Title

Co-evolving Business Networks: An exploration of the relation between structure and dynamics

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Extended Abstract

This paper deals with the influence of the structure of co-evolving business networks on the diffusion of technological innovations. Conceptually, it builds on theories of increasing returns economics, structural embeddedness sociology and co-evolutionary biology. Methodologically, it builds on Kauffman's N/K model and on our work for the ECCON 2003 conference on network morphology.

It is by now well established that the structure of a network influences the diffusion of innovations throughout this network. The reason for this is that economic actors do not take their decision in isolation, but they are influenced by the decisions of others. This is true on the demand side and on the supply side.

On the demand side we see economic network effects, i.e., that customer value of a product based on a specific technology increases as more customers adopt these products or as they adopt more complementary products based on this technology and we see social interaction effects, i.e., that the preference of customers or potential customers for a product is dependent on the opinions and expectations of other customers or potential customers.

On the supply side we see patterns of competition emerge that do not match the economic models of perfect competition or even of oligopolistic or monopolistic competition. Rather,

competition takes place between a few large coalitions of firms around a common technological platform.[1] We call such coalitions 'co-evolving business networks'.

The central question to be explored in this paper is: "What is the influence of network structure on the diffusion of technological innovations through business networks and what are the consequences for the performance of the firms participating in these networks?"

For the characterization of network structure, we refer to our ECCON 2003 paper, by assuming that a network can be characterized by its morphology, i.e., the degree of connectivity and the degree of concentration that together make up the network entropy.

For the exploration of the relation between network structure and network dynamics, we will use Kauffman's N/K model. We may think of the supply side and the demand side of the business network as two interacting fitness landscapes, where the overall fitness of the supply landscape is dependent on the shape of the demand landscape and vice versa. The fitness of each actor in the landscape is dependent on its own fitness contribution and the fitness contribution of the actors with which it is related.

An important observation from Kauffman's model is that large, densely connected networks have more rugged fitness landscapes than small or sparsely connected networks. Therefore, we expect that when the network entropy increases as a result of changes in connectivity and concentration, the network topology becomes more rugged in Kauffman's terms. This may lead to avalanches of change throughout the whole network. On the other hand, when network entropy decreases we expect that the landscape become smoother and changes will spread more slowly throughout the network.

References

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[1] This 'platform' may later become a technological 'standard'.