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Author(s): H. Tsoukas and N. Mylonopoulos

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Part Special Issue Introduction: modelling organizational knowledge

H Tsoukas^{1,2,*} and N Mylonopoulos³

¹The George D. Mavros Research Professor of Organization and Management, Athens Laboratory Business Administration (ALBA), Greece; ²University of Strathclyde, Strathclyde, UK; and ³Athens Laboratory of Business Administration (ALBA), Greece

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Ever since the resource-based view of the firm has been put forward to explain the competitive advantage of firms, the issue of intangible firm assets has been the focus of several studies.^{1,2} According to this view, while physical resources continue to be of significance to a firm, what, however, is important for a sustained competitive advantage is the way a firm uses its human and organizational resources (its intangible resources). Such resources are unique to the firm — they are idiosyncratic — since they have been developed over time, in the particular circumstances facing a firm, as a result of particular choices made by a firm's managers, and include webs of particular relationships (formal and informal) that have developed within the specific context of a firm. Intangible resources are largely knowledge-based: they incorporate knowledge concerning (a) what each individual knows and the skills they have, and (b) the formal systems and routines a firm has developed for organizing individuals and technology, as well as the informal ways of doing things (culture) that a firm has developed over time. Given that knowledge-based resources are distinctive to a firm (idiosyncratic), history-dependent and ambiguously related to firm performance, they are difficult to imitate and, insofar as this is the case, they are thought to give a firm a competitive advantage over its rivals.¹

While there is no knowledge-based *theory* of the firm yet, a minimum number of inter-related assumptions inform the work of those researchers who study the organizational and economic significance of knowledge. Grant³ (p 138) has summarized these assumptions as follows:

1. Knowledge is the most important productive resource and a source of Ricardian rents.
2. Different types of knowledge differ in their transferability.

3. Knowledge is subject to economies of scale and scope.
4. Knowledge is created by human beings who carry out work and interact in the context of social practices.
5. Several types of knowledge are required for the production of a good or service.

If knowledge is the most important productive organizational resource (point 1), what exactly is organizational knowledge? For several researchers, the latter has been thought to be both a *stock* and a *process*. It is a stock insofar as it includes institutionalized procedures and routines, which constitute, to a large extent, the formal organizational memory. Organizational members routinely accomplish tasks and, therefore, they accumulate experiences. Provided the routines and the experiences resulting from their application are made systematically available to other individuals in the organization, a stock of relevant knowledge develops over time. Product and process innovations are some of the most tangible stocks of organizational knowledge — they incorporate knowledge, which can become a commodity to be sold in the market place. What else is a consulting report, a medical diagnosis, or a software package than a stock of knowledge?

As well as a stock, organizational knowledge is a *process* insofar as a stock of knowledge develops over time, gets refined and revised, and new knowledge is added to it. In other words, in the context of their work, organizational members draw on stocks of existing knowledge and interact with one another (as well as with others outside the organization) to solve particular problems and tackle particular issues. By doing so, individuals create new knowledge. The problems organizations face, in that regard, are firstly how to secure that individuals do interact to exchange knowledge in order to tackle particular issues they are facing; and secondly, preventing that knowledge and the rewards associated with it from being captured by only a few individuals at the expense of others who are involved in knowledge transactions. In short, for organizational

*Correspondence: Dr H Tsoukas, The George D. Mavros Research Professor of Organization and Management, Athens Laboratory Business Administration (ALBA), Greece.
E-mails: htsoukas@alba.edu.gr, hari@gsb.strath.ac.uk

knowledge to emerge, individuals must equitably interact — they must coordinate their efforts while avoiding free riding⁴ (p 73).

The duality of organizational knowledge — knowledge as a stock and a process — is highlighted in the definition provided by Tsoukas and Vladimirou. They have argued that organizational knowledge is ‘the capability members of an organization have developed to *draw distinctions* in the process of carrying out their work, in particular *concrete contexts*, by enacting sets of generalizations [...] whose application depends on historically evolved *collective understanding* and experiences’⁵ (p 983). This definition underscores both the nature of knowledge as a stock (sets of generalizations and collective understandings) and as a process (individuals drawing distinctions and exercising their judgments in the context of their work).

If this definition is accepted, three questions arise. Firstly how do individuals draw fresh distinctions and revise their stocks of knowledge? Secondly, how do individuals exchange knowledge? And thirdly, how do individuals develop common understandings of certain problems and issues? Each one of these questions is, respectively, tackled by each of the three papers included in this Themed Issue. While they have not been the first papers to address such questions, they are among the few to approach them formally. Indeed, most of the relevant studies of organizational knowledge tend to be either qualitative or survey-based, but few attempt to formally model aspects of organizational knowledge. By and large, the authors of the three papers included here focus on a particular aspect of organizational knowledge (respectively: knowledge revision, knowledge exchange, and knowledge sharing) and they either build a formal model to make sense of the phenomenon under study, or map out the phenomenon in the form of a typology.

Of course, as the OR/MS community knows well, while formal models are of immense value in capturing the salient properties of a phenomenon, they tend to simplify the phenomenon at hand. This is inevitably the case here too. For example, an important assumption of Tselekidis *et al*, as the authors themselves acknowledge, is that a knowledgeable agent is a perfect reasoner — he/she is aware of all logical consequences of his/her beliefs. Similarly, Deng and Tsacle study knowledge exchange *as if* it was market-based. Nonetheless, formal models are best viewed as ‘what if’ probes: by simplifying, they help us go systematically in depth and capture certain aspects of the phenomenon under study. More elaborate and complex models may be progressively built by relaxing key assumptions.⁶

In their paper, Tselekidis *et al* are concerned with formally studying the evolution of knowledge in organizations. They particularly focus on codified knowledge and formally explore how organizations transform articulated knowledge into codified knowledge. The more effective such transformation is, the authors argue, the more able an organization is to reconfigure and develop its resources and routines,

while, at the same time, such a process helps agents understand their own articulated knowledge better. Drawing on the theory of Belief Revision, Tselekidis *et al* show how agents in organizations revise their beliefs when faced with external and internal stimuli. They also reinforce the ‘uniqueness thesis’, which is an important assumption of the resource-based view of the firm, namely that even when organizations receive the same input and possess the same initial knowledge, they may react differently, provided their beliefs are differentially ranked in terms of their epistemic importance. In the same vein, the authors formally show that the possibility of an organization engaging in ‘single-loop’ or ‘double-loop’ learning depends on whether the organization modifies the epistemic value that it places on its set of beliefs (‘epistemic entrenchments’), over time. To put it differently, single-loop learning is present when the organization does not modify its set of epistemic entrenchments over time. The reverse happens in the case of double-loop learning.

Deng and Tsacle are also interested in the evolution of organizational knowledge, but from a different angle. Focusing on multiple-step learning tasks, they propose a market-based model for organizational learning. Since organizational knowledge is widely distributed (as Kay⁴ (p 73) aptly remarks, ‘the purest form of organizational knowledge is where each employee knows one digit of the code which opens the safe’), collaboration among organizational members is essential for task completion. In Deng and Tsacle’s computational model, knowledge exchange operates like a market system in which buyers, sellers and brokers participate collaboratively in knowledge transactions for accomplishing organizational tasks. The model is characterized by the local competition among seller agents and the global collaboration among winner agents in forming a plan for task accomplishment. The authors show how organizational learning is an emergent phenomenon of knowledge redistribution among knowledge agents via knowledge transactions. An organization learns over time as a result of a sequence of nested single-loop learning tasks at the local level.

Finally, Shaw, Ackermann, and Eden set out to explore how groups of senior managers, charged with the task of making strategic decisions, develop a shared view of a problem. Focusing on JOURNEY Making, a particular ‘soft OR’ method, the authors examine how real groups of senior managers surface, connect, and develop some shared understanding of the problem situation at hand. Through the study of 15 different gatherings of senior managers, Shaw, Ackermann, and Eden develop a typology of the different ways knowledge is shared in such groups. This typology consists of stories, expanded sequences, broadcasts, and news-flashes. A ‘story’ is a network of causes and consequences; an ‘expanded sequence’ is a participant’s concentration on a particular aspect of the problem; a ‘broadcast’ is when participants ‘broadcast’ their opinions to

the group; and a 'news-flash' is when a participant shares a thought that bears little resemblance to the other thoughts that the group has shared. These knowledge-sharing approaches range from more in-depth thinking (stories) to superficial thinking (news flashes). The authors discuss both the implications of this typology for the development of a common stock of knowledge among top-management teams and for future research.

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