2-1 For the Utilization of Knowledge on Geological Disposal Technology
–Detailed Design of Knowledge Management System–

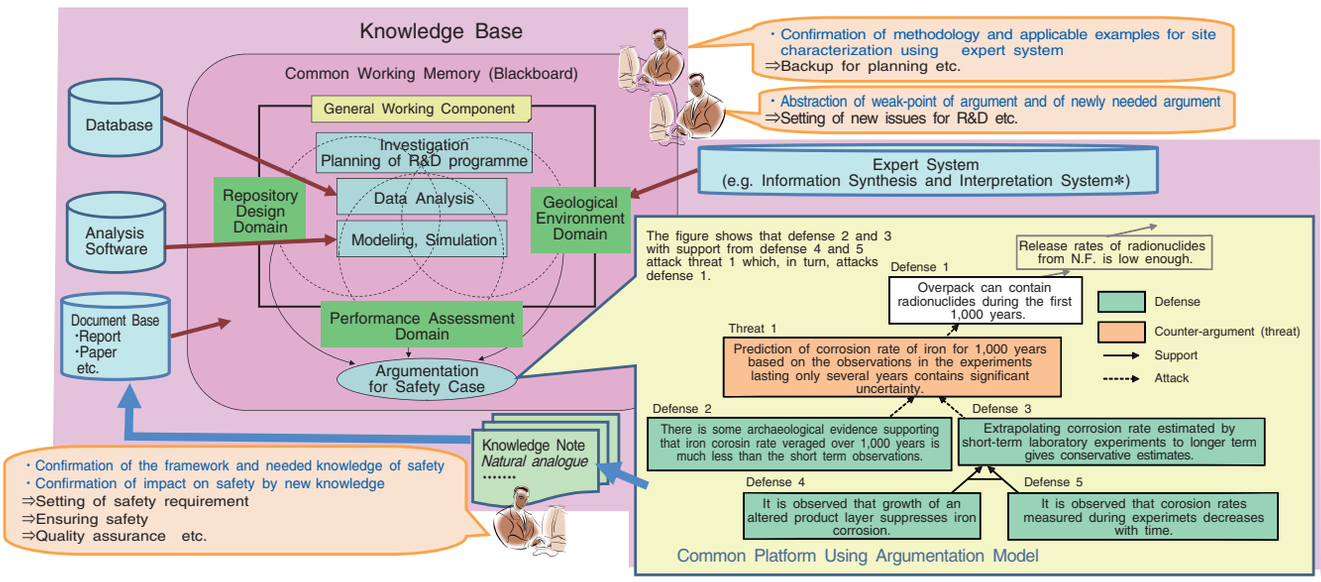

Fig.2-3 Schematic detailed design of knowledge management system
(*: performed under a contract with ANRE)

The unique feature of geological disposal of radioactive waste is that safety needs to be ensured for an extremely long time, tens of thousands of years in the future. It is necessary to have society accept explanations of the safety of geological disposal based on a variety of evidence, because it is impossible to actually demonstrate safety for such a long term. A reliable knowledge base on geological disposal is indispensable to give a trustworthy explanation. The objective of R&D on geological disposal technology is to accumulate knowledge and to enhance the reliability of the technology.

Explanation of the safety of geological disposal is complicated, drawing on an enormous amount of knowledge in multiple fields. The main body of a safety report alone runs to several thousand pages. In addition, the amount of knowledge related is anticipated to increase exponentially during the next few decades as waste disposal is implemented. It is important to continue to systematically collect such new knowledge in order to demonstrate safety.

The results of R&D, such as a database, software for analysis and technical report, are organized into a knowledge base. The knowledge base is updated with new knowledge provided through the R&D. The results of R&D are evaluated as to how they contribute to explanation of safety. Newly gained knowledge is examined carefully as to whether it supports the reliability of procedures or creates doubt. The evaluation of knowledge is a very time-consuming task. Therefore, it is necessary to build a new system in order to share the information among those concerned. A framework of knowledge management that optimizes production, dissemination, and use of the relevant knowledge has been proposed, based on a concept that regards development of the safety case as a chain of arguments and counter-arguments (argumentation model) regarding the design.

Our Knowledge Management System (KMS) enables those concerned to understand the effect of new knowledge upon safety, identify issues in use of knowledge, and make plans for the necessary investigations and analyses to solve the identified issues. In many cases these activities depend on “tacit knowledge” of the experts which has been accumulated over decades. In our KMS, the tacit knowledge, including technical know-how on application of complex investigation techniques and experience gained in the past, is synthesized as an expert system in order to improve the efficiency and quality of the safety case and to transfer the knowledge to the next generations (Fig.2-3). The detailed design of an intelligent KMS that utilizes state of the art technology in knowledge engineering has been completed. A prototype of a novel KMS will be developed by the end of the current five-year R&D program (2005 - 2010), taking into account both present requirements and possible future needs of users.

Reference

Osawa, H. et al., Design Concept of a Knowledge Management System of Geological Disposal Technology, Karyoku Genshiryoku Hatsuden, vol.621, no.6, p.26-33 (in Japanese).