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ABSTRACT

A field study was designed to explore the processes involved with the assimilation of computers into the K-12 instructional program in the state of Washington. The study examined patterns of microcomputer adoption and implementation in both rural and urban school districts. Specific research objectives were to describe: (1) actual computer adoption processes; (2) actual computer implementation processes; and (3) the relationship of these two processes to theoretical models of educational innovation. Three theoretical models of the innovation process were examined: (1) research, development, and dissemination model; (2) social interaction model; and (3) problem solving model. Two important findings were that educators were more concerned with the feasibility of the innovation than with its potential for improvement of instruction and that the implementation process itself tended to change the innovation. While the theoretical models were useful in understanding the change process, the models were more normative than descriptive. The report concludes by proposing seven additional research hypotheses for future research. (CB)

MICROCOMPUTER ADOPTION AND IMPLEMENTATION PATTERNS IN TWO SCHOOL DISTRICTS IN WASHINGTON STATE

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ABSTRACT

Microcomputer Adoption and Program Implementation: Change Models and Change Agents

Microcomputers, along with related hardware and software, are being increasingly introduced into the school districts in the State of Washington. The research question accompanying this phenomena is quite important: "Is this an example of unplanned change or an example of planned instructional innovation?"

This field study was designed to explore the processes involved with the assimilation of computers into the K-12 instructional program. It examines patterns of microcomputer adoption and implementation in two kinds of school districts -- rural and urban. Specific research objectives were to describe: (1) actual computer adoption processes; (2) actual computer implementation processes; and, (3) the relationship of these two processes to theoretical models of educational innovation.

Microcomputer implementation is an example of educational change. In order to conceptualize the change process, the sources of change and the decision-making processes, as they relate to the choice of a particular adoption, must be understood. Three theoretical models of the innovation process are examined. (1) Research, Development, and Dissemination Model: According to this model, change involves a rational sequence of steps beginning with the discovery of an innovation, its logical development, the production and packaging phase, and then its dissemination. Major flaw: the a-priori assumption of rationality. (2) Social Interaction Model: This model describes the diffusion of innovations by the examination of social patterns keying on "adopters". Major flaw: the temporality of the major actors. (3) Problem-Solving Model: Innovation is seen as a solution for a perceived user need, with the impetus for change coming from outside the organization. Major flaw: the "solutions in search of problems" quandry.

Two important generalizations arising from the field study, which are compared to the theoretical models are: (1) educators are more concerned with the feasibility of the innovation than with its potential for improvement of instruction; and, (2) the implementation process, itself, tends to change the innovation. The theoretical models, while useful in understanding the change process, are more normative than descriptive. Innovation involves the systematic allocation of resources based to some extent on values, which in turn implies an important political perspective. A political perspective would allow a more pragmatic explanation of innovation because it includes the portion of the decision process based on social value systems.

Seven research hypotheses are proposed, based upon the following major findings in the study: Ambiguity in the implementation process is linked to ambiguity in the adoption process, which is a reflection of ambiguity concerning educational-computer goals, and "planning" then becomes the rationalization of the adoption decision.

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MICROCOMPUTER ADOPTION AND IMPLEMENTATION PATTERNS IN TWO SCHOOL DISTRICTS IN WASHINGTON STATE

Introduction

In the early 1980's, microcomputer hardware and software was introduced into many school districts in Washington State. Was this an example of unplanned change or was this an example of purposeful instructional innovation? A study was undertaken to provide insights into this question and to provide an interpretation of the microcomputer adoption phenomenon. Specific objectives of the study included contributions to (1) an understanding of the decision to utilize microcomputers, including identification of the participants in the decision, (2) an understanding of the process of assimilating microcomputers into the instructional program, and (3) an understanding of the process of educational change itself. A major purpose of the study was to generate hypotheses for further research.

Methods used in this report include the development of a conceptual framework which distinguishes change from innovation. Three models of innovation are identified and described in this framework in order to assist in the interpretation of study findings. Data relevant to microcomputer implementation, in the form of interviews with school district personnel, was collected from two

non-similar school districts, and is presented in the form of a narrative.

A discussion of the similarities in the adoption and implementation patterns in the selected school districts is included. An analysis of the relation between these patterns and three existing models of innovation is provided. Some conclusions and hypotheses are derived from this analysis.

The study design is qualitative in nature; there was no intention to quantify the results or to imply that the results are generalizable. The intention was to identify some processes that are present, and to contribute to knowledge of variables involved so that further studies could explore these factors. It is important to note that the study was not designed to evaluate the educational uses of microcomputers, nor was it designed to evaluate the quality of the implementations in the selected school districts.

Innovation and Change

The introduction of microcomputers into the school environment is an example of educational change. While change in itself implies neither planning nor direction, innovation implies both. In order to conceptualize innovation, it is important to distinguish between the subprocesses of adoption and actual implementation. Adoption is the decisional process that associates the

school district with the innovation: it is the announcement of intentions. Implementation is the actual placement of the innovation in the instructional process. This distinction is important because many innovations are adopted but never implemented (Neale, Bailey, and Ross, 1981).

Morrish (1976) presents three models that contribute to a theoretical understanding of the innovation process: (1) the research, development, and dissemination model, (2) the social interaction model, and (3) the problem solving model.

The Research, Development and Dissemination Model: According to this model, change involves a rational sequence of steps beginning with the invention or discovery of an innovation, followed by development, then production and packaging, and finally dissemination of the innovation (Morrish, 1976). This model stresses the role of the innovation developer, and the one-way dissemination of information in the direction of the adopter. Descriptively, this model assumes that innovations constitute rationally implemented change.

The Social Interaction Model describes the diffusion of innovations by the examination of social patterns. For example, an early adopter (in this case a cosmopolite) may have encountered an innovation at a national meeting. This "cosmopolite" then spreads the innovation within his/her organization (Morrish, 1976). A weakness of this model is

that it fails to account for the selection of innovations, at what rate they are implemented, and the durability of the innovation (Morrish, 1976). Many innovations are diffused into the school system, but few are implemented.

The Problem Solving Model examines change from the standpoint of the user. Innovation, then, is a solution for a perceived need, and is implemented by a series of steps with an outside consultant acting as a catalyst (Morrish, 1976). For example, the administrators in a school district feel that their high school science program is weak. A consultant is hired, who recommends a new science textbook series as the solution to the problem.

Bayview School District

Bayview is a small city in Western Washington, with a school district enrollment of approximately 10,000 students. Bayview first became involved with microcomputers through some isolated early adoptions and implementations at the high school level. A background of pressure for implementing microcomputer use from teachers, parents, and the community resulted in the formation of a microcomputer review committee in December of 1982. This committee reported directly to the assistant superintendent level of the school district administration.

The actual decision to adopt microcomputers stemmed from the attendance of Bayview administrators at national conventions which featured reports of "successful"

microcomputer implementations in major school districts. On the basis of this demonstrated feasibility of implementation, the superintendent decided it was time to "go ahead" with microcomputers.

Additional committees composed of teachers, principals, administrators and consultants were formed to develop recommendations concerning (1) instructional uses, (2) management uses, and (3) community, staff, and miscellaneous uses. The committee approach was intended to secure broader involvement within the school district, and to methodically and deliberately develop their recommendations. These committees reported to the original microcomputer review committee, which reported to the assistant superintendent, thus creating a hierachical structure.

The elementary schools in the district were required to justify the allocation of resources for microcomputers: before funds were made available, each school would complete a "Microcomputer Implementation Plan." This policy was the result of administrative sensitivity to the relatively high national test scores in the elementary schools. Specific problems other than academic achievement would have to be identified as targets for microcomputer use. In addition, administrators felt that these plans would lead to the identification those individuals best able to facilitate the implementation. The plans would stimulate the commitment in each school to their microcomputer plan.

Considerable effort was expended at the school, committee, and administrative level in the discussion and documention of student learning objectives, which were stated in the form of specific microcomputer applications. The committee also developed an elaborate plan for continuing inservice training and course development. Topical areas include wordprocessing for classroom and management uses, the development of problem solving skills, computer awareness for parents, and computer assisted instructional applications. Teacher skills, support material, and hardware selection were seen as important but subsidiary factors in the planning process.

The clearest statement of the intended uses of microcomputers was found in a document produced for a "computer tour" by members of the Bayview board in February of 1985. This tour was organized by the administration in response to board interest in the utilization of the allocated resources. With over 300 computers in the schools (see Appendix A), Bayview devoted considerable monetary and organizational resources to the implementation, in addition to the time spent by numerous school system personnel.

Grass Valley School District

The Grass Valley School District, with an enrollment of about 100 students, is located in rural Eastern Washington. Original school district consideration of implementation

occured due to pressure from the School board chairperson whose child showed an interest in microcomputers.

In response to pressure from the chairperson, the superintendent formed a committee of parents, teachers, board members, and interested members of the community to "scout" computer usage in other school district. While no formal, written policies were produced, the committee recommended the purchase of 3 computers to "get computers in use."

After this initial purchase was made, two teachers began using computers for word processing and computer assisted instruction. A grant was written for 3 additional computers. Currently, eight teachers are making substantial classroom use of microcomputers in several curricular areas, including vocational education, programming, computer assisted instruction, and word processing for writing term projects in history.

Although not intended by the committee, Grass Valley now has 9 computers of 3 different, incompatible types. This is seen, by the administration, as an advantage because students gain exposure to a wider variety of hardware and software.

Concepts that are viewed as important to the implementation include (1) the close involvement of at least a few teachers, and (2) inservice. Several on-site inservice programs were conducted; these were important to

the expanded implementation, as perceived by the superintendent.

Analysis

There are some obvious differences in the scale of the implementation, due to the sizes of the two school districts. Bayview purchased over 300 computers, and developed an elaborate series of inservice programs; Grass Valley purchased 9 and conducted a couple inservice programs. Despite these differences, there are some remarkable similarities in the patterns of microcomputer adoption and implementation:

1. Both school districts experienced internal pressure from teachers and students, and external pressures from community members to adopt microcomputers.

2. In both cases, committees were used to control the rate of implementation. In the case of Grass Valley, the purpose of the committee, from an administrative point of view, was to "slow down" the implementation. In the case of Bayview, the purpose of the committee was to ensure a formal, deliberate process, which had the same effect.

3. In both cases, the clearest statement of the intention of the microcomputer implementation came after the implementation occured. In the case of Bayview, this was in the form of the "board Tour" document. While no documents exist in the Grass Valley case, it is apparent that the intentions grew along with the implementation.

4. While no attempt was made to evaluate effectiveness, the perceptions of personnel in each school district is that the two microcomputer implementations were successful.

The Bayview implementation, despite some minor timing differences between individual schools, was accomplished in a single step. The Grass Valley implementation occurred in a more flexible, fragmented manner. Political pressure in Grass Valley forced an early, limited adoption.

While each elementary school in Bayview was required to develop its own plan, the results of the implementation for all schools is remarkably similar (see Appendix A).

Applicability of the Change Models

In the case of Bayview and Grass Valley, the three models, while useful in understanding the change process, are more normative than they are descriptive. A possible reason for their lack of explanatory power is that we tend to underestimate the social complexity of change (Fullan, 1982). An accurate model needs to account for the failure of some planned changes, as well as the differing rates of implementation.

The Research, Dissemination and Diffusion Model assumes that innovations are implemented rationally, yet many sound innovations are adopted but not implemented, and many innovations skip the planning steps and are spontaneously implemented. In the two cases studied, a rational series of steps is not apparent.

Similarly, the Social Interaction Model fails to account for the selection of inovations that are actually implemented, at what rate they are implemented, and the durability of the innovation (Morrish, 1976).

The Problem Solving Model describes innovation as a solution to a problem. Yet microcomputers may well be a solution in search of a problem. Solutions are not necessarily connected to problems, and the presence of both is inadequate to explain change (March and Olsen, 1979). In both school districts studied, the perceived problem focused more on the feasibility of implementing microcomputer use than it did on solving specific educational problems.

The purposeful nature of innovation implies assessment in relation to educational objectives, and a concern with improvement of instruction. Ambiguity of the educational objectives of microcomputer use, as experienced by the two school districts studied, illustrates the difficulty of applying these models. Further, it may be a mistake to assume that planning is directly coupled to outcomes (Weick, p. 1). Analysis of innovations, then, must reference the contextual intentions of the participants. An example of this is the important role of the board chairperson's child in the Grass Valley adoption.

The adoption process in the two school districts studied involved the change in values of the administrative leaders. The form of this change was acceptance of the

association of the school district with the microcomputer innovation concept. In the case of Bayview, the superintendent accepted the concept when presented with evidence of peer acceptance. In the case of Grass Valley, political pressure caused the superintendent to accept the concept, at least in a limited way.

Rational models are inadequate to explain planned change because they fail to account for people's values. If innovation involves the systematic allocation of resources based to some extent on values, a political perspective is implied. Such a perspective would allow a more accurate explanation of planned change because it includes the portion of the decision process based on social value systems. Thus the three rational models are inadequate to explain innovation because they fail, to some extent, to account for people's values and associated political activity.

Two important generalizations are that (1) educators are concerned more with the feasibility of the microcomputer implementation than they are its potential for improvement of instruction, and (2) the mode of implementation tends to change the nature of the microcomputer implementation.

Conclusion

Microcomputer adoptions differ from most other curricular innovations in the extent to which microcomputers have permeated society. Large scale advertizing and mass

media coverage are important examples of this phenomenon. At the time of adoption, the two communities had a much greater awareness of computers than awareness of, for instance, a new textbook series. The magnitude of this awareness resulted in (1) the existence of change agents within the school districts, and (2) the existence of considerable external pressures to adopt microcomputer use.

These pressures created a potential for adoption, but the timing of the decision depended on a change in the value structure of the leadership. Thus the decision itself must be explained politically.

If the ramifications of an innovation were wholly understood, it wouldn't be new. Where there is no specific organizational experience of an innovation, the consequences cannot be wholly anticipated, and planning becomes ambiguous. This paradox suggests a possible explanation for the pattern of microcomputer implementation.

The ill-defined nature of the educational goals of microcomputer use tends to make the implementation planning an obscure process. The assumption that intentions precede actions may well be faulty. The systematic allocation of resources for implementation is designed to maximize the number of individuals and interest groups accessing the resource. Ambiguity in the implementation is thus a reflection of ambiguity in the adoption, and planning becomes the rationalization of the adoption decision.

The following hypotheses may be useful in further research.

Hypothesis #1: Diffusion of the concept of the educational use of microcomputers takes place at many points in the school system.

Hypothesis #2: The combination of internal and external pressures for the innovative use of microcomputers creates the potential for adoption.

Hypothesis #3: The decision to adopt microcomputers is political.

Hypothesis #4: The implementation plan is a rationalization of the adoption decision.

Hypothesis #5: The existence of change agents in the form of early adopters accelerates the implementation of microcomputers.

Hypothesis #6: Larger school districts utilize management resources to control the rate of implementation.

Hypothesis #7: Smaller school districts control the implementation by partitioning it into small stages.

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Appendix A

Bayview School District Microcomputer Inventory

BRAND	A		B	C	D	E	F		MISC.
MODEL #	I	II					I	II	
LOCATION									
Elementary Schools									
School #1	8		2						
School #2	13	3							
School #3	14	4	1						
School #4	8	3	1						
School #5	11								
School #6	15		3						
School #7	3	3							
School #8	8	2	2						
School #9	9	4	1						
School #10	15	3							
School #11	6	4	1						
School #12	9	1	1						
Middle Schools									
School #1	5	7	2	2	16				
School #2	10	5	3		16				
School #3	6	7	3		16				
High Schools									
School #1	3		4	18	2	8	3	9	2
School #2	1	6	6		2	9	4		2
TOTALS (336)	144	53	30	20	52	17	7	9	4