DOES STUDENT INTERNET PRESSURE + ADVANCES IN TECHNOLOGY = FACULTY INTERNET INTEGRATION?

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ABSTRACT

*Internet (Net) integration into the **mainstream campus classroom** may unleash some of the educational potential to customize classrooms for larger and more diverse groups of learners than the classrooms devoid of the Net. Within their physical campus classrooms, students may express interest in having educators revise or supplement traditional teaching methods with Internet-based resources as students' technological competencies increase, perhaps disproportionately to those of faculty. University and training administrators could increasingly support Internet integration into classroom-based courses, rather than viewing the Web solely as a distance education tool. Do these extrinsic faculty forces—student pressures, the presence of Internet technologies, and formal administrative persuasions—lead faculty to integrate the Internet into their on-campus learning environments? Does faculty Internet adoption patterns follow an established diffusion pattern? Will affected students view the Internet-supported-educational environments as improved, more efficient, and more effective in stimulating learning? This research attempts to answer these questions.*

Keywords: Internet integration, Web integration, technology in education, diffusion of technology

INTRODUCTION

A three-year study of Internet integration across disciplines at one public university indicates that instructors increasingly utilize the Internet to stylize their courses. The present study identifies some of the forces that appear to influence significantly instructors' decisions to integrate and some forces that do not. The overall pattern of Internet integration at this organization is compared to a general diffusion pattern, and inferences from this comparison are drawn using diffusion theory. Data collected from students during the same three-year period and attending the same university as the instructors is evaluated. This evaluation helps determine if students value technological advancement in their classrooms, and it helps identify which Internet features they value most. Suggestions on how to achieve technological advancement among an organizational majority and how scarce resources can be managed to achieve a common goal of technological penetration are offered in the conclusion of this research.

OVERALL STUDY DESCRIPTION

During the fall terms of the 1998-1999, 1999-2000, 2000-2001 academic years all tenure, tenure track and term appointed faculty employed by Northern Michigan University received email invitations to participate in an online cross-disciplinary faculty survey to evaluate Internet and Web integration into courses. To reach faculty uncomfortable with email and boost participation

among those utilizing the Net, individuals not completing the online survey received paper copies of that survey after the number of online submissions dropped significantly. Approximately 59 percent of the faculty participated in the 98-99 survey, 47 percent participated in 99-00, and 40 percent in 00-01.

Survey participants provided information on faculty status, discipline, age, personal computer ownership, and home access to the Internet. From an instructional viewpoint, faculty then identified themselves as current Internet users, expected users, or rational Internet rejecters. Internet users provided input on the quantity and duration of Internet features integrated into their courses, and they selected from a list of possible extrinsic and intrinsic motivation factors for using the Internet. Expected users identified those features of pedagogical value to them, and all groups selected from a list of reasons to reject Internet integration. A copy of the faculty survey is located at <http://cobweb.nmu.edu/faculty/survey.htm>.

The faculty data combined with research on the diffusion of technology are used to determine whether faculty decisions to integrate the Internet are based on pressures to meet the needs of students, peers or administrators, and/or desires to advance technologically or not fall behind. The faculty data on Internet use over the three-year period was also evaluated to determine whether Internet integration followed an identifiable pattern of technological diffusion over a three-year period. The results and inferences drawn are presented below in the Faculty Survey Section of this paper.

To measure students' perception of the influence the Internet has on their learning experiences and to determine which Internet components they value most, student surveys were conducted during the same academic periods as the faculty surveys. During each period, the student survey was distributed to students enrolled in pre-selected courses. The courses chosen were cross disciplinary, offered at similar times during each academic year, and were instructed by faculty volunteering to participate. During the 1998-1999 and 1999-2000 academic years, online and paper surveys were distributed. No significant differences in the web and paper survey responses were detected; the paper version of the student survey was dropped during the 2000-2001. A copy of the student survey is located at <http://cobweb.nmu.edu/student/survey.htm>. Diagnostic results of the student surveys are intended to assist faculty and administrative choices involving the integration of the Internet into on-campus, learning environments.

Throughout 1998 and 1999 presentations at a variety of professional conferences, university meetings and faculty gatherings validated the survey instruments chosen, generated valuable feedback on the quality and usefulness of the survey results, and helped identify the strengths and weaknesses of this project (3, 4). Presentations will continue and faculty and student surveys are planned for the 2001-2002 and 2002-2003 academic years.

FACULTY SURVEY RESULTS AND INFERENCES: 1998-2000

Did Internet adoption within this organization increase over the three-year period, did the observed pattern of Internet integration across time follow a general diffusion pattern, and did student demands, technological forces, and administrative pressure significantly influence the

technology adopters (instructors) decisions to adopt over the three-year survey period? Analysis of the faculty data suggests the following answers.

In each period, the data indicates that many faculty members are experimenting with the technology and incorporating it into their courses. Increases in the number of faculty reporting Internet adoption combined with observed increases in the total number of WebCT-complemented courses offered at the university under study indicate growth in Internet integration and penetration over the three-year period. During the three-year period, the percentage of instructors using the Internet increased by 95% with approximately three-fourths of the faculty reporting Internet use during the 2000-2001 academic year. Figure 1 charts this Internet activity.

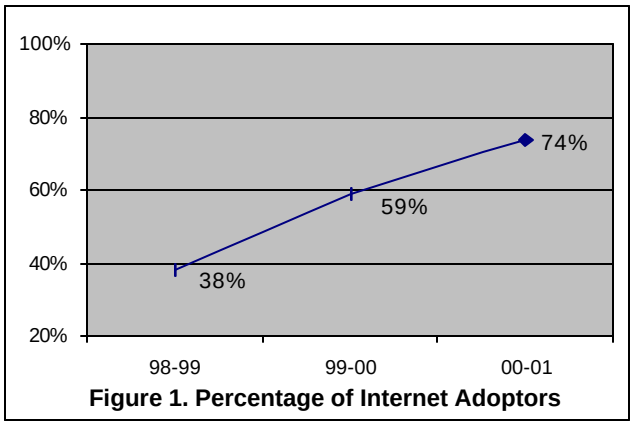

Figure 1. Percentage of Internet Adoptors

Can a general model on the diffusion of innovations explain this pattern? Diffusion theorists use a figure like Figure 2 to illustrate the adoption process (1), (2) and (6). According to this general model, individuals adopt the technology at different times. Pioneers (innovator and early adopters) are the first to use the technology, experiment with it, and pass on information concerning its use to the non-adopters. Initially, pioneers represent a small percentage of the organizational whole. As time passes, a second wave of adopters rises and eventually a critical mass emerges with the mass majority of individuals implementing the technology. At some point in time, traditionalists and long-term technological rejecters build a wall of reluctance and cause growth in technology adoption to go flat. Why? A majority of individuals have adopted leaving only a minority of individuals to choose adoption. Traditionalists do eventually adopt, but they do so slowly and with reluctance and resistance. A strong presence of internal and external technological activities are usually required to invalidate traditionalists' suspicions and significantly reduce the risks they perceive as attached to adoption. Eventually, these forces push them to break from tradition and adopt. Long-term rejecters simply never do so.

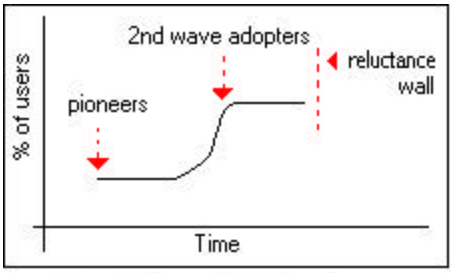

Figure 2. General Diffusion Curve

The simplified "S" curve of technology integration illustrated in Figure 2 does seem to help explain the pattern of Internet integration observed at the academic organization under study. As illustrated in Figure 1, only 38 percent of the survey participants identified themselves as current adopters in the 1998-1999 survey. This small representation of Internet adopters represents the pioneer group of adopters. They appear to be the individuals whose work and experimentation with the technology precedes the work of the early and late majority. Approximately 59 percent of the participants identify themselves as Internet integrators in the 1999-2000 academic survey. Evidence to suggest that the early majority is emerging. This number jumps to approximately 75 percent in the following period, representing a majority of Internet adopters among those instructors surveyed, indicating that a late majority of adopters may be present. Late adopters

require nudging and a university technology initiative requiring faculty and student laptop use may have pushed instructors to adopt. These statistics appear to suggest that the pattern of technological diffusion within the organization under study appears to follow some variation of the S-curve pattern. This suggests that this organization may have realized its critical mass of Internet adopters. If it has, growth may continue but at a decreasing rate. The 2001-2002 and 2002-2003 studies may provide data to support this claim. Now, let us turn to identifying the significant forces behind the decisions to adopt.

A review of the literature on diffusion theory shows that a number of forces can influence individuals' decisions to adopt new technology. A number of intrinsic and extrinsic factors can influence individuals' decisions to adopt and the rates at which they adopt new technologies like the Internet. The intrinsic factors comprise individuals' beliefs that the new technology is better than the current technology, individuals' tolerances for risks, the start up costs faced by individuals choosing to adopt at different times given different skill levels, perceived incompatibility issues between the new and existing ways of doing things, the degree of technological complexity, and individuals' abilities to identify the long-run benefits and costs associated with the new technology over time. Extrinsic events include pressures from outside forces, the presence of the institutional resources for technological advancement, extensive research and development centering on the technology, and deep penetration of the technology outside of one's organization. According to the literature, individuals' decisions to adopt can be affected differently by one or any combination of these intrinsic or extrinsic factors. Consequently, individuals can be expected to adopt at different times, levels, and rates.

Rogers research on the diffusion of innovation is specifically used to identify five adopting groups of individuals possessing some shared motivational adoption forces. These groups comprise the innovators, early adopters, early majority, late majority and traditionalists. (The traditionalist label replaces the laggard label used by Rogers to avoid attaching a derogatory label to this late group of adopters.) Research indicates that pioneers' decisions to adopt are often influenced by new and exciting opportunities to experiment with innovative technology, risk-loving or neutral behaviors, and desires for new discovery. Pioneers play an important role in achieving a critical mass of adopters (6). Pioneers are the individuals who tend to not be affected by administrative and peer pressures to conform to the ways of the majority. According to Peled (5), pioneer willingness to adopt innovative technology and experiences produce trials and errors from which they, as well as others, can learn. The pioneers also act and interact with non-adopters. All of this helps the non-adopters understand the complexity of the technology, generates more information on the net benefits of technological progression, spawns shared values, and challenges current ways of doing things without invoking defensiveness. These internal organizational interactions combined with new events like institutional change and technological penetration forces outside the organization can encourage the members of the early and late majority of individuals to adopt. At times, members of the late majority and traditionalists can require formal pushing to utilize the technology. Do any of these forces significantly contribute to the growth in Internet adoption in the study at hand?

To build a single-equation linear model of Internet adoption, the number of Internet features (NET) utilized by instructors is identified as the dependent variable. The qualitative variables chosen as the independent variables are: the three extrinsic motivational factors investigated in

this paper (pressure from students, pressure from administrators and peers, and advances in technology making tasks easier to complete tasks OR feelings of falling behind technologically) AND the variables - improvement in the quality of the course, improve communication, dissemination advantages, professional growth, promotion of individualized learning, honing students' Internet skills, and addressing the needs of distant learners. Regressions on the number of Internet features adopted against all variables did not produce solid results. Overall significance of the model with many low t-scores and some unexpected signs in the coefficients of the independent variables led to tests for significant correlation among the variables. Correlation was detected so some variables were dropped to avoid redundancy. Still the student, administrative, and technological variables did not produce significant results. The only variables, which consistently showed up as significant with expected signs were the motivational variables connected to the instructor's desire to reach students learning at a distance (DISED), instructor's interest in professional development (GROWTH), and interest in improving disseminating course materials with relative ease and at minimal cost (DISSEM). The results of the significant linear model are:

NET=	**3.832**	**+ .526*DISED**	**+ .840*DISSEM**	**+ .748*GROWTH**
(t-statistics	(7.32)	(2.830)	(3.438)	(3.040)
significant at 5% or below)				

Model Summary

R	R Square	Adjusted R Square	SE of the Estimate
.520	.270	.257	2.4975

These results indicate that, on average, individuals integrate four Internet features. Individuals add approximately one feature to this level if driven by desires to reach distant learners, disseminate materials electronically, or grow professionally. These results are not surprising when the strong presence of pioneers (innovators and early adopters) is recognized and their role in influencing the early majority is taken into account. Pioneers, and the people they influence in the early majority, are not likely to respond to extrinsic pressures from administrators, peers or subordinates. Other forces (DISED, DISSEM, and GROWTH) most likely influence their decisions. Pressure may play a role in the late majority or traditionalist's decisions to adopt. The faculty data to be collected in the 2001-2002 and 2002-2003 academic periods can test this claim.

STUDENT SURVEY RESULTS AND INFERENCES: 1998-2000

The three-year student study indicates that students are reacting to technological changes in their courses by taking a more neutral position on the general learning impact of the Internet and by viewing the presence of the Internet less positively within and across their courses. Students, however, express strong desires to have Internet features integrated into their courses and the percent of negative survey responses is extremely low. (Figure 3.)

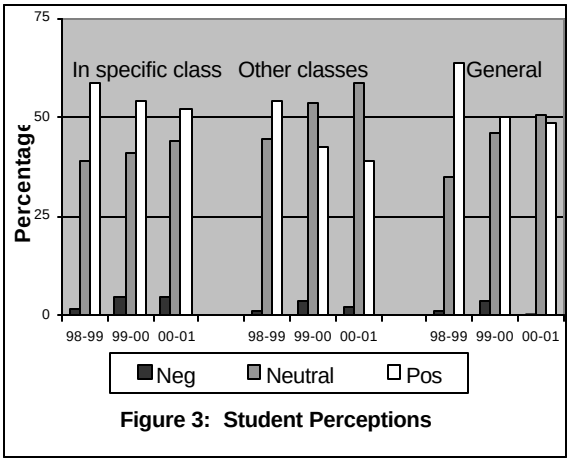

Figure 3: Student Perceptions

In order of importance, eighty percent or more the students surveyed placed value on the following Internet course features: online access to practice tests, email communications between instructor and students, receiving electronic access to grades, electronically posted course notes, online course syllabi, email communications among students taking the same courses, electronic office hours offered by the instructor and active hyperlinks to web-related course resources. On-campus students place the least value on taking asynchronous courses on the web, having access to electronic chat rooms, and using remote labs for classroom activities.

FACULTY INTEGRATION ACTIVITIES AND STUDENT DESIRES COMBINED

Over the three-year period, the majority of instructors surveyed integrated the Internet, and instructors did provide the students with some of the Internet features that they value. The evidence presented here indicates that student pressures did not play significant roles in their decisions to do so. Nonetheless, the data also suggests that instructors are progressing in some areas valued by students. Awareness of student values gives instructors insight on what factors may spark student interest, provide motivation and/or stimulate learning. Instructors can then use this information when they choose to adopt, retain, or abandon Internet features for future course designs. Late adopters can use this student information to choose which Internet skills to acquire and instructional sessions to attend.

Email communications, posting online syllabi and electronic submissions for coursework are the Internet components of courses most valued by students. (See Figure 4.) At the institution under study, faculty offerings and student wishes are closely matched on these features. Instructors interested in adopting these features can integrate them at relatively low costs and minimal sacrifices if limited technical support, virus protection software and administrative support are available.

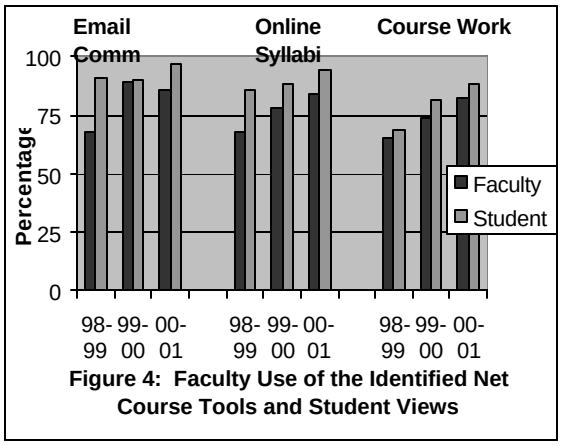

Figure 4: Faculty Use of the Identified Net Course Tools and Student Views

Figure 5 illustrates that the biggest gaps between instructor choices of Internet features and student desires lie in electronically posting sample tests and electronic access to grades. Sample tests once saved as Microsoft Word or Word Perfect documents can be saved as HTML files and then integrated into electronic course materials with minimal cost and relative ease with current, sophisticated software. Security issues over posting grades on the Internet can be addressed effectively if instructors have access to WebCT, Bulletin Board or some other security protected server and they are given solid technical support.

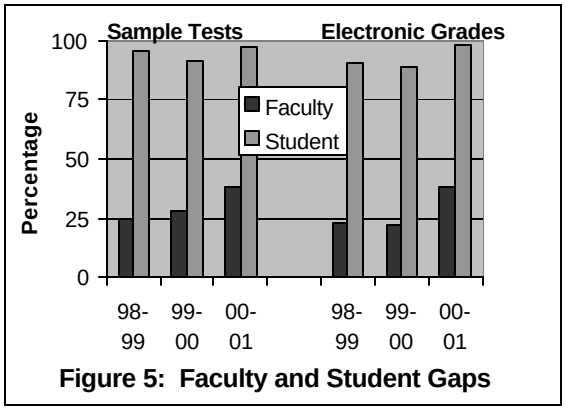

Figure 5: Faculty and Student Gaps

CONCLUSION

The research presented here suggests that people in academia, business and governments can benefit from recognizing that innovators and early adopters may not respond to adoption pressures. In addition, groups of individuals within organizations are likely to choose to adopt new technology at different times, levels, and rates and that their choices will be influenced by a number of factors most of which appear, for the early adopters, to be non-pressure forces. When the technology begins to penetrate an organization, pioneers pave the way for the mass majority of future technological adopters. All agents should not be expected to adopt at the same levels or rates as the pioneers, and technological non-adopters will likely challenge the activities of the pioneers while defending the use of their existing methods. Information can be gathered from the actions and interactions of all agents involved in the diffusion of technological progression. Mass adoption will likely occur after the technological pioneers can gain the knowledge needed to transform their experiences and the data they gather into information. This information can then be translated into majority action. At that time, the second-wave of adoption occurs. The challenges and defensive behaviors of technological rejecters can encourage technological adopters to evaluate continually the technological benefits and costs, and to improve the technology to increase the net benefits realized by all.

Once the organization's location on the technology diffusion timeline has been determined, and technological pioneers are identified, organizations can use these identifications to determine the needs of the pioneers and to establish non-defensive contacts between the pioneers and expected adopters. Individuals in academia, business and governments can then economize on their resources and increase the likelihood of achieving their technological goals while managing their budgets by letting the process of diffusion take place between the pioneers and second wave adopters.

REFERENCES

1. Brancheau, J.C. and Wetherbe. (1989, Fall). Understanding Innovation Diffusion Helps Boost Acceptance Rates of New Technology, Chief Information Office Journal, 23-31.
2. Cottrell, Janet. (1997, November 9). The Diffusion of Innovations: Applying Change Theory to Academic Computing. ACM SIGUCCS (Special Interest Group on University and College Computing Services)'97 Annual Conference, Monterey, CA. Available online: http://cit.uvm.edu/projects/Presentations/diffusion.jrc/
3. Ferrarini, Tawni and Sandra Poindexter (1999, June). Web Integration: Which Factors Significantly Motivate Faculty? Proceedings of ED-MEDIA 1999 International Conference, Seattle, WA.
4. Poindexter, S. and Ferrarini, T. (1999, February) Web Integration: Which Factors Significantly Motivate Faculty. Proceedings of 1999 Stop Surfing/Start Teaching National Conference, Myrtle Beach, S.C.
5. Peled, Alon. (2001, January). Centralization or Diffusion? Two Tales of Online Government, Administration & Society, 686-709.
6. Rogers, Everett M. (1995) Diffusion of Innovations. New York: The Free Press.