Chapter XII
Evolutionary Diffusion Theory

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ABSTRACT

Improved understanding of issues affecting uptake of innovative technology is important for the further development of e-business and its integration into mainstream business activities. An explanatory theory that can provide a more effective instrument for determining acceptance levels should therefore be of interest to IS practitioners and researchers alike. The authors aimed to establish whether evolutionary diffusion theory (EDT) could offer such an instrument, developing a set of axioms derived from the EDT literature and applying these to an in-depth review of two e-business implementations: a G2B document delivery system introduced by the Australian Quarantine Inspection Service (AQIS) across a number of industry sectors; and an enterprise-wide system implementation in a local government instrumentality. The authors found EDT offered remarkable explanatory depth, applicable not only to analysing uptake of complex, multi-user technologies in organisational settings but to any e-business investigation requiring a system-wide perspective.

INTRODUCTION

A variety of theoretical frameworks and approaches have been used to study Information Systems (IS) diffusion processes (see, for example, Holbrook and Salazar, 2004; Baskerville and Pries-Heje, 2001; Edquist, 1997). Investigations of a number of these theories and models of Innovative Technology Uptake (ITU) have found that each has only a narrow perspective which tends to capture 'just one part of the story' and only highlights particular areas of interest. No

single theory appears uniquely able to explain the circumstances of any particular case (Jones and Myers, 2001 p.1018).

Despite these limitations, influences on uptake and diffusion of IT innovations are of perennial interest to IS researchers. Those attempting to make progress in identifying key issues affecting uptake have had to grapple with the limited explanatory power of recognised diffusion theories over some four decades. The most commonly cited diffusion theory in the IS literature is Rogers' Classical Diffusion of Innovation (DoI) theory, first published in 1961 (Clarke 1999). Rogers originally focused attention on the shape of the diffusion curve, describing innovation as a process that moves through an initial phase of generating variety in technology, to selecting across that variety to produce patterns of change resulting in feedback from the selection process, to the development of further variation (Rogers, 1995).

As a pioneering contribution to conceptualising adoption and diffusion, Classical DoI theory appears to have maintained its iconic status over time and continues to be cited in the IS literature, despite the fact that interest in innovation studies has moved on from the shape of the diffusion curve to a focus on articulating underlying dynamic mechanisms (Lissoni and Metcalfe, 1994; Nelson, 2002). The innovation 'journey' now appears to be more readily understood as a non-linear dynamic system, far less predictable and stable than staged models based on Classical DoI theory represented it to be (see for example Van de Ven et al., 1999). The static orientation of Classical DoI theory, its focus on individual firms and a 'single innovation' perspective has diminished its relevance to the IS field and to the development of online technologies in particular.

The limited explanatory power of Classical DoI theory is well documented in the literature (see, for example, Downes and Mohr, 1976; Moore and Benbasat, 1991; Damsgaard and Lyytinen, 1996; Galliers and Swan, 1999; Clarke, 2002). Seminal work in the IS field (for example: Orlikowski and Hofman, 1997; Boudreau and Robey, 1999; Reich and Benbasat, 2000) has also clearly established a need for analytical theory in this field which:

- Aligns more closely with the way beliefs, attitudes and understanding of plans and structures are known to influence organisational decision-making
- Can articulate underlying dynamic mechanisms intrinsic to adoption and diffusion processes
- Addresses how complex and networked technologies diffuse
- Acknowledges the uncertainty and surprises that mark the ITU process

The IS field needs a unified theory to identify key influences on uptake of innovative technology that is: appropriate to reviewing open-ended and customisable innovations associated with uptake of e-business technologies; takes into account issues of discontinuing practice or slowing uptake of inappropriate technologies; acknowledges the active role users can play in the innovation process; and allows for changes in an innovation during the adoption and implementation process. Such a theory must also be readily applicable in organisational settings featuring the adoption of complex, multi-user technologies – where the majority of potential applications of diffusion of innovation now occur. An analytical instrument which appears well suited to these requirements is Evolutionary Diffusion Theory.

In this chapter, we begin by exploring the origins and principles underpinning Evolutionary Diffusion Theory, before turning to examine its explanatory strengths. We will make close reference to two case studies that illustrate the relevance of EDT to the field of Information Systems (IS) and, in particular, to the explanation of innovative technology uptake.

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