Change and Revolutionary Change: Formalizing and Extending the Punctuated Equilibrium Paradigm

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Abstract
The concept of punctuated equilibrium, long periods of incremental change interrupted by short periods of revolutionary change, is often employed to understand organizational transitions. This article uses insights from work on change in individual and organizational beliefs to develop a formal model of organizational change which is consistent with the core concepts of the punctuated equilibrium paradigm. However, it highlights the influence of critical incremental processes that underpin revolutionary organizational changes that have been overlooked in the current applications of the paradigm in organizational studies. It suggests that the key to understanding radical observable changes, is an understanding of the latent incremental processes that have been neglected.

Keywords: belief change, organizational belief systems, organizational change, formal model, punctuated equilibrium

1. Introduction
Organizational change is a central issue in organization theory. A better understanding of change issues will not only improve knowledge about the nature of organizations, it will also enhance the ability of change leaders to manage real organizational change. The concept of punctuated equilibrium has been widely used to understand change phenomena in organizations (Gersick 1989; Miller and Friesen 1984; Tushman and Romanelli 1985). The same concept has also been used in the study of revisions in individual beliefs (Yager et al. 1993). This interdisciplinary use of a common concept provides an opportunity for researchers to develop formal models based on the similarities in different phenomena, and then use insights from the knowledge in one area to enhance understanding in the other.

Carley (1995), in a recent review of the literature, described computational and mathematical theory as an interdisciplinary scientific field that focuses on the use of formal models to develop and test organizational theory in four areas: organizational design, organizational
learning, organization and information technology, and organizational evolution and change. In this paper, we draw on literature from organizational design, organizational learning, and organizational evolution and change, and integrate it with concepts of human learning from artificial intelligence to develop a formal punctuated equilibrium model of organizational change.

Gersick compared models of change from six domains to “explicate the punctuated equilibrium paradigm and show its broad applicability for organizational studies” (1991:10). According to the punctuated equilibrium paradigm, the evolution of human systems can be described as

“relatively long periods of stability (equilibrium), punctuated by compact periods of qualitative, metamorphic change (revolution)... the interrelationship between these two modes is explained through the construct of a highly durable underlying order or deep structure.” (Gersick 1991:12)

Among other domains, this concept has been applied to the history of science (Kuhn 1970), organization studies (Miller and Friesen 1984; Tushman and Romanelli 1985) and small groups (Gersick 1989).

Gersick’s (1991) analysis is based on the notion that there are important commonalities among the domains she has analyzed, thereby permitting comparisons, and that organizational studies can benefit from an examination of research findings and methodologies of other relevant domains. We believe, as we will demonstrate later, that recent work on change in individual belief systems, particularly participatory learning models, can help develop a better understanding of the dynamics of change in organizations. In our presentation, we will rely on discussions in Gardenfors (1988) and models suggested by Yager (1990) and Yager et al. (1993) that capture relevant developments in the area of human learning.

The notion that organizations, in some senses, display behavior patterns similar to human beings is well accepted in discussions of organizational learning (e.g., Levitt and March 1988; March 1991; Simon 1991) and information processing (e.g., Tushman and Nadler 1978). Although organizational learning and human learning, or organizational information processing and human information processing, are phenomena occurring at two levels, they are related (Carley 1992; Huber 1991; Simon 1991). The organizational learning and organizational information processing literatures will be applied to provide the bridge between discussions of changes in individual belief systems and changes in organizational belief systems.

Insights from current work in human and organizational learning will be used to develop a formal model of organizational change. For ease of presentation and understanding we start with simple representations of change and add elements to make the formal model more realistic. At every stage of the development, we illustrate the process of modeling by discussing and explaining changes in one organization. The final model is consistent with, and can explain, the punctuated equilibrium model as it has been applied to organizational change (Tushman and Romanelli 1985) and small groups (Gersick 1989). However, it also permits us to highlight the influence of important incremental processes that underpin revolutionary change but are often neglected by the theorists and/or researchers who use the concepts of punctuated equilibrium. It suggests that the punctuated equilibrium model, as it has been applied to organizations, is incomplete because it focuses only on the observable