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A Study on Design and Evaluation of Knowledge Creating Environments

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Abstract

Knowledge science has been producing results such as knowledge conversion theory, knowledge systematizing methods, and methods for the development of creativity. It is expected recently that knowledge science should help researchers produce creative theoretical results in important natural sciences. For this purpose, we have to establish an environment or circumstance, which supports the development and practice of scientific knowledge creation. This research tries to explore how the interaction between members and environments advance growth of graduate students of scientific research from the point of view of knowledge creation or knowledge management, by questionnaire surveys and modeling analysis.

We first search interaction rules between members and self-reform rules in some experiment laboratories at JAIST. The candidate of rules are extracted from the personality description sentences about factors: extroversion, agreeableness, conscientiousness, neuroticism and openness in the Big Five theory of personality psychology. Here, interaction and self-reform rules are not described by personalities themselves, instead, they are described by corresponding phenomena: activity empathy persistence, autonomy, and thinking skill which appear in the behavior side. Each member's initial value is determined from the main 5-factor personality investigation to the member, and the target value is given by the member's self-declaration. The rule selection is carried out by the genetic algorithm, where a sigmoid function is introduced in the renewal algorithm of the value, whereby a difficulty such as settlement of the renewal parameter is avoided. An analysis is added about the obtained rules, and the validity of this approach and the subjects for future study are discussed.

Because the above modeling analysis is not fully sufficient to explore the effects of research environment on the growth of students, we then propose a checklist on research capabilities and research environments based on a knowledge creation model to design and evaluate the environments for technology creation in academia. The Nonaka model is very famous as a knowledge creation model in the management domain, but the model developed by A. P. Wirzbicki may be the first one which teats the knowledge creation process in academia; our model is based on the latter one. We have carried out a questionnaire survey on the research capabilities and environments of the graduate students in the research fields of material science, then analyzed this data with the fuzzy correspondence analysis and presents some useful interpretation of data for supervisors.