DIFFUSION THEORY, THE INTERNET AND FACULTY ADOPTERS

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Abstract

Diffusion theory offers a rich perspective on innovation and the forces that drive adoption of innovations and those that restrain them. The process of diffusion is interesting in the field of technology due to the applications and the fact that technology diffusion may differ in the forces that drive it. The Internet is a medium that is unique in its ability to communicate and has experienced a high level of growth and diffusion in the past few years. However, unless the Internet can exploit a key application more attractively or conveniently than other communication alternatives, its promise may not be met. One application that the Internet can provide more attractively and conveniently is education. The limiting factor in online education is the diffusion process among potential online faculty. Through identification of influences and possible barriers to diffusion, recommendations and actionable items are addressed to increase the rate of diffusion among faculty as consumers of the Internet and online educational opportunities.

Diffusion Theory

Diffusion theory examines the process by which innovations are adopted over time (Gregor & Jones, 1999), or by which innovations are communicated through specific channels over time among the members of a social system (Apperson & Wikstrom, 1997). It originated in Europe in the early part of the twentieth century with the rise of the social sciences, and its early focus was on individuals as decision makers; by the early 1960s studies were conducted on organizations as units of adoption, including areas such as political science (Apperson & Wikstrom, 1997). Diffusion theory's beginnings can also be traced to rural sociology, geography, medical psychology, cultural anthropology, and industrial economics; however, it was introduced to the consumer behavior field in the mid-1960s (Gatignon & Robertson, 1985).

As originally applied by Rogers to the field of consumer behavior, diffusion theory has four key elements: innovation, communication channels, time, and the social system (Mahajan, Muller & Bass, 1990). In terms of innovation, diffusion models examine the development of a life cycle curve in order to forecast first purchase sales of innovations (Mahajan, Muller & Bass, 1990). Communication channels are made up of both the mass media and interpersonal communications; external communications influence early innovators or adopters, while interpersonal communications influence the speed and shape of the diffusion process over time (Mahajan, Muller & Bass, 1990). As such, diffusion's focus is on interpersonal communications within social systems over time as it relates to the spread of innovations (Gatignon & Robertson, 1985) and it emphasizes that the norms and beliefs of the social system must be considered in any diffusion process of innovation (Gregor & Jones, 1999).

Since all potential adopters in a social system do not adopt a new product at the same time, adopters can be classified into categories, depending on when they adopt the product. These

categories are important because they can aid the targeting of new prospects for a new product, assist in developing marketing strategies to penetrate the various adopter categories, and assist in predicting the continued acceptance or rejection of a new product (Mahajan, Muller, & Srivastava, 1990). Rogers' method of categorizing adopters was to distribute the classifications on a bell-shaped curve, using basic statistical parameters of normal distribution. As such, he identified five adopter categories: Innovators, who make up 2.5% of the schema; Early adopters, who constitute 13.5% of the category; Early majority, who make up 34%; Late majority, who comprise another 34%; and finally, Laggards, who form 16% of the categorization (Mahajan, Muller & Srivastava, 1990).

Innovative Diffusion Models and Criticism of Diffusion Theory

One of the problems with adopting a normal distribution curve surfaced as early consumer theorists examined the model and attempted application. Because Rogers offered no empirical justification for using a normal distribution for all products, attempts to improve the predictability of the model and offer more innovative models were conducted by, among others, Bass (Mahajan, Muller & Srivastava, 1990). Bass divided the market into Innovators and Imitators, which led to some confusion, because according to Bass, Innovators, as Rogers defined them, were not the same as the first adopters (Mahajan, Muller & Bass, 1990). However, working with the adoption formula, Bass does provide a more dynamic model by examining the coefficient of external and internal influence, respectively, as well as the market potential, noting examples where the categories first proposed by Rogers may vary, according to those three variables (Mahajan, Muller & Bass, 1990). The advantage to adapting Bass' model to Rogers' categories is that the categories reflect the adopter groupings that are unique to a specific innovation. However, the disadvantages are that it depends largely on the values assigned to

external and internal influence; stable estimates of these values can only be obtained if the data include the peak of the distribution curve (Mahajan, Muller & Srivastava, 1990). Continued research has been encouraged to focus less on direct effects in diffusion theory, and to examine other variables in the model, such as price, individual innovator characteristics, marketing, and competitor initiatives (Gatignon & Robertson, 1985).

Lambkin and Day (1989) take exception to the diffusion theory model as being aligned too much with demand side economics. They argue that diffusion theory ignores the structure and interplay of competition, marketing mix variables, competitive advantage, resource allocation, and how they might influence the speed and pattern of diffusion in alignment with the product life cycle (Lambkin & Day, 1989). However, they also note that the basic models have been extended in an attempt to include supply-side variables (Lambkin & Day, 1989, p. 7).

The Diffusion Process

Despite these limitations, the overall theoretical concept of diffusion theory has held up well, and continues to be used in the consumer research field. As outlined earlier, the diffusion process is shaped by the rate of diffusion, the pattern of diffusion and the market potential. The diffusion effect is the "cumulative increasing degree of influence on an individual to adopt or reject and innovation"(Mahajan, Muller & Srivastava, 1990, p. 38). There are behavioral assumptions that determine the diffusion process. As outlined above, the first to adopt an innovation were termed "innovators" by Rogers (Lin, 1998). Midgley and Dowling (cited in Lin, 1998, p. 96) define innovativeness as "the degree to which an individual is receptive to new ideas and makes innovative decisions independently of the communicated experience of others." In Bass' model, innovators are distinguished from adopters because they are not influenced by previous adopters in the social system, but by sources outside the social system (Gatignon & Robertson, 1985). Lin

(1998) notes the distinction between inherent innovativeness and actual innovativeness, because it separates the need for innovativeness with the ability to act on that need. This can be linked to Maslow's theory of self-actualization, explaining the link between those who would be innovators and can, versus those who would be innovators and cannot (Lin, 1998). This also has theoretical linkage to psychographics and lifestyles, especially the VALS2 psychographic profile, which describes Actualizers as that segment of the population who have high resources with a focus on principle and action, who are active, take-charge in terms of expression of taste, independence and character. Their demographic characteristics include a median age of 43 and median income of $58,000 (Mowen & Minor, 1998). In addition, they are successful and sophisticated, can indulge in self-orientations; 95 percent have some college (Evans & Berman, 1997). This demonstrates an orientation high in resources, both physical and otherwise. While studies on innovators and early adopters often vary among certain demographic profiles, they are often termed venturesome and respectable (Rogers, cited in Gatignon & Robertson, 1985), while other studies show tendencies for innovators to have higher income, higher education and a bit younger than their counterparts in the social set, with more favorable attitudes toward risk and bearing higher opinion leadership (Atkin, Jeffres & Neuendorf, 1998; Gatignon & Robertson, 1985). Technophiles and early adopters of technology display these demographic characteristics vividly (Mitchell, 1994; Lin, 1998).

There is also a need to distinguish between types of innovations. Continuous innovations are those that might represent a variation of existing channels, such as brand extensions; discontinuous innovations are more difficult to adopt, such as those that might necessitate the purchase of a separate piece of hardware, such as shopping on the Internet (Hawkins, Best & Coney, 1998). Dynamically discontinuous innovations, such as a VCR or computer, require a

specific purchase and a dedicated set of user skills (Atkin, Jeffres & Neuendorf, 1998); other examples of dynamic discontinuous innovations might be electric cars or laser eye surgery (Hawkins, Best & Coney, 1998). Hirschman (cited in Gatignon & Robertson, 1985) notes that innovations can be also classified in two forms: symbolic innovations, which communicate social meaning, and technological innovations, which provide new tangible features.

The characteristics of innovations and their influences that affect the rate of adoption include relative advantage (how an innovation is perceived to be greater than its predecessor); compatibility (the degree to which the innovation is compatible with existing values, the horizon of experiences and the needs of the adopters); complexity (the degree to which the innovation is easy to use or considered useful); trialability (how much the innovation can be experimented with); observability (the level of an innovation's results that are observable to others (Gregor & Jones, 1999). Hawkins, Best and Coney (1998) add to this list the type of group, type of decision, the marketing effort, felt need, and perceived risk. Barriers to diffusion often occur when the innovation does not fit the existing consumption system, as in a case where the new product requires the consumer to change the entire consumption event process (Gatignon & Robertson, 1985). The critical part of the diffusion process is to analyze the innovation based on the characteristics that influence the rate of diffusion from the target market's perspective (Hawkins, Best & Coney, 1998).

Innovators, who adopt innovations very early, often are among the heavy users within a product category or similar product categories (Gatignon & Robertson, 1985). This correlation may be due to the greater knowledge and knowledge structures that innovators have, as well as their ability to process complex information that improve outcome predictions (Gatignon & Robertson, 1985). Mitchell (1994) notes that innovators and early adopters of new technology,

such as computers, do lots of research, with publications as the number one source of information. Neuendorf, Atkin and Jeffres (1998) postulate that new technologies are more likely to be adopted if they are functional similar to existing technology. They note that when it comes to technology, a concept of "technology cluster" adoption provides a better fit than more general profiles of innovators (Neuendorf, Atkin & Jeffres, 1998, p. 84). One consideration of adopters and innovation is the concept of risk. While Lin (1998) postulates that what separates adopters from non-adopters might be the need for innovativeness, Brancheu and Wetherbe (1990) note that adoption involves a degree of uncertainty. Potential adopters are motivated to seek additional information. Earlier adopters have greater levels of innovativeness, or ability to make informed judgments independent of the communicated experience of others, while later adopters rely more on interpersonal influence (Parthasarathy & Bhattacherjee, 1998). It is the activation of the interpersonal communication or influence that causes the cumulative diffusion pattern that results in the S-shaped bell curve (Parthasarathy & Bhattacherjee, 1998).

However, there are times when it may be worthwhile targeting the majority instead of the innovators in new product launches (Mahajan & Muller, 1998). Moore (cited in Mahajan & Muller, 1998) notes that targeting Innovators for high-tech products will not guarantee the success of that product, and it may be more advantageous to combine Innovators with Early Adopters and Early Majority with Late Majority adopters when segmenting the market. The practices of some personal computer companies seem to suggest that this is the tactic they are, in fact, using (Mahajan & Muller, 1998).

Innovation and the Internet

The use of the Internet is increasing: It grew from 171 million users in March of 1999 to 304 million in March of 2000, an increase of 78% (U.S. Department of Commerce, 2000). In July

1991, Nielsen NetRatings estimated the number of Americans age 2+ years that can access the Internet at home to be over 165 million (http://www.nielsen-netratings.com/hot_off_the_net.jsp.). According to the U.S. Census, the population of the United States is slightly over 276 million people, giving the Internet penetration of approximately 59.7% (http://www.census.gov/population/estimates/nation/intfile2-1.txt). As noted above, according to Rogers' classification, if the entire United States population were the market potential (which is doubtful), this would place the Internet as an innovation emerging from the Early Majority category into the Late Majority group (Mahajan, Muller & Srivastava, 1990). This contrasts with 1998, when Atkin, Jeffres and Neuendorf (1998) found that the Internet was only in the early stages of diffusion at that time, partially due to barriers such as the high cost of computers and the monthly subscription fees necessary to access the Internet. They also note that the Internet is not likely to achieve the status of household necessity until it can exploit a key application more conveniently or more attractively than other communication alternatives (Atkin, Jeffres & Neuendor, 1998, p. 486). The falling price of technology and the seesaw pattern of free Internet access may have helped the diffusion pattern since that time. As Morris and Ogan (1996) indicate, this would mean that the Internet, as an adopted form of communication medium, has achieved critical mass, since over 20 percent of the population has adopted the innovation. They further note that critical mass initially works against adoption, because it takes a number of other users to view the innovation as advantageous to adopt (Morris & Ogan, 1996). This correlates to diffusion theory, which notes that for an innovation to move through the diffusion curve, innovators must first adopt the product, and after determining that it is advantageous, pass along the information through word of mouth (Gatignon & Robertson, 1985). Mitchell (1994) notes that those who are comfortable with computers are actually making the buying decisions for their

work group, friends and families. This group, known as techthusiasts, resembles the Actualizer psychographic group defined above. In fact, Actualizers, which make up just 8-10% of the overall U.S. population, also make up 50% of those who use the Internet (Heath, 1996). Techthusiasts tend to be younger, affluent, and better educated than the average American (Mitchell, 1994). This also follows the classic characterization of innovators (Hawkins, Best & Coney, 1998).

The question might be how the Internet came to be adopted so quickly as an innovation. Reagan (cited in Neuendorf, Atkin & Jeffres, 1998) found that the adoption of most telecommunication technologies were more powerfully predicted by the use of other such technologies and the attitudes toward the technologies. Another explanation is that new technologies are most likely to be adopted if they are functionally similar to existing technologies (Perse & Courtright, 1993). Rogers (cited in Lin, 1998, p. 99) identifies this as a technology cluster, which "consists of one or more distinguishable elements of technology that are perceived as being closely interrelated." This concept of technology clusters of user groups and applications may provide a better fit than general innovator profiles (Neuendorf, Atkin & Jeffres, 1998); this is confirmed by a study in 1994 indicated that one-fourth of American adults had never used a computer or programmed a VCR, and nearly one-third of adults were so intimidated by computers that they were afraid they would break them (Mitchell, 1994).

In order to have access to the Internet, one generally needs a personal computer, so it is fitting to examine some of the patterns of diffusion that the personal computer is experiencing when trying to understand the Internet pattern of diffusion. Lin (1998) found that experience with technology encourages adoption of such things as cable television and computer media, and that communication technology ownership was the strongest predictor of computer adoption, which

is necessary for Internet connectivity. This was followed by income, television viewing level, innovativeness need and perceived advantages; education, in contrast with past studies, was not a significant predictor, indicating that personal computers may be taking on the status of a technology appliance. Atkin, Jeffres and Neuendorf (1998) confirm that adoption of media innovation is most powerfully correlated with the adoption of other technologies, such as PCs, CDs and cable. Rice (cited in Atkin, Jeffres and Neuendorf, 1998) found that media adoption in organizations placed media in two categories: traditional, such as the telephone, and new media, such as email. Lin's (1998) study confirmed that those who are inclined to adopt computers are younger and more affluent, have already adopted a greater number of communication technologies and perceive greater advantages for adopting a personal computer (Lin, 1998). This indicates that complexity of personal computer technology is not a significant barrier to adoption; however, perceived available resources are (Lin, 1998). Like the techthusiasts that Mitchell (1994) describes, adoption may hinge on the need for innovativeness, as well as the perception of the practical advantages of adoption, rather than on actual monetary cost to adopt (Lin, 1998). Interestingly, at the time of the study, those who comprised the innovator-early adopter-early majority market comprised over 43% of the personal computer market potential; the demographic differences in the adopter/non-adopter profiles indicate a market that had not yet reached its critical adoption threshold, and were still an indicator of adoption likelihood, unlike the VCR or the cable television market (Lin, 1998). Perhaps as the diffusion process continues, the degree of innovativeness may recede in importance as the necessity dimension takes precedence (Lin, 1998). This would indicate that the trade-off complexity, in terms of advantages versus cost or complexity, would become lessened (Hawkins, Best & Coney, 1998).

Atkins, Jeffres and Neuendorf (1998), like Lin (1998), posit that demographic profiles are not sufficient in predicting adoption behavior, especially in terms of the Internet. Rather, technology adoption is better indicated by audience needs as the prime determining factor (Neuendorf, Atkin & Jeffres (1998). Since the Internet presents a merger of interpersonal communication, group communication, organizational communication and mass communication opportunities, communication needs in terms of message sending and receiving might typify these needs (Jeffres & Atkin, 1996). Unlike computer adoption, Atkins, Jeffres and Neuendorf found that education is positively related with Internet adoption (1998, p. 483). In addition, their study of Internet adoption behavior failed to support communication needs as a reason for adoption; rather, it found that interest in new technologies and staying up to date with them (almost a definition of an early innovator), along with computer ownership, were better indicators. Confirming Lin (1998), the degree of need for innovativeness is a driving force behind this innovation adoption (Atkins, Jeffres & Neuendorf, 1998). As noted above, they posit that the Internet will not reach the status of household appliance until it can exploit a key application more conveniently and attractively than other communication alternatives.

One of the reasons the Internet may have difficulty in achieving the status of a more convenient or attractive communication alternative can be found in the reasons that Internet users discontinue their service. Parthasarathy and Bhattacherjee (1998) note that a great deal of discontinuance is due to dissatisfaction, which might be described as a function of the performance-reality gap, which tends to affect later adopters, who have unrealistically high service expectations, as opposed to the more realistic orientation of earlier adopters. Discontinuers generally fall into two catergories: Replacement users (who find another online service for the one that they are dissatisfied with) and disenchanted discontinuers (those who

discontinue using the innovation). A psychographic profile of discontinuers would indicate that they are later adopters who rely less on external information and more on interpersonal influence, utilize the product less than earlier adopters, perceive the innovation as less useful at the time of adoption, and do not use complementary products as much at the time of the initial adoption (Parthasarathy & Bhattacherjee, 1998).

Applications of The Internet as Educational Communication and Faculty as Consumers

Perhaps the exploitation of a key application and convenience in communication alternatives that can aid the diffusion of the Internet can partially be found in the concept of the Internet as an educational communication medium. In turn, a key difficulty in using the Internet as an educational communication medium is the diffusion curve for the innovation of online education with college faculty. The extension of education opportunities to distance learning has created new delivery systems that have increased the demand for online courses (Kroder, Suess & Sachs, 1998) and this demand is also increasing the need for instructors that can communicate through distance technology. In this sense, potential online instructors can be considered consumers of online technology and teaching opportunities. It is necessary and important to universities who endeavor in non-traditional educational delivery methods to identify those individuals who can successfully make this transition to the online environment and those who cannot. In a sense, that is the quandary found by many universities as they struggle to find qualified online instructors. They are attempting to match a new delivery system for a traditional product and increase their share of the educational market. Yet, they need to accelerate the shaping of the diffusion curve through acceptance by potential online faculty, who may be thought of in this instance as consumers of technology. Applying the concept of innovation diffusion to acceptance by traditional faculty should examine at least four of the influences on diffusion as described earlier:

relative advantage, compatibility, complexity, and trialability (Gregor & Jones, 1999). Due to the nature of education through the Internet as a medium, observability may not be relevant.

Relative Advantage

Relative advantage is the degree to which the innovation is perceived superior to what preceded it (Gregor & Jones, 1999).

While still associated with part-time nontraditional universities, numerous traditional schools, including California State University, the University of California, and Duke University have begun offering courses through Internet based technology (Hallman, Plaisent, & Bernard, 2000). Baer cites several studies that conclude distance learning is cost effective across a wide range of subjects to diverse students (as cited in Hallman, Plaisent, & Bernard, 2000). The University of Phoenix, the world's largest private adult university, now counts its online campus as the largest (Irving, 1998). "Compared with other media for distance learning, the Internet offers more interactivity, greater flexibility, more functionality and potentially lower costs" (Hallman, Plaisent, & Bernard, 2000).

Pitt, Berthon and Berthon (1999) point out that using the Internet as a distribution tool has three major differentiating effects: it kills distance, homogenizes time, and makes location irrelevant. Because an Internet site is always open, the virtual marketplace, or marketspace, is atemporal; the service provider need not be awake to serve the student. Distance is not an impediment for providing education. Distance learning through the Internet homogenizes time and makes location irrelevant. "Using this medium, a student can interact with faculty and fellow students…students enroll in the courses in many parts of the world and in many time zones, yet can now self-assort the MBA program they really want" (Pitt, Berthon & Berthon, 1999).

Compatibility

Issues with compatibility arise when the innovation is perceived as inconsistent with existing values or past experiences (Gregor & Jones, 1999).

The University of Phoenix currently has over 1,000 online instructors and is still searching for more (T.W. Devin, personal communication, August, 31, 2000). Part of the reason is that the role and skills of the traditional face-to-face encounter between faculty and student changes in the communication medium of the Internet. The traditional role of faculty in computer-mediated environments changes somewhat from "leader to coach, from purveyor of knowledge to facilitator of personal meaning making" (Jonassen, Davidson, Collins, Campbell, & Haag, 1995). This calls on traditional classroom instructors at these various institutions of learning to take on and display different skills than found in face-to-face education. Webster and Hackley (1997), in a qualitative and quantitative study of technology mediated distance learning outcomes that included remote video, found that technology quality relates positively to learning outcomes, and that students perceive that distance learning technology is less rich than traditional face-to-face instruction (using the video method); however, a positive relationship between classmates' attitudes and student outcomes was found, and the more interactive teaching styles related positively to learning outcomes was supported for involvement and participation, attitudes toward technology, and attitudes toward distance learning.

Complexity

Complexity is often associated with the degree of difficulty that is perceived in terms of understanding or usage with an innovation (Gregor & Jones, 1999). The complexities of delivering education via the Internet have to do with the complexities of online education and finding qualified faculty. Qualified in this case does not mean that degrees are lacking; rather,

qualified in this sense means having the skills necessary to effectively deliver quality product through the communication medium, and the willingness of faculty to adopt the innovation of the Internet as online teaching medium, which demands that faculty assume more interactive roles in the Internet environment. As Gatignon and Robertson point out, "The amount of learning required before adopting the innovation also influences the shape of the learning process. In decisions that involve a learning hierarchy process with a substantial amount of information processing, the diffusion process starts slowly" (1985, p. 859).

One of the factors that may affect diffusion of this process with potential online faculty in terms of both compatibility and complexity is technostress. Psychologist Craig Brod coined the term technostress as "a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner" (as cited in Clark & Kalin, 1996). Weil and Rosen (1997) build upon this definition by concluding that technostress is any negative impact that technology has, directly or indirectly, on attitudes, thoughts, behaviors, or body psychology. Technostress stems from the individual's reaction to technology and how the individual may be changing due to its influence. It manifests itself in distinct ways: in the struggle to accept computer technology, and in overly identifying oneself with computer technology (Genco, 2000). Some potential faculty may view this introduction of new technology into the teaching area as creating psychological strain by increasing job responsibilities, while simultaneously reducing decision latitude (Karasek, 1979). Two out of three professors reported that they were stressed trying to keep up with the emerging technology, surpassing in rank traditional troubles such as publishing pressure and teaching loads (McQueen, 1999).

Trialability

Another related problem with diffusion of this innovation among faculty may be the uncertainty attached to the innovation (Gatignone & Robertson, 1985). A 1998-99 study conducted by the University of California - Los Angeles found that of 34,000 faculty members surveyed across the nation, nearly nine out of 10 college instructors agreed that the student use of computers enhances learning, but only 35 percent used the Internet to conduct research themselves, and just 38 percent used technology to create class presentations. Studies among vocational/technical teachers in Dade County, Florida indicate that while there may not be differences among faculty due to demographic variables such as age, ethnic background, and teaching/professional area and computer related anxiety, there are differences based on computer experience, educational level and school type (Yang, Mohamed, & Beyerbach, 1999). Much of this problem with trialability is lack of experience with the Internet as a communications medium or with computer usage. Yang, Mohamed & Beyerbach (1999) suggest there are four methods that that may be effective in reducing computer related anxiety, and much of this revolves around training/trialability: 1) Increasing computer based training; 2) Enhancing computer competence, such as keyboard skills, by focusing on skills rather than abstract concepts and jargon; 3) Increasing computer related confidence by developing training programs that build a sense of control in the learning environment and dispel stereotypes; 4) Improving computer perception by providing training that is relevant to educators' interests and learning styles.

The emphasis on training cannot be overstated. Training helps relieve stress by reducing anxiety; in addition to training, staff must have adequate time for practice and reinforcement (Clark & Kalin, 1996).

Strategies to Shape the Diffusion Curve of Internet Education and Faculty Adoption

There are a number of strategies to help shape the diffusion curve when conceptualizing potential faculty as adopters/consumers of Internet education. Part of this shaping is dependent on how the current innovators and adopters communicate to later adopters, especially in terms of expectation and performance (Parthasarathy & Bhattacherjee, 1998). Relative advantage to the organization and student has been described above. Relative advantage can be positioned more positively to potential adopters as an opportunity to manage the personal work environment and increase the faculty member's ability to plan and control time demands, which may positively affect the faculty member's feelings toward the introduction of new technology and teaching methods. Compatibility may continue to be a problem if the social norms and values of educators' social system are not willing to embrace the new technology. Perhaps the best diffusion strategy in this case is to target those faculty who can be identified as innovators with high innovative needs, as well as those with high levels of experience with technology, using psychological profiles that indicate higher Internet adoption, such as the Actualizer segment of VALS2 (Heath, 1996), remembering that the social system size is variable, and only certain members can potentially adopt the innovation (Gatignon & Robertson, 1985). As noted above, the strategy to influence complexity and trialability concerns is through training. Confirming this, Mitchell (1994) notes that technophobes are not necessarily opposed to new technology and its uses, but are seriously uncomfortable with them; overcoming their fears is the key to growing new technologies.

One last consideration is to address the factors that may influence discontinuance by later adopters, those with the unrealistic expectations-performance gap. Parthasarathy and Bhattacherjee (1998) note the influence of personal communication and perceived usefulness at

the time of adoption by this group. They also note that perceived usefulness can be influenced by advertisements, training programs and customer (faculty) service programs, while perceived compatibility can be influenced by providing interfaces to other content, such as other educational services that can help relate the online service to their everyday activities (Parthasarathy and Bhattacherjee, 1998). This could also increase utilization. Other strategies to negate discontinuance could include a referral forum to spread positive interpersonal influence, as well as making complementary products (such as Office software suites and other software) available for use (Parthasarathy and Bhattacherjee, 1998).

Conclusion

Diffusion theory offers a rich perspective on innovation and the forces that drive adoption of innovations and those that restrain them. Its theoretical underpinnings have been demonstrated in a number of fields. The process of diffusion is interesting in the field of technology due to the applications and the fact that technology diffusion may differ due to the existence of technology clusters and the education, income and need for innovativeness that drives it. The Internet is a medium that is unique in its ability to communicate and has experienced a high level of growth and diffusion in the past few years. Stewart (cited in Atkins, Jeffres & Neuendorf, 1998) calls it the “most likely gateway for wide ranging messaging, entertainment and information applications driving the economy in the coming century” (p. 486). Still, Atkins, Jeffres & Neuendorf (1998) note that unless the Internet can exploit a key application more attractively or conveniently than other communication alternatives, its promise may not be met. One application that the Internet can provide more attractively and conveniently is education. The limiting factor in online education is the diffusion process among potential online faculty. Through identification of influences and possible barriers to diffusion, recommendations and actionable

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