FACULTY ADOPTION OF ONLINE TECHNOLOGY IN HIGHER EDUCATION

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ABSTRACT
As technology becomes ubiquitous in classrooms, faculty will be asked to utilize new technologies in their instruction. Some will accept new ways to teach with technology while others resist. This paper aims to explore the factors that influence faculty to adopt online technology and faculty's concern about the adoption. The focus is on adoption and diffusion of online technology related to faculty development efforts that may help them effectively integrate online technology in their instruction.

Keywords: adoption, online technology, faculty development, higher education

ÜNİVERSİTE ÖĞRETİM ÜYELERİNİN ÇEVRİMİÇİ TEKNOLOJİYE UYUMU

ÖZET
Teknoloji tüm sınıflara girdikçe, öğretim üyeleri de bu yeni teknolojileri eğitimleri sırasında kullanmaları yönünde yönlendirilmektedir. Bazı öğretim üyeleri bu yeni öğretim yöntemlerini kabul ederken bazıları hala direnmektedir. Bu çalışma, öğretim üyelerinin çevrimiçi teknolojilere uyumunu etkileyen faktörleri ve öğretim üyelerinin uyum süreci hakkındaki kaygılarını ortaya çıkarmayı amaçlamaktadır. Çalışmada ayrıca çevrimiçi teknolojilerin yayılımı ve etkili bir şekilde eğitime entegrasyonu için planlanacak eğitim unsurları üzerinde durulmaktadır.

Anahtar Sözcükler: uyum, çevrimiçi teknoloji, eğiticilerin eğitimi, yüksek öğretim

1. INTRODUCTION

Increased competition, decreased enrollments, greater numbers of non-traditional students and decreased government funding are the most obvious problems of higher education faces in the twenty-first century (Levine, 2001). Many higher education institutions view technology as a cost-effective and innovative solution to many problems (Hooper & Rieber, 1998). The faculty members are being pressured to integrate technology into their instructional activities. The pressure faced by the faculty is coming from administrators trying to keep up with new technological advances, from students who are becoming increasingly insistent that technology be integrated in their courses, and colleagues who are considered "innovators" (Rogers, 1995) of instructional technology and always willing to spread its advantages to "laggards." Faculty members adopt online technology either into face-to-face (Sun 2004), hybrid (Sands 2002), blended (Saunders 2003), or mixed delivery courses (McFadden 2004).

Despite the fact that 80% of public 4-year colleges make course management tools available to their faculties, professors actually use them in only 20% of their courses (Lynch, 2002). According to a recent study by the Higher Education Research Institute at UCLA, many faculty members are hesitant to embrace technology because it is perceived as a source of stress (Lynch, 2002). According to 1998/1999 HERI Faculty Survey, 67% of college and university faculty find keeping up with information technology to be stressful. Information technology is the 4th most frequently cited among women 74%, and 5th most frequently cited among men 64%.

Educational change begins with what teachers do and think (Fullan, 1982). Rogers (1995) defines diffusion as the "process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). Rogers (1995) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit on adoption" (p. 11). Johnson (2001) suggests that adoption and implementation of an innovation may be characterized as having three relevant stages: technology, pedagogy, and presentation style. In this research, technology is the use or inclusion of online technology within course instruction. Pedagogy concerns the instructional design and strategy that an educator would use to deliver their course content. Presentation Style refers to the medium used to present the course material. As an individual contemplates adopting online technology for their course instruction, three important factors influence their

decision: (1) the adoption of the technology, (2) the adoption of a new or modified pedagogy, and (3) the adoption of a new or modified presentation style.

II. LITERATURE REVIEW

Online Technology

William Massy and Robert Zemsky (1995), in an analysis of the economics of higher education, conclude that higher education cannot become more productive or hold costs down unless colleges and universities embrace technological tools for teaching and learning. The growth of computer technology has caused the development and use of online technology in teaching and learning. The classification of educational technologies by structural characteristics (Bates, 2003) is depicted in Table 1. Online technology associated with this research includes the World Wide Web, course management software, and one-way and two-way digital multimedia.

Table 1. Bates (2003, pp. 55): A Classification of Educational Technologies by Structural Characteristics.

Technologies				
	Broadcast (one-way) Applications		Communication (two-way) Applications	
Media	Synchronous	Asynchronous	Synchronous	Asynchronous
Face-to-face	Lectures	Lecture notes	Seminars	
Text		Books		Mail
Audio	Radio	Audio cassettes	Telephone tutoring Audio conferencing	
Video	Broadcast TV Cable TV Satellite TV	Video cassettes	Video conferencing	
Digital multimedia	Webcasting Audio streaming Video streaming	Web sites CD-ROMs DVDs Learning objects Multimedia clips	Chat MUDs Web conferencing	E-mail Discussion forums

Adoption/Diffusion Theories

In general, when someone is confronted with a new technology, he/she goes through an adoption decision process in which he/she gathers information, tests the technology, and then considers whether it offers a sufficient improvement to warrant the investment of time and energy that is required to add it to his/her repertoire of skills (Rogers, 1995). The faculty being urged to integrate technology in their courses faces a similar situation.

Since early in this century, various new educational technologies have been adopted and integrated into the curriculum with varying degrees of success. Their adoption and diffusion process generally followed a "top-down" process (Carman, 2003) in which administers introduced the technology and administrative perceptions, decisions and strategies drove adoption and diffusion. This process can be beneficial by speeding up decisions that might otherwise be difficult to make, but such a process can also become a barrier to successful adoption and dissemination because of some of the intangible benefits associated with the adoption of technology. Today's educational generation, sees personal computers, the Internet and the World Wide Web as technology's new wave. The impetus for the innovation frequently grows from individual users of the technology and moves through the institutional administration to commit to adoption of the technology. This supports more of a "bottom-up" approach (Carman, 2003) whereby individuals are involved in the decision to adopt and in the actual implementation process. It would thus appear that a mixture of both top-down and bottom-up decision-making processes would best ensure the successful adoption of technology. Rogers (1995) presented four additional adoption/diffusion theories (Fig. 1).
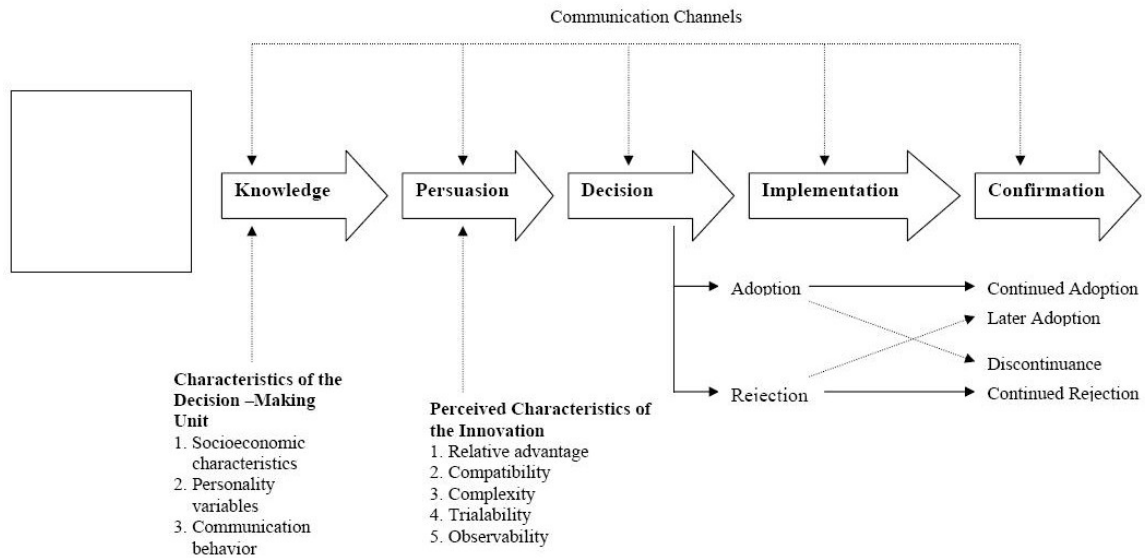
Figure 1. Rogers & Shoemaker (1973): A Model of Stages in the Innovation Decision Process

Innovation Decision Process theory. Potential adopters of a technology progress over time through five stages in the diffusion process. First, they must learn about the innovation (knowledge); second, they must be persuaded of the value of the innovation (persuasion); they then must decide to adopt it (decision); the innovation must then be implemented (implementation); and finally, the decision must be reaffirmed or rejected (confirmation). The focus is on the user or adopter.

Individual Innovativeness theory. Individuals who are risk takers or otherwise innovative will adopt an innovation earlier in the continuum of adoption/diffusion.

Rate of Adoption theory. Diffusion takes place over time with innovations going through a slow, gradual growth period, followed by dramatic and rapid growth, and then a gradual stabilization and finally a decline.

Perceived Attributes theory. There are five attributes upon which an innovation is judged: that it can be tried out (trialability), that results can be observed (observability), that it has an advantage over other innovations or the present circumstance (relative advantage), that it is not overly complex to learn or use (complexity), that it fits in or is compatible with the circumstances into which it will be adopted (compatibility).
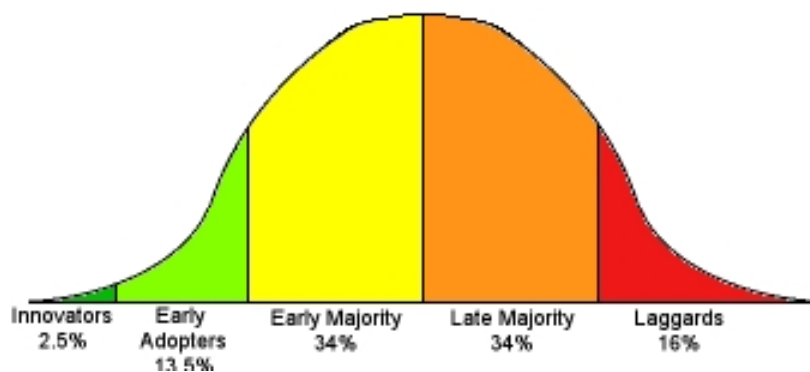

Figure 2. Roger's five categories of technological innovation

Rogers' diffusion of technological innovation model suggests that large numbers of faculty are quite slow in adopting technological innovation in their teaching. Rogers' model identifies five categories of technological innovation adopters (Fig. 2). Applying his model to faculty, we can expect that on any given campus approximately 2.5% will be venturesome "innovators" of instructional technology. We can expect that another 13.5% will be respectable "early adopters" who wisely adopt instructional technology and become that group to whom the rest of the faculty consult with for information and advice in this arena. Of the remaining faculty, the model predicts that 34% will adopt the technology only after a period of deliberation in which they examine the

early adopters' results, and 34 will adopt it, but with a great deal of skepticism and only if pressured by necessity. Ronkowski (2000) refers to these two groups as "mainstream" faculty. Assuming eventual 100% adoption of technology, the remaining 16% are "laggards" who highly suspicious of the innovation, prefer traditional approaches, and will adopt only if they can be certain it will not fail.

Massy and Zemsky's e-learning innovation curve follows the Roger's curve (Fig. 3). They claim that "Adoption processes usually start slowly because of the need for experimentation. They accelerate once the dominant design emerges, and then eventually reach saturation."
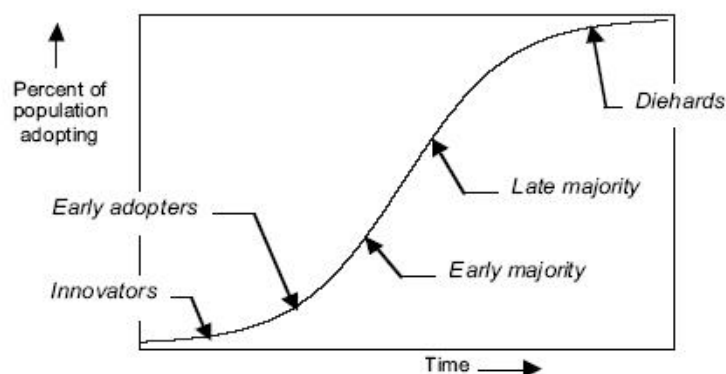

Figure 3. Massy and Zemsky (2003): The Stages of Technology adoption

Massy and Zemsky propose that the adoption of online technology occurs in different levels and sometimes those levels overlaps. It makes it more difficult to analyze the S-curve. Massy and Zemsky's e-learning's adoption cycles (Fig. 4) is designed specifically for online technology.
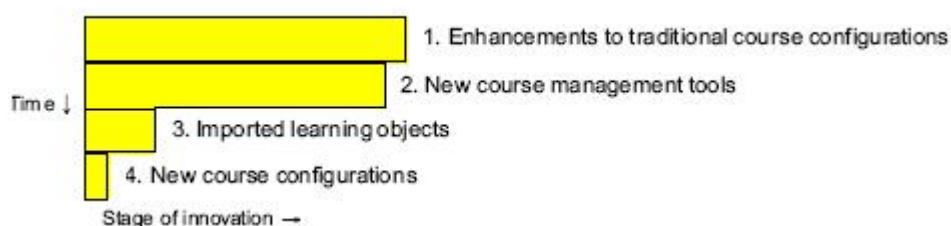

Figure 4. Massy and Zemsky (2003): E-learning's Adoption Cycles

Ronkowski (2000) from the University of California at Santa Barbara, proposes a three-step technology adoption model: 1. *Making the Strange Familiar*: Faculty gets accustomed to new technology. This stage does not involve any change in content or instructional methods. 2. *Making the Familiar Strange:* As faculty gets more familiar with the new technology, he begins changing the teaching method with the innovative content. 3. *Synergistic Innovation:* Faculty is familiar enough to go beyond the existing and make the transform into across the content areas.

Concern Models and Faculty Development
Frances Fuller (1969) studied the developing concerns of small groups of prospective teachers and reexamined the findings of other investigators in the hope of discovering what teachers are concerned about and whether their concerns can be conceptualized in some useful way. She suggested three phases of concern: a pre-teaching phase (non-concern), an early teaching phase (concern with self), and a late teaching phase (concern with students).
Hall and Loucks' (1979) Concerns-Based Adoption Model is useful in explaining the lack of teacher investment in innovations, and describes the seven levels of concern that teachers experience as they adopt a new practice:
- Awareness - Teachers have little concern or involvement with the innovation.
- Informational- Teachers have a general interest in the innovation and would like to know more about it.
- Personal- Teachers want to learn about the personal ramifications of the innovation. They question how the innovation will affect them.

- Management- Teachers learn the processes and tasks of the innovation. They focus on information and resources.
- Consequence- Teachers focus on the innovation's impact on students.
- Collaboration- Teachers cooperate with other teachers in implementing the innovation.
- Refocusing- Teachers consider the benefits of the innovation and think of additional alternatives that might work even better.

Wedman and Strathe (1985) administered Hall's Stages of Concern (SoC) Questionnaire to five groups of teachers in a two credit in service educational computing course, and found that teachers had most intense awareness and informational concerns.

Martin (1989) identified user Stages of Concern on technology use as contextual, information, personal, management, consequence (self), consequence (other), collaboration, and refocusing.

Bly (1993) used Martin's Stages of Concern about Computer Questionnaire and studied if there were a difference between groups of teachers with regards to their SoC and what they described to be effective staff development and support activities. She found that teachers at lower stages of concern rated structured introductory workshops, with much time given to hands-on activities, as being more effective than teachers at higher stages of concern. When groups of teachers are planning to adopt a technological innovation staff development is often the first strategy they suggest (Bradshaw, 2002). Joyce and Showers (1995) identified four types of staff development activities: a) presentation of theory, b) theory and modeling or demonstration, c) theory, demonstration, and opportunities to practice with low-risk feedback, and d) theory, demonstration, practice, and follow-up through coaching, study groups, or peer visits.

Adoption of Technological Innovations
While these above models explain the adoption and diffusion of innovations in general, there are also some specific models describing teachers and the adoption of technological innovations. Rogers (1986) noted the ways in which adoption of ICT differs from other types of innovations.

1. A critical mass of adopters is needed to convince the majority of other teachers of the utility of the technology.
2. To ensure the success of the adoption and diffusion, regular and repeated use is necessary.
3. Information and communication technologies can be used in a variety of ways, and adoption is part of a process that involves significant evolution on the part of the adopters.

Research conducted by Apple Computer in the Apple Classroom of Tomorrow (ACOT) project led to the development of a five stage model of technology implementation when computers are place in school classrooms (Dwyer, Ringstaff, & Sandholtz, 1991)

1. Entry - teachers struggle to cope with and establish order in the transformed classroom.
2. Adoption - the beginning of adoption into the traditional classroom
3. Adaptation - while traditional teaching methods still predominate, but now supported with technology
4. Appropriation - with increasing confidence teachers become confident and pedagogically innovative
5. Invention - creativity including active experimentation by teaches and students

Table 2 provides three ways of viewing technology adoption, each relying on a fundamentally different metaphor of learning, behaviorism, cognitive learning theory, and cultural studies (adapted from Wilson et al, 2000).

Table 2. Three views of technology adoption, based on behaviorism, cognitive learning theory, and cultural studies.

Technology adoption as…	Based on…	Outcome stressed…	Common research method…
Consumer behavior	Behaviorism Market research Economic theory	Purchase and installation behaviors	National and regional demographic surveys
Information diffusion and rational choice	Information and organizational theories	Information leading to decision to adopt	User surveys within an organization or department

	Cognitive psychology		
Assimilation of cultural tools and practices	Anthropology Cultural studies Activity theory	Interactions and practices within a local community	Ethnographies or case studies
Consumer behavior	Behaviorism Market research Economic theory	Purchase and installation behaviors	National and regional demographic surveys

Table 3 describes eight conditions that facilitate the implementation of educational technology innovations (adapted from Ely, 1999).

Table 3. Eight conditions that facilitate the implementation of educational technology innovations

Condition	Description	Linked to…
Consumer behavior	Behaviorism Market research Economic theory	Purchase and installation behaviors
Dissatisfaction with the status quo	Feeling a need to change.	Leadership
Expertise	Access to the knowledge and skills required by the user.	Resources, rewards & incentives, leadership, and commitment
Resources	Things needed to make it work— funding, hardware, software, tech support, infrastructure, etc.	Commitment, leadership, and rewards & incentives
Time	Prioritised allocation of time to make it work.	Participation, commitment, leadership, and rewards & incentives (table continues)
Condition	**Description**	**Linked to…**
Rewards or incentives	Internal and external motivators proceeding and following adoption.	Participation, resources, time, and dissatisfaction w/status quo
Participation	Shared decision-making; full communication; good representation of interests.	Time, expertise, rewards & incentives
Commitment	Firm and visible evidence of continuing endorsement and support.	Leadership, time, resources, and rewards & incentives

III. CONCLUSION

Hall and Hord (1987) suggest three to five year implementation times for innovation. Fullan (1990) describes change as development in use and tells us to assume that effective change takes time. Staff development is an important consideration when implementing any innovation. Visioning, planning, and financing are necessary steps in the implementation of technology initiatives. For an effective technology adoption, faculty's different stages of concern should be acknowledged and appropriate support should be provided. Rogers (1995) describes adoption periods taking from a few months to several years. Future research should answer "What are the concerns of higher education faculty defining each band of the Rogers' categories of technology innovation and how do these concerns relate to faculty development efforts that may help them effectively integrate online technology in their instruction."

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