

## 論文の内容の要旨

### Thesis Summary

論文題目     A Study of Organizational Knowledge Management with  
                  Agent-Based Modeling and Behavioral Experiments  
                  (エージェントベースモデリング及び行動実験による  
                  組織的ナレッジ・マネジメントの研究)

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Knowledge is recognized as the ultimate source of value creation and competitive advantages for organizations, nations and regions. Knowledge management (KM) approaches that address microscopic cause and macroscopic effect, states and dynamics, rationalities and behaviors, and various systemic causalities are barely found in the literature. Meanwhile, as conventional methodologies overemphasize the development of KM technology and decision support systems (DSS), e.g. expert systems, the direct links between KM efforts and organizational outcomes, and the effectiveness of administrative policy are either hardly observable or poorly analyzed in hindsight. To overcome the limitations and probe into a new paradigm of generative complexity for next generation KM, a combination of the rapidly popularized agent-based simulation and behavioral experiment is proposed as a plausible and promising solution. By utilizing such an integrated approach in the context of a basic KM game, this study aims at exploring how evolutionary and behavioral KM from the microscopic individual's effort and interactions affect the macroscopic outcomes including organizational performance and social network structure; and elucidating various causal relationships among environmental conditions, exogenous administrative policies, endogenous agents' decision behaviors, and emergent properties.

In the basic KM game settings, individuals are competing to solve problem and optimize performance strategically under an uncertain environment by doing either Innovation (creating new knowledge independently) or Imitation (acquiring shared knowledge through creating social networks). The decision making of each agent involves two stages: one on choosing a strategy for problem solving, and the other on choosing an agent to learn from when doing Imitation. The productivity of new knowledge and the accessibility of the social network is controlled by the policymaker for creating various scenarios as exogenous administrative interventions. The game is implemented in agent-based simulations as well as a series of behavioral experiments. Results of microscopic agent endogenous adaptation, macroscopic collective performance optimization and bottom-up structure emergence under exogenous intervention and turbulent environment are obtained and analyzed. With a detailed comparison of results obtained

from simulations and experiments, a scarcity heuristic on individual decision making has been identified suggesting a mental shortcut and cognitive bias of human agents who place a value on the action which is more difficult to succeed. Based on such findings, the modification of the agent-based model has been proposed and tested. Moreover, a macroscopic non-monotonicity in collective performance has been revealed indicating that alongside the increase of social network connectivity, collective performance is not always enhanced continuously. Such phenomenon can only be identified through generating evolutionary KM results on long-term at steady state. The uncertainty from environmental turbulence is taken into consideration when explaining such casual relations. On top of the basic game, an extended game introducing a managerial control through a KM incentive system, namely a payoff function to knowledge creation and sharing is developed. Under such exogenous reward policy, agents need to act strategically when facing a dilemma between the keeping of individual profit and the optimization of collective performance. Hence, the evolving processes of individual behavioral decision making against collective performance optimization is visualized. Furthermore, the most suitable incentive policy which motivates the individuals and unleash their potential can be identified and tested; and the conditions for cooperative and competing behaviors can be identified. In the future work, the KM game will be further extended with the designation of an administrative role to examine how administrator and member agents' co-evolution can be realized and what impacts it would bring to the macroscopic outcomes. It will also incorporate administrative control on what organizational knowledge can be seen to certain agents as well as how agent's reputation is built when generously sharing knowledge, therefore, the social influence on decision making can be explored in depth. With such an integrated development, the managerial insight can be gained, various causal relations can be sorted, and the effective KM policies can be designed and tested before execution in the real workplace without sacrificing huge cost or introducing undesired risks.