Part IV Model development – Clusters as complex adaptive systems

> *If I had to model industrial clusters, I would search carefully for middle-level semi-empirical rules that might persist all the way from the real world down to the highly simplified model, and test the model by seeing if it clarifies how the rules arise*
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> Murray Gell-Mann 2002, p. 24

Having established that clusters can be defined as complex adaptive systems, the following chapters investigate how complexity theory and especially the N/K framework could be used to establish causalities regarding the roles of two empirically derived cluster-level factors (degree of division of labour and mode of co-ordination) for their adaptation to change. As such, the qualitative simulation model developed here aims at finding explanations for the role of both factors and adaptive performance within the N/K framework.

Understanding clusters as co-evolving N/K systems implies that one deals with different agents aggregated into groups that conduct parts of the activities in the local value chain. Interdependence between agent activities can then occur among activities controlled by one agent reflecting that strategy choices (e.g. in research and production) may have to be aligned within firms to produce good results. The effect of agglomeration externalities is mirrored in the existence of cross-agent interdependencies between value chain activities, e.g. situations where the outcome of end-producer activities depends on those undertaken by suppliers.

A role for the degree of division of labour at the vertical level of the cluster as well as the mode of co-ordination between its agents is then found with the effect of both aspects on cluster adaptability, i.e. its likelihood of finding good new configurations after a change event (chapter 7). Arguing that the mode of co-ordination provided by the local rules of the game influences the goals underlying agent strategy selection, the model introduces different forms of indirect inter-agent co-ordination by assuming different selection mechanisms at the agent level.

The extent of division of labour in turn impacts on the degree to which interdependencies between activities exist at the level of agents or between agents. Both aspects matter for the number, cluster-level optimality and spread of modifications found by each agent group, thereby driving cluster adaptability. An investigation into their exact roles is then done by comparing the dynamics regarding agent-driven adaptation within static cluster architectures (part V).