Researching Technological Innovation in Small Business

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INTRODUCTION

The introduction of a new information system into a small business, or upgrading an existing system, should be seen as an innovation and considered through the lens of innovation theory. The most widely accepted theories of how technological innovation takes place are provided by innovation diffusion (Rogers, 1995) and the technology acceptance model (Davis, 1986), but most of the research based on these models involves studies of large organizations or societal groups. This article argues that another approach, innovation translation, has more to offer in the case of innovations that take place in smaller organizations (Burgess, Tatnall, & Darbyshire, 1999; Tatnall, 2002; Tatnall & Burgess, 2004).

BACKGROUND

There are important differences in the processes by which small and large enterprises choose to adopt or reject computers (Tatnall, 2002, 2005a), and this article concerns itself only with issues related to small business. To begin, however, it is important to distinguish between invention and innovation. Whereas invention can be seen in the discovery or creation of new ideas, innovation involves putting these ideas into commercial or organizational practice (Maguire, Kazlauskas, & Weir, 1994). Invention does not necessarily invoke innovation, and it fallacious to think that invention is necessary and sufficient for innovation to occur (Tatnall, 2005b).

Changing the way things are done is a complex affair (Machiavelli, 1515) and one that is difficult to achieve successfully. The dominant paradigm, by far, in innovation research is that of *innovation diffusion*, and no discussion would be complete without consideration of this approach. Innovation diffusion has had success in describing how innovations diffuse through large populations (Rogers, 1995). There are occasions, however, when diffusion does not occur, and the diffusion model finds these difficult to explain (Latour, 1996). Another common approach is to use the technology acceptance model proposed by Davis, Bagozzi, & Warshaw (1989) that looks at user perceptions of technology as a basis for adoption or non-adoption. The approach offered in *innovation translation*, informed by actor-network theory (ANT), is also worthy of consideration. In the translation model the key to innovation is creating a powerful enough consortium of actors to carry it through, and when an innovation fails, this can be considered to reflect on the inability of those involved to construct the necessary network of alliances amongst the other actors. This article will compare these models of technological innovation.

INNOVATION DIFFUSION

Rogers (1995), perhaps its most influential advocate, approaches the topic of innovation diffusion by considering a variety of case studies, the prime concern of which is the identification of factors that affect the speed with which an innovation is adopted, or that cause it not to be adopted at all.

In diffusion theory the existence of an innovation is seen to cause uncertainty in the minds of potential adopters causing a lack of predictability and of information. Rogers (1995) asserts that a technological innovation embodies information and that this has the potential to reduce uncertainty. Diffusion is thus considered to be an information exchange process amongst members of a communicating social network driven by the need to reduce uncertainty (Lepa & Tatnall, 2002). There are four main elements of the theory of innovation diffusion (Rogers, 1995):

Characteristics of the Innovation Itself

Rogers argues that the attributes and characteristics of the innovation are important in determining the manner of its diffusion and the rate of its adoption and outlines five important characteristics of an innovation that affect its diffusion: relative advantage, compatibility, complexity, trialability, and observability. The attributes of the potential adopter are also seen as an important consideration, and Rogers maintains that these include social status, level of education, degree of cosmopolitanism, and amount of innovativeness.

Nature of the Communications Channels

Acts of communication are a necessary part of any change process, and to reach a potential adopter the innovation must be diffused through some communications channel. Channels

involving mass media are the most rapid and efficient means of spreading awareness of an innovation, but interpersonal channels are generally more effective in persuading someone to accept a new idea.

The Passage of Time

In common with earlier researchers, Rogers found that different individuals in a social system do not necessarily adopt an innovation at the same time. Borrowing from work by Deutschmann and Fals Borda (1962), he proposes that adopters can be classified by their degree of "innovativeness" into five categories—innovators, early adopters, early majority, late majority, and laggards—and that if the number of individuals adopting a new idea is plotted over time, it usually follows a normal curve.

The Social System

Diffusion occurs within a social system in which the structure constitutes a boundary inside which this diffuses. Rogers argues that the system's social structure affects diffusion through the action of social norms, the roles taken by opinion leaders and change agents, the types of innovation decisions that are taken, and the social consequences of the innovation.

TECHNOLOGY ACCEPTANCE MODEL (TAM)

The main goal of TAM is "to provide an explanation of the determinants of computer acceptance that is general, and capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified" (Davis et al., 1989, p. 985). Davis's (1986) conceptual framework proposed that a user's motivational factors are related to actual technology usage and hence act as a bridge between technology design (e.g., system features and capabilities) and actual technology usage. In his conceptual framework, Davis (1986) assumes that stimulus variables (e.g., system features and capabilities) trigger organism factors (e.g., user motivation to use the technology), and in turn users respond by actually using the technology. Davis identifies the following major determinants of technology acceptance:

- Perceived usefulness
- Perceived ease of use

INNOVATION TRANSLATION

An alternative view is that of innovation translation, which draws on the sociology of translations, more commonly known as actor-network theory (ANT). The core of the actor-network approach is translation (Law, 1992), which can be defined as "... the means by which one entity gives a role to others" (Singleton & Michael, 1993, p. 229).

Essentialism

Diffusion theory asserts that a technological innovation embodies "information": some essential capacity or "essence" instrumental in determining its rate of adoption. A significant problem with an essentialist paradigm like this arises if a researcher tries to reconcile the views of all parties involved in the innovation on what *particular* essences are significant. The difficulty is that people often see *different* "essential attributes" in any specific technological or human entity, making it hard to identify and settle on the ones that allegedly were responsible for the diffusion.

To illustrate this difficulty, consider the case of a small business deciding whether to purchase their first computer. Researchers using an innovation diffusion model would begin by looking for innate characteristics of the PC that would make a potential adopter more likely to accept it. They would consider the relative advantages of a PC over alternatives like a filing-cabinet. An examination of the compatibility, trialability, and observability of a PC with this older office technology would show good reasons for acceptance. An examination of the PC's complexity would, however, bring out some reasons for reluctance in its adoption. The researchers would then investigate characteristics of the potential adopters, considering factors like their educational background, innovativeness, and how they heard about the innovation. If, however, you *ask* small business people why they purchased their first PC, the answers often do not match with this view.

Actor-Network Theory: The Sociology of Translations

Rather than recognizing in advance the essences of humans and of social organizations and distinguishing their actions from the inanimate behavior of technological and natural objects, ANT adopts an anti-essentialist position in which it rejects there being some difference in essence between humans and non-humans. ANT considers both social and technical determinism to be flawed and proposes instead a socio-technical account (Latour, 1986) in which neither social nor technical positions are privileged. To address the need