Chapter 25
Designing Complex Organizations Computationally

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ABSTRACT

Business process management is recognized increasingly as a critical factor in organizational success, leaders and managers seek to cope with increasingly complex and dynamic environments, and traditional approaches to process management become increasingly inadequate due to their lack of flexibility and adaptability. Alternatively, an organizational form receiving considerable current focus is the Edge, which distributes knowledge and power to the "edges" of organizations, and which enables organizational members and units to self-organize and self-synchronize their activities. The dynamics of such self-organization and self-synchronization, however, are extremely complex, and balancing the flexibility and adaptability inherent in the Edge with sufficient control to avoid chaos is very challenging. We employ the state-of-the-art POWer environment for dynamic organizational representation and emulation to develop and experiment with models of competing organizational forms, and to inform our understanding of complex organizational design and management—thereby making an important contribution to theory, research methodology, and practice.

INTRODUCTION

Business process management is recognized increasingly as a critical factor in organizational success: a factor that helps to improve organizational processes, to reduce operational costs, and to promote real-time visibility into performance (Al-Mudimigh, 2007; Shaw, Holland, Kawalek, Snowdon, & Warboys, 2007). In recent years, organizational processes have been becoming increasingly complex and dynamic,

as leaders and managers seek to cope with increasingly complex and dynamic environments (Chen, Zhang, & Zhou, 2007; J. E. Scott, 2007).

Indeed, Nissen and Leweling (Nissen & Leweling, 2008) explain how numerous organizational scholars (Chaharbaghi & Nugent, 1994; Donaldson, 1987; Tung, 1979) note widely that the contingency contexts of many modern organizations can change rapidly and unpredictably (Romanelli & Tushman, 1994), due to multiple factors such as globalization (Raynor & Bower, 2001), technology (Adner & Levinthal, 2002; Rahrami, 1992), hypercompetition (D'Aveni, 1994; Hanssen-Bauer & Snow, 1996), knowledge-based innovation (Jelinek & Schoonhoven, 1990), explicit linking of organizational structures to strategies (Sabherwal, Hirschheim, & Goles, 2001; Venkatraman & Prescott, 1990; Zajac, Kraatz, & Bresser, 2000), mounting competition from co-evolutionary firms (Barnett & Sorenson, 2002), high-velocity environments that are in perpetual flux, and the kinds of nonlinear, dynamic environmental patterns that never establish equilibrium (Eisenhardt & Tabrizi, 1995). Traditional approaches to process management are becoming increasingly inadequate in such dynamic environments due to their lack of flexibility and adaptability (Küng & Hagen, 2007; Ramesh, Jain, Nissen, & Xu, 2005; Vanderhaeghen & Loos, 2007).

Alternatively, an increasing number of scholars are viewing organizations as complex adaptive systems, which are designed, managed and redesigned iteratively to fit and adapt to complex, unpredictable and constantly shifting environments (Brown & Eisenhardt, 1997; Burgelman & Grove, 2007). One such organization receiving considerable current focus is the Edge (Alberts & Hayes, 2003), which distributes knowledge and power to the "edges" of organizations (e.g., where they interact directly with their environments and other players in the corresponding organizational field (W. R. Scott, 1995)), and which enables organizational members and units to self-organize and self-synchronize their activities. Key to Edge performance is decentralization, empowerment, shared awareness and freely flowing knowledge required to push power for informed decision making and competent action to the edges.

As an organizational form, the Edge shares almost no similarities with the Hierarchy, the latter of which represents the predominant form today (Nissen, 2007), and which is notably rigid, inflexible and slow to adapt to change. Indeed, well over a hundred, diverse organizational forms (e.g., M-Forms, see (Chandler, 1962); Clans, see (Ouchi, 1980); Virtual, see (Davidow & Malone, 1992)) have been proposed over the past several decades as contrasts to the Hierarchy (Nissen, 2005). We focus here on the Edge, because it is designed explicitly to be flexible and adaptable, and to address the kinds of unpredictable, dynamic environments noted above. Also, the Edge provides a vivid contrast with the predominant Hierarchy. Additional examination of other organizational forms via the approach described in this chapter is certainly merited, and represents a useful avenue for future research along these lines.

The dynamics of Edge self-organization and self-synchronization, however, are extremely complex and challenging. Without the traditional hierarchy to provide guidance, structure and stability, many people find it difficult to organize themselves effectively. The apparent disarray of many social movements and ad-hoc groups provide a couple of easily identifiable examples, and team-based approaches (e.g., cross-functional teams, matrix organizations) require sufficient buffering and management support (Thompson, 1967) that is provided generally by the traditionally hierarchical organizations within which such teams operate. Moreover, without well-established organizational routines and well-practiced communication patterns, many people find it difficult to synchronize their activities. This is particularly the case where people are dispersed geographically. Further, balancing the flexibility and adaptability inherent in the Edge with sufficient control to avoid chaos is very challenging. As Nissen and Leweling (Nissen & Leweling, 2008) explain, "maneuverability" (e.g., via flexibility and adaptability) is inher-

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