2011 Russell Ackoff Doctoral Student Fellowships Proposal

Giving Randomness a Chance:
Strategy vs. No Strategy in Knowledge Acquisition

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Giving Randomness a Chance:
How Much to Strategize in Knowledge Acquisition?

In this project, I use computational modeling to study the ways in which organizations can benefit from uncertainty. In particular, my goal is to understand how organizations can capture opportunities to innovate, given that innovation depends on at least some level of uncertainty. This underlying assumption takes into account that the history of innovation is replete with stories of serendipities and lucky accidents. Two distinct processes that drive innovation, the discovery of new knowledge and the recombination of existing knowledge (Arthur, 2009), are both frequently sparked by chance events.

A common thread in most—if not all—accounts of accidental innovation is that despite the element of surprise, the innovators knew they had stumbled upon something valuable. As Louis Pasteur famously said, "Chance favors the prepared mind." Chance, however, arises due to uncertainty, and given uncertainty, it is often unclear what constitutes a prepared mind. In an uncertain environment, the present and the future are often sufficiently decoupled such that organizations may not even have a hint of what will come their way and how to be ready for it.

As a first step in deconstructing this problem, I assume that in the context of innovation, the most prepared organizations are those that are stocked with the broadest and deepest knowledge. To use an immune system metaphor, an organization's set of knowledge perhaps can be compared to an organism's set of antibodies: Everything else equal, organizations that have the best expectation of innovating from uncertainty are those that are equipped with the richest knowledge stocks, capable of engaging with virtually any kind of new knowledge.[1]

Based on this assumption, I have developed an agent-based computational model to compare different knowledge acquisition modes and see which of them generates the broadest and deepest knowledge stock in a given condition. In particular, I compare the performance of *strategic* and *random* knowledge acquisition modes. In the spirit of March (1991), I look at two types of strategic modes: *exploitative* and *explorative*. An exploitative agent prefers new knowledge that is similar to its existing knowledge stock, whereas an explorative agent prefers new knowledge that is dissimilar from its existing knowledge stock.

In this model, an agent acquires knowledge via a two-step process: In the first step, the agent evaluates knowledge units in its knowledge acquisition environment and, through a probabilistic process, chooses a knowledge unit that suits its particular mode (explorative, exploitative, or random). In the second step, the agent evaluates the chosen knowledge unit against its absorptive capacity (Cohen and Levinthal, 1990), which is a function of its existing knowledge stock. The agent can be successful in acquiring knowledge only to the extent that its absorptive capacity allows it. The model thus treats the evolution of an agent's knowledge acquisition and knowledge stock as co-occurring and co-dependent.

My preliminary results show that over time, a random knowledge acquisition mode tends to result in a knowledge stock that is more balanced in terms of breadth and depth, compared to exploitative and explorative modes. When the initial knowledge acquired is peripheral rather than central, random knowledge acquisition mode can outperform both exploitative and explorative modes. These results are surprising as they suggest that there are times when organizations are better-off *not* following a specific strategy in acquiring knowledge.

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[1] I recognize that this assumption may need to be revisited. The size and diversity of a knowledge stock presumably imposes some cost to the organization such that broader and deeper knowledge is not always better.

Based on these results, I am currently preparing to run larger scale simulation experiments to further understand how the relative performance of each the three classes of knowledge acquisition modes is influenced by the following factors: (1) absorptive capacity parameters (e.g., 'intelligence'), (2) type and composition of knowledge that is available in the agent's knowledge acquisition environment, and (3) learning and memory parameters (e.g., retention decay). Furthermore, I plan on revisiting and validating the original assumption that the broadest and deepest knowledge set translates into the most "prepared mind." In this regard, I will test agents possessing different knowledge stock characteristics for innovative capabilities in environments of varying complexity and turbulence.

I hope to utilize support from the Ackoff Fellowship to purchase a high performance computer/mini server to meet the computational demands of the simulations. Additionally, I hope to obtain support to present this work at two conferences: first, the Academy of Management Annual Meeting, which will take place in San Antonio, TX, in August 2011, and second, the Trans-Atlantic Doctoral Conference, which will take place in London, England, in May 2011. I will greatly appreciate any support that the Ackoff Fellowship can provide. Thank you for your consideration.

References

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