The Integration of Educational Technology in the University

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Abstract: The research literature in educational technology contains very little information on how university faculty respond to new technologies for the purpose of integrating them into their teaching responsibilities. Since the role of technology in the university is taking on increased importance in terms of student access and preparation in the employment of technologies, the use of such instructional innovations in university teaching becomes increasingly important. This paper examines the literature regarding the implementation of instructional innovations within the university and works toward a clearer definition of how instructional innovation takes place in universities. The paper concludes that faculty are key decision-makers in the implementation process and that the discipline of the faculty member appears to be influential in this decision process.

INTRODUCTION

As early as 1972 the Carnegie Commission recognized the importance of integrating educational technologies into higher education (cited in Carr, 1986). Many have called attention to the need for higher education to prepare to incorporate these technologies (e.g., Lielber, 1978; Boaz, 1982; Kelly & Anandam, 1984; Carr, 1986; Wartgow, 1986). The challenge is to combine all types of education to make a superior quality of higher education using technology. Yet, over twenty years later, educational technologists still express much concern that faculty in higher education have not integrated these technologies with day-to-day teaching activities (e.g., Heinich, 1984; Shrock, 1985; Cannon, 1983; Liebler, 1978; Harrington, 1977). In a recent teleconference regarding the involvement of faculty in providing distance education, which uses many of these technologies, administrators expressed frustration in working with faculty to develop courses using distance technologies.

The frustration is apparently not one-sided. Holloway (1985) noted that faculty often express feelings of being 'at the mercy of' media units. Shrock (1985) documented the suspicions faculty and educational technologists had of each other, and the problems these suspicions caused in implementing technologies in higher education.

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Kelly and Anandam (1984) and Heinich (1984) state that these technologies are threatening to faculty in that the very structures by which teachers teach and students learn may undergo drastic changes. In total, barriers appear to exist which have prevented the integration of educational technologies into university teaching.

The research tradition of instructional technology appears to contain very little information on how non-technologists relate to instructional technologies including adoption/rejection patterns (Shrock, 1985). The purpose of this study is to review the literature regarding the integration of educational technology into higher education and to provide a clearer picture of what WC do and do not know about how to effectively integrate technologies into teaching in higher education.

Educational technology is defined as both a product and a process (Romiszowski, 1981). Products refer to the equipment used in the provision of education and cover a wide spectrum from chalkboards to communication satellites. Process refers to the software produced such as overhead transparencies, videotapes, audioteleconferences, and computer-assisted instruction. The process by which these are produced, usually called instructional development, is also considered educational technology.

Little distinction appears to have been made between processes and products, and between specific forms of technologies. Some of the literature refers to educational technologies as 'instructional innovations,' grouping different educational technologies (e.g., video and computer-based instruction), processes (e.g., instructional design, course team approach), and strategies (e.g., pcrsonalized system of instruction, competency-based instruction) together. It was difficult to separate and distinguish these for the purpose of analysis.

The focus of this paper is educational technology in the university. The terms educational technology, instructional development, and instructional innovation will be used interchangeably. The term higher education will refer to the traditional university structure. Some of the literature has referred to the integration of technologies into community colleges. Community colleges appear to have a slightly different organizational tradition and have used technologies more readily in the provision of instruction. (e.g., competency-based learning). In addition, the university differs from institutions providing primary and secondary education (Kozma, 1985; Baldridge, 1983; Meyer & Rowan, 1983). These institutions differ from the university in many respects. Universities are more loosely-coupled than primary and secondary schools in defining the functions of their teachers. The amount of control exercised by clients of primary and secondary schools is greater than that found within the university. The governing structures differ as well. As will be demonstrated, thcsc factors appear to be related to the ways in which the organization responds to instructional innovation. Because primary and secondary schools and community colleges differ from universities with respect to these factors, comments made in this study do not extend to either of these sectors.

Much has been written about instructional innovation within some specific types of university programs such as teacher and medical education. While this appears useful in defining how innovation takes place within these disciplines, this literature is too narrowly focused to adequately address instructional innovation in the university organization as a whole.

In this paper, the term administrator refers to those people in the university who have management functions and do not have teaching among their primary responsibilities. Department chairpersons appear to be a hybrid of administrator and teacher and, therefore, are not included in this category of administrator. Educational technologists are those individuals responsible for the development of instructional hardware and software in the university but who do not teach as part of their primary university responsibilities. These include audiovisual specialists, computer systems analysts and programmers, video production specialists, and instructional developers among others. The term faculty refers to those who have teaching, research, and community service as their primary responsibilities. For the purposes of this paper the term integration will mean the use of educational technologies in routine instruction for which faculty are responsible. Some of the literature distinguishes between instructional innovations and other kinds of innovations which may take place in the university (such as administrative or curricular innovations). There is reason to suspect that differences may exist in the ways in which integration takes place for different types of innovations. Therefore, this study will be confined to the study of instructional innovations.

FACTORS RELATED TO NON-INTEGRATION

Various reasons have been cited for the non-integration of educational technologies. The literature has generally consisted of observations made by either administm-tors or educational technologists. As well, the integration problems in North American universities appear to exist in European and Australian universities (Cannon, 1983; Lallez, 1986; Jevons, 1984). In examining the literature, it was difficult to separate a potential causal agent from a symptom to get at the roots of the problem.

Cannon (1983) cited three reasons for the fact that after thirty years of recommendations for change in Australian universities it has not come about. They are: a) a failure to take into account the distinctive organizational pattern of the university; b) the characteristics and work patterns of faculty are not understood; and c) the forces to change teaching have been weak. In a survey to determine why faculty did not participate in teaching improvement programmes, many faculty indicated that good teaching was not rewarded in promotion and tenure decisions (Botman & Gregor, 1984). Liebler (1978) also noted that there were very few incentives for faculty to involve themselves in instructional development procedures. Lallez (1986) noted that university structures themselves may contribute to the problem. They have a long-standing and rigid tradition which is resistant to changes in educational technologies.

Wartgow (1986) notes that the conflicting value systems of administrators and faculty may also be another factor in the lack of integration. Forsythe and Collins in a report on the effect of new technologies on universities in British Columbia, noted that instructors involved in the course design process were not entirely happy with the great amounts of time and energy they expended in creating the instruction for an off-campus course using the technologies. The study recommended that faculty reassess their roles and adapt to the changes in learning which come about as a result of the presence of the new technology. In a study of the patterns of service to adult

learners, which included course delivery using educational technologies, Harrington (1977) noted that faculty would rather not change their instruction. Yet, when scarce funds were diverted to technology ventures, faculty expressed resentment. He also notes that extension courses which used technological delivery systems were met with stiff opposition but those which used faculty presented no problems. Faculty wanted such technology-based services kept away from the academic structure; preferably in the extension division. Shrock (198.5) noted that faculty perceived instructional development procedures as lowering the standards of the course and of the university in general. Outright sabotage and knowledge-hoarding were cited as ways in which faculty have thwarted the integration of educational technologies (Shrock, 1985; Rogers, 1975; Kozma, 1985).

Kelly and Anandam (1984) were more sympathetic to the reticence of faculty to change the structures by which teachers teach and students learn. Habermas (1973) defends the slowness of faculty to adapt to changes and technologies. External forces can pressure the university to assume an advocacy position for a technology. The act of academic deliberation and slowness of the university and its faculty are defenses against external pressures to swiftly adopt a technology without sufficient attention to the consequences of the adoption.

The availability of resources may be a factor in the integration as well. In studies of the diffusion patterns of instructional innovations within universities, the response most given by faculty for not adopting an educational technology was lack of resources (Kozma, 1985; Rogers, 1975). Although it has been suggested that the complexity of the technology may be a factor in its adoption, few authors treated this factor. Rogers (1975) suggests that other factors related to the specific technology may be more important in determining whether and how it becomes integrated into the university.

STUDIES IN THE INTEGRATION OF EDUCATIONAL TECHNOLOGY

Many have treated the integration of educational technology into higher education as a change problem. While the literature is filled with descriptions of the ways in which the university differs from other types of organizations and what this means in terms of initiating change in higher education, few research studies have documented how instructional innovation occurs in the university.

Rogers (1975) conducted the most comprehensive study found. He defined innovation as, "an idea, practice, or product perceived as new by the individual or some other adopting unit" (p. 17). The innovations were considered tracers whose diffusion into the university could be traced to illuminate the change process. The purpose of the study was to determine how four instructional innovations diffuse to and are adopted by university professors. Rogers provided an outline of the underlying theory of diffusion and adoption first presented in *The Communication of lnnovation* (for a complete description of this theory see Rogers & Shoemaker, 1971). There were three key populations from which data were solicited: requesters of information on IMPACT, secondary receivers of information, and tertiary receivers of information on the same

project. The innovations were sponsored by a major grant institution and were publicized to personnel in institutions of higher education who could apply to take part in the innovation project of their choice. The study used questionnaires and interviews to obtain information from 2,921 individuals who had requested information on IMPACT. Standard follow-up procedures were employed, and non-response was discussed in both the procedures and the results. Results were analyzed by the type of respondent.

Of the requestors of information, 57% were administrators and 43 % were faculty, the majority of both groups holding doctorates. Over half first learned about the project through the brochure which described the projects (54%). Diffusion to secondary receivers was more difficult to isolate using the data gathering techniques employed. Most secondary receivers were located in the same department in which the requestor resided. Those secondary receivers who adopted the innovation talked more with their colleagues about the innovation than did non-adopters. Personal discussion was by far the most pervasive form of diffusion activity engaged in by adopters. But secondary receivers did not normally hear about the innovation from requestors. Only 21% of the secondary receivers indicated that the requestor was the first source of the IMPACT information. More often they first learned of the innovation from the brochure (40%). Conversations between requestors and secondary receivers were casual, and over half said the conversations regarding the innovation were informational rather than persuasive in nature. There was little effort by the requestor to encourage the secondary receiver to adopt the innovation. Only 6% of the secondary receivers adopted the innovation. Those secondary receivers who adopted differ horn other secondary receivers who did not adopt in that they were: a) more likely to take on more than one IMPACT innovation; b) had shorter tenure at the university; c) showed greater innovation in using teaching methods; d) were slightly older; e) held more doctorates; l) consisted of more administrators; g) were in universities in which there were greater rewards for teaching; h) were in institutions with smaller enrollments; and i) were slightly higher on the Gorman Scale for rating universities on academic achievement. Secondary receivers and requestors were similar with respect to personal and institutional characteristics as well as discipline. Secondary receivers talked to tertiary receivers 38% of the time and normally were in the same department as the requestors and secondary receivers.

Rogers had suspected that the complexity of the innovation (in this case, computers) would be a barrier to diffusion. However, lack of diffusion does not appear to be related to lack of experience with the computer but with other related factors (e.g., programming languages, processes employed, administrative support). Some evidence was found to support lack of compatibility with existing computer systems to be a factor. Rogers summarized the apparent resistances and barriers to diffusion as being: a) lack of funds; b) lack of time; and c) lack of trained personnel.

Using Rogers' (1975) study as a basis and examining IMPACT and LOCI innovations, Kozma (1985) described the way in which faculty become aware of new ideas and technologies in teaching, and decide whether to adopt/disseminate them further into the institution. He identified four different frameworks commonly used to examine innovation: a) complex organization framework — the decision to innovate is made by those in positions of authority in response to external pressures; b) conflict framework

— different groups within the system hold diffcrcnt interests which are resolved through a confrontational process; c) diffusion model — the presence of an innovation in the system starts the change process and the rate of its diffusion into the system depends on the characteristics of the adopters and of the innovation; and (d) planned change — a plan for change is developed by a change agent (opinion leaders are central to the process because of the influence they have on others in their system), and change is reached through interpersonal processes to facilitate communication, joint decision-making, and to reduce tension and conflict within groups. Kozma used theoretical sampling to determine whether the dam supported any parts of these frameworks.

Twenty-six cases which received IMPACT or LOCI support were analyzed. Data were collected using field and telephone interviews with 145 persons in 28 institutions, and examining institutional catalogs, project proposals, reports, and other documents. Kozma reached a number of conclusions.

a) Innovation is evolutionary — new instructional practices are built on past practices and experiences of instructors, and with familiarity with similar innovations. A corollary is that innovations which were adopted appear to be alternative expressions of attitudes, values, preferences, and philosophies embedded in previously used techniques.
b) Innovation is not easily distinguishable from previous practices unless pronounced resources are needed. Innovations were rarely implemented in addition to the faculty member's regular activities.
c) Adopters appear to fall into two categories — personal and collaborative;
d) Most innovations were the result of personal decisions on the part of the faculty member — 'individual adoptions'. These people tended to be relatively isolated and did not have positions of organizational responsibility nor extended interpersonal networks within the organization.
e) For most cases, the decision to adopt was personal. Reasons for individual adoption of an innovation are egocentric and relate to personal rather than institutional concerns.
f) Individual adopters did not fare well with the innovation after external funding was withdrawn.
g) Collaborative adopters differed from personal adopters in that they involved others in their decision.
h) The motivation for collaborative adopters is an identified need in the group or organization.
i) In its dominant form, instructional innovation is an internal process of personal or professional development.
j) Instructional improvement centres can play a part in the innovation process.

Kozma also made two observations regarding innovations, faculty, and the university organization. The university organization in its present form elevates the personal motivations and attitudes of faculty members and decreases the importance of organizational needs for innovation. Further, teaching and accountability are not normally linked. He concludes that more institutionalization is needed for increasing innovation.

However, the call for instructional improvement centres and more institutionalization did not appear to have grounding in the data presented in his paper. Kozma concluded that these results invalidate some change frameworks. The planned change framework appears not to take into account the ways in which faculty members decide to alter their teaching. Rather the adoption process appears to be one of the teacher matching the components of the innovation with similar, previous teaching practices. In addition, a conflict model of change does not appear to go along with the types of collaboration described by respondents in the study. No cases of resistance to innovation were found among the participants.

The studies of both Kozma and Rogers contain the most comprehensive data found regarding the integration of educational technology into the university. The purposes of these studies are admittedly to describe how an innovation is naturally diffused throughout the university. Since faculty who did not receive information on these innovations were not studied, the question arises as to whether these findings represent the way in which most faculty respond to the change process.

Shrock (1985) conducted a naturalistic study for the purpose of gaining information as to how non-technologists view instructional technologists and the instructional innovations they espouse. The study took place at an unidentified university which had acquired federal funding to convert its curriculum to a competency-based form of instruction. Data were collected through observations of workshop presentations, structured interviews with workshop participants and with workshop consultants, and examination of participants' products, records of participants and workshops, and grant correspondence files, (through unstructured interviews with grant administrators and instructional development personnel, and informal observation and conversations).

As this was a naturalistic study, certain themes began to emerge as the data were collected. Many faculty were in the program only for the monetary stipend paid and had no intention of using the materials in their classes. Faculty viewed the grant administrators as outsiders and resented the intrusion of the grant personnel into how they conducted classes. Grant personnel regarded many of the faculty as lazy and inflexible. Great amounts of hostility were present between the grant administrators and the faculty, and instructional development was associated with other environmental stressors (cutbacks and faculty layoffs). Faculty expressed resentment towards the 'lavish' funding the instructional development program received and the power it gave grant administrators. Grant administrators considered the lack of facility with instructional development to be an informational rather than an attitudinal problem and based their strategies on this assumption. They appeared to neglect the role of affect in the adoption of innovations, and offended faculty. A substantial number of the faculty rejected instructional development and instructional technology. Shrock notes that the results were different for different faculty members but does not elaborate on these differences. She limits the generalizability of her study since it is naturalistic, but her data paint a picture of faculty as a powerful force in the change process.

Liebler (1978) surveyed the utilization of instructional development in higher education in the United States. Chief academic officers of universities in several selected states were requested to indicate if their institutions used an instructional development process. One hundred and thirty institutions (81%) replied of which 38

indicated initially that they did not use instructional development procedures. Follow-up telephone interviews with these 38 resulted in changed answers, which indicated to the researcher that there may be a lack of understanding on the part of the chief academic officer regarding the functions of instructional developers. Only 15 institutions indicated that they used a complete model of instructional development. Responses indicated that very few faculty members were involved in the process, and little incentive was offered to faculty for their involvement in the instructional development process. Most institutions still follow a traditional pattern of audiovisual and curriculum planning in which aids and materials arc developed after the lessons have been planned. Since faculty are considered central to the instructional development process, the author expressed concern that after ten years of work to integrate it into universities so few were involved with the innovation. He concludes that key administrators must support instructional development if it is to become an integral part of the university. However, this conclusion does not appear to be substantiated in his data.

Botman and Gregor (1984) addressed instructional development in teaching improvement programs. They used a variety of data collection techniques to develop a picture of faculty participation in these programs. The respondents indicated that good teaching was not rewarded in promotion and tenure decisions as much as was research. In communicating the workshops to other faculty, word of mouth was considered the most effective means. The findings indicated that faculty in different disciplines held consistently different views of teaching. The authors also noted that if attitudes toward teaching are discipline-specific, then it is reasonable to assume that heads of units will reflect the attitude espoused by the discipline. If heads of units are used as change agents, this may present difficulties for the change process.

In a case study documenting the introduction of satellite technology into higher education in British Columbia for the purpose of providing distance education, Forsythe and Collins (1983) presented the models employed for course development and described the processes and institutional involvement. The study dealt with the interaction of institutions and faculty with satellite technology and with the 'systems approach' (instructional development) used to develop courseware. Data were collected using interviews with senior administrators concerned with distance education. Information was obtained regarding faculty involvement but it is not clear from the report how this information was obtained. Although the instructors agreed that the produced course was much superior to the traditional offering on campus, they were not entirely happy with the great amounts of time and energy they were required to expend in creating the instruction for an off-campus course using the technologies. The project used a 'course team' approach which differs from the ways in which faculty personally design their courses in that they work with a team of experts. This procedure may have influenced the responses of the faculty to the technology and systems approach.

Many researchers appear to regard instructional development procedures as innovations which offer faculty more effective organizing procedures for their instruction. There is also the assumption that faculty do not engage in these procedures. Kerr (1981) questioned this view and studied the ways in which teachers design their instruction. He notes that teachers normally have no formal training in instructional development procedures and find it difficult to use these procedures when asked to do

so. This does not mean that teachers do not have an approach to designing their materials. Rather, they have their own ways of proceeding although these vary greatly between teachers. He refers to their efforts as 'naturalistic design procedures.'

In total, the studies which have been done to date about the integration of educational technology into the university seem to agree that: a) integration efforts have not been very successful; b) faculty individually and collectively appear to be autonomous; c) rewards provided by the university do not appear to encourage faculty to become involved with educational technology on an on-going basis; and d) faculty themselves appear to be the primary decision-makers regarding the integration of technologies into their instruction. Several concluded that more support for change is needed from administrative levels and that strategies employed for integration should include teaching improvement centres. As will be demonstrated, administrative support and teaching improvement programmes may not be as effective as one might think. The ways in which faculty think and act may diminish the value of these approaches for the integration of educational technology.

THE ROLE OF FACULTY IN INTEGRATION

Much of the literature found regarding university faculty reinforce the conclusion that faculty respond more to their own initiatives to change than to administrative initiatives. Ikenberry (1972) noted that the decentralized nature of the academic enterprise affords faculty significant power. The university is characterized by the institutionalization of discipline differences and a weak system of coordination of these disciplines. These differences are highlighted and supported in the university; integration is not emphasized (Lane, 1985). Rugg, Warren, and Carpenter (1981) studied faculty orientation toward goals of the university using the Institutional Goals Inventory. The results demonstrated differences along the lines of discipline. Unity across all faculty was found regarding the importance of the teaching and research functions and the importance of sufficient economic support to attract and keep qualified faculty. On most other points faculty differed, including their perception of the importance of non-traditional education (off-campus learning). Education faculty were more predisposed to this goal than were faculty in business, arts, humanities, science, and mathematics.

Kozma (1985) noted that the university organization in its present form elevates the personal motivations and attitudes of faculty members and decreases the importance of organizational needs for innovation. Further, teaching and accountability are not normally linked in the university. Cannon (1983) stated that the university cannot be examined as a monolithic structure which will respond uniformly to change but must be approached as a heterogeneous organization. Because faculty are strongly allied to their disciplines, "the relationship between individuals, departments, and faculties in other universities is often more important, stronger, and more active than intra-university relationships" (p. 23). Faculty may identify more with goals expressed by others in their own discipline in other universities and less with the goals articulated by the university in which they are employed This point is almost always overlooked by change agents in universities.

Clark (1983) refers to this system as an 'organized anarchy'. The working and relating patterns of academics in a given discipline are constructed and arranged by the academics themselves rather than by forces external to the discipline. Change flows within a discipline and through individual works it permeates the discipline. Thus, the discipline appears to be the unit which both resists change as well as generates change. Faculty in one discipline do not normally interfere with changes in another discipline in the same university. Units can independently prosper or die. The means for change, then, are found within this 'understructure' of the university rather than at the upper orgauizational levels. Clark notes, however, that while the balance of power may appear to consistently reside within the understructure, external forces to the university may at times shift this balance in favour of the upper levels. Declining enrollments and decreased economic supports may be seen as forces which shift the power to initiate change to upper, more centralized levels. It may be that under such conditions faculty will respond more readily to change initiated at administrative levels.

The way in which faculty members perceive their roles as teachers and the privacy they attach to their teaching may influence their openness to instructional innovations. Rogers (1975) noted that the faculty member's need to be a lecturer is negatively related to being an adopter of the innovation. As previously noted, faculty in Shrock's (1985) study resented the intrusion of grant personnel into their classrooms. What occurs in the individual classroom is considered private by many faculty, and decisions about what will occur are considered individual and private It would appear that the university coordinating structure has little influence on the way in which faculty elect to design courses (Dowdeswell & Good, 1982).

The observations of Kozma (1985) and Rogers (1975) reinforce the conclusion that the discipline appears to be a meaningful unit for the faculty member in the change process. Faculty in both studies appeared to have more contact with others in their discipline than with other faculty. Not surprisingly, they also have more contacts with other faculty than with administrative staff (Cannon, 1983). Shrock (1985) also noted discipline differences in passing. In total, it would appear that faculty: a) have more autonomy in their work as afforded by the way in which the university is structured; b) engage in communications with others in their discipline much more than they do with those outside of the discipline; and c) hold similar values to other faculty in their discipline with regard to teaching, research, goals, and standards. The discipline of the faculty member appears to be a stronger influence on their thoughts and actions than is the university structure, and instructional innovation appears to be a matter of personal choice influenced by the discipline rather than the university. This suggests that if a fuller integration of educational technology is to be achieved in higher education, efforts should focus on the individual faculty member and the discipline. A strategy of global integration into the organization may not be appropriate for a university.

FACTORS RELATED TO THE TECHNOLOGY

The characteristics of the innovation may also help to explain why some educational technologies are adopted and others rejected. Fewer researchers treated this

variable although common sense would indicate that the interaction of the innovation with the client would be a factor worthy of attention. It is important to assess an innovation in terms of its: a) relative advantage; b) compatibility; c) complexity; d) trialability; and e) observability (Rogers, 1975). Kelly and Anandam (1984) note that various technology vendors will use 'haphazard, piecemeal, and erratic' means of making a sale to the university, and these might not necessarily be compatible with the existing organizational needs. The development of a technology in the university must be considered evolutionary. As well, human needs should have preeminence, and technologies should not be imposed. Rogers (1975) noted that little modification of the innovation appears to take place once it is adopted, which does appears to be related to differences in disciplines. There seems to be a relationship between the discipline of the inventor and that of the requestor in the decision to adopt. Again, this reinforces the lines of discipline as being a major factor in the adoption of a technology. If the innovation was developed within the discipline, others in the discipline might be expected to adopt it. The perceived relative advantage of the innovation is related to its rate of adoption. Rogers concluded that the compatibility of the innovation with existing beliefs and practices was not a factor in the decision to adopt. However, Kozma (1985) found a relationship.

As faculty hold value systems which may differ from those of university administrators, Kelly and Anandam (1984) caution that the cost-effectiveness of a technology should be weighed from several different viewpoints before identifying this as a relative advantage in adopting it. Cost-effectiveness is a subjective concept with different interpretations. An administrator's definition of cost-effectiveness may threaten the teaching and research values held by faculty members and create conflict situations.

Technologies are never adopted alone but are accompanied by 'systemic effects'. That is, the presence of the technology in the university may result in a change in organization of the university's resources and functions. Lallez (1986) noted that when one adopts an innovation, one also adopts the culture of the innovation. They bring with them an entire interrelated set of life-cycles, standards of conduct, interpersonal relationships, social representations, images of the world, views of life, and a plethora of ambitions and desires. The culture of the innovation consists of those administrative and resource structures and practices which are associated with the innovation. The course team approach is an example of an innovation culture. It is not a physical part of other technologies but has been extensively accepted as the method by which software should be developed. Other examples of innovation culture are found in the divisions of personnel in computer service units and in television production centres. Changes in the balance of power are often a part of this as well, as noted by Shrock (1985) and others. Service units responsible for a technology may become vested with power and resources which generate the feelings of frustration described by Holloway (1985) and result in new power relationships and games. Wartgow (1986), in discussing obstacles to non-traditional learning, notes administrators might be better off spending time analyzing the symbolism and perceptions of various decisions related to non-classroom learning and in assessing the relative compatibility of the particular activity with the 'culture' of the institution than dealing with straight cost-effectiveness calculations.

Forsythe and Collins (1983) address the university culture/innovation culture interaction in their recommendation: "The coming of the new technology presents new challenges for educators and changes the nature of their task. There is a need for educators to reassess and redefine their roles, to be open to adaptation, and, to, themselves, be prepared to learn" (p. 43). "There needs to be increased co-operation amongst educators, instructional designers and media producers; a willingness to share knowledge and expertise and an openness to learning" (p. 46). Their recommendation is that the university culture change to incorporate the culture of the innovation. Smith, Daniel, and Snowden (1984) were also describing the university culture/innovation culture discrepancy when they noted that while traditional academia is informal and collegial, distance education is highly centralized and requires a more directive style.

As important as the interaction of the innovation culture with the university culture is the interaction of the innovation culture with the student culture. Students have learned to learn in certain ways which the technology may alter. The effects of this interaction on students is important in making the decision to innovate. In judging a technology, then, Lallez suggests that "its significance does not lie in its technical features and one cannot appreciate and judge its cultural consequences from that point of view" (p. 188).

Earlier in this paper the impact of the discipline was treated as an important factor in the decision to integrate technology. As each discipline has its own set of values for teaching and research, it can be argued that each discipline has the potential of forming a separate culture within the university culture. Lallez's suggestion that the compatibility of the technology culture with the university culture be examined may extend to disciplines as well. Those elements which compose the technology culture may merit examination in terms of its compatibility with the discipline culture.

RESOURCE ALLOCATION FOR INTEGRATION

As the innovation has a potential effect on the culture of the university, it has a more obvious effect on the allocation of resources within the university. Lallez (1986) notes that one reason to employ these technologies is to compensate for shortage of material, financial, and human resources. He refers to the integration of technology as being an 'educational capital gain,' which can have an effect on the internal resource structure of the university as well as on the external resource relationships. It is rare for a technology to be completely under the control of the organization of which it becomes a part. There are always spare parts or additional pieces or new relationships formed with external bodies for the purpose of fostering the technology. Technologies, then, might be viewed as perpetuating a capital-intensive rather than labour-intensive resourcing plan. Wartgow (1986) recommends that administrators not become lost in the accounting and budgeting for innovations but rather maintain a perspective that recognizes educational technology within the larger context of academic program development. Williams (1966) also cautioned that too much central budget control can hinder innovation. Kelly and Anandam (1984) recommended giving people who experiment with the innovation full monetary and moral support through failures and

through successes to enable them to identify how the innovation might work best in the university.

Kozma (1985) stated that lack of resources was the primary reason given by faculty for not adopting an innovation. He also noted that individual adopters did not fare well after external funding was withdrawn. This obviously demonstrates a need for on-going resource support for an innovation. The question arises as to how much alteration of resource allocation patterns is acceptable in the name of innovation.

Hackman (1985) observed that investment of resources into separate service units (such as television production centres, computer services, audiovisual centres) may be detrimental to the existence of the unit. She distinguished between core and peripheral units in the university. Core units are defined as those whose functions are central to the mission of the institution. Academic departments engaged in teaching and research are examples of core units. Peripheral units arc non-central and often include the administrative and support services of the university. Core units appear to be more stable. She noted that peripheral units become regarded as optional and are vulnerable in that they are the first to be cut back when funding becomes scarce. Separate service units for educational technology can and have suffered this fate in a number of institutions.

Taken together, the observations of Hackman (1985), Wartgow (1986), Williams (1966), Kelly and Anandam (1984), and Kozma (1985) build a case for flexibility in resource allocation with more authority for resourcing vested in the substructure. If core units are more stable as Hackman observes, then it may be appropriate to consider a resource allocation plan for educational technology which would facilitate the development of the technology within core units rather than setting up a separate cost-centre. This might encourage experimentation and adaptation to individual and discipline-related teaching values.

DISCUSSION

There is wide agreement that the university structure differs from other formal organizations in the amount of autonomous decision-making granted to faculty and disciplines. A great deal of support was found for the conclusion that decision-making for instruction rests with the individual faculty member rather than with departmental or other administrative levels of the university. Therefore, the decision to integrate technologies into higher education appears to rest with individual faculty.

Values held by individual faculty appear to be strong determinants of adoption patterns. Several sources indicate that the beliefs and previous experience of the faculty member strongly influence the decision to use a new technology in teaching. The discipline of the faculty member appears to be the significant unit of influence on faculty teaching and research values. Academic standards, teaching practices including acceptable technologies, and rewards in the form of acceptance by colleagues appear to be determined within the social structure of the discipline. Affiliation with the discipline appears to be stronger than affiliation with the university and extends into other universities. If opinion leaders of a group make a difference in the adoption of an innovation as Rogers (e.g., 1975) suggests, then it may be necessary to look beyond the

immediate institution to identify opinion leaders for a given discipline and to work with them to initiate change.

The university's influence on teaching practices appears to be minimal due to the rewards it gives for teaching and due to the factors described above. But there are indications that this balance may shift in favour of the university when external pressure is applied (e.g., during times of economic hardship) (Clark, 1983; Rutherford, Fleming, & Mathias, 1985). Given such circumstances, it is possible that faculty will be more receptive to technological changes originating at the administrative level of the university.

The characteristics of the educational technology appear to be important factors in the integration process. The more the technology is similar to and compatible with the beliefs and teaching experience of the faculty member, the greater likelihood that the technology will be adopted. This could explain why, when so many other new technologies have failed, microcomputer technology has enjoyed widespread acceptance by faculty. The compatibility of the technology with the teaching tradition of the discipline also appears important. It was noted that innovations developed within a discipline appear to be more readily adopted by others in that discipline.

It was pointed out that an innovation culture is adopted in addition to the innovation itself. In the process of integrating the technology the university may find itself integrating processes and relationships associated with the technology. A prime example of this is the course team approach to the design of instruction, which is not a part of the technology but is strongly associated with it. It would appear important to be aware of the discrepancies between the university, discipline, and technology cultures and to determine what kinds of compromise are appropriate to maintain meaningful value systems for higher education. Resourcing patterns for the technology may as well affect the integration of the technology. The decision to place technologies in separate service units may be immediately rewarding to the administrator but may inhibit integration and place the technology in vulnerable positions in the university. The empty television studios in universities are monuments to this tactic. Development of the technology within academic units may be a more sound approach to educational technology within the university.

Much of the literature specifically examined workshops and teaching improvement centres as strategies for change. These have met with mixed reaction from faculty. Shrock (1985) cautioned that the use of such strategies is based on the assumption that faculty will use the technology if they are provided the knowledge and skills to do so. This does not take into consideration other potential reasons for non-use such as attitudes and environmental problems. It appears probable that these other reasons may account for the lack of faculty involvement more than lack of skill and knowledge.

In total, it would appear that within the university prospects for integration of educational technology are limited if a global strategy alone is utilized. Strategies for integration should be formulated for each separate academic unit and take into account the value systems of the discipline.

It is obvious that much more work is needed to determine how the integration of educational technology into the university is best accomplished. A number of change models have been examined for use in higher education (e.g., Wartgow, 1986; Kozma,

1985; Rutherford, Fleming, & Mathias, 1985; Clark, 1983; Kelly & Anandam, 1984; Swanson, 1983; Dill & Friedman, 1979; Rogers, 1975; Bennis, 1976; Havelock & Havelock, 1973; Rogers & Shoemaker, 1971; Lippitt, Watson, & Westley, 1958). While much has been written, it would appear that more systematic examination of the problem is warranted. There is a need to develop working hypotheses which can more accurately describe how educational technologies are integrated, and to more accurately describe how integration naturally takes place. Various models of change merit further systematic examination of their effect on the adoption of educational technologies within the university. The literature suggests definite directions for further research but more is needed before a paradigm for the integration of educational technology into the university can be more accurately described.

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