Chapter 9
A Complex Systems Theory and Model of Distributed Team Development

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ABSTRACT
Confidence in distributed or virtual team working is running high. However, some concern is evident that practice is leaping ahead of theories to guide its implementation. There are calls for new and improved theories to specifically embrace distributed team working. This chapter is a response to such calls, offering a complex-systems-based model of organization development. This model was originally designed to improve performance of the management of technology and innovation, but also underpins a methodology of community of practice and team development known as the KALiF System. The theory and model described here is mainly a synthesis of established team and community of practice theory, Dunbar’s Social Brain Hypothesis, and elements of complexity science based on the work of the biologists and systems thinkers Humberto Maturana & Francisco Varela, and also Stuart Kaufmann on attenuated supracritical systems.

INTRODUCTION
The intent of this chapter is to introduce a complex systems model of distributed team development and its underlying theory. The model is also applicable to community of practice development and, with an appropriate web 2.0 based supportive infrastructure, may be used for project management and implementing organizational change, including cultural change. The basic model was the product of a European research project called KALiF, completed in 2004 (see Kelleher et al.,

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The aim of the project was to establish a knowledge sharing and learning infrastructure, the function of which was to support the formation and development of a pan European community of experts in e-learning technologies and strategies. Underpinning the final community development methodology at that time, referred to here as the KALiF System, were theories of individual and organizational learning and knowledge management. Although substantially the same model is presented at the end of the chapter, the theoretical foundation is now radically different, completely rewritten and represented in terms of the biology of cognition and selected aspects of complexity science. Though expressed differently, individual and collective learning and knowledge sharing remain central to the explanation of team development and team performance.

Since completion of the KALiF project there has been a revolution in Internet technologies, especially Web/Enterprise 2.0, that have strengthened the KALiF System. The system now finds application in a variety of situations from facilitating learning of university student cohorts, to the creation of single enterprise knowledge and learning infrastructures and managing the formation of intra-organizational communities of practice. The new theoretical foundation, however, is largely implicit in implementation. This is principally because it presents such a strong challenge to the existing theories of team and organization development, and because the language in which it is expressed is so unfamiliar as to be an obstacle to sharing. This chapter, therefore, is an attempt to articulate the theory in a way that will promote sharing. However, it is still an intellectual challenge. Bearing this in mind, the chapter is so structured as to lead the reader from something familiar, namely, team and community of practice theory, to something radically different in Maturana and Varela’s unique interpretation of language and conversation and Kauffman’s idea of explosively unstable supracritical systems. The step of including a significant number of diagrams is designed to aid communication and learning. The structure of the chapter is as follows.

The chapter is presented in four parts and will be focused on what will be referred to as the schema phenomenon, which is the something that appears to glue individuals together as part of a collaborating collective. Understanding the nature of the schema, how it occurs, how it evolves, and how it can be disrupted is central to understanding how we are able to work together with a very high degree of coordination. The first part of the chapter provides the context for the complex systems based model and will introduce and explore the nature of the schema with reference to communities of practice and Dunbar’s (1998a) social brain hypothesis, a theory of social group development that links brain size to groups size. For humans, this number is 150, a figure known as Dunbar’s number. In the second part the real challenge is met, the systems theory of living devised by the biologists and systems thinkers Humberto Maturana and Francisco Varela, also known as the biology of cognition (BoC), or autopoietic theory (Maturana & Varela, 1980, 1992). An explanation of their novel interpretation of language and conversation will provide the backbone of the model that is developed in the fourth and final part. It will show how a schema arises and the role it plays in maintaining group cohesiveness. The next piece of the jigsaw will be the notion of supracriticality, which, when combined with the BoC, is transformed into the concept of attenuated supracritical networks of conversations. In the third part, the model of team development is described and presented using the modeling convention known as systems dynamics, or systems thinking.

BACKGROUND

The Internet and its facility to connect people over vast distances, the high profile successes of open source software developments, and the sheer per-