

R&D Information System to Support Knowledge Creation

Hyojeong Jin, Il Yeon Yeo, Youn-Gyou Kook, Byung-Hee Lee, and Jaesoo Kim

{jin,ilyeon9,ykkook,bhlee,jaesoo}@kisti.re.kr

Abstract. In this paper, we introduce a web-based national Research & Development (R&D) information system that is called ‘Open R&D Knowledge Service’. It is based on the SECI model of knowledge creation theory for supporting knowledge creation process on a national basis. The R&D information system gathers and shares tacit and explicit R&D knowledge through three separate services – Open R&D encyclopedia service, Knowledge Q&A service and Precedent R&D Information service –utilizing crowdsourcing and accumulated government-funded R&D outcomes.

The system facilitates the conversion of individual tacit knowledge to national explicit knowledge and expands the existing national explicit knowledge.

Keywords: R&D Information system, Organizational knowledge, knowledge management, SECI model, Crowdsourcing.

1 Introduction

It becomes very significant for advancement of national science and technology to enhance the R&D knowledge creation since the knowledge is a core element in planning or performing R&D projects.

According to the SECI model proposed by Nonaka and Takeuchi which is one of the most widely accepted models for managing the knowledge, the knowledge is created through the spiraling knowledge processes of interactions between explicit and tacit knowledge. And the organizational knowledge creation is the process of making available and amplifying knowledge created by individuals as well as crystalizing and connecting the individual knowledge to an organization's knowledge system. In other words, ensuring what individuals come to know in their (work-) life benefits their colleagues and, eventually, the larger organization [1], [2].

In this paper, we consider systematic methods to support knowledge creation by applying SECI model and propose a web-based National R&D Information System that is called ‘Open R&D Knowledge Service’ to integrate and share R&D knowledge by utilizing crowdsourcing and accumulated national R&D outcomes database.

2 System Requirements Based on SECI Model

There are two types of knowledge, i.e., tacit and explicit knowledge. The tacit knowledge is normally gained from experience or intuition and difficult to state explicitly in

words, formulas or figures. On the other hand, the explicit knowledge is represented in a form of certain media and easily shared with others [1], [2], [3].

According to the SECI model, knowledge creation is a continuous process of dynamic interactions between the tacit and explicit knowledge. The four modes of knowledge conversion interact in the spiral of knowledge creation. The spiral becomes larger in scale as it moves up through organizational levels, and can trigger new spirals of knowledge creation [1], [2] (Fig.1).

- Socialization (tacit-to-tacit): where tacit knowledge is shared through shared experiences.
- Externalization (tacit-to-explicit): where tacit knowledge is articulated into explicit knowledge with the help of metaphors or analogies.
- Combination (explicit-to-explicit): where explicit knowledge is systemized and refined e.g. by utilizing information and communication technologies and existing databases.
- Internalization (explicit-to-tacit): where explicit knowledge is converted into tacit knowledge, e.g. by learning.

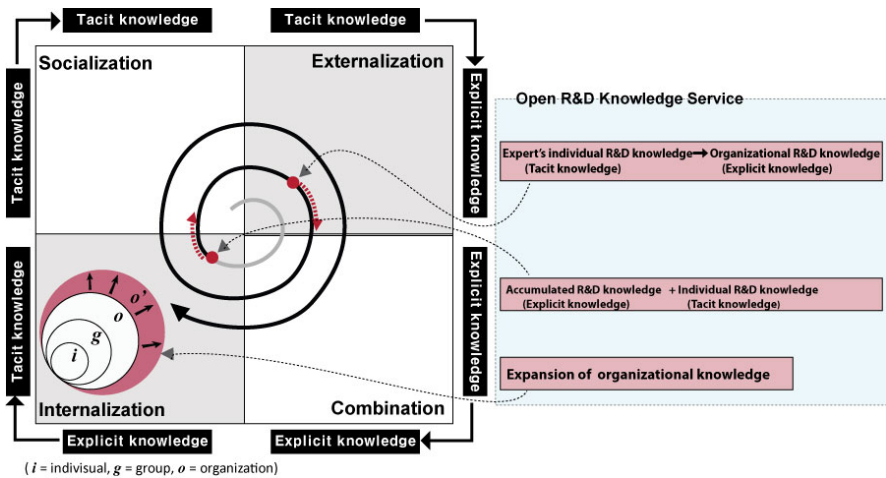


Fig. 1. SECI model & the proposed system's impact on the knowledge creation

By applying the SECI model, we suggest requirements of R&D Information System for R&D knowledge creation support, as follows.

- How to support the knowledge conversion process?
- How to support the expansion of the organizational knowledge scale?

To solve these requirements, the proposed system utilizes crowdsourcing based on open environment realized Web 2.0 and accumulated national R&D outcomes database.

In the open environment, users can draw up their tacit knowledge and easily interact with other users' knowledge or the existing organizational knowledge from

database. Through this process, user's tacit knowledge is transformed into explicit knowledge, which expands existing organizational knowledge to new organizational knowledge. (Fig.1)

3 Providing Services in the System

The proposed R&D Information System that satisfies the two requirements provides three information services, 'R&D encyclopedia service', 'Knowledge Q&A service' and 'Precedent National R&D service', for sharing or concentrating R&D knowledge.

3.1 R&D Encyclopedia Service

R&D encyclopedia service aims to establish an encyclopedia in the field of R&D with the current and practical knowledge of the related experts. Experts who are selected from applications and recommendation from R&D management institute or government basically manage contents of R&D encyclopedia. R&D Encyclopedia experts engage in the whole contents life cycle, from an examination to deletion. Users can freely draw up their tacit knowledge (know-how, opinion, etc.), which are examined by experts before registration for reliability of contents.

This service also provides the link to concerned precedent National R&D outcomes. To search the concerned precedent National R&D outcomes in database, this service uses tagged metadata of contents.

By using this service, users' individual tacit knowledge can be transformed into organizational explicit knowledge and shared with other users, and the existing organizational explicit knowledge in database can be transformed into new organizational knowledge through interaction with users' tacit knowledge (the existing organizational explicit knowledge + the expert's tacit knowledge + users' tacit knowledge).

3.2 Knowledge Q&A Service

Knowledge Q&A service is question and answer service about R&D. There is no restriction or rule in this service, therefore users can freely ask any questions or draw up their tacit knowledge as answers.

This service enables to create new organizational knowledge (collective knowledge) with concentrating user's tacit knowledge.

3.3 Precedent R&D Information Service

Precedent R&D Information service provides R&D projects outcomes (e.g., reports) which are classified into success cases and failure cases.

Contents of this service are registered by user's voluntary registration and recommendation from R&D management institutes, hence accessibility to R&D cases can be improved, especially government-funded R&D projects.

This service enables to add user's tacit knowledge and shares through the discussion board of each R&D cases.

4 Conclusion

We introduced a national R&D information system that is capable of sharing R&D knowledge and interacting with tacit and explicit knowledge on national basis in this paper.

In this system, users can share their knowledge and create new knowledge based on national R&D knowledge of this system, and the related national institute can maximize the utilization of R&D Information and promote development of the national science and technology.

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