A Case Study of Institutional Reform Based on Innovation Diffusion Theory Through Instructional Technology

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Abstract

A theory-based system of educational reform through instructional technology, the Training, Infrastructure and Empowerment System (TIES), was developed and piloted in a research university during the late 1990s. In 2001, a research study was conducted on this implementation using qualitative methodology. Interviews were conducted with 12 participants who represented 4 different stakeholder groups. Some of the themes to emerge were: (a) Vision for instructional technology, (b) learning technologies and alternative delivery systems, (c) adoption of innovation, (d) general challenges and (e) lessons learned. Discussion includes implications of these themes for reform of education as they relate to a theoretical reform framework. Suggestions for further research are also identified.

Résumé

Le TIES (*Training, Infrastructure and Empowerment System* ou Système de formation, d'infrastructure et d'habilitation), un système, à fondement théorique, de réforme éducative par la technologie pédagogique, a été, à la fin des années 1990, élaboré et mis en uvre de façon expérimentale dans une université de recherche. En 2001, une étude de recherche a été entreprise sur cette mise en uvre à l'aide d'une méthodologie qualitative. Des entrevues ont été menées auprès de 12 participants qui représentaient

quatre groupes différents de parties prenantes. Voici certains des thèmes qui en sont ressortis : a) vision pour la technologie éducationnelle, b) technologies d'apprentissage et systèmes de distribution parallèles, c) adoption de l'innovation, d) défis d'ordre général et e) leçons tirées. L'analyse porte sur les conséquences de ces thèmes sur la réforme de l'éducation, et plus particulièrement sur le cadre de réforme théorique. Certaines suggestions de recherches ultérieures sont également présentées.

Introduction

> The big story in the field of information technology for education and training is not what marvelous new technology we educators now have available at our fingertips. The big story is the slow take-up of this technology and the challenge this poses for educational managers. (Mitchell, 1992, p. 1)

Reform of education is a popular topic, as evidenced by the volume of writing on the subject. A recent web search (change, reform, instructional or educational) yielded 490,000 hits. Technology is frequently linked with reform (Hughes, 2001; Postman, 1992), and it appears quite natural to create a link between instructional communication technology and educational reform (Cuban, 2001; Fullan, 1999). "Thus the technology could profoundly reshape the activities of all institutions, such as the university, whose central function is the creation, preservation, integration, transmission, or application of knowledge." (National Academy of Science, 2002, p. 21). Instructional communication technology might be more narrowly defined as the use of computers and telecommunications to support or supplant instruction. Substantial resources have been expended to develop this link further, i.e., to infuse instructional communication technology into education at all levels, and thus attempt to promote reform.

Although it originated in the early 1960s, instructional communication technology's relation to reform is still rather unclear, and evidence of reform related to instructional communication technology is still weak. Teachers in the 1960s and today make little use of instructional communication technology in their classrooms and continue to use it to support their existing teaching strategies, rather than explore its transformative potential (Cuban, 2001).

This paper assumes instructional communication technology is an innovation with the potential to be highly disruptive and culture changing in our profession. For example, using instructional communication technology to deliver instruction within or beyond the classroom raises fundamental questions about a host of issues, such as how people learn, the culture of education, and technology-based assessment, to name a few. Compare this with switching to electronic mark submission from a paper and pencil format: this does not interrupt the culture of the institution. The change strategies employed to accomplish the latter would involve information, training, careful phasing in of the new system, and a help desk. These basic and well-known change strategies are insufficient to bring about the kind of structural, cultural and process reform that have been linked with instructional communication technology (National Academy of Science, 2002; U. S. Congress, 1995). A different approach is needed to deal with the basic structures, cultures and processes of

education.

Ties and Ties Reform Theory

The apparent link between a disruptive technology and reform brings to mind the term `innovation' and leads to the question - can a study of disruptive innovations (from a variety of fields such as technology, sociology, education and government) and models of reform provide help in formulating a more complete view of reform. A review of studies of innovation diffusion (e.g., Mosteller, 1981) and models of reform, such as Rogers' innovation diffusion theory (1995) and Schwartz's long view (1996) identified ten characteristics associated with diffusion of disruptive innovations from a variety of fields including technology, sociology, education and government (Szabo, 2002). This review led to the formulation of the Training, Infrastructure and Empowerment System (TIES) Reform Theory (Szabo, 1996: Szabo, Lauman, & Sobon, 2002).

The TIES Reform Theory hypothesizes the most serious impediment to instructional communication technology diffusion is the lack of attention to issues of reform. TIES, based on the theory, was developed and piloted in a post-secondary research institution between 1996 and 1999 (Szabo, 2002; Szabo, Anderson & Fuchs, 1998). TIES is a workable and testable system that combines top-down, bottom-up and mid-level reform strategies. The first goal of TIES is to stimulate Chief Academic Officers to create an institution-wide, shared vision for instructional reform through instructional communication technology (top-down). Next, leadership teams (bottom-up) are identified, trained, empowered and supported to provide continuing professional development to their immediate colleagues, and leadership to their respective units to actualize a shared vision. The teams are strategically located in departments (mid-level) that have power to control reform (Cuban, 1999).

Boiled down to its essence, this theory argues that diffusion of a disruptive innovation (instructional communication technology) may be enhanced by: (a) the development and communication of a shared vision for the future of the innovation in the institution, by leadership (chief academic officers); and (b) empowerment of the faculty to interpret and develop that vision, and operate within a power base (department).

Literature Review

Throughout the decades, there have been numerous calls for changes in education. Governments, corporate bodies and individuals have exerted pressure to expand rapidly into the use of computers and telecommunications to support or supplant teaching. (e.g., CEO Forum, 1999; National Academy of Science, 2002; U. S. Congress, 1995). In 2000-2001, American colleges allocated a record $3.3 B for hardware and software, an increase of thirteen percent over the previous year (Olsen, 2001). The ratio of students to computers in American classrooms rose to 10 in 2000, up from 125 in 1984 (Lou, Abrami, & d'Apollinia, 2001).

Efforts at reform have been mixed, but largely unsuccessful. "But why do so many of the

promising and highly touted innovations fade into obscurity or later face ridicule?" (Alexander, Murphy & Woods, 1996, p. 31). Although most innovators pursue change for valid reasons, not simply for the sake of change (Smith, Prunty, & Dwyer, 1986), most reforms do not succeed (Berman & McLaughlin, 1977; Goodlad, 1984; Leithwood & Montgomery, 1986; Parish & Arends, 1983). Presseisen (1985) analyzed eight major projects created to address widely recognized (American) educational problems (NCOEIE, 1983) and concluded none of them proposed any serious innovation, simply adjustments to the current way of doing things. Cuban's (2001) study of the adoption of instructional communication technology in Silicon Valley schools concluded less that 10% of teachers who used computers in their classrooms were serious users, 20-30% were rare users, well over 50% were nonusers. Furthermore the overwhelming majority of teachers employed the technology to sustain existing patterns of teaching.

Cuban (1996) referred to well meaning but uninformed technological determinists as techno-reformers,

> mostly public officials, corporate leaders, and other noneducators far removed from classrooms, deeply believe in the power of technology to transform schools into productive workplaces. This persistent dream of technology driving school and classroom changes has continually foundered in transforming teaching practices. Although teachers have slowly added a few technologies to their repertoires, techno-reformers have seldom been pleased with either the pace of classroom change or the ways that teachers have used new machines. (p. 1)

Many reasons have been put forth for limited success in education. For example, schools often undertake innovation with unclear goals, unpredictable technology, and uncertainty in general (Morris, 1997). Fullan & Stiegelbauer (1991) observed that educators are neither trained nor expected to identify or overcome the major sources of resistance to renewal, a natural response of individuals to disruptive change over which they have little or no control.

Effectiveness of organizational change in schools is impacted by the experience, education and longevity in the position of those leading the change efforts (Datnow & Castellano, 2001; Fullan, 1999; Hall & Hord, 2001; Kouzes & Posner, 1995; Senge, Cambron-McCabe, Lucas, Smith, Dutton, & Kleiner, 2000). Perhaps the typical five-year administrative appointment may not be sufficient to drive organizational change with respect to any disruptive innovation, including instructional communication technology. Literature on innovation diffusion reflects the recurrent theme of the presence of a guiding vision to provide direction in a new and unexplored area. However, in a recent nationwide survey, Green (2000) concluded, "It is clear that most colleges and universities do not have a strategic plan for electronic commerce, distance education, campus portal services, or financing ICT." (p. 2).

Whether in a business or public agency, continuing professional development has been established as one of the core organizational change factors in organizational transformation (ACOT, 1998; Bolman & Deal, 2001; Drucker, 1999; Fullan, 1999; Hall & Hord, 2001; Kouzes & Posner, 1995; National Academy of Science, 2002; Peters, 1988; Senge et al., 2000).

Change and reform are not the same. Incremental change in research universities is based on the belief that the basic university structures, cultures and processes are solid but some areas need to be tuned up. Fundamental reform argues the structures, cultures and processes are flawed and the university is in need of a complete overhaul (Cuban, 1999). Moller (1993) distinguishes between "first-order" and "second-order" changes. "First-order" changes (e.g., a shift to electronic mark submission from a paper and pencil system) do not affect the basic structure or culture of the organization and can often be accomplished through new policies and procedures. "Second-order" change requires transformation in thinking for which existing policies and procedures are inadequate. An example is transitioning to an instructional communication technology-enhanced course structure from a lecture format. Instructional communication technology is a disruptive, fundamental, `second-order" innovation which requires a new transformational (reform) paradigm.

Cuban (1999) observed that to handle reform pressures and conflicting demands placed upon them, universities have developed "a sponge-like capacity to absorb and respond to their turbulent surroundings" (p. 84). In this environment, universities convert attempts at fundamental reform

> into modest alterations by using the language of reform while practicing ad hoc incrementalism, creating conditions of change, and enclaving. [i.e., forming a small cluster which has marginal influence on the rest of the university] Thus university presidents and faculties tame reform (p. 82).

The present study sought to explore an application of reform theory in the environment of a research university in order to inform those in the field of instructional communication technology-based reform.

Methodology

The TIES is a reform system created to:

1. Foster the development of a shared vision for instructional communication technology within a research university, through a retreat format involving the chief academic officers of the institution.
2. Create and operate a training and support program for five department-based teams who spent the subsequent year providing leadership to their department colleagues with respect to the vision. The retreat was held in 1997, the workshop in early 1998 and leadership teams functioned during the 1998-1999 academic year. TIES is documented in Szabo (1996; 2002) and Szabo, Anderson & Fuchs (1998).

The participants of this research study were employees of a major Canadian research university who participated in the TIES between 1997 and 1999. In 2001, 12 of these participants were interviewed about their instructional communication technology and TIES experiences. They included 2 Chief Academic Officers, 4 Faculty or Department Administrators (Administrators), 4 faculty members (Faculty Member) and 2 Project Directors. Note that faculty members who did not participate in this study are referred to as professors. The interviews were tape recorded and transcribed. Qualitative methodology was used to identify emergent themes. Ten themes were identified and this paper presents

five of them: (a) Vision for instructional technology, (b) learning technologies and alternative delivery systems, (c) adoption of innovation, (d) general challenges and (e) lessons learned.

Authors' Note: The interviews used the terms Alternative Delivery Systems (ADS) and Learning Technologies (LT) in place of instructional communication technology used in the present article.

Findings

Vision for LT and Ads (At the Institution)

Chief Academic Officers interviewed stated that a (institution's) vision, for the use of ADS, did exist. They observed that (the institution) had not been a leader in the field of technology, actualized its vision yet, nor was it using a specific model to guide its progress. One Chief Academic Officer recognized that, overall, the institution was "struggling" with determining how ADS would be used in the future, but that possibly "that struggle is a good thing". In terms of the actual vision at the institution, both Chief Academic Officers "saw the alternative learning technologies as enhancing and expanding our presence, both in the geographic...and...program sense...there are a number of advanced areas, specialized areas, and cost-recovery areas where...the focus would be". One Chief Academic Officer suggested that the focus could be on asynchronous activities that are interactive with "post-degreed professionals". They recognized that the adoption of this innovation had moved beyond the "early adoption" stage and that "a broader group is starting to use the technology now". One Chief Academic Officer identified professorial turnover as having contributed to more acceptance and comfort with technology by current professors. Regarding the university's vision of the future of ADS, one Chief Academic Officer stated

> The landscape is changing greatly but we are holding on to models, and I think all universities are trying to differentiate themselves. When I said that we're holding on to a face-to-face model, however technologically enhanced, what we're really saying is we're betting the farm, so-to-speak,..that our approach is going to be good approach andthe future...best students (will) really want a face-to-face interaction, again with all the technology enhancementswe've got a huge infrastructural investment, we've got huge intellectual capital investment in a lot of the models we've been used to for hundreds of years and it's a tough thing to think about, someone coming in with absolutely new approaches that, can simply say that we don't need any of that infrastructure, we don't need our instructional faculty.

Chief Academic Officers identified numerous challenges they experienced while trying to actualize their perception of university's vision for instructional communication technology: (a) Financial barriers for technological support and renewal; (b) time requirements, "it's a pedagogically different format and for professors to take the time and effort to learn how to shift the way they teach to the new format takes a lot of effort, so that's a cost at the personal level"; (c) issues related to rate of change/adapting to change (i.e., staff, students, administration); (d) divergent needs in faculties; (e) rivalry between and/or within faculties; (f) rapidly changing technologies, and; (g) communication issues and viewpoints among those involved Another challenge identified by one Chief Academic Officer was that

> We've inserted into the university a slough of technologies, whether its labs...smart classrooms...all purchased out of one time money, no monies available on this campus for evergreening or renewal so that we're always feeding this capability through things that I call `budget dust'because we haven't got some of this base funding.

> None of the Administrators identified that a vision for the use of ADS existed at the university.

One Administrator stated that, at least, "not a stated vision" and went on to state

> Our niche is as a research-intensive university and what we need to do as institutions is to think through what that means in terms of use of technology and interaction with our students...what we need to do is cater to students who want to be in an institution where they're close to the heat vents where knowledge is being created, they want to learn the skills, they want to be part of dialogue and if we don't use instructional technology to enhance that unique mission, then we've missed it.

Although more than one Administrator indicated that their faculty or department supported (e. g., funding, release time, evaluation criteria changed to recognize production time) the development of technology-related initiatives, this perception was not supported by the experiences of many of the Faculty Members interviewed. More than one Faculty Member indicated that they received no recognition for their technology-related efforts. One Faculty Member stated that s/he did not receive any institution recognition, but did publish papers and attended conferences as a result of his/her technology-related efforts. Another Faculty Member also stated that s/he did not receive personal recognition, but was aware of a team that used ADS who received an award for teaching collaboration.

Most Faculty Members were aware that a vision and "strategies" existed at the institution regarding ADS. One Faculty Member stated that the institution's vision proposed being "connected globally and increasing learner accessibility". Another Faculty Member indicated that the institution's vision stated, "by the year...2002, all classes will use instructional technology". Some skepticism regarding the institution's vision was expressed by some of the Faculty Members. One stated "All the right words are included in the university's strategic plan and vision statements". Another Faculty Member suggested that the institution's vision may have been governmentally rather than internally driven.

Learning Technologies (Lt) and Alternative Delivery Systems (Ads)
This theme incorporated several sub-themes, including transformative potential and challenges when using LT and ADS.

Transformative potential effects of LT and ADS. One Administrator indicated that using LT and ADS had resulted in the development of "learning circles" that facilitate student, professor, industry, and government collaboration. He stated that the "learning circles" create community and ease entrance for students into the workplace and require a different approach to teaching and learning. Another Administrator indicated that LT and ADS can create virtual discussion groups for large classes, as well as encourage more active learning. Faculty Members agreed that using LT and ADS have resulted in some transformation in teaching and learning, "absolutely, I think it definitely has" caused some transformation. Another Faculty Member described the transformative process as slow, "We're in that process. I don't think we've transformed a whole lot of people yet. We've got them thinking, which is the first step in transformation...I think it's slow". S/he

continued to state that LT and ADS encourage student-directed learning, and that the relationships among learner, teacher, and content needs to be explored further to enhance our understanding of this dynamic.

Challenges identified when using LT and ADS. Administrators identified the following challenges they experienced related to the use of LT and ADS:

1. They are only embraced by specialists or early adopters in faculty.
2. Early adopters can be sidelined from regular duties as a result of related demands.
3. Lack of financial resources and time pressures inhibit adoption by others in the faculty.
4. International post-secondary institution choices could result in a drop in institution enrollment as students may choose other institutions to get their degrees from.

Two Faculty Members identified the following challenges related to their use of learning technologies and alternative delivery systems:

1. Administrators do not recognize the importance of providing distance learning for students unable to attend the institution.
2. The lack of technical knowledge can result in fear of use by other professors.

The challenges Project Directors identified were:

1. Internet accessibility has resulted in a lack of quality control of course materials.
2. It takes more time than one would expect for the diffusion of innovation.
3. Chief Academic Officer, Administrator, and professor commitment to long term projects is difficult to gain.
4. A wide range of tools is needed to support creativity.

The Adoption of Innovation

Requirements for the adoption of innovation. One Administrator identified the requirement for the adoption of innovation is inside leaders must utilize new technologies and share that information with colleagues. One Project Director listed several elements for the adoption of innovation: (a) cultural change, (b) determining how to use the technology to affect cultural change, (c) recognition that innovation takes much longer to diffuse than we believe, (d) ways are needed to get the faculty involved in thinking about this as a long range project rather than one year or a couple of months project, (e) support (i.e., dollars, release time, and/or a variety of resources) from the highest level, (f) senior administrators need to encourage deans and department chairs about the importance of such initiatives and engage in a cost sharing program, (g) the conditions of innovation diffusion need to be utilized by asking "What does this mean to the project?", and (h) recognition that "One characteristic of innovation is that it is a very creative, risk-taking activity".

Ways of facilitating the adoption of innovation. One Administrator suggested several ways of facilitating the adoption of instructional communication technology: (a) Ensure that people are informed, (b) generate excitement about the new technology in the faculty, and (c) seek wise adoption of the new technologies. One Project Director identified facilitating the adoption of innovation through instructional modules that teach the leadership teams how to develop long-range multi-year rolling instructional communication

technology plans that are reviewed regularly. Another challenge Project Directors noted was getting "faculty involved in thinking about this as a long range project, because we're used to thinking in terms of one year projects or a couple of months projects".

Challenges experienced with the adoption of innovation. The main challenge Faculty Members experienced was referred to as resistance. One Faculty Member indicated that some professors feel " I've been successful so why should I change?" and "Many people think that we have almost reached perfection here at the [institution] in terms of the teaching and learning process". One challenge Project Directors identified was that the commitment to change is not held by many professors or senior administrators. In addition, a Project Director stated, "Administrator's commitment to a long-term project, once they recognize that it's a long-term project, is problematic". Other challenges identified by Project Directors were:

1. Administrators and faculty often believe that "they're going to create the killer application CD ROM which is going to revolutionize the world".
2. There is a lack of awareness and commitment, "I think the majority of people on campus are certainly, if they're not unaware, they're uninvolved".
3. University "policies, procedures, and guidelines mitigate against the creativity that one needs to innovate...we're not really stimulating people's creativity, we just need to tell them what to do and get them to do it _ sort of a micro-management process".

General Challenges

General challenges identified. A Chief Academic Officer identified that due to the dynamic nature of technologies "They [faculty] need refreshment, they need more horsepower, they need production environments that are stable, and we just haven't been able to deal with (it)". This general challenge was also identified by one Faculty Member who stated, "I knew the pain associated with the long delays of slow and old technology...Our network infrastructures weren't particularly supportive as far as exchanging information". A general challenge that one Administrator identified was related to TIES on-campus workshop. S/he was concerned because Faculty Members tended to "slip away", to take care of other demands (i.e., emails), during the training sessions and suggested that taking Faculty Members to a remote retreat might be the only way to resolve this challenge, although s/he concluded with skepticism that "They'll always sneak off". One Faculty Member indicated that one main challenge faced with the diffusion of the innovation of technology was that

> We're kind of stuck in a positivist approach that we take one...small thing and change it and see how it works, then take another...small thing and change it and see how it works...We're sort of a slave to methods we've learned for our research.

One-half of the Faculty Members interviewed identified that a major challenge was the attitude and lack of support from administrators and other professors, although one indicated that s/he had not been "hindered by bureaucracy". One Faculty Member suggested that some professors are not interested in technology because they believe "It does not affect them". This attitude does not appear to be related to age or seniority. One Faculty Member stated, "I think the staff were afraid _ they looked and all they ever saw

were the problems and they tend to be the type that get frustrated". One Faculty Member indicated that there is now less concern that computers will replace teachers, "We showed them...we will never be replaced by computers". The main challenge and source of frustration identified by a Faculty Member was that the promotion and tenure review committees do not recognize or reward the development of technically-based materials. A Faculty Member identified that poor hardware infrastructure is a challenge. One Project Director identified the main challenge as being resistance to change in terms of: (a) Lack of commitment by many professors or senior administrators to initiate change; (b) peoples' belief that they have almost reached perfection, which is "dead wrong", "presumptuous" and "uninformed" and "It doesn't do justice to a research university that's supposed to be doing research on all components of their life"; and (c) recognition that "We don't have a drive from our customers", students are not visibly dissatisfied with the teaching and learning situation therefore there is little motivation to change.

Ways Challenges Were Addressed. Administrators indicated that one way they overcame the challenge of gaining professors' involvement and commitment was to encourage team development of courses,

> There is actually an advantage to having team developed courses rather than individually developed. That's related to ownership. When people really put their heart and soul into something, without much additional help, then they feel they own it, which includes they feel they should be able to market it.

Other ways Administrators addressed the challenge of increased involvement and commitment was by: (a) Using WebCT for course development, (b) providing release time through the instructional communication technology production facility's program (although this was disputed by some Faculty Members), (c) providing leadership through modeling and demonstrating the use of technology, and (d) adding another technician to the faculty.

One way Faculty Members addressed the challenge of lack of recognition was to seek a better system to recognize scholarship related to instructional learning, instructional development and instructional design, "not just recognition for innovative teaching, but recognition for time spent on the development and recognizing that this is a form of scholarship and that has not happened". To address the challenge of getting more professors involved Faculty Members: (a) provided ways for students to motivate instructors through course evaluation; (b) provided an instructional technology lab that assists professors with putting courses online; (c) provided instructional communication technology training to teaching assistants, graduate students and professors so they can help others in the instructional communication technology lab ("As more faculty become trained, then they can talk to each other"); and (d) developed course templates.

To address challenges related to the diffusion of innovation (i.e., technology) Project Directors: (a) Sent instructional communication technology articles to members of the university committee charged with technology policy; (b) sought support from the department chairs; (c) acquired some financial incentive so participants could acquire resources; (d) helped teams develop a vision and plan, (e) encouraged communication ("We thought that these teams from each of the departments would really benefit from

hearing about each other and learning about each other and I think that happened during the week of real-time activity we had"); post-computer conferences, and; (f) reframed instructional communication technology as

> requiring machine technology andintellectual technology...the really important part of instructional technology is intellectual capital, writing the programs, the advising, the instruction, testing it out, and that is not a limited resource...(it's) a renewable almost expandable resource. I think if we look at it from that point of view, the administration might think differently about instructional technology.

and (g) sought to articulate a discussion on the disadvantages and benefits of instructional communication technology and reform.

Lessons Learned

One Chief Academic Officer made it very clear that the direction instructional communication technology was going to take at this university was not coming from Chief Academic Officers, "There's been nothing that the university has done, just given the profoundly decentralized nature of this institution that says that we're driving this from the top and this is the way it must be". S/he continued to state, "The university has never applied a `thou shalt' on any of these, nor probably could it, although you see it in some smaller institutions and colleges." One Chief Academic Officer stated this was because "The university doesn't react well to any plans that come from the centre".

In terms of vision, one Chief Academic Officer identified there "has not yet been a clear message that has been driven through all the layers of the university to everyone to understand what it is we think we want to be". In addition, "Faculties, departments, areas of one kind or another are themselves struggling as to what they want to be in this world and there's no clear direction being given". One Chief Academic Officer acknowledged the difficulty inherent in this process,

> whether we ever achieve that definition corporately I think is unlikely. I'm not sure that our best bet isn't to seek that definition from the faculty level but even at the faculty I think there's a lot of mixed views and opinions.

The Chief Academic Officers acknowledged the value of collaboration and sharing of knowledge related to the diffusion of this innovation. They recognized that the instructional technology production facility played an important role in training people who have then gone back to their respective departments and become resource persons. As a result, they identified that there is now more expertise on campus, although, they believed that some professors feel that being a resource person is a waste of their time. A Chief Academic Officer noted it is the university's responsibility to provide professors with short courses aimed at developing technology-related skills, and indicated it is their belief that professors prefer to learn just-in-time knowledge via short courses. One Chief Academic Officer suggested that departments likely do not need a full-time resource person on staff, but rather require someone who can provide occasional advice.

One Chief Academic Officer observed there is a need for cultural change at the university, "We have to work with the Deans and with the university culture generally to say give these people some room to try things". In addition, time and recognition need to be

factored in as one Chief Academic Officer identified using alternative delivery systems requires a "pedagogically different format and for professors to take the time and effort to learn how to shift the way they teach to the new format takes a lot of effort. So that's a cost at the personal level."

Administrators acknowledged that challenges exist. Some of the suggestions they proposed for dealing with these challenges were to: (a) broker courses in areas where teaching and research strength does not currently exist on campus; (b) develop content and have top-notch, instructional and website designers develop competitive learning product; (c) keep professors focused on quantitative learning, "That's probably where they do their job best. It also keeps it in better alignment with their other responsibilities and research we're trying to draw them too far" and; (d) create a "balance between keeping people fully engaged in the political life of the faculty versus just being bogged down, just meaningless, mindless, administration" by providing better support through faculty committees. The Administrators recognized that there has been some progress and that "Now people are perhaps more accepting" of the changes they are facing.

Two suggestions Faculty Members made were to shift control from the "techies" to the professors, and that a university-wide plan needed to be developed so as to utilize an economy of scale purchasing approach. It was also suggested the university needs to consider utilizing learning technology systems materials that are developed by its own faculty. There needs to be realistic expectations within faculties, in regards to the time it takes to develop instructional communication technology related materials. A Faculty Member noted that some students are demanding that they have the opportunity to gain their skills and knowledge in nontraditional ways.

Discussion

How do the findings of this analysis compare with results from the study of another disruptive innovation that relies heavily on technology, namely distance education? Muilenburg & Berge (2001) identified ten barriers to distance education, six of which were directly related to the findings of the present study: (a) administrative structure; (b) organizational change; (c) technical expertise, support, and infrastructure; (d) social interaction and program quality; (e) faculty compensation and time; and (f) threat of technology.

The four barriers that were not reflected in the interviews are: (a) Legal issues, (b) effectiveness, (c) access, and (d) student-support services. The inclusion of administrative structure is consistent with the TIES Reform Theory view on disruptive change which argues extensive implementation trials should be conducted and the resulting system be used to inform policy development, not vice versa. Policies serving established institutions that focus on face-to-face teaching often fail, or are disruptive to reform through instructional communication technology. This raises the question whether instructional communication technology should be implemented within the totality of an existing institution, within a portion of it, or in a completely new organization, created specifically

for instructional communication technology? The former is a formidable task and the latter two options run the risk of `enclaving' (Cuban, 1999). Shared vision and strategic planning (organizational change) are incorporated into both the TIES Theory and results of Muilenburg & Burge.

The need for technical expertise infrastructure is also acknowledged by both writings. The specific needs are to be identified and arrangements made to meet them, in terms of training and long-term support, by leadership teams who use instructional communication technology and share the results with colleagues. Interviewees acknowledge concerns about program quality, and some felt that quality may be diminished if students are not in close contact with researchers ("sitting near the `heat vents.'). While faculty compensation is an issue that cuts across both studies, the interviewees identified comments focused mostly on recognition of their efforts in general rather than monetary or other compensation.

While the Muilenburg & Berge (2000) study indicated a strong concern with technology (use and fear of replacement) interviewees suggest threat of technology has been partially addressed ("We showed them...we will never be replaced by computers"). Perhaps the TIES participants, through the selection process, were well versed in instructional communication technology relative to most professors. Alternatively it might reflect a lack of understanding of the potential of instructional communication technology to exert large, unsettling cultural change forces on the academic institution, or the view that their primary value to the institution is as researchers, a key role that cannot be turned over to instructional communication technology.

How do the findings of the present study relate to the TIES Reform Theory? The paradigm takes a top-down, bottom-up and centrist approach to reform that involves consensus vision among chief academic officers, department administrators and faculty (leadership teams), and implementation by the latter two levels. This portion of the discussion focuses on vision, leadership, and resistance.

Vision
The TIES Reform Theory ideally suggests that the institution develop, through consensus, a shared vision for instructional communication technology, one strongly promoted by chief academic officers who develop change strategies commensurate with a 2nd order innovation. This view did not command a high level of importance by Chief Academic Officers in this study. Lack of clarity about a shared vision is reflected in the observation that Administrators stated no such vision existed, contrary to the views of Chief Academic Officers and some Faculty Members. There was little if any recognition of the view that traditional change strategies would have to be carefully examined and modified or replaced when dealing with the second-order innovation of instructional communication technology.

Two years after TIES, a draft document for ADS strategy, created shortly after the visioning retreat, had not been formally considered by this institution. The authors of the draft subsequently left the institution and were thus unable to drive it to completion. The

interviewees had different opinions as to whether a vision for instructional communication technology existed at either the institution or department level. Administrators appeared to interpret vision (where do we want to go as a faculty/department?) as strategy (how do we get there?) and used terms such as vision, goal, strategy, reform and change almost interchangeably.

It might be inferred from the interviews that if a vision did exist, it would incorporate: (a) Continued reliance upon face-to-face instruction, interspersed with; (b) opportunities for special courses via instructional communication technology, such as professional development for graduates, and; (c) experimentation with individual instructional communication technology projects as resources and interests became available.

Leadership

One Chief Academic Officer expressed reluctance to drive instructional communications technology, eschewing the directive approach, in keeping with the decentralized nature of the university. In contrast to this lack of direction surrounding an instructional communication technology vision, research universities are permeated, from their presidents on down, with the vision that the institutions become, or increase their status as, major research universities (Cuban, 1999). Administrators aggressively promote a research vision and empower faculties and departments to determine what research will be done to meet that vision. What would happen if institutions took a similarly strong and decisive stand on a vision for instructional communication technology? The TIES Reform Theory and other reform theories hypothesize such a stand would accelerate reform through instructional communication technology more effectively than more laissez-faire approaches.

One can speculate why a research university provides leadership in research but not instructional communication technology. Is it because the difficulty of changing cultures and embracing a disruptive innovation like instructional communication technology have been underestimated or perhaps appear too daunting? Do the issues of vast investments in infrastructures and reliance upon the use of old models present significant barriers to reform? Perhaps it is because instructional communication technology emphasizes teaching, whereas the major drivers of institutional structure and culture are research and affiliation with the subject matter profession. Or could it be there is an unspoken recognition of a risk to the economic well being of the university? Tuition and government allocations fail to cover the cost of student education. Put differently, universities lose money on each new student; an unsustainable business model to say the least. The growing gap between costs and revenues causes universities to aggressively supplement revenue through grants, contracts, royalties, patents, endowments and alumni fund raising. The financial return on investment from these efforts far exceeds the potential returns from sales of instructional communication technology-based educational materials.

Resistance to Reform

The term resistance can be a generic label given to a variety of factors, many of which are

poorly understood. Participants' comments ranged from a felt lack of support, to actual hindrances or impediments (leading to a sense of frustration), to strong support. There did not seem to be any rhyme or reason to explain this variation, only that it exists. Cuban (1999) points to a satisfaction theory which argues that to the extent an institution is satisfied with its performance and things are going well, why take the risk to change into something which is quite unknown? This perception was reflected in at least one of the interviews.

Participants acknowledged not only the issues with technology itself (e.g., ever-changing, unreliable, an add-on resource) but also the issues associated with the sociotechnological system (Hughes, 2001) brought about by exposing the lecture hall to technology. They noted that instructional communication technology can exert a transformative effect upon teaching and learning. They also recognized the significant amount of time required to implement instructional communication technology. This is consistent with other innovation diffusion studies which record a large time gap between discovery and diffusion of a technological innovation (Cuban, 1999, Mosteller, 1981).

Departments have their unique sets of politics, personalities, pressures and circumstances that must be considered in any plans to expand the use of instructional communication technology. It seems prudent to permit (empower) each department leadership team to set its own unique agenda rather than forcing all departments to fit the same model. Some interviewees questioned the idea that one model of instructional communication technology would fit all areas of the institution. Innovation studies have consistently shown the innovation is often changed by the implementers in order to adapt the innovation to the department, rather than the reverse.

"Faculty are evaluated on their number of publications not their continuing professional development", according to some Faculty Members. The main challenge identified by many Faculty Members was that promotion and tenure review committees do not recognize or reward the development of technically based classroom materials. This appeared to be an on-going challenge and source of frustration for some Faculty Members. One Faculty Member stated the promotion and tenure review committee is "one of the big problems" related to the diffusion of this innovation, as there is a "lack of ability to get credit for developing, instituting and evaluating instructional technology".

Universities generally select and reward professors based upon their strong individual scholarly performance that can work against the use of a team approach, in terms of recognition by administrators and promotion and tenure review committees. One Chief Academic Officer identified that collaboration would be appropriate, but noted "There's a lot of lip service being paid to collaborationwe have a difficulty, it seems, separating what's mine and what's ours". Creating working collaborative communities, which could best suit the diffusion of instructional communication technology innovation, may be difficult to attain in this setting.

The prevailing university culture can penalize people when they make mistakes, thus

discouraging risk taking with non standard ventures whose outcomes are not guaranteed and whose target audiences are not well understood. While the focus of the research institutions is the creation of new knowledge through research, apprehension to experimenting with instructional communication technology may exist because of fear of being penalized (e.g., poor research record, lower class ratings), ignored, or unrewarded.

Conclusions

This paper began with the view that the use of instructional communication technology in and of itself and to reform education is a highly disruptive innovation. The findings from the case study suggest stakeholders did not utilize methods from successful diffusion of past innovations (e.g., vision, leadership, empowerment) in a systematic way to guide the change process. They also point to a myriad of individual issues and challenges faced by the stakeholders in a research university with respect to the diffusion of the instructional communication technology innovation.

Future Research

Several questions for future research have emerged from this study. How would the effectiveness or efficiency of diffusion of instructional communication technology in a post-secondary environment be impacted by?

1. Establishment of a shared vision, built by consensus, of the role of instructional communication technology; a vision that permeates the institution on a level commensurate with the research vision.
2. The perception that diffusion of instructional communication technology is as a major disruptive innovation, rather than as minor change, with application of appropriate strategies for reform.
3. Institutional preparation of employees (continuing professional development) for discontinuous change (i.e., increasing awareness of the stages characteristics of innovation diffusion) to raise awareness of and thereby decrease resistance to change.
4. Emphasis upon the individual entrepreneur or the department structure as the primary change agent (and their interaction).

Acknowledgments

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