Factors Affecting the Adoption of Educational Technology

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INTRODUCTION

There are many in education who appear to think that it is sufficient to purchase and install technology for it to be successfully used (Boddy, 1997). Another common belief is that teachers will "automatically seek to learn about new technology and instructional methods" (Dooley, 1999, p. 38). However, while the investment in technology is there, surveys have consistently found that very few teachers integrate technology into either the K-12 (Newhouse, 1999) or the university classroom (Spotts, 1999). One research study found that even when the technology is readily available and staff accept the functionality of it, they "might not anticipate their personal use of it" (Mitra, Hazen, LaFrance, & Rogan, 1999).

Even with intensive staff development, results may be disappointing. Staff developers with Apple Computer tried a range of staff-development approaches with teachers involved in the Apple Classrooms of Tomorrow (ACOT) project. They held workshops after school over a day and even over a week during vacation. As one said, they used the "spray and pray" approach. The most successful of these was a week-long workshop introducing constructivist learning strategies. They hoped that after returning to their classrooms, the teachers would modify their teaching practices. However, on follow-up visits to their classrooms, they "did not see that teaching strategies had changed much or that teachers were implementing the units they had designed during the workshop" (Apple Computer Inc, 2000).

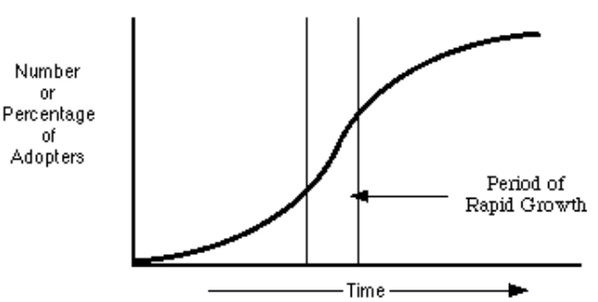
BACKGROUND

There is a significant body of knowledge concerned with the diffusion or adoption of innovations that can provide a theoretical base. An increasing number of instructional technologists are turning to these theories after realizing that innovative products and practices are underutilized (Surry, 1997).

There is no unified theory of diffusion. Among the most widely cited theories are those of Rogers from his book *Diffusion of Innovations*, originally published in 1960 and now in its fourth edition (Surry, 1997). These theories include the rate-of-adoption theory, which "states that innovations are diffused over time in a pattern that resembles an *s*-shaped curve" (Surry & Farquhar, 1997)(see Figure 1).

The rate of adoption rises slowly at first. When around 20% of the population has joined, the adoption "takes off." The rate increases to a maximum when adoption reaches about 50% of the population. After this period of rapid growth, the rate of adoption gradually stabilizes and may even decline. This theory is related to the individual-innovativeness theory, which states that "individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less predisposed" (Surry & Farquhar, 1997). Individuals can be placed into adopter categories based on specific characteristics in relation to a proposed innovation. These categories are innovators, early adopters, early majority, late majority, and laggards. The *s*-shaped curve relates to the timing of adoption by the various

Figure 1. Rate of adoption (Surry, 1997)



categories. These are, of course, "ideal" types, and in reality there are no pronounced breaks between the categories. Nevertheless, they are useful for guiding research efforts, planning professional development strategies, and anticipating reactions to change (Dooley, Metcalf, & Martinez, 1999; Edmonds, 1999; Rogers, 1983). These theories highlight that change is a process and that characteristics of individuals will affect when or if they will adopt a change during this process.

As well as the general diffusion theory, there are theories specifically related to the diffusion of instructional technology. These can be divided into two categories based on their underlying philosophies regarding technological change: technological determinism and technological instrumentalism (Surry & Farquhar, 1997).

TECHNOLOGICAL DETERMINISM

Must society be shaped by the available technology, or may society shape technology? (Jones, 1982, p. 211)

Many theories of diffusion are based on a deterministic view of technology. Technology is seen as an inevitable, autonomous force. Utopian determinists, such as Alvin Toffler, feel that it will lead to prosperity and be the salvation of humanity. On the other hand, dystopian determinists, such as George Orwell, view technology as morally corrupt and that it will eventually lead to the destruction of humanity (Surry & Farquhar, 1997).

Determinist or developer-based models of diffusion focus on the technical characteristics in order to promote change. They assume that technological superiority is all that is required to bring about the adoption of innovative products and practices (Hansen, Deshpande, & Murugesan, 1999). However, successful adoption entails continued use. There are classic examples, such as the results of the contests between Beta and VHS video or the Dvorak and QWERTY keyboard, which demonstrate that technical superiority alone is not sufficient to ensure change. Clearly, other factors influence change.

Instrumentalist or adopter-based theories of diffusion emphasize the importance of the social context of change and the need to address the knowledge, beliefs, feelings, and concerns of the users (Crawford, Chamblee, & Rowlett, 1998). Successful change is seen in relation to meeting the real and perceived needs of the bulk of the users, not just the innovators. Technology is viewed as being under human control and its use can lead to beneficial or disastrous consequences. Jones (1982) notes that technologically determined decisions do not just happen. They are "contrived, pushed and promoted by conscious human agencies—specialists in particular fields, many bureaucrats, advertising agencies, manufacturers, newspapers and television—people who argue a position and, in default of any effective alternative view being put, win the debate" (p. 210).

However, care needs to be taken, as a totally instrumentalist approach that turns out "technically inferior and pedagogically weak products that people want to use is not the answer" (Surry & Farquhar, 1997). Nevertheless, the history of the adoption of innovations is littered with failure due to the lack of attention to the concerns of the people ultimately responsible for the change: the end users. For example, in the 1960s a number of "teacher proof" curricula were developed in the United States, partly in response to the fear of being left behind raised by the launch of Sputnik. A study of a number of high-school teachers using one of the supposedly teacher-proof curricula found that in the classroom, teachers still had strikingly different patterns of practice (Hall & Hord, 1987).

Many authors comment on the importance of addressing the concerns of the teachers who will actually implement the change in the classroom (Bondaryk, 1998; Dooley, 1999; Harasim, Hiltz, Teles, & Turoff, 1998; Marx, Blumenfield, Krajcik, & Soloway, 1998). Concerns theory and research reveals "that concerns change over time in a fairly predictable, developmental manner" (Dooley et al., 1999, p. 109). Individuals go through stages during the change process with differing needs through these stages. Change strategies that meet these needs are more likely to be effective (Crawford et al., 1998; Schiller & Mitchell, 1993). In order to address these concerns, it is necessary to identify them.