization develops, its knowledge creation process is also upgraded from simple to complex, partial to complete, fragmentary to module based, with different characteristics of openness and increasingly high efficiency.

Index Terms—Knowledge creation process, Organization growth, SECI Model.

I. INTRODUCTION

With the rise of Knowledge Economy, it is well recognized that knowledge resources are of paramount importance and exceptional significance to an organization’s survival and development. Especially at the beginning of the 21st century, the development of information technology and a low carbon economy make every country standing at the same starting line of a new competition, therefore who can outperform other countries in the new round of knowledge creation, which will play a dominant role in the economy of the 21st century. In such a context, the research on the process of knowledge creation is of crucial importance and significant meaning.

Extant theories on knowledge research are limited for practice in a global economy environment. First of all, they discuss knowledge creation in a closed organizational environment. As a matter of fact, an organization is not able to acquire a sustainable competitive advantage in a globalised competition by only depending on its own knowledge resources. Participating in knowledge co-operations is a tendency for an organization to overcome its limitation (Fine, 1998; Mowery, Oxley and Silverman, 1996). Therefore, the research on knowledge creation process of an organization can not ignore its cooperation with external knowledge resources. Secondly, most of the existing theories are based on independent and static studies of organizational knowledge creation while to create new knowledge is a dynamic capability of an organization, which evolves with organizational growth and in turn promotes organizational development.

Therefore, this research investigates the organizational knowledge creation in a dynamic process of firm growth and opening environments. Two questions below will be particularly addressed: (i) how does knowledge creation process evolve with organizational growing and development? (ii) what the knowledge creation’s open characteristics are in different stages of organizational growth respectively?

The research is expected to fill in a gap in related research to some extent and provide both theoretical bases and practical guide to all kinds of organizations for them to win in the new round global competition of knowledge creation.

II. PROCESS OF ORGANIZATIONAL KNOWLEDGE CREATION

The general process of knowledge creation for an organization can be abstracted into six developmental stages. They are the birth of individual tacit knowledge, development of group tacit knowledge, externalization of tacit knowledge, integration of different organizational knowledge, experiment with newly generated knowledge and knowledge summary.

The first stage, birth of individual tacit knowledge, is the starting point of knowledge creation, and mainly completed by individual. It may be generated from accumulation of years of experience or the burst of instantaneous inspiration. Individual tacit knowledge can not be described. However, it is the important foundation of knowledge creation.

During the second stage, development of group tacit knowledge, individual tacit knowledge interacts, so that the original ambiguous and unstable individual tacit knowledge can be developed into excellent and perfect group shared tacit knowledge. This stage is mainly completed by groups. Here, “group” does not mean a simple assemblage of individuals; but a collection of individuals who have a common target and complementary knowledge and skills. Therefore, the group tacit knowledge is not a simple addition of...
individual tacit knowledge; it is a result of tacit knowledge creation in a higher level, which is based on a full sharing and understanding of individual tacit knowledge.

The third stage, externalization of tacit knowledge, is a process of the specification of group shared tacit knowledge, that is, the process "externalization", which has been referred by Nonaka (1990). In this process, both individuals and group can be the knowledge actors.

During the fourth stage, integration of different organizational knowledge, the organization integrates its new explicit knowledge together with other internal and external knowledge or capacity units, in order to fill certain targets. In this process, group is the main knowledge actors.

The fifth stage refers to application of systematized knowledge into business activities and to produce new products and services. In this process, both individuals and group can be the knowledge actors.

As shown, the orderly operating of the six stages constitutes a general process of knowledge creation. At each stage, knowledge actors from different areas and levels conduct particular knowledge activities to perform different functions of knowledge creation.

In an open environment, the process of knowledge creation is influenced by external knowledge resources from the starting point: the interaction between and integration of internal and external knowledge creates an abundance of knowledge resources, broadens the boundary of knowledge activities and enhances organizational capacity for knowledge creation, so compared with knowledge creation in a closed environment, it usually has special characteristics. For example, at the starting point, external knowledge resource can give knowledge individuals more inspiration, thus more valuable and innovative tacit individual knowledge can be generated; at the stage of development of group tacit knowledge.

III. KNOWLEDGE CREATION IN DIFFERENT STAGES OF ORGANIZATIONAL GROWTH

In the last section, this essay gives a summary of the common procedure of the knowledge creation. However, in real-life practice, knowledge creation will evolve together with the enrichment of organizational elements, and experience a transformation from simple to complex and module-based with increasingly high efficiency. To better understand this evolution, the following paragraphs will take SPRCD and its development in the last two decades as an example.

Growing out of Research Center for Display of SEU, SEU-Philips Research Center of Display Tube, SPRCD for short, was established through cooperation between SEU and Philips in 1994. With an outstanding reputation, this center is the only one that Philips has established with a Chinese university. The course of growth of SPRCD in the last 20 some years is an appropriate exemplification for this essay.

A. Simple knowledge creation in start-up stage of an organization

In the start-up stage of an organization, the procedure of knowledge creation does not include all six stages mentioned above, as organization elements are not fully prepared. Instead, this procedure can be simplified to three stages. They are knowledge organization, knowledge systematization and knowledge application. The interaction between organization and external resources is mainly demonstrated on externality of knowledge source. Knowledge is imported from external source through purchasing or licencing etc. in order to form initial knowledge of an organization, to inspire organization members to create new knowledge and even finish the initial knowledge accumulation.

In the case of SPRCD, its initial knowledge creation can be tracked back to as early as 1980s. With a passion to upgrade China’s electronic industry, Dr. Zhang, a Chinese senior researcher with RCA in USA, came back to his motherland, bringing back with him an unfinished patent “modified high definition display tube” and gave it to Research Center for Display of SEU for further R&D. The essence of this patent lies in the way to put circuits into display tube. At the start-up stage, there are only five researcher with different background in this center, and their only knowledge source is Dr. Zhang’s unfinished patent. Professor Tong regularly invited Dr. Zhang to join their meeting and carry out an in-depth discussion on the research idea and plan. One day, two researchers challenged Dr. Zhang’s research processes. After several meetings and discussions their opinion was finally accepted by all fellow researchers. Their three innovative research processes were later proven to be of crucial importance to future R&D. In 1991, the center developed successfully Monochrome Display Tube with Inner Deflection after more than 300 experiments.

The above case is a typical one for simple knowledge creation procedure. At the very beginning, an external source —— an unfinished patent taken back from RCA by Dr. Zhang —— formed a base for knowledge creation. Following this, the procedure can be clearly divided into the following steps: first, through meetings and discussions, Professor Tong transferred external explicit knowledge into organization’s explicit knowledge, finishing the summarization of knowledge. Secondly, taking advantage of their different academic background, fellow researchers digested the patent and reached their own understanding. Base on this, they proposed innovative some processes. Thirdly, researchers successfully developed Monochrome Display Tube with Inner Deflection after more than 300 experiments. The following figure can help better understand the whole procedure.
The successful research of Monochrome Display Tube with Inner Deflection not only significantly upgrades SPRCD’s technology level and academic reputation, but also lays a solid foundation for center’s future R&D of “Multicolor Display Tube with Inner Deflection”, speeding up a transformation from start-up stage to development stage.

B. Knowledge Creation in development stage

In the development stage of an organization, as organizational elements become mature, the knowledge creation upgrades consequently. In this stage, the knowledge creation procedure includes a complete six stages, and the interaction between organization and external resources will be throughout the whole procedure. An organization can lay a solid foundation for its future development through wider range of knowledge sources in all stages, and constant import of new external knowledge and knowledge-creating methods. At the same time, organization members can perfect and express their own implicit knowledge by the way of exchange and collision with external knowledge.

Still taking SPRCD as an example, in its development stage, SPRCD chose to cooperate with Philips, and to use it as a platform to walk up to the world. SPRCD’s R&D of PDP technology is a typical knowledge creation practice in development stage.

At the beginning, PDP technology comes from a brainstorm of a Professor Tong’s PhD candidate when he is doing a program for Philips (1). SPRCD discussed their proposal thoroughly with Philips. The latter put forward some amendment suggestions and SPRCD adopted some of them to adjust their initial plan (2). Later SPRCD proposed a feasible research protocol (3). After confirmation of the research protocol, SPRCD began to apply funds from relevant national research foundation and establish a PDP research base with equipment from Philips to start their research work (4). PDP research came out as an extremely successful one. It was listed in Double Key Project of China’s National Ninth Five-Year Plan. It was granted two FED patents and more than ten CRT patents. PDP technology certainly would have a bright market prospect (5). Moreover, this PDP research project not only trained the fellow researchers, but also produced many patents. PDP technology certainly would have a bright market prospect (5). Moreover, this PDP research project not only trained the fellow researchers, but also produced many patents. PDP technology certainly would have a bright market prospect.

In the whole procedure of PDP research, Philips played a crucial role with its supply of advanced methods of management, valuable suggestions and a large quantity of advanced equipment.

C. Knowledge Creation in maturity stage

As research ability developed, SPRCD received recognition from abroad for its research level and began to obtain more and more foreign institutions’ attention. Collaborative research projects between Philips and the Center also developed from the single project at the beginning to multiple ones in horizontal level. For example, they gradually cooperated five or six projects simultaneously. Besides, projects exercised by SPRCD increased along with the expanding of “863 projects” assigned by the Ministry of Science. SPRCD has stepped into the maturity stage to create module-based knowledge.

With experience of creating knowledge in the early stages and advanced management methods introduced from Philips, the head of SPRCD divided all the researchers into eight groups which have 3-5 people respectively to create knowledge for different projects. The Center held a meeting involving all members every two weeks and the person in charge of each group reported their current research achievements followed by discussion for solution of problems encountered with every group. As the study issues of every group are linked with each other, research achievement of one group could be shared among others and taken as basis of knowledge creation of other groups through such regular communication. In addition, the center had kept in touch with Philips in forms of passing research results of groups to Philips as well as receiving latest relevant research results from Philips. The Center and Philips also held a quarterly board meeting, in which the two sides summarized their research findings and discussed the differences and proposed new research directions.

Process of module-based knowledge creation in SPRCD could be demonstrated as the figure below.

It is indicated by the case of SPRCD that the efficiency to create module-based knowledge depends on the degree of communicating and sharing among different knowledge creation modules. An organization should coordinate the cooperation among every module and the cooperation with external organizations to reach normal operation of every module/group.

D. Knowledge creation in regeneration stage

Under the tide of globalization at the beginning of 21st century, many large companies began to streamline their manufacturing operations and reverted to original designing. Philips was no exception. Out of the need to...
and sent five resident experts to SPRCD to teach relevant starting phases, Philips provided experimental equipments field with the assistance of experts from Philips. At the hadn't been studied. The center slowly involved into this with image display, how to control the image quality knowledge held by the center researchers were related existing basic knowledge of image display, the center also helped in establishing visual perception lab. With knowledge on image quality evaluation. The five experts could not be applied in the market.

The direction change was subversive. Although knowledge held by the center researchers were related with image display, how to control the image quality hadn't been studied. The center slowly involved into this field with the assistance of experts from Philips. At the starting phases, Philips provided experimental equipments and sent five resident experts to SPRCD to teach relevant knowledge on image quality evaluation. The five experts also helped in establishing visual perception lab. With existing basic knowledge of image display, the center researchers mastered the operation methods of visual perception experiment quickly and improved specific details and experimental techniques in accordance with their own knowledge and expertise. It is the interaction of external knowledge inputs from Philips and internal specific knowledge owned by the center researchers that constitutes knowledge basis of a new round knowledge creation in the center. That basis was also the starting point of knowledge creation in the regeneration stage of the center.

Starting from the above, the center experienced countless times of knowledge cycles like JND mentioned earlier in the following five years, achieving nation-wide leading research achievement in the fields of movement artifact, three-dimensional display, and etc. Meanwhile, drawn by inspiration and experience from cooperated projects, the center staff conducted more extensive research and accessed to high social recognition. For instance, their studies on new display modes have been supported by the national “973” project. In 2009, SPRCD and Philips signed a 5-year renewal agreement and expand their cooperative scope to medical and lighting fields.

In the case of SPRCD, it is the introduction of new external knowledge and disruptive changes beyond conventional thinking that took effects in breaking through the bottleneck of development and gained a new life. A mature organization would be prone to depend on its previous knowledge creation approach since it is familiar with every existing factor. SPRCD, too, was inclined to choose the first option to continue display research. Therefore, it is significant for organization to enter into new life cycle that it could discard old concept of knowledge, break the old mode of thinking, introduce and accept new knowledge that differs from existing one. If heterogeneous knowledge could be proactively introduced from the external and merged with existing one, an organization could exceeds old knowledge creation cycle and comes into a new one. Besides, the organization could reborn with more competitiveness and larger development space against the opposite that the organization would fall into developing bottleneck, recess and perish.

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AUTHORS

Xie Cheng-yang
is with Department of Economics and Management, Southeast University, Nanjing, 211189, China (e-mail: xiechengyang@yahoo.cn).

Hu Han-hui
is with Research Center of Industrial Organization, Southeast University, Nanjing, 211189, China (e-mail: huhh@seu.edu.cn).

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