# PERCEIVED STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS IMPACTING THE DIFFUSION OF DISTANCE EDUCATION TECHNOLOGIES IN A COLLEGE OF AGRICULTURE AND LIFE SCIENCES

*Theresa Pesl Murphrey, Visiting Assistant Professor*
*Kim E. Dooley, Assistant Professor*

**Texas A&M University**

## Abstract

*The purpose of this study was to determine the strengths, weaknesses, opportunities, and threats associated with using distance education (DE) technologies in the College of Agriculture and Life Sciences at Texas A&M University from the perspective of administrators, faculty, and professional support staff. Rogers' Diffusion of Innovation (1995) served as the theoretical underpinnings for the study. Qualitative research (naturalistic inquiry) was employed and the constant comparative method was used for data analysis (Lincoln & Guba, 1985). Analysis revealed that respondents perceived various organizational strengths and recognized the opportunity to utilize DE technologies to improve instruction and reach new audiences through collaboration and new courses/programs. A need was expressed to expand policies/procedures to address critical issues (i.e., incentives, support, training, quality control, careers, and communication channels). Competition, dependency on outside assistance, and misinformation on the Internet were perceived as organizational threats. Based on Rogers' attributes (1995), the rate of adoption of DE technologies could be enhanced through revised policies/procedures and the development of strategies to address critical issues.*

## Introduction & Theoretical Framework

Many colleges of agriculture are dedicating resources to high-speed Internet connections and interactive videoconferencing to reach new audiences through distance education. Specifically, continuing education, academic courses, and full degree programs are being developed to meet demand from individuals seeking non-traditional access. Nationally, there were 93 "cybercolleges," or accredited institutions offering credit-granting courses online in 1993, listed in *Peterson's Guide.* Now, there are 1,000 degree and certificate programs available from nearly 900 institutions (Peterson, 2000). According to the International Data Corporation, the number of people taking at least one college course over the Internet will triple by the year 2000 to approximately 2.2 million (Thornton, 1999).

Based upon the strategic planning document *Vision* 2020, Texas A&M University is developing a framework of action to increase access to knowledge resources. "Coincidentally, we must recognize that the technology related to the storage, access, and distribution of knowledge resources has changed as much in the last decade as in the 550 years since the invention of movable type.. . The wedding of communications and computer technology will, no doubt, yield the most formidable change in academe by 2020" *(Vision 2020,* p. 5). This vision includes advances in information technology strategies and infrastructure, to "increase to 50 percent the proportion of the master's population enrolled in distance and other non-traditional master's offerings" (p. 24). As these programs are implemented, the determination of administrative, faculty, and professional support staff perceptions, concerns, and interests regarding distance education (DE) technologies will be crucial. This understanding can facilitate the diffision of DE

technologies throughout the institution to enhance student learning while maintaining employee (administrator, faculty, and staff) involvement and satisfaction.

The theoretical foundation for this study stems from Rogers' diffusion of innovation research. Multiple theorists focus on change theory. Tony Bates *(Managing Technological Change)* and Hord, Rutherford, Huling-Austin, and Hall *(Taking Charge of Change)* have considered specific contexts in business and education settings. Roger's diffision ofinnovation was selected because this theory provides a familiar framework to determine obstacles that can impede the diffusion of DE. Applying Roger's theory can advance understanding of the adoption rate of DE based upon attributes of the innovation.

Rogers defined an *innovation* as "an idea, practice or object that is perceived as new by an individual or other unit of adoption" (1995, p. 11). "*Diffusion* is the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p. 5). The innovation-decision process is the "process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers, 1995, p. 20). The process can be influenced by prior conditions, characteristics of the decision-making unit, the perceived characteristics of the innovation, and communication channels.

Rogers (1995) discussed five attributes that impact the rate of adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability. "Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 1995, p. 212). Many change agencies use incentives to increase the rate of adoption. The main function of an incentive is to increase the degree of relative advantage. The second attribute, compatibility, "is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995, p. 224). The third attribute, complexity, "is the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 1995, p. 242). The rate of adoption is slower with more complex innovations. The fourth, trialability, (sometimes called divisibility) "is the degree to which an innovation may be experimented with on a limited basis. New ideas that can be tried on the installment plan are generally adopted more rapidly than innovations that are not divisible" (Rogers, 1995, p. 243). The last attribute, observability, "is the degree to which the results of an innovation are visible to others" (Rogers, 1995, p. 244).

DE technologies continue to increase rapidly in power while decreasing in cost. New technologies such as the World Wide Web and multimedia have the potential to widen access to new learners, increase flexibility for "traditional" students, and improve the quality of teaching by achieving higher levels of learning, such as analysis, synthesis, problem solving, and decision making (Bates, 2000). "The view of distance education as an innovation provides an important means for understanding the phenomena of distance education, particularly from the perspective of those upon whom its acceptance depends: the faculty" (Dillon & Walsh, 1992, p. 6). How people perceive and react to these technologies is far more important than the technical obstacles in influencing implementation and use, thus, this study explores this realm in determining the rate of diffusion of DE as an innovation.

## Purpose & Research Questions

The purpose of this study was to determine the strengths, weaknesses, opportunities, and threats (SWOT Analysis) associated with using

DE technologies for a college of agriculture from the perspective of administrators, faculty, and professional support staff. Strengths and opportunities, including perceived benefits, promote the diffusion of DE innovations while weaknesses and threats hinder diffision. Three research questions were developed to guide the study:

1. What were the perceived strengths and opportunities expressed by the respondents?

2. What were the perceived weaknesses and threats expressed by the respondents?

3. How did the perceived strengths, weaknesses, opportunities, and threats impact the rate of adoption of distance education as an innovation?

## Methodology

This study used an alternative to the traditional positivistic view of research, which states that the ideal "is the formulation of general laws, laws that we hope are universal. The essential feature of such laws is that they be context independent, free of the specific constraints of any particular context and therefore applicable to all" (Mishler, 1979, p. 2). Investigators in educational research have increasingly begun to propose alternative approaches that are more appropriate to the study of meaning in context (Bronfenbrenner, 1977; Mishler, 1979). This study employed the alternative approach of naturalistic inquiry as the methodology.

Respondents were selected using the snowball sampling technique (Babbie, 1989) in which individuals were interviewed based upon recommendations from the original interviewees. The process began with a high level official within the College of Agriculture who mentioned key employees who were leaders in using DE, The interviews continued until the researchers felt there was a consensus of information and redundancy in responses. A total of 42 interviews were conducted. The interviewees consisted of 16 administrators, 15 faculty members, and 11 support unit employees. Total respondents consisted of 8 females and 34 males Approximately one-half (22) of the respondents were professors, 7 were associate professors, 1 was an assistant professor, 1 held the title of research assistant, and 11 were professional staff. All respondents were familiar with DE technologies (i.e., interactive videoconferencing, Internet, CD-ROM).

Respondents were coded to ensure confidentiality, with the letters indicating a departmental abbreviation and the numbers corresponding to the sequence of the interview within a department. Nine individuals were nominated but failed to respond to persistent correspondence. See Table 1 for a list of respondent codes and group affiliation.

According to Warwick (1973), "every method of data collection is only an approximation of knowledge. Each provides a different and usually valid glimpse of reality, and all are limited when used alone" (p. 190). For this study, the researchers used a variety of qualitative methods to ensure truth value, applicability, consistency, and neutrality (Erlandson, Harris, Skipper & Allen, 1993, pp. 133-161): 1) *Prolonged Engagement* - The researchers interviewed respondents Ii-om August – December, 1999. Interviews typically ranged from 30 minutes to 1% hours. 2) *Interview Protocol Development* was based on the review of the literature, specifically with regard to procedures for a SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis (Goodstein, Nolan & Pfeiffer, 1993) and diffusion of innovations (Rogers, 1995). 3) *The Interview Process* served as the primary data collection instrument. Individuals were asked probing questions to gather descriptive information.

Table 1. Group Affiliation and Respondent Codes, 1999 (N=42)

| Group | Codes Included |
|---|---|
| Administration (A) | ED2, EC1, SC1, BB1, RP1, WS1, AN1, EN4, RE1, EG1, PP3, HS2, EG3, FS1, EG5, HS3 |
| Faculty (F) | HS1, PSI, ED1, PP1, CM1, PP2, WS2, AN3, AN4, AN2, EN3, EN2, EG4, EG2, HS4 |
| support units (s) | ODE1, OC1, ODE2, DE1, OC2, DE1, OC2, OC3, DE2, OC4, EN1 |

The interviews were semi-structured with each interview beginning with a brief explanation of the reason for the meeting. Questions included items such as "How do you see this technology impacting your department?" and "In relation to distance education technologies – what strengths, weaknesses, opportunities, and threats do you see?" Interviews were reconstructed using field notes. 4) *Member Checking* was done throughout the interview by asking for verification or clarification of the information. 5) *Triangulation* was used to verify the data. A variety of people with varying perspectives were interviewed over the four-month period. In addition to interviews/field notes, some respondents provided additional documents that were reviewed. The researchers also used triangulation in analyzing the data based upon the theoretical framework (Rogers, 1995). 6) A *Reflexive Journal* and *Audit Trail* included interview scheduling, logistical information, insights/reflections, methodological decisions, and respondent codes to document original data sources.

The constant comparative method was used for the data analysis (Lincoln & Guba, 1985, pp. 339-344). This method includes four stages: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the construction, and 4) writing the construction. For the first stage, the researcher studied the detailed field notes to determine trends in the data fi-om the varying perspectives. Each idea (unit) was initially listed, without placement into categories. The investigators drew upon tacit knowledge in making these initial judgments for early category formulation. Colored markers were used to differentiate respondent themes so that the data would remain in context and provide visual indications of emerging categories.

"The first rule of the constant comparative method is that while coding an incident for a category, compare it with the previous incidents in the same and different groups coded in the same category. This constant comparison of the incidents very soon starts to generate theoretical properties of the category....Thus the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories" (Lincoln & Guba, 1985, p. 341). Categories were established from this process.

For the second stage of the constant comparative method, a peer debriefing was conducted in February 2000 with the DE Workgroup within the Department of Agricultural Education. This group was familiar with DE issues at the university level, but was not interviewed in the study. This session and subsequent e-mail correspondence allowed the researchers to test emerging categories and move into the next stage of the constant-comparative method. As the data analysis progressed, the researchers were able to combine and more specifically define categories based on overlying themes in the data. Once the categories emerged, fewer modifications were required as more data were processed. Delimiting the construction occurred as the data sources became saturated and the categories were integrated.

## Findings and Conclusions

1. What were the perceived strengths and opportunities expressed by the respondents?

Within the context of a SWOT Analysis, strengths and opportunities refer to those things that currently exist within an organization and those things that have not been realized but may be able to be taken advantage of to achieve the organization's desired future, respectively. Evaluation and synthesis of the responses revealed topics related to technology, audiences, content, the institution, enhancement of teaching, and collaboration.

Seven primary categories related to strengths surfaced out of comments provided by the interviewees. The first category addresses the continuous improvement of distance education technologies as a fundamental strength. "The Web is the primary strength - we can deliver anything, anywhere, anytime" (OC2). The second category focuses on the ability to reach new audiences and existing demand for particular content. Respondents expressed this in both specific terms (i.e., "urban population" (EN3), "workshops" (PP3)) and broad terms (i.e., "teach more students" (EG2), "contact a greater number of people" (AN3)). The accessibility created by the technology was perceived by the respondents to allow nontraditional students to be reached (FS1, EN4, EN3, HS2, EG3, PP2, AN3, EG2, AN2, PP3). Respondents indicated that audiences were comfortable with technology (HS4) and that in some cases demand for particular topics exceeded what could be handled with traditional delivery (HS4). Presence of early adopters and proximity to technology encompasses the third category. "Faculty [who] are bent on technology" (EC1) was perceived to encourage adoption of the technologies. In addition, having an interactive videoconference room in the building (PP3) was a perceived strength in that it facilitated the use of the technology.

The fourth category focuses on the reputation for quality content at the institution. "[The institution] is well known for its' expertise and has a reputation for quality" (ED1). The institution was also noted to have "well-defined content experts" (ED2) and "unique content" (ED1). The extensive infrastructure and network of the institution serves as the fifth category. Respondents noted that the "state and international network that has been established" (ED2) was an important strength. The sixth category involves the use of technology to enhance teaching and learning. Respondents indicated "delivery will become more and more sophisticated" (PP2) "making teaching more effective" (FS1). Multiple technologies to improve teaching and learning were mentioned by the respondents. "E-mail" (AN2, EG2), "electronic bulletin boards" (EG2), "animations" (EG4), and "graphics" (EN2, EN1) are examples. One of the prevalent aspects was providing students access to information. "References and resources" (EG4), "old tests" (EN3), "support material" (SC1, EN4), and information in general (EG1, EN1, EN3) were specifically stated. "Convenient" (EG2, EC1, RP1, PP2, EN3) access to the information was perceived to be a significant strength. The final category focuses on administrative encouragement and support. Respondents indicated that "support from administration to do these types of things such as online development" (PS1) and "Department Head support" (WS2) were strengths within the organization.

In relation to opportunities, five primary categories surfaced out of comments provided by the interviewees. The first category focuses on expansion of the audience base to reach nontraditional students. Respondents indicated that opportunities are being created for students who cannot come to campus for courses and degrees (EN1, EG2, AN4). Geographically, respondents indicated the opportunity to reach potential students internationally (PS1) and specifically in Latin America and across the state (ED1). The opportunity to reach all people in a

new way (SC1, HS3, EG3, FS1, EN3) (i.e., "older students" (RP1), "inner-city youth" (HS2), "county extension agents" (FS1)) was expressed as a significant opportunity. Continuing education (HS1, DE2, OC2, WS1, EC1, EG5, HS4, HS3, EG2, HS2) was specifically addressed. "Profit-driven topics can feed back into the classroom" (HS4).

The second category relates to the expansion of collaboration with private and public institutions. Respondents indicated that distance education technologies were providing opportunities to collaborate across educational institutions (HS1, FS1) (i.e., "public schools" (ED2), "community colleges" (HS3), system schools (BB1, AN1, AN2, PP3)) and to partner with the private industry (EG4, PP2). The opportunity to create an individualized and enhanced interactive learning experience defines the third category. "Students have grown up with computers and are expecting this" (EN1). Distance education technologies are creating opportunities to enhance courses (ED2), "peak students' interest" (AN3), and provide higher levels of training (CMI, EN3). In addition, communication through e-mail is providing opportunities for students to ask things they would not ask in class (AN3). "The teacher can become a facilitator of learning" (HS4).

The fourth category focuses on the opportunity to provide unique and specialized courses/programs. Because "graduate students already know how to learn, there is a lot of opportunity at the graduate level with Master degrees" (EG4). In addition to Master's programs (HS1, WS1), respondents indicated opportunities in Extension (HS2) and undergraduate programs (WS1). The concept was mentioned that smaller programs could exist by pooling students from multiple locations (EG4). The final category relates to the advancement of technology. "The future is in web-based delivery" (DEl). As bandwidth issues continue to diminish (EG5) with the advancement of desktop videoconferencing (AN2, PP2) and better technologies (AN1), instantaneous delivery (EG3) will create opportunities.

Based on the findings, respondents perceived administrative encouragement and support, extensive infrastructure, and reputation for quality content to facilitate the use of DE technologies. Respondents perceived the opportunity to utilize new technologies to improve the delivery of instruction and expand that delivery to new audiences. Collaboration with other institutions to offer new courses and programs can facilitate these opportunities. A summary of the perceived strengths and opportunities can be found in Table 2.

2. What were the Perceived weaknesses and threats expressed by the respondents?

Within the context of a SWOT analysis, weaknesses and threats refer to those things that currently exist within the organization and those things that, while not realized, can prevent the organization from achieving its desired future, respectively. Evaluation and synthesis of the responses revealed topics related to incentives, expertise, communication channels, administrative and student issues, competition, and job security. In relation to weaknesses, there were seven primary categories that surfaced out of comments provided. The first category focuses on limited incentives, development support, and funding. Incentives for faculty to participate in distance education course development were predominant weaknesses mentioned by the respondents (PP1, ED1, HS1, OC4, CM1, WS1, EC1, SCI, WS2, EN4, PP3, HS2, EG4, HS4, HS3, PS1, PP2). "Just because it is a good thing -- is not enough of a reason" (HS3). A number of respondents indicated that they felt that participation in distance education course development should be included in the review process for promotion and tenure (WS2, HS3, EG3). Lack of development support (ED1, DE1, PP2, WS2, FS1, EC1) and resources to participate (OC4, RP1, PP2, WS2)

Table 2. Categories of Strengths and Opportunities Expressed by Respondents, 1999 (N=42).

| Strengths | Opportunities |
|---|---|
| Continuous improvement of DE technologies | Expansion of audience base to reach nontraditional students |
| Ability to reach new audiences and existing demand | Expansion of collaboration with private and public institutions |
| Presence of early adopters and proximity to technology | Create an individualized and enhanced interactive learning experience |
| Reputation for quality content | Provide unique and specialized courses/programs |
| Extensive infrastructure and network | Advancement of technology |
| Use of technology to enhance teaching and learning | |
| Administrative encouragement and support | |

were also noted as weaknesses. As three respondents stated, "There is no time to do this" (ED1, OC4, WS2). The second category focuses on limited knowledge regarding copyright and intellectual property. Respondents indicated that a need existed to inform faculty regarding copyright issues (HS3) and legal aspects (EN3) involved in delivering distance education courses. The third category focuses on weak communication channels. Respondents indicated that only limited information was available regarding distance education courses (DE1, EC1, PS1). In addition, the procedures to conduct a distance education course (PS1), the availability of support (EG2, DE2, RP1), and the administrative vision (DE2, PP2, EC1, ED2, HS1, RP1) is not readily known.

The fourth category relates to slow action on critical issues. Respondents indicated that the need to standardize distance education delivery (AN2, DE2) and coordinate efforts (WS2) had not been addressed. In addition, respondents perceived that slow action in regard to incentives, support, and funding issues created an inherent weakness. The fifth category relates to the current technological limitations. "Technologies come with baggage to work out" (AN4). Technology issues, such as bandwidth limitations and availability, are perceived as weaknesses (FS1, EG4, OC2, PP3). The speed of technological change (EN1) itself creates a weakness. Lack of skill, expertise, and desire to develop interactive DE courses is the sixth category. Respondents indicated that they lacked the expertise required to create distance education courses (EG2, EC1, FS1) and that "you need a desire to do this kind of thing" (WS2). The final category relates to the loss of interaction. Disconnect between students and faculty was indicated as a significant weakness (AN4, EN4, EN2, EG2, RP1, SC1, AN1, EN3, EG1). The idea that students would have to be self-motivated in order to succeed at distance education courses was expressed because it was perceived that the interaction with the faculty and other students created motivation (AN4). The loss of extracurricular activities commonly called the "other" education was also perceived to be a significant weakness (AN4, RP1).

In relation to threats, there were six

primary categories that surfaced out of comments provided by the interviewees. The first category focuses on career and job security. One respondent posed the question, "As faculty, are we safe to do this in a career?' (PS1). Faculty reviews are based on the number of publications produced, not on teaching techniques (CM1, EN1). Additionally, the extent to which the web circumvents the role of educators (OC4) and the issue of intellectual property (FS1) were mentioned. If courses are stand-alone, administration could try to downsize faculty (WS2, AN4). The second category relates to competition from private and public institutions. The statement, "If we don't do it - someone else will" (HS3, ED2, RP1, HS1, WS1) was a predominant threat expressed. Respondents felt that there could be a "threat to the long-term survival of the university" (HS1) in that students could go elsewhere (OC4) and thus create business/revenue issues (FS1). The overall institutional threat (EG5, HS4, PP3) from other universities (RP10) and the private sector (HS4) was mentioned. The third category relates to dependency on outside developers/ programmers and security concerns. Respondents indicated that there is a danger in external groups developing courses for you because you become dependent on them (HS1). In addition, the potential for content information to be edited by hackers (OC2, AN3) was also cited as a threat. Quality measurement issues constitute the fourth category. One respondent asked the question, "What does this mean for quality education down the road?" (SC1). The idea of losing one's focus on the content by being distracted by the technology was a concern in that quality would be lost (AN3, DE2). "If it is not done right - you lose your reputation" (PS1). The fifth category relates to using old models to develop new policies. Respondents indicated that institutional treatment of academic and outreach programs should not be treated the same (HS2). The limited motion forward (ED2) and poor response time (ED2) associated with "weakness-related" issues (i.e., incentives, support) created an inherent threat to diffision. Lack of new policies related to procedures for students to take DE courses (AN2), coordinating board issues (EG5), and lack of a communicated commitment (HS2) regarding the new delivery mechanisms creates a threat. The final category relates to misinformation on the Internet. Respondents indicated concern regarding misinformation (OC2, EN1, EN4, EG4) due to the ease of publishing and lack of peer review often inherent on the Internet.

Based on the findings, respondents perceived a need to expand policies and procedures to address issues related to incentives, support, training, quality control, careers, and communication channels. Respondents believed that competition, dependency on outside assistance, and misinformation on the Internet are threats to the organization's ability to achieve its desired future. A summary of perceived weaknesses and threats can be found in Table 3.

3. How did the perceived strengths, weaknesses, opportunities, and threats impact the rate of adoption of distance education as an innovation?

Based on the Innovation-Decision Process (Rogers, 1995), all of the respondents can be classified at the "implementation" stage of diffusion. The respondents were the innovators/early adopters as the result of snowball sampling. Their reflections were based upon how to diffuse distance education across the institution. The rate of adoption of an innovation (DE technologies) is influenced by the perceived characteristics of the innovation. Respondents described DE technologies to have some degree of "relative advantage." The respondents indicated that they recognized the usefulness of the technologies (i.e., accessibility to information, improving the teaching and learning experience, reaching more students); however, they also indicated that using the technologies required increased time and effort and were not rewarded.

Table 3. Categories of Weaknesses and Threats Expressed by Respondents, 1999 (N=42).

| Weaknesses | Threats |
|---|---|
| Limited incentives, development support, and funding | Career and job security |
| Limited knowledge regarding copyright and intellectual property | Competition from private and public institutions |
| Weak communication channels | Dependency on outside developers/ programmers and security concerns |
| Slow action on critical issues | Quality measurement issues |
| Current technological limitations | Using old models to develop new policies |
| Lack of skill, expertise, and desire to develop interactive DE courses | Misinformation on the Internet |
| Loss of interaction | |

In relation to the attribute of "compatibility," adoption of the DE technologies was perceived by the respondents to benefit the administration more so than the faculty. While respondents did not define "benefit" specifically, it can be inferred that benefit corresponds to financial gain. "There are too many students already -- why do we want to gain more at a distance?" (PPl, ED1). The idea is raised that unless there is an incentive to use the technology it will not be compatible because there is no perceived "need." Past experiences for the respondents involved interaction with students on a face-to-face basis. The idea to replace face-to-face interaction with communication through technology is not perceived to be compatible (AN4, EN4, EN2, EG2, RP1, AN1, SC1, AN3, EN3, EG5, EG1).

The respondents' perception of the "complexity" of DE technologies is illustrated by the strong expression of the need for support (ED1, DE1, PP2, WS2, FS1, EC1) and training (WS1, RE1, EG3, EC1, FS1). The respondents perceived "use" to be something more complex than something they can handle on their own. Additional complexity relates to logistical issues expressed by the respondents, such as student registration and reporting procedures (DE1, EC1, HS2).

The respondents' perception of the "trialability" of DE technologies varied, depending on the type of technology. The use of two-way interactive video conferencing is perceived to require special skills that cannot be implemented incrementally (PS1). In relation to web-based technology, respondents implied that it can be done -- but it "takes time to do it right" (ED1, OC4, WS2, BB1).

"Observability" was perceived to increase when there was a "champion" of DE technologies in the department or unit. In addition, the proximity of a video conferencing room to a department increased respondents' willingness to participate. Respondents perceived that DE takes extensive time and effort but is not recognized or rewarded. This lack of recognition and reward impacts the "observability" aspect of the diffusion of DE technologies.

Based on triangulation of Rogers' attributes (1995), respondents did perceive DE technologies to have a "relative advantage;" however, because there are limited incentives or requirements regarding use, respondents did not see it being "compatible" with their current situation. Because respondents perceived the "complexity" of the technologies to include policy related issues, and the "trialability" of the technology to be limited due to required time and effort, the "observability" aspect of diffusion is impacted, thus negatively affecting the rate of diffusion.

**Recommendations & Implications**

Actions can be taken to *diffuse* DE in higher education settings, specifically within colleges of agriculture. Based upon the attributes of an innovation (Rogers, 1995), an incentive structure must exist in order to increase the "relative advantage" of using DE. Incentives could include release time, faculty workload adjustments, DE fees distributed back to units/departments, salary supplements, and providing expertise such as media experts/instructional designers to assist in converting courses to DE technologies.

For "compatibility," DE must be viewed as being consistent with the existing values, past experiences, and needs of potential adopters. Respondents in this study mentioned limited administrative vision and support. Having technical infrastructure alone does not ensure the diffusion of an innovation. The need for policies and procedures that are "seamless and transparent" to the distant learner for admission, registration, financial aid, technical support, etc., must also be institutionalized and communicated. Additionally, instruction is currently delivered primarily using lecture formats. DE requires a new assessment of how we teach and learn – often requiring time-intensive instructional design on the part of the faculty member.

The "complexity" of the use of technology for teaching and learning is often difficult to overcome. Just when a faculty member has mastered a technology, it changes! The learning curve on some technology (i.e., videoconference equipment and basic presentation software) is much less complicated than other authoring programs that allow the creation of a highly interactive online course. One recommendation would be to train faculty, staff, and students on the less complicated software/applications and provide technical expertise through development centers on the more complicated technologies. Faculty could then focus their time and effort on content conversion/delivery and sound instructional design, not on mastering the technology.

"Trialability" is the degree to which an innovation may be experimented with on a limited basis. A faculty member can start the diffusion process by simply converting documents into digital formats/presentation software to use in the traditional classroom. Once these items are converted, displaying the material over TV monitors in an interactive video classroom and posting them on a course website is a logical next step. The complete re-design of lecture into interactive modules can then follow.

For "observability," those who are using DE technologies must be recognized through awards and grants to encourage these efforts among other faculty. Institutions should establish multiple communication channels (i.e., listservs, newsletters), workshops, presentations, and demonstrations to "show and tell" others about the impacts of DE on teaching and learning. Opinion leaders and change agents can be strategically placed throughout departments and units to help those who would like to "try" this new and innovative way of teaching. In addition, incentives put in place should be communicated clearly.

In summary, the three major recommendations to diffise DE technologies are: 1) administrative support, 2) training, and 3) incentives. Administrative support would include

student/technical support and providing a seamless infrastructure and "virtual presence" for the distant learner. Training should not only include technology exposure, but instructional design, pedagogy/andragogy, and "cook-book" strategies and "how-to" manuals. Support extends beyond "verbal" to providing the support/professional staff to assist. By providing incentives such as release time, mini-grants, continuing education stipends, and recognition in the promotion and tenure process, faculty will have more than verbal encouragement to continue, or begin, using DE technologies and will have the reason to do so.

## Contribution to Knowledge

Analysis of an organization's strengths, weaknesses, opportunities, and threats provides a framework to review and improve strategies to encourage the diffusion of DE technologies in the most efficient and effective manner. Colleges of agriculture, considering DE, can benefit from the findings presented in this study. The importance of incentives cannot be overlooked by administration. The quote, "Just because it is a good thing-is not enough of a reason" (HS3), expresses it quite concisely. The new paradigm of DE requires that policies, procedures, and strategies be reviewed and revised to ensure that critical issues are addressed and clearly communicated to all participants.

Further studies should be conducted to advance our understanding of DE. While financial gain did not surface as either a strength or an opportunity in this study, recognition of the role revenue will play in DE within institutions cannot be overlooked. Research is needed to: determine specific needs for access to programs offered at a distance and innovative strategies to reach these populations; examine the perspectives of students who will participate in DE programs; address reasons for the adoption of DE and processes by which the adoption is encouraged. This study illustrates a framework to review and improve strategies to encourage the diffusion of DE technologies and also provides techniques to do so. Additional research could further enhance understanding of the variables that impact the diffusion of DE and provide guidance in the implementation of DE programs.

## References


Babbie, E. (1989). The practice of social research. Belmont, CA: Wadsworth Publishing Company.

Bates, A. W. (2000). Managing technological change. San Francisco, CA: Jossey-Bass.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. American Psychologist. 32(7), 513-531.

Dillon, C. L. & Walsh, S. J. (1992). Faculty: The neglected resource in distance education. American Journal of Distance Education, 6(3), 5-2 1.

Erlandson, D. A., Harris, E. L., Skipper, B. L. & Allen, S. D. (1993). Doing naturalistic inquiry. Newbury Park, CA: Sage Publications.

Goodstein, L., Nolan T. & Pfeiffer. J. W. (1993). Applied strategic planning: How to develop a plan that really works. New York: McGraw-Hill.

Hord, S. M., Rutherford, W. L., Huling-Austin, L. & Hall, G. E. (1987). Taking charge of change. Austin, TX: Southwest Educational Development Laboratory.

Lincoln, Y. S. & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage.

Mishler, E. G. (1979). Meaning in context: Is there any other kind? Harvard Educational Review. 49(1), 1-19.

Peterson's Lifelong Learning Group (2000). Peterson's guide to distance learning programs, 2000, Lawrenceville, NJ: Thomson Corporation.

Rogers, E. M. (1995). Diffusion of innovations. 4th Edition, New York, NY: The Free Press.

Texas A&M University (2000). Vision 2020: Creating a culture of excellence. College Station, TX: Texas A&M University.

Thor-ton, C. (1999). Back to school, web-style. PC World. 17 (7), 39-40.

Warwick, D. P. (1973). Survey research and participant observation: A benefit-cost analysis. In D. P. Warwick & S. Osherson (Eds.), Comparative research methods (pp. 189-203). Englewood Cliffs, NJ: Prentice-Hall.