Chapter XXII
Modelling Knowledge Production and Integration in Working Environments

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ABSTRACT

This chapter introduces a formal model of a complex knowledge integration process named “thinking along.” Here, the firm is modelled as a working environment consisting of agents arranged into work-practices, which provide the context for their interactions. The objective of the simulations reported here is to compare two different practice structures and test their effectiveness for solving problems by thinking along. To do so, we will also introduce the notion of problem complexity as the basis for different experiments. From such a comparison, it emerged that complex problems are better tackled when practices group together agents with disparate skills (i.e., divisional practices) whereas simple problems can be more effectively addressed by organisational practices composed of agents with similar skills (i.e., functional practices). In either case, the simulated knowledge integration process played the dominant role.

INTRODUCTION

Enterprises are increasingly seen as complex systems within which learning processes take place individually as well as through the dynamic interaction of peers. From a descriptive point of view, it has been observed how organisational learning requires both (1) specialisation as a means to acquire high expertise and (2) differentiation as a viable way of broadening the scope of possessed
knowledge. From an analytical point of view, on the other hand, emphasis is placed on how knowledge is acquired individually (individual learning) as much as on how it is integrated by means of peers’ interactions (interactive learning).

High complexity of work processes such as problem-solving, R&D, etc., typically faced by knowledge workers suggests the importance of knowledge integration in such environments. This could be facilitated or it could be impaired by the organisational structure of the workplace.

It seems straightforward to envisage a nexus between the complexity of problems to be addressed in a working environment and the kind of skills required for their solution. For instance, firms producing a standardised product face a low level of uncertainty and therefore can ex-ante define the set of skills necessary to perform the required routines and easily integrate them. However, increasing the complexity of the task performed by firms might increase uncertainty and as a result require a broader spectrum of knowledge to address ex-post unpredictable problems which might arise over the production process. This, in turn, might have significant effects over workplace organisation as grouping skilled workers endowed with different expertise becomes crucial to promote effective knowledge-integration processes.

Knowledge transfer has been widely considered a dominant mechanism of knowledge integration. Once transferred, knowledge is mastered and subsequently integrated with personal knowledge. However, the mechanism of knowledge integration presents a dilemma: Tacit knowledge is difficult, and also inefficient, to transfer. Moreover, knowledge transfer counters the specialisation argument previously introduced as it assumes that individuals absorb diverse specialised knowledge by means of face-to-face encounters. As put by Berends et al. (2004): How is it possible to integrate knowledge without actually transferring it? In a recent study, the authors suggested a solution to such a dilemma; their core idea is that peers’ interactions might be useful in solving problems, without aiming at transferring knowledge. Such a mechanism has been labelled “thinking along,” meaning that two (or more) individuals combine their specialised knowledge to solve a problem; nonetheless, at the end of the interaction they do not share that knowledge (Berends et al., 2004).

However largely debated, few efforts to model such complex learning mechanisms have been made so far. Building our work on the thinking along concept and on the empirical analysis of Berends et al. (2004), we present an agent-based model which attempts to capture the overall complexity of knowledge integration in an industrial research setting. We shall model a working environment (e.g., R&D department) within which individuals aim at solving problems. Agents are arranged into practices (i.e., working groups). They can solve problems individually (if they possess all the knowledge required to do so) or jointly with one or more colleagues working in the same practice.

The objective of the simulation experiments reported here is to compare two different practice structures and test their effectiveness for solving problems by thinking along. To do so we will also introduce the notion of problem complexity as the basis for different model scenarios.

** KNOWLEDGE INTEGRATION AND LEARNING IN WORKING ENVIRONMENTS**

Knowledge is an essential ingredient needed for the initiation of innovation processes, and the ability to acquire it is considered as an indispensable skill for innovative firms. At the same time, the capacity of firms to innovate is determined not only by the individual ability of their employees to integrate new pieces of knowledge into the production system (individual learning) but also by the ability of the organisation itself to absorb knowledge produced externally and translate it into...
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