A Qualitative Study of the Development and First Year of Implementation of the Blacksburg Electronic Village

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Dissertation submitted to the Faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Curriculum and Instruction

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May 27, 1997
Blacksburg, Virginia

Keywords: Technology, Innovation, Internet, Electronic Media

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(Abstract)

This qualitative study examined and describes the development and first year of implementation of the Blacksburg Electronic Village. This project, which came to national attention February 10, 1994 on the NBC Nightly News, was a collaborative effort by Bell Atlantic of Virginia, Virginia Tech, and the Town of Blacksburg, Virginia. This study looks at the origins of this project as it relates to the development of technological innovations, examines the formation of the partnership, and describes critical events that occurred over time which contributed to the success of the project.

Data sources included published documents, key participant interviews, and participant observations. These data sources were then coded and analyzed using HyperQual 2 version 1.0, a qualitative data analysis program, to establish the development and first year of implementation of the Blacksburg Electronic Village. The information gleaned from this analysis was then used to present the Blacksburg Electronic Village story through the first year of official operation. Included in the story are the critical events for the village, a timeline of these critical events, and the successes and challenges that have shaped the electronic village and contributed to what it has become today.

Acknowledgments

I wish to thank special friends and in particular my family, Marian, Ashley, and Colleen, for the support they have given me throughout this grueling process. I would not have succeeded without their help. This experience has made Montana even more attractive than it was when I left. I thank the "powers that be" the time has come for completion of this process.

Special thanks are also due to my committee chairs: John Burton and Sue Magliaro who have alternately pushed, prodded, and poked me to get this dissertation finished. Sometimes I didn't appreciate the "help" but I have valued the growth opportunity. In addition, I wish to acknowledge Jim LaPorte, Mike Moore, Norm Dodl, and Tom Head. I would not be here without them. Finally I would like to thank the faculty of the Teacher Education Department, and all the support staff of the School of Education and Graduate Studies at Adams State College for the help and support given to me the past two years while I was teaching and writing. It would not have happened without each and everyone of you.

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Preface

The events and descriptions presented in the following chapters relate to a qualitative study conducted from August, 1993 to March, 1995. The time period, of approximately ten years, examined begins in mid 1984 and ends in October of 1994. Information sources included published documents, personal interviews with key participants, and observations. These sources have been used to situate the Blacksburg Electronic Village story. In addition, the conclusion contains an epilogue which reviews some of the events that have taken place since the completion of formal collection of this study (i.e., March 1995) to the present.

CHAPTER 1

Introduction

In many areas, computer technology over the past twenty years has prompted massive changes in society. One of the most profoundly affected areas has been the area of telecommunications. Telecommunications is an innovation that has expanded rapidly with the advent of computer mediated communications (CMC). The dictionary defines telecommunications as the art of communicating at a distance especially by radio, television, voice, data, or image. Computer mediated communications are now capable of all types of communications including data, still images, and video. According to Naisbitt and Aburdene (1990), telecommunications capabilities are being united in one worldwide information network. With this international information highway, communicating anything to anyone, anywhere, by any form is becoming possible. The Blacksburg Electronic Village represents a major effort to bring this type of capability to the entire community of Blacksburg, Virginia.

The qualitative study reported here delves into how the Blacksburg Electronic Village was developed, how it evolved in the ten-year period of 1984 to 1994, and some predictions for the future. Of primary concern is the development and implementation of electronic services that the Blacksburg Electronic Village (BEV) provided to the community of Blacksburg and the impact these services had on this community. Major segments of this community included the campus of Virginia Tech, the public school system, town government, businesses and the county library.

Change has been the operative word within the world of technology for quite some time. Change, by its very definition, implies that some level of innovation is being implemented. Innovation can best be described as a process that takes place over time, involving a new idea, an innovator, which can be an individual or an organization, and an adopter or adopters of the innovation (Rogers, 1983). This process occurs through communication of the innovation from the innovator or innovating organization to the adopter or adopters who are members of a social system. As the innovation is implemented in the social system, over a period of time, several stages of implementation are traversed which affect the success or failure of the innovation. I would suggest that this is the process which took place in Blacksburg when several technological innovations were combined to provide a selection of electronic services to the community. While it remains to be seen if this project ultimately will be fully adopted by the community, the process certainly has begun.

Organizationally this document begins with this introduction. In the second chapter a review of the diffusion of innovation literature is presented, and includes general background information about telecommunications and the stated vision of the BEV. The third chapter, Methods, deals with the setting, participants, my stance as a participant observer in this project, data sources and procedures and qualitative data analysis procedures. The fourth chapter contains an extensive discussion of the interviews, documents and observations obtained during data collection. Finally, the conclusion explores some consequences/influences and problems of

BEV followed by drawing some conclusions based on the data collected from the 1984-1994 timeframe. In addition an epilogue reviews the project since the conclusion of data collection March 1, 1995 to April of 1997.

CHAPTER 2

The Innovation Process: A Literature Review

The following review discusses the innovation-development process and the innovation-decision process. While these processes are interrelated they are not identical. Through graphic representation and discussion, the relationship between these processes are illustrated. In addition, telecommunications is established as a technological innovation and BEV is then defined as a telecommunications innovation case study.

Innovation: Defined

As defined by Rogers (1983):

> an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behavior is concerned, whether or not an idea is "objectively" new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation (p. 11).

It is clear that the perception of an innovation is through the eyes of the intended adopter. The casual observer must keep in mind that what might be taken for granted by the observer could be an innovation for the adopter. Another point to consider is that there has to be an awareness on the part of the adopter that another method exists to solve a problem which does not maintain the traditional, "we have always done it this way", solution. Innovation does not exist if the intend adopter cannot perceive the innovation.

Another definition of innovation, given by Kantner (1983), is "the process of bringing any new, problem-solving idea into use" (p. 20). She continues by saying, "Innovation is the generation, acceptance, and implementation of new ideas, processes, products, or services" (p. 20). Other definitions include: (1) an idea or set of ideas that represent a recombination of old ideas, a scheme that challenges current practice, or a unique approach that is perceived as new by the individuals involved (Zaltman, Duncan, & Holbeck, 1973); (2) a temporal sequence of events that convert ideas from concepts to reality (Schroeder, Van de Ven, Scudder, & Polley, 1989); and (3) finally and probably the most simply-put definition is provided by Norman (1993) who states that an innovation is "a better way of doing things" (p. 5).

It appears that all of these definitions are viable and simply look at the innovation from slightly different perspectives. In all, it seems that a clear picture of what constitutes an innovation emerges from these definitions. Common threads run through all of them and various assumptions are implied by each one. It is probably safe to say that an innovation should possess the following characteristics:

1. Be a new idea or set of new ideas, at least to the adopter or adopters.
2. Present a solution to a problem, the implication of which is that it is a better way to solve the problem.

3. An innovation takes places over some period of time, implying that it has some degree of compatibility or complete compatibility with the adopter or social system in which it is being adopted.
4. Innovations are the ideas or concepts, and their adoption is accomplished through a process that converts these ideas into practice.

Furthermore there are two classes of innovation, routine and radical (Nord & Tucker, 1987). Routine innovations are classed as something new but very similar to something that has been done before while radical innovations, in addition to being new, are very different from what has been done before. In their study of innovations, Nord and Tucker state that the requirements for successful routine and successful radical innovation are different. Radical innovations cause more disruption of the status quo and cause more changes to take place in information, values, incentives, and power. These ideas are reinforced by Zaltman, Duncan, and Holbek's (1973) study of innovations and organizations when they refer to the degree an innovation may be considered radical. They state that the more risky, the more novel, and the greater the innovation differs from existing alternatives, the more radical it is. Consequently more changes are required of individuals or organizations to implement a radical innovation that a routine innovation, making the chances of successful adoption more difficult.

The Innovation-Development Process

The innovation-development process is just that, a process. A process has various stages that can be systematically followed to project completion. Adherence to this process does not necessarily insure success of the innovation. The following stages (Rogers, 1983) establish the process and are used for discussion points in this section:

1. Needs/Problem
2. Research (basic and applied)
3. Development
4. Commercialization
5. Diffusion and adoption
6. Consequences

Needs/Problems

Braun and McDonald (1978) compare the development of a technological innovation to a river; it has a starting point but its growth and development depend on its tributaries and the conditions met along the way. It is apparent from this metaphor that innovations have the ability to take on a life of their own. They seem to go in a specific direction but minor deviations frequently occur with major deviations on occasion. Schroeder, Van de Ven, Scudder, and Polley (1989) reinforce this idea from their comparative study of seven innovations including four new product technologies (hybrid wheat, cochlear implants, therapeutic apheresis, and a naval weapons system), and three new administrative arrangements (a new business startup, site based management of public schools, and strategic human resource management):

> The process we observed is fluid and includes an initial shock to propel the innovation idea into being, proliferation of the original idea, setbacks and surprises along the way

provide numerous opportunities for trial and error learning, and a blending of old and new ideas as the innovation is implemented and diffused (p. 107).

Another analogy for the beginning of innovation provided by Toulmin (1966) uses a biological model. He suggests that this first phase is a mutation activity (a slight variation from the norm), an act of conceiving new possibilities, of recognizing departure points from accepted practice, or of seeing variants from current traditions. These explanations generate a very good conception of how the innovation process is initiated and a glimpse of where we are headed.

Research

The point of origin, for this process, is recognizing a need, or becoming aware of a problem that is perceived to require a solution (Rogers, 1983). Resources are then expended in the form of capital expenditure, research hours, and development. This process, traditionally known as a research and development (R&D), is an effort committed to producing a process, product, or both (i.e., a technical innovation, Damanpour, 1988; Damanpour & Evans, 1984; Knight, 1967). This concerted effort does not always occur in an R&D laboratory. It can just as easily take place in a garage, as in the case of Apple Computer, Inc., or even in a person's mind. Rogers (1983) refers to Einstein's first conceptualization of the theory of relativity by his imagining that a man who was falling from a skyscraper took out and let go of his wallet; both the man and the wallet were falling at the same rate but, relative to each other, they were not moving. The development effort can take place anywhere people are trying to solve problems.

Basic or experimental research can be a provider of input information for this process. In this case the researcher is pursuing a course of inquiry for the advancement of scientific knowledge but the result could produce the microchip. Applied research is also used, at this point, to turn a discovery, or invention, or even re-invention into a developed product or process that can be used (Rogers, 1983). An example of this would be Henry Ford’s idea of assembly-line manufacturing which solved a specific problem. Additional information sources are trial and error, observation and experience.

These types of initiations of innovations are considered internally motivated (for profit), but externally-forced innovation also occurs. An example of externally-induced innovation is provided by Marcus and Weber (1988) when discussing the case of automobile safety standards forced on the automobile industry by government regulations. Similarly, potent forces can be exerted by consumer demand for a variety goods and services. Consequently, the stimulus for innovation can be internal (a response to a perceived opportunity) or external (a response primarily to necessity).

Development

The development stage begins when an objective is identified and the move is made to put the new idea in a form that is expected to meet the needs of the potential adopters (Rogers, 1983). Of course part of the driving force at this stage is economic gain. Gruber (1966) puts it very succinctly when he states "Innovation does not occur; there is no meaningful transfer until there is utilization; and the importance of whatever transfer that does take place is usually measured in economic magnitudes" (p. 55-56). Generally, there is a relatively high degree of

uncertainty associated with this stage. To this point there has been an investment of resources but there has been no cost recovery. Marquis (1988) suggests that towards the end of the developmental stage some risk has been reduced in terms of whether a product or process will be produced but the risks in terms of investment have increased prior to marketing. If the innovation is successful there is no problem but if it fails, there can be great financial loss. Marquis also mentions that "Only one or two new products out of five achieve sales whose profits provide break-even return on the investment in the innovation" (p. 82).

Commercialization

The conclusion of the development stage, in most cases, marks the beginning of the commercialization stage but some overlap can occur. At this point, the innovation is incorporated in a product or process that is ready for distribution to potential adopters. An official release can also be preceded by several different marketing strategies. An example is a product being sold to a limited test market to determine if it has commercial potential. Another option would be to ask a group of consumers to use the product for a trial period, days or weeks, and provide feedback to the developers. Yet, another possibility would be a pilot test where individuals use the product once and provide their opinions to the developers. In these ways, attempts are made to eliminate any oversights and to ascertain an innovation's commercial potential. Feedback from these tests can validate the innovation for market, suggest modification, present new ideas for research, or initiate more development before widespread release. As Kantner (1988) puts it:

> For example, the failure of innovation in one organization can be the trigger for the creation of a new organization designed solely to develop the same innovation. An illustration is the entrepreneurial process in which spin-offs occur from larger companies that have rejected innovations later developed and exploited successfully by start-up companies (p. 522).

Diffusion and Adoption

One of the most critical decisions in this entire process is the decision to begin diffusing the innovation to potential adopters (Rogers, 1983). Monetary concerns can be a motivator for diffusing an innovation prematurely, while concern for thorough product safety testing may inhibit diffusion. According to Rogers, scientists tend to be conservative when it comes to translating their scientific findings into practice.

The diffusion and adoption stage is where the previous stages (research, development, commercialization) relate to a diffusion mechanism that will communicate the innovation to its users. Some examples of these diffusion mechanisms are: mass media, government agencies, mass marketing techniques, manufacturer’s representatives, and various types of advertising and sales personnel to suggest a few.

Consequences

The consequences of an innovation are the changes that occur to an individual or a society as a result of adoption or rejection of an innovation. An innovation has little effect until it is

distributed and put into use (Rogers, 1983). Only at this point can the consequences of an innovation be explored.

Classifications of consequences for innovations advanced by Rogers (1983) are: (1) desirable versus undesirable; (2) direct versus indirect; and (3) anticipated versus unanticipated. The problem that enters into the situation here is that a value judgment has to be made and is therefore very subjective in nature. What is valued as useful to one individual or group may not be valued by another individual or group. An example is the value placed on the importance of a computer in the home by some family groups while being ignored completely by other family groups. In addition, the unequal consequences of innovations, particularly advanced technological innovations, can create technological have and have nots.

Innovation Observations

Six observations made by Schroeder, Van de Ven, Scudder, and Polley (1989) (from their comparative study of seven innovations), on the development of innovations provide appropriate additional information relevant to initiation and development of the innovation process.

1) Innovation is stimulated by shocks, either internal or external to the organization. Shocks do not need to be viewed as negative. They stimulate peoples' action thresholds to pay attention and initiate novel action. This is assuming that necessity, opportunity, or dissatisfaction are the major preconditions for stimulating people to act.

2) An initial idea tends to proliferate into several ideas during the innovation process. Initial ideas that stimulate innovation projects proliferate over time into an increasing number of alternative paths, and it is impossible to know which paths might be successful. Some ideas go on the shelf, some create spin-offs, and others converge at a later time as central to making the innovation a reality.

3) In managing an innovation effort unpredictable setbacks and surprises are inevitable; learning occurs whenever the innovation continues to develop. Organizational learning can result from these setbacks as the innovative idea progresses.

4) As an innovation develops, the old and the new exist concurrently, and over time they are linked. New ideas often represent a threat to the established order and create opportunities for new organizations and linkages.

5) Restructuring of the organization often occurs during the innovation process: this restructuring can take the form of joint ventures, change of organizational responsibilities, use of teams, and altered control systems. These restructuring

methods deal with the changes inherent in divergent, parallel, and convergent streams of progression in development.

6) Hands-on top management involvement occurs throughout the innovation period; several levels of management removed from the innovation itself are directly involved in major decisions. Multiple levels of managers appear to provide balance and to run interference among ever-present contradictory forces for expansion and contractions in program scope, resource allocation, time schedule, and performance targets.

These steps are additional valuable considerations for the examination of developing innovations.

The Innovation-Decision Process

The innovation-decision process has several stages and in some ways is similar to the innovation development process. Both processes begin with a need or the beginning of awareness and end with an action. In the case of adopters, the innovation is either used or rejected, and in the case of the development process the innovation is diffused, modified, or rejected. This process is a series of actions and choices taken over time by which an individual or group evaluates the innovation and decides whether or not to incorporate the innovation into ongoing practice. Rogers (1983), suggests a five-stage model for this process which is used for discussion headings in this section:

1. Knowledge
2. Persuasion
3. Decision
4. Implementation
5. Confirmation

Knowledge

In this stage an individual or organization becomes aware of an innovation and gains some understanding of how it functions. This knowledge can be created by a need that has developed for an innovation or the innovation's existence may create the need.

On occasion innovations are discovered by accident but Hassinger (1959) argues that individuals will seldom expose themselves to information about an innovation unless they first feel a need for the innovation. In addition, the individual must also perceive the innovation as relevant to his needs and be consistent with his existing attitudes and beliefs.

On the other hand, an innovation can create the need in the individual by its mere existence. A microwave oven can be used as an example in this case. The operations that a microwave performs can be accomplished in another ways in the home but it offers more convenience for certain operations. Consequently the microwave oven creates a need in the consumer based on convenience.

Whether need comes first or the innovation creates the need is debatable, but the end result is that individual becomes aware of the innovation. Awareness is a necessary condition for the persuasion stage.

Persuasion

During this stage the adopter forms a positive or negative attitude towards the innovation by actively seeking information about the innovation. A general perception of the innovation is developed at this point. Perceived attributes of the innovation such as its relative advantage, compatibility, and complexity are particularly important in this information seeking process. The attitude derived in this stage establishes the framework for a decision.

Decision

At this point the individual or organization either adopts or rejects the innovation. Adoption is considered to be making full use of the innovation as the best solution to the perceived need while rejection is the decision not to adopt.

Small scale trials can take place during this stage. Individuals prefer to determine the usefulness of the innovation before they adopt completely; thus the logic behind free trials and free samples by companies hoping to influence the adoption rate of their product. It should be pointed out that rejection can take place at any time including after a decision to adopt has been made.

Implementation

The innovation is put into use by the individual or organization. This is the action stage where the mainly mental activities of the previous three stages are put into practice. As Rogers (1983) points out:

> Conceptualizations of the innovation decision process have generally not fully recognized the importance, or even the existence, of the implementation stage. It is often one thing for the individual to decide to adopt a new idea, and quite a different thing to put the innovation into use (p. 174).

Nord and Tucker (1987) call implementation the "payoff" stage of the innovation process. This is where the decision to adopt is put into concrete form. It is a flexible time in the innovation process and there is usually a degree of uncertainty among the adopters. Their concerns turn to how to use the innovation, how to operationalize the innovation, and how to resolve the problems the operationalization of the innovation creates. At this point the possibility still exists that the innovation may be implemented in a way not intended or expected and problems of how to use the innovation may arise. Difficulties can also result from the theoretical expectations of the adopter and the actual hands-on application of the innovation. An example of this possibility is a tool that does not meet the performance expectations of the user.

Zaltman and Duncan (1977) would describe the early problems of implementation as the first of two implementation substages. The first stage being a short-term trial to determine if the innovation is really practical followed by the second stage of long-term commitment to the adoption of the innovation. This second stage, if reached, eventually leads to a point where the innovation or "new idea" becomes a regularized part of the adopter's operational routine, losing its newness, and consequently losing its innovation status. The innovation has become established and part of everyday operations.

Confirmation

During this stage the individual or organization seeks reinforcement for the already-made innovation decision. Rejection after adoption (discontinuance) can occur if enough negative information is encountered about the innovation.

As can be seen by this chain of events, rejection of an innovation can occur at any time. For an innovation to be adopted it must have positive implications throughout the complete adoption decision process while a negative implication can result in adoption delay or rejection. It is no wonder that it is so difficult to have innovations adopted.

Innovation-Adopters

In any analysis of adopters and the adoption process, it is necessary to discuss adopter types. Factors included in adopter types are the adopter's attributes, attitudes, and socioeconomic status. These adopter types and identified factors are ideal categories used for classification purposes to facilitate comparisons between groups.

Adopters are placed in one of five categories by Rogers (1983). He identifies these categories with an accompanying dominant group attitude as: (1) innovators/ venturesome; (2) early adopters/respectable; (3) early majority/ deliberate; (4) late majority/ skeptical; and (5) laggards/ traditional. These attitudes are dominant forces in the adopter's life and form the basis for decision making, particularly during the innovation-decision process.

Adopter Characteristics

Additionally, Rogers ascribes many important differences in socioeconomic status, personality variables and communication behavior between early and late adopters of innovations. In comparing early with late adopters the following characteristics are predicted based on content analysis of approximately 900 empirical publications dealing with diffusion of innovations (Rogers & Shoemaker, 1971):

Socioeconomic differences.

a. Early adopters are no different in age than later adopters.
b. Early adopters have more years of education than later adopters.
c. Early adopters are more likely to be literate than later adopters.
d. Early adopters have higher social status than later adopters.
e. Early adopters have a greater degree of upward mobility than later adopters.
f. Early adopters have larger-sized units (farms, companies, etc.) than later adopters.
g. Early adopters have a commercial (for market) rather than subsistence (for subsistence) economic orientation than later adopters.
h. Early adopters have a more favorable attitude towards credit than later adopters.

Personality variables.

a. Early adopters have greater empathy than later adopters.
b. Early adopters may be less dogmatic than later adopters.
c. Early adopters have a greater ability to deal with abstractions than later adopters.

d. Early adopters have a greater rationality than later adopters.
e. Early adopters have greater intelligence than later adopters.
f. Early adopters have a better attitude towards change than later adopters.
g. Early adopters have a greater ability to cope with uncertainty and risk than later adopters.
h. Early adopters have a more favorable attitude towards education than later adopters.
i. Early adopters have a more favorable attitude towards science than later adopters.
j. Early adopters have less fatalism than later adopters.
k. Early adopters have higher achievement motivation than later adopters.
l. Early adopters have higher aspirations for education and occupations than later adopters.

Communication behavior.

a. Early adopters have more social participation than later adopters.
b. Early adopters are more highly connected in the social system than later adopters.
c. Early adopters are more cosmopolitan than later adopters.
d. Early adopters have more change agent contact than later adopters.
e. Early adopters have greater exposure to mass-media channels than later adopters.
f. Early adopters have greater exposure to interpersonal communication channels than later adopters.
g. Early adopters seek information about innovations more actively than later adopters.
h. Early adopters have greater knowledge of innovations than later adopters.
i. Early adopters have a higher degree of opinion leadership than later adopters.
j. Early adopters are more likely to belong to highly interconnected systems than later adopters.

It is obvious that there are quite a few differences between early adopters and later adopters concerning socioeconomic status, personality variables, and communication behavior. What must be kept in mind is that a value judgment should not be attached to either of these adopter category differences. The differences indicate the degree of willingness to adopt an innovation that each group possesses. These characteristics can be placed on a continuum ranging from innovators on one end to laggards on the other.

Adoption and Critical Mass Theory

Problems inherent in the adoption of interactive media are addressed by "critical mass" theory. As defined by Oliver, Marwell, and Teixeria (1985), "critical mass" refers "to the idea that some threshold of participants or action has to be crossed before a social movement 'explodes' into being" (p. 532). Actually, initial adopters become isolated until a critical mass is reached. Markus (1987) suggests that "only when universal access has been achieved can any user of a newer electronic interactive medium generally expect to reach intended recipients more quickly than via traditional media" (p. 505). For this reason, interactive innovations are often adopted very slowly but, when critical mass is reached, the rate of innovation adoption increases

very rapidly. According to Van de Ven and Rogers (1988), in some cases, interactive communications such as electronic messaging, teleconferencing, and bulletin boards can have little advantage initially and sometimes can be a distinct disadvantage to early adopters of these innovations.

In order for critical mass to be reached in a community, Markus (1987) believes that there must be "operational access" to the interactive medium. He defines operational access as the existence, in the community, of the following three resources: (1) infrastructure; (2) access devices; and (3) knowledge about how to use the system. Of course this assumes that the user checks and responds to communications in a timely fashion.

Through the previous discussion it has become apparent that many factors influence the adoption of an innovation and that interactive media is particularly subject to discontinuance unless critical mass can be achieved. At the beginning of the innovation-decision process, a largely mental effort has taken place, but the decision to implement an interactive media related innovation is where the "rubber meets the road."

Technological Innovation and Interactive Media

Since this study is based on the adoption of a technological innovation and relates very closely to the problems associated with the adoption of interactive media several examples of these inherent difficulties are provided. In order to avoid confusion, examples of interactive media are: electronic mail; computer conferencing; telephone; and computer bulletin board systems. Leonard-Barton (1988) argues that a technological innovation has its own implementation characteristics; transferability, complexity, and divisibility which place self-imposed limits on the implementation of an innovation. The common thread is the interactive nature of the adopter's behavior, much like face-to-face communication, but the communication is facilitated by some type of equipment, usually a computer.

According to Markus (1987) "interactive media are extremely vulnerable to start-up problems and discontinuance" (p. 491). An example of this type of difficulty could be represented by the decision of an individual to adopt an interactive telecommunications service, but because the start-up problems such as software installation, software configuration, or modem initialization were so great, the service was abandoned.

Telecommunications

Telecommunications driven by computer mediated communication (CMC) is a case of technological innovation that mirrors the innovation-development and innovation-decision process. CMC has developed very rapidly over the last several years due in large part to the rapid growth of the computer and telecommunications industries (Travis, 1992). Moreover, Travis (1992) suggests that, through the increased power and drastic price reductions of computers over the past ten years, a huge household consumer market has opened and allowed ever increasing network access for the individual. This advent coupled with the explosion of networks, primarily the Internet, can be fused to provide an infrastructure more promising than the individual technologies (Dertouzos, 1991). As indicated by Kroll (1992), with the Internet,

networking has arrived, what visionaries talked about in the 80's is now available to home users. Kroll continues by saying that once connected to the Internet an almost indescribable wealth of information is accessible. In addition the National Research and Education Network (NREN) promises to spend at least $1 billion to implement a high-speed network, linking educational and research institutions across the country, designed to promote communication, computation, and access to information resources and research equipment (Bishop, 1991).

With these advances, and the promise of profits, it could be said that the "Information Age" has arrived. The original excuses for not becoming involved were the expense, the difficulty of use, and, once connected, there was not anything to get or do. All of these objections are beginning to fade. Costs have come down, networks are less difficult to navigate than they used to be, and with more and more users, services and information available have increased.

Part of the progress in network accessibility is due to client/server architecture. A client/server model is defined by Berson (1994), as a situation where application processing is divided between the client and the server. The processing is begun by, and partially controlled by, the client, and both work together to execute an application successfully. More simply put, a client is an application residing on the user's computer capable of communicating with a server. The server is a remote computer waiting for clients to make requests for information. When a server receives a request for information from a client, it searches for the specified information. If the information is located, it is returned to the user's computer by the client. This is a much different relationship than using a dumb terminal which requires the user to access the remote computer and directly manipulate it with appropriate commands to locate the needed information. The client/server model removes the need to know exactly what commands (protocol) to use to produce the desired information. In addition, the client/server relationship saves computing time since two computers negotiate the protocol faster that a human telling the remote computer what to do.

As recently as two years ago, it was necessary to use the dumb-terminal model and memorize the commands necessary to do the following operations:

1. Exchanging files with a host computer using file transfer protocol (FTP).
2. Receiving and sending electronic mail (e-mail).
3. Browsing menu-based information resources in a text format (gopher).

Today these operations can be done with client applications by simply using the server's address and several clicks on the mouse. What was once very difficult at best, has become considerably simplified. The changes have been wide-spread and the speed with which they have taken place are breath taking. As Grudin (1990) has suggested, the focus of the computer is no longer the engineer or the programmer but the end user. Client/server software is aimed at the end user and by providing easy access will most likely increase the user base.

Vision of the Blacksburg Electronic Village

The case in point is the Blacksburg Electronic Village. As computer mediated communication technology continues to evolve, the Blacksburg Electronic Village has taken

advantage of the shift to a client/server model. The Blacksburg Electronic Village was based on the cooperative effort between Virginia Polytechnic Institute and State University, the Town of Blacksburg, and Bell Atlantic of Virginia. These groups provide the organization and support for the operation of the Blacksburg Electronic Village. The primary responsibilities of each group were as follows:

1. Virginia Polytechnic Institute and State University
   Responsibilities included: software development and distribution; provider of electronic services; network support; and overall systems management
2. Town of Blacksburg
   Responsibilities included: provider of local information; and organizational support.
3. Bell Atlantic of Virginia
   Responsibilities included: provider of the digital switch; off-campus data transportation; and maintenance of the off-campus transportation system.

It was the goal of these three groups to provide an electronically connected community with access to local and Internet electronic resources (Blacksburg Electronic Village Vision Statement, 1994). Furthermore, this concept included the electronic connection of community members to each other as well as to the world. Other goals of this project were the creation of a model that will serve as the basis for constructing other electronic cities and towns, and further investigation into determining the factors that contribute to the success of self-supporting electronic communities.

The Blacksburg Electronic Village was not a new technological invention. Rather, it was a combination of client/server software packages made into a distributable product. Using Rogers' (1983) definition of an innovation, what was new, was the idea of creating an electronic social environment for community members to experiment with and use for the exchange of information and services, a new means of electronic social interaction, if you will.

While most users were connected by modems using ordinary telephone lines, some users, living in selected apartment buildings, had access using the ethernet. An ethernet, as defined by Fraase (1993), is "a high-speed local area network that consists of a cable technology and a series of communication protocols. The hardware (cable) provides the physical link to connect systems together. The TCP/IP protocol" (transmission control protocol/internet protocol) "allows different computers to exchange information" (p. 271). The primary difference between these access methods is the speed of data transfer. Ethernet transfer is approximately 100 times faster than by 14.4 modem. Currently, the primary off-campus connection remains the modem while on-campus connections have been converted to ethernet. It is the stated goal of the Blacksburg Electronic Village to have a network connection available for every home, business, and classroom in the community (Blacksburg Electronic Village Vision Statement, 1994).

Furthermore, since Blacksburg is a prototype for an electronic community, it stands in a position to be a test market for network and information services. To remain in this position, a critical mass of users must adopt and implement the services that are now available and take

advantage of new services as they are instituted. Acquiring a critical mass of users is of utmost importance to this project. It is evident that there must be users to consume services but at the same time there must be services to attract users.

This question of user adoption of a technological innovation to form a critical mass in a community-wide setting led to this investigation of the development and initial implementation of the BEV. Specifically the study describes: 1) the history of the infrastructure; 2) the interface and operations; 3) the users; 4) the social/political impact; and 5) the technical assistance available. This investigation presents a clear picture of how the BEV was developed and implemented, and provides some idea of its future direction.

CHAPTER 3

Methodology

Qualitative methodology has been used in this study to describe the development and implementation of client/server type electronic services on the campus of Virginia Tech and in the community of Blacksburg. According to LeCompte and Preissle (1993), ethnography and other qualitative designs provide methods for describing, interpreting, and explaining the social world. Participant observations, published documents, and key stakeholder interviews are used to develop the historical, current state, and future of the Blacksburg Electronic Village.

Qualitative Context

This section deals with the context of the study in terms of geographic location, the people involved, and my involvement in the project. This perspective establishes necessary background for interpretation of qualitative data.

Setting

The Blacksburg Electronic Village is one of the first national efforts to electronically link an entire town to the rest of the world. This experiment took place in the town of Blacksburg, a geographically compact town, 18.8 square miles, located in Southwest Virginia. Blacksburg, with a population of approximately 35,000, contains a small downtown business community, two malls, a high school, a middle school, four elementary schools, and Virginia Polytechnic and State University (Virginia Tech). The occupational breakdown for the town is as follows, as taken from the town of Blacksburg home page:

Professional	28.6%
Technical & Sales	18.9%
White Collar	69.4%
Blue Collar	30.6%
Production, Craft, & Repairs	12.2%
Operators & Laborers	6.9%

Virginia Tech plays a significant role in the town with a student population of about 23,000, as well as being the town's major employer. Blacksburg was an ideal choice for this type of project "Because Virginia Tech is a large university in a relatively small town, it is likely that the per-capita usage rate of computers in Blacksburg is the highest of any town or city in Virginia" (Blacksburg Electronic Village Vision Statement, 1994).

Participants

The primary participants in this research are the major stakeholders in the BEV project. These major stakeholders are Bell Atlantic of Virginia, Virginia Tech, the Town of Blacksburg, and the users/adopters. Figure 1 illustrates the relationship of these specific groups. The users/ adopters, in the figure, are attached only to Virginia Tech since there was no official communication channel between them and the other groups.

The responsibilities of each of these stakeholders were fairly clearly defined. Bell Atlantic of Virginia's Planning and Engineering office coordinated the off-campus infrastructure, namely the phone lines, ethernet connections, and digital switching. The Town of Blacksburg provided information and organizational support from the town manager's office. Virginia Tech provided software, network

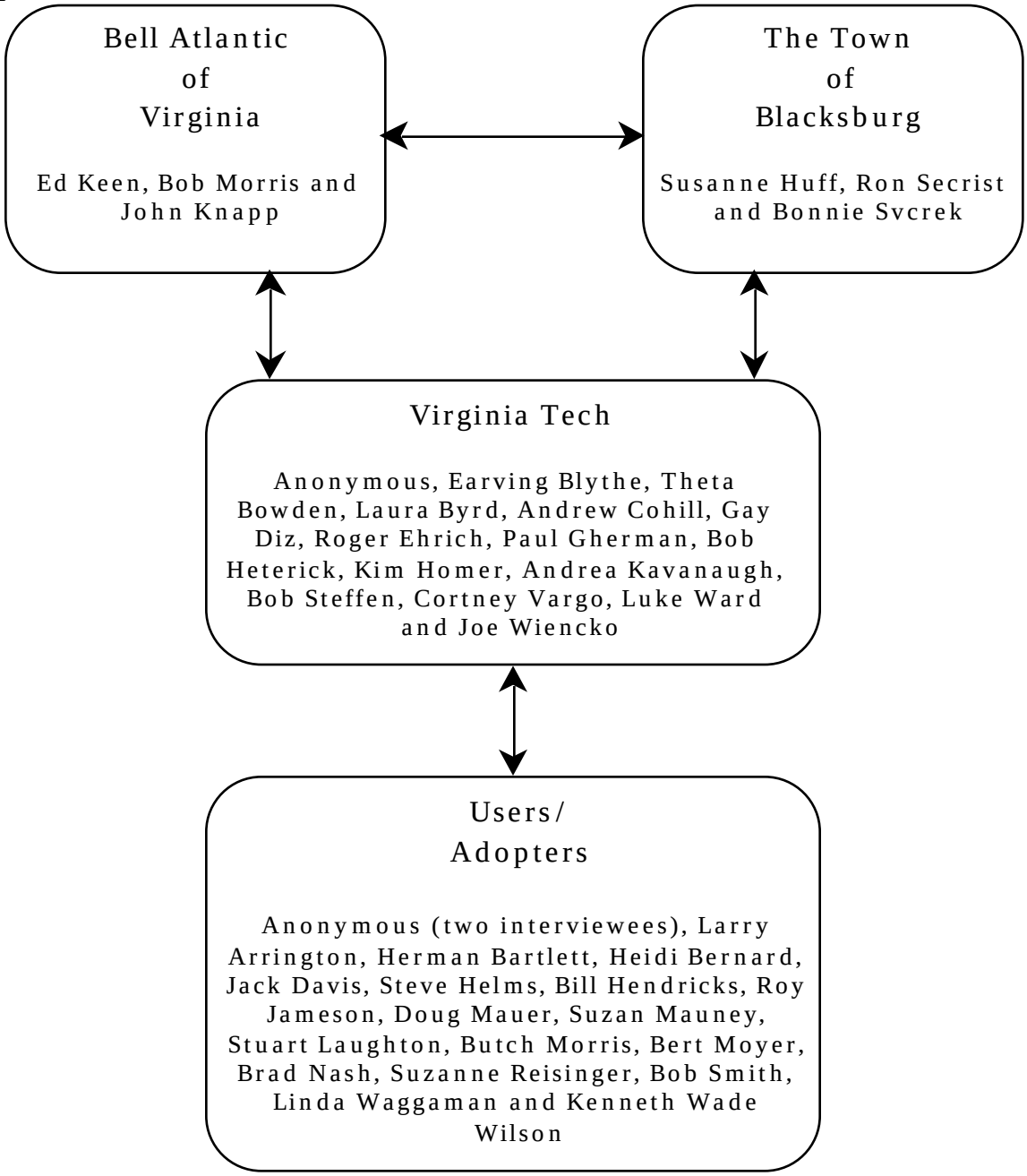


Figure 1. Relationship of Participants.

management services, and overall administration through the Blacksburg Electronic Village, Computer Network Services, and the Computer Center. The users/adopters were and continue to be the main consumers of electronic services. Furthermore this user group can be divided in two groups: those who were affiliated with Virginia Tech and those who were not. This distinction is important since those affiliated with Virginia Tech had direct access to the resources of the university. Those who were not affiliated with Virginia Tech had to rely on their own resources. While BEV's primary user group was Blacksburg residents, residents of other areas were not turned away if they were willing to make the trip to the Blacksburg Electronic Village office to register.

My Stance

As the researcher, I have assumed a participant observer's role in this study. Spradley (1980) depicts the participant observer as having a dual purpose: "(1) to engage in activities appropriate to the situation, and (2) to observe the activities, people, and physical aspects of the situation" (p. 54). As a result, the participant observer is an actively involved participant and, at the same time, trying to be an uninvolved objective observer. According to Spradley (1980), the level of involvement with people and the level of participation in the activities varies depending on the researcher's style. In this case I was highly involved with at people and actively involved in the project.

I was actively involved with the Blacksburg Electronic Village from August, 1993 until June, 1995. During that time I participated in the following activities:

1. Graduate assistant for the "Preliminary Evaluation of the Blacksburg Electronic Village" project. Duties included assistance in the design, recruiting, and moderation of focus groups for data collection for this study.

2. Participant observer in a brainstorming session for educational training ideas for the BEV.

3. Participant observer/facilitator for three one-hour training sessions given to faculty on how to use the BEV.

4. Participant observer in the bi-monthly BEV open meetings held on the first and third Wednesdays of the month.

5. Participant observer in the three sessions presented by the Blacksburg Public Library titled: (1) Overview of E-mail and Gopher; (2) Gopher workshop; and (3) E-mail workshop.

6. Participant observer in a training session presented to community volunteers organized to assist new users/adopters.

7. Observer of a lecture presented to the public about the Blacksburg Electronic Village at the Donaldson Brown Center Hotel and Conference Center.

8. Volunteer to assist the Blacksburg Electronic Village office in registering new members.
9. Graduate Student Assembly (GSA) representative to the University Communications Resource Committee (UCRC).

In addition, I attended, primarily as an observer, any function pertinent to the Blacksburg Electronic Village throughout the course of this study. These events were chronicled in an observer's notebook.

My overall attitude has been, and continues to be positive towards the development and implementation of the Blacksburg Electronic Village. I feel that although there have been some difficulties, the project and the project ideas have been beneficial for Blacksburg, Virginia Tech, Bell Atlantic, and the users/adopters. It is also my opinion that if this project were not to succeed in Blacksburg, a project like it would succeed, in the near future, somewhere presenting a picture of telecommunications for communities in the future. Given my position, I have, when given the opportunity, facilitated the use of BEV software for individuals that have needed assistance and have answered many questions in workshops and demonstrations in a positive manner.

Data Sources and Procedures

For the purposes of this study, three data sources have been utilized: documents, semi-structured interviews, and participant observations.

Documents

Thirty-two documents related to the development of the Blacksburg Electronic Village were obtained over the period between Fall 1993 and Spring 1995. A complete list of all examined documents appears in Appendix A. The most critical documents collected to this point include:

1. "Enhanced Communications for the Town of Blacksburg" (October, 1990). This is the first document dealing with the possibilities of an electronic village.

2. Background research materials used for preliminary Blacksburg Electronic Village design: "Princeton Gate Fiber Trail" (October, 1990) and "Cascades" projects developed by Bell Atlantic. These where projects that were examined as possible preliminary designs for Blacksburg.

3. "The Blacksburg Community Network" (April, 1991). This document is an early vision statement for what was then called the Blacksburg Community Network.

4. "The Blacksburg Electronic Village" (February, 1992). This is the first document with the name change and is a later and more evolved vision statement.

5. Blacksburg Electronic Village, vision statement (February, 1994). The current vision statement of the BEV.

6. National news video clip (February, 1994). A three-minute NBC Nightly News video demonstrating BEV to the nation.

7. "The Preliminary Evaluation of the Blacksburg Electronic Village", final report (April, 1994). The first research conducted on BEV using the initial users.

8. "Structured Systems Development: Group Project" a research project conducted upon the Blacksburg Electronic Village (April, 1994). A research project by a graduate students investigating the BEV system structure.

9. The Blacksburg Electronic Village Survey conducted through "About Town" newsletter (April, 1994). A town survey sent to random homes and apartments in Blacksburg.

10. "Blacksburg Electronic Village Background Questionnaire" data report, profiling the users as they register (April, 1994). A summary of intake user profiles as they register for BEV.

11. The Blacksburg Electronic Village: A Replicable Model for National Infrastructure (May, 1994). A grant proposal submitted to the National Telecommunications and Information Administration (NTIA).

12. Various installation guides for BEVNETPC and Macintosh for all of the official release versions. A collection of the various software releases produced by BEV and the documentation provided with it.

An additional study was provided by the Montgomery-Floyd Regional Library. This study was a grant, initiated in the summer of 1993, to provide access and training for using the Blacksburg Electronic Village. The data and analysis of this study has been reviewed.

Participant Observation

A fieldwork journal has been kept from April of 1994 to February 15, 1995. This journal contains field notes relating to the 22 activities and functions in which I participated (see Appendix B). Several audio and video tapes of sessions were made and are included.

Semi-Structured Interviews

Forty semi-structured interviews have been conducted with primary and secondary participants of the development and implementation process as well as with users of the Blacksburg Electronic Village (see Appendix C). The interview questions dealt with the areas of interest generated for this study (see Appendix D). All the interview sessions were audio taped and then transcribed professionally.

Informal Conversations With Key Participants

In addition to the above data sources, several key participants volunteered their time to informally discuss the beginning, development, and implementation of the Blacksburg Electronic Village. These informal conversations took place approximately bi-monthly for an hour to an hour and a half for the length of my involvement with the project (July 1993-May 1995).

Human Subjects

A proposal was submitted for permission to interview human subjects for the purposes of this study to the Institutional Review Board (IRB) at Virginia Tech in September 16,1994. Permission was given November 11, 1994 by the Chairman of IRB, Ernest R. Stout, Ref. 94-261 (see Appendix E).

Qualitative Data Analysis Procedures

HyperQual 2[1], a qualitative data analysis software program, was used to parse, categorize, and reorganize all data sources. The interviews were transcribed by a transcriptionist from audio tapes, digitized and made into individual documents. The participant observation notebook was typed into the analysis program and the documents were scanned, digitized and then entered into the program. Each data point had its own stack. Hyperqual 2 is a version that uses Hypercard for the Macintosh and has an individual stack for each type of data point. Therefore, each data point, or type of data point had its own individual stack that was created by the data entry. By scanning the documents, typing in the participant-observation notebook and entering the digitized transcripts of all the interviews, I obtained a complete database of all data collected. These data were coded and categorize for analysis and integrated into the narrative of the story of the Blacksburg Electronic Village.

Once all the raw data were entered in the three hypercard stacks, I reread all the data from beginning to end to re-familiarize myself with the entire project. A coding scheme was designed for all of the raw data based on the source origin (i.e., Town, Bell Atlantic, The Blacksburg Electronic Village, Virginia Tech Users, Community Users, someone from the schools or school document, the Library or from the Blacksburg Electronic Village history project), and whether the data was related either to the development and/or implementation of BEV. Exemplar stacks were built from these raw data sets based on the specific tags with which each data point was coded. This was the primary tag scheme and was designed to show the source of the data. A secondary tag scheme coded physical infrastructure, political infrastructure, critical event, vision of the Blacksburg Electronic Village, or the future of the BEV. A special tag was coded to identify

[1] HyperQual 2 vesion 1.0 by Raymond Padia

passages and/or quotes that dealt with the notion of needing a critical mass of users which would be critical for continuation of this project.

The third category or tag pinpointed kinds of impact of BEV: impact on the community, on education, on Virginia Tech, or if it would have an affect on all of those areas. Initially social impact was coded, but discontinued since it overlapped extensively with those three areas already. The fourth category identified interesting comments made by interviewees that seemed to illustrate a point or capture the spirit of the project. In most cases, data were coded with multiple tags. As I identified a passage that dealt with either development or implementation, it would be directed to a particular stack depending on which data point it came from. Then a tag or tags would be applied where appropriate. A tag could be political, historical, or it could be a critical event and it could have impact on the community and education. So if it was a passage that pertained to all those categories, it was given appropriate tags and then directed either to a development or implementation stack. By conducting the searches in this manner subsequent searches could be made on one tag or on combinations of several tags within the development or implementation stacks.

The decision process for coding went as follows:

1. Identify source: document, interview, participant observation

2. Relevant to: development or implementation

3. Affiliation of who said or wrote it: Bell Atlantic, BEV, town, VT user, community user, schools, Library

4. How or occurrence affected: physical, political historical, critical event, vision, infrastructure, future, problems

5. What/who did it impact if any: community, education, Virginia Tech, town, Bell Atlantic, all

This systematic process enabled me to sort through all the relevant data needed to produce a thorough narrative of the development and implementation of BEV.

In addition, by using triangulation where possible, I provided a means of validating the findings of this study. In essence, triangulation is a method of confirming findings by showing that independent measures agree with the finding or at least do not disagree with it (Miles & Huberman, 1994). An example, in this case, would be the agreement of what the documents say, what individuals say in interviews, and what I have observed on critical events during the development of BEV. According to Miles and Huberman (1994), "If you self-consciously set out to collect and double-check findings, using multiple sources and modes of evidence, the verification process will largely be built into data collection as you go" (p. 267).

Given that reliability and validity were an issue for this study, as they are for any research, the meaning and thus process for establishing these crucial elements must be discussed (LeCompte & Preissle, 1993). People being observed in naturalistic settings cannot be controlled as they can be in a laboratory or a clinical setting. Consequently, the application of traditional tests of reliability and validity are difficult, if not impossible, to use for qualitative research. In this study, as in many qualitative studies, the lines of inquiry dictate what could be done in these areas.

The measures being taken, in this study, to increase external reliability are:

1. Full disclosure of my role within the Blacksburg Electronic Village is included to present my frame of reference and social position. LeCompte and Preissle (1993) state that conclusions reached by researchers are qualified by the social roles they hold at the research site. Thus, those conclusions cannot be repeated if other researchers do not duplicate similar social positions.

2. A description of participants involved is included in this study to provide the information necessary to locate informants similar to the original informants for a replication study.

3. A extensive description of the methods of data collection is provided to guide further or repeat studies.

The measures taken to increase the internal reliability of this study were:

1. As this study progressed, a review of the data and findings were reviewed by several committee members to insure accurate interpretation and avoid researcher bias. In addition, all transcribed interview data reviewed by the participants before inclusion to further protect information accuracy.

2. Conclusions are supported by use of accurate field notes and published documents to provide the reader with an immediate means of assessment.

3. The use of audio tape recordings for the interviews and video tapes of press releases were used to preserve accuracy. These media reduce researcher interpretation as the event progresses and can be reviewed by others.

While these measures were taken to increase the reliability of this study, it must be remembered that, "applying reliability to much of qualitative work is limited; at best it can only be approximated" (LeCompte & Preissle, 1993, p. 341).

Measures being taken to increase internal validity are:

1. The extended length of time I was associated with the Blacksburg Electronic Village reduced my impact as a participant observer as well as having revealed key stakeholders. Observer effects were minimized due to my extended association with the project.

2. Identification and consequent representation of all groups involved hopefully prevented a one-sided representation of the project.

3. Inclusion of participants from the beginning of the project as well as latter stages of development documented change over time for the project.

4. The use of multiple data sources obtained by different methods provided a means to substantiate points of view, opinions, and observations. By using these methods the chances of reaching false conclusions were minimized.

Through the description of data sources and procedures, and the qualitative data analysis procedures described in this chapter, every effort has been made to insure the accuracy of the collected data and to describe the data sources. In addition the qualitative context has been established through description of the setting and my stance towards the project. This process sets the stage for the BEV story.

CHAPTER 4
Discussion

Innovations are rarely developed and implemented in an uneventful simplistic process. BEV is no exception. The development and implementation of BEV is chronicled in four levels. First, a brief overview sets the context for the BEV project. The second piece is a timeline which articulates the most salient events as reported by key participants and documents. The third and the major component is a narrative with detailed descriptions of events supported by evidence aggregated across all data sources. The fourth and closing section of this chapter offers discussion of the consequences/influences of BEV upon the community and the university, as well as some of the problems BEV encountered through its first year of existence.

Overview

The concept of the BEV had its beginnings in the mid-nineteen eighties when Virginia Tech was debating the possibilities of building a campus network. Coincident with these discussions was the development in 1986 of NSFNET by the National Science Foundation (NSF). According to Fraase (1993), the Internet began in the early 1970's as a Defense Department network called ARPAnet. It was originally designed to provide military communications even in the event of partial network outages caused by an act of war. This network was abandoned in March of 1990, but by this time NSF had built five supercomputers for academic research which used the ARPAnet Internet Protocol (IP) technology to facilitate communication. NSF's intent was to increase the bandwidth of the system and make it available to a wide variety of users, not a limited system designed for military users. In addition, LaQuey (1992) states that, around the same time NSFNET was being built, the exponential growth of the Internet began which continues to this day.

Coupled with the growth of the world wide Internet, these events lent national impetus to Virginia Tech decision makers to build the campus network. Concurrently, Virginia Tech began to consider the larger issue of connectivity beyond higher education and the research community. The decisions to build the campus network set the stage for the inception of what was then simply called a community networking service (Heterick, interview 1/13/95).

The campus network provided high-speed connectivity to students faculty and staff on campus. As a result of the high quality of service on-campus, a demand began to grow for similar services off-campus. This pressure, combined with the earlier ideas of connectivity beyond education, caught the imagination of then Vice President of the University for Information Systems, Bob Heterick, and then Director of Telecommunications, Earving Blythe. Several papers were generated for internal review describing how on-campus services could be extended off-campus.

The initial discussions between Virginia Tech and then Chesapeake & Potomac Telephone Company (C&P Telephone, subsequently reorganized as Bell Atlantic of Virginia) began in the fall of 1990. The first meeting took place at the Continuing Education Center (CEC) (now the Donaldson Brown Hotel and Conference Center), on the campus of Virginia Tech and was

followed a series of meetings continuing through April, 1991. At a formal meeting in Richmond in April of 1991, an agreement in principle was reached by the two parties on a common vision for a "Blacksburg Community Network." The crux of this vision or plan was to develop a hybrid data/video network supporting a number of applications that would addressing the needs of different types of users in the community. Specifically, these users included K-12 students and teachers, businesses, Virginia Tech students and professors, civic leaders, and individual citizens. In addition, a commitment was made by Virginia Tech and Bell Atlantic to continue to work together towards a possible future partnership for implementation of this plan.

Soon both Virginia Tech and Bell Atlantic recognized that the Town of Blacksburg needed to be included in the project if the project was to be a true community network. With the addition of the town, the principal partners for the project became Bell Atlantic of Virginia, the Town of Blacksburg and Virginia Tech by late summer of 1991.

Additional discussions continued throughout the rest of 1991, during which time the name evolved from the Blacksburg Community Network to the Blacksburg Electronic Village (BEV) service (Heterick, interview 1/13/95). Part of the philosophy behind the name was to emphasize a sense of community and focus attention on services for citizens. It was envisioned, at this point, that BEV was to be a people-oriented project and not technology/software development project.

BEV became public with a January 20, 1992 press conference which announced the partnership and its intentions to do a feasibility study for the implementation of BEV. This press conference marked the culmination of the discussions of the previous year as well as made a public commitment to pursue the possibilities of the project. Almost one year later, on January 11, 1993, a second press conference announced the completion of the feasibility study and the agreement by the partners to move ahead with the project. An addtional event setting the stage for Bev, in this same year, was the conversion to client/server architecture by the university. This move allowed the types of applications BEV was going to use to operate over the network.

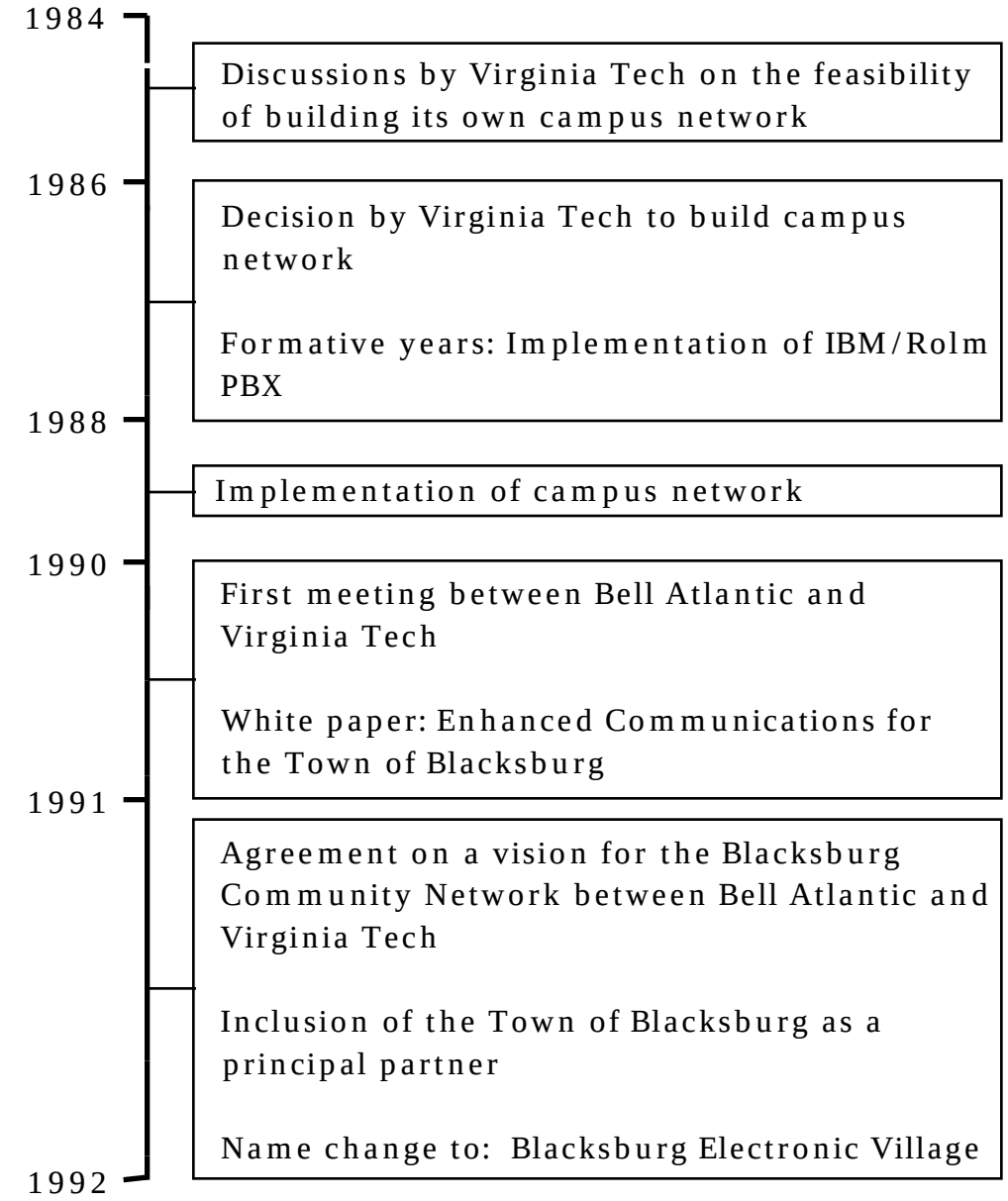
The Blacksburg Electronic Village officially opened for business on October 25, 1993. The first software package available for access was BEVNETPC version 1.0 which operated under MS DOS on an IBM or IBM clone. However, this was not a deterrent to implementation of the project since 95% of the users at this time were IBM or IBM clone users. The Macintosh software package called BEVNET Mac became available in early 1994.

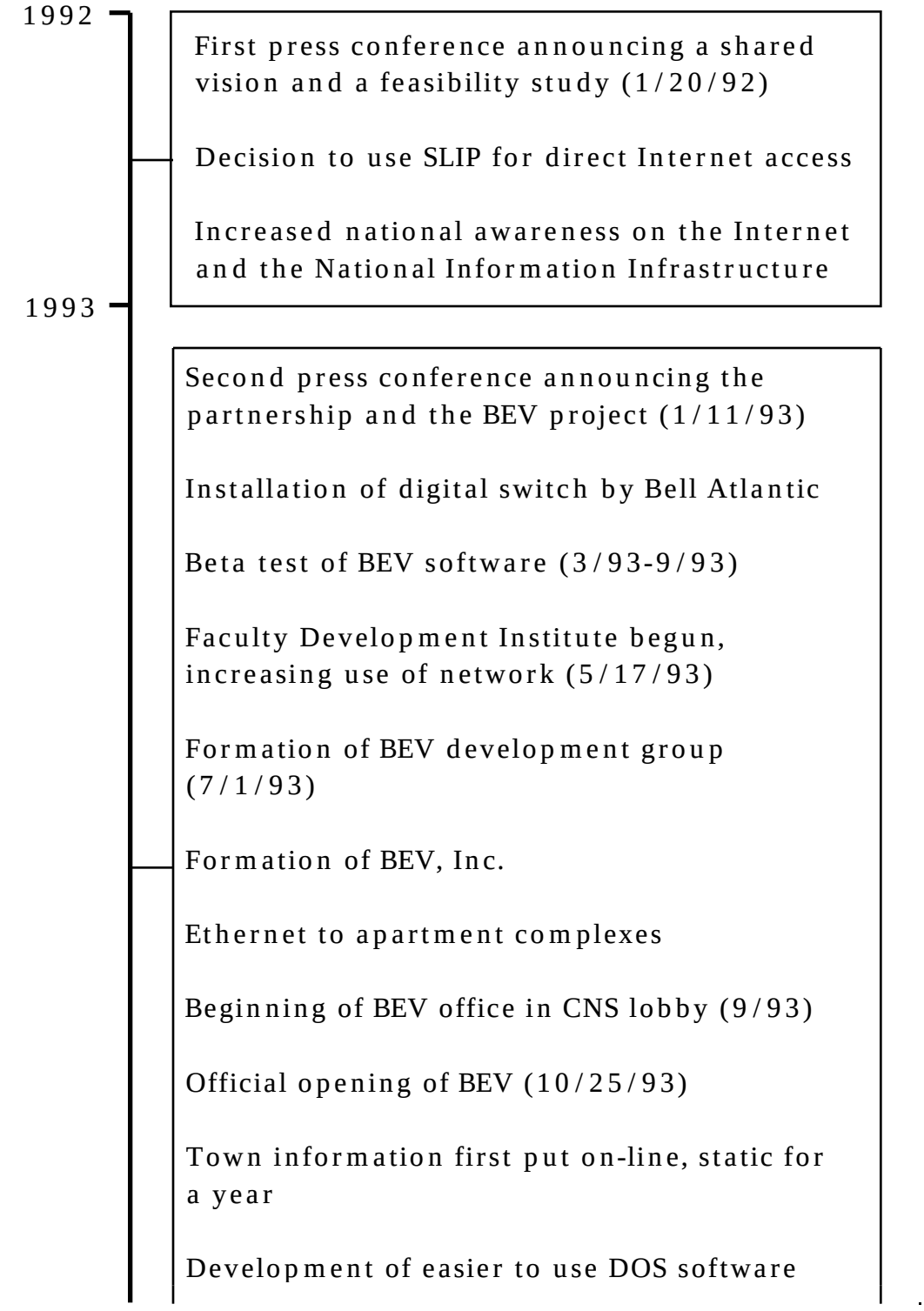
In addition to the aforementioned events, several other first year events provided momentum for BEV. Public terminals were opened at the Blacksburg branch of the Montgomery-Floyd Regional Library accompanied by information and training sessions. A three-minute national evening news spot by the National Broadcasting Company (NBC) produced a flurry of inquires from around the nation as well as internationally. The close of the first year of implementation was marked by a third press conference announcing a $99,000 planning grant from the National Science Foundation for a "virtual schools" project. By this time

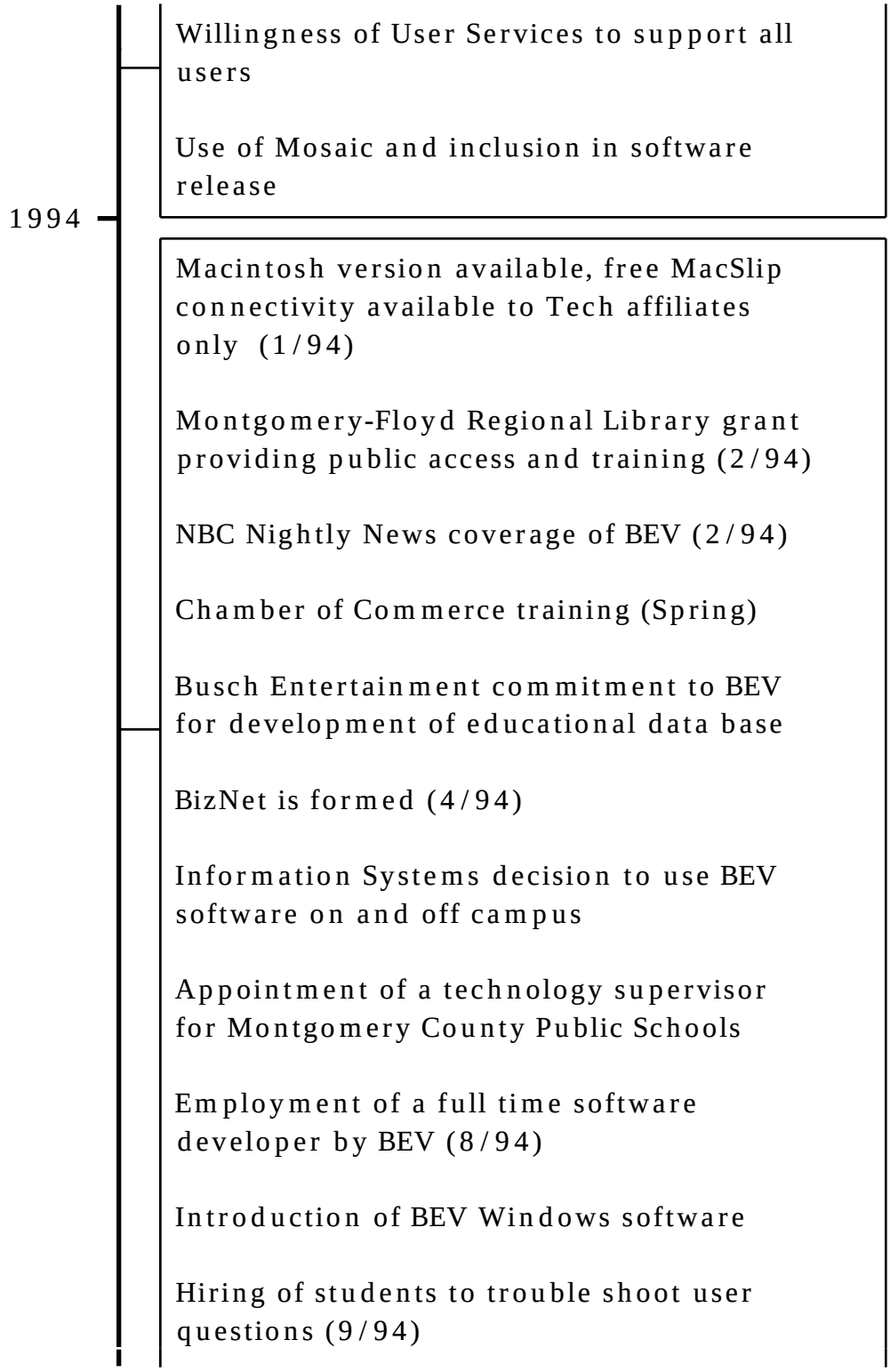
BEV's user base was considered to be 9000 or approximately 25% of the community. Based on these growth data, the partnership considered the first year as successful.

Timeline

Aggregated across interviews, documents and observations, the following events outlined with a timeline, offer a visual representation of the development and implementation of BEV in a chronological order (see Figure 2). This representation was reviewed and confirmed by the BEV History Committee. This timeline offers more specific events than did the overview in order to develop a more comprehensive understanding of the shaping of BEV. Exact dates for the events are provided where possible.




1992
First press conference announcing a shared vision and a feasibility study (1/20/92)
Decision to use SLIP for direct Internet access
Increased national awareness on the Internet and the National Information Infrastructure
1993
Second press conference announcing the partnership and the BEV project (1/11/93)
Installation of digital switch by Bell Atlantic
Beta test of BEV software (3/93-9/93)
Faculty Development Institute begun, increasing use of network (5/17/93)
Formation of BEV development group (7/1/93)
Formation of BEV, Inc.
Ethernet to apartment complexes
Beginning of BEV office in CNS lobby (9/93)
Official opening of BEV (10/25/93)
Town information first put on-line, static for a year
Development of easier to use DOS software


Willingness of User Services to support all users
Use of Mosaic and inclusion in software release
1994
Macintosh version available, free MacSlip connectivity available to Tech affiliates only (1/94)
Montgomery-Floyd Regional Library grant providing public access and training (2/94)
NBC Nightly News coverage of BEV (2/94)
Chamber of Commerce training (Spring)
Busch Entertainment commitment to BEV for development of educational data base
BizNet is formed (4/94)
Information Systems decision to use BEV software on and off campus
Appointment of a technology supervisor for Montgomery County Public Schools
Employment of a full time software developer by BEV (8/94)
Introduction of BEV Windows software
Hiring of students to trouble shoot user questions (9/94)

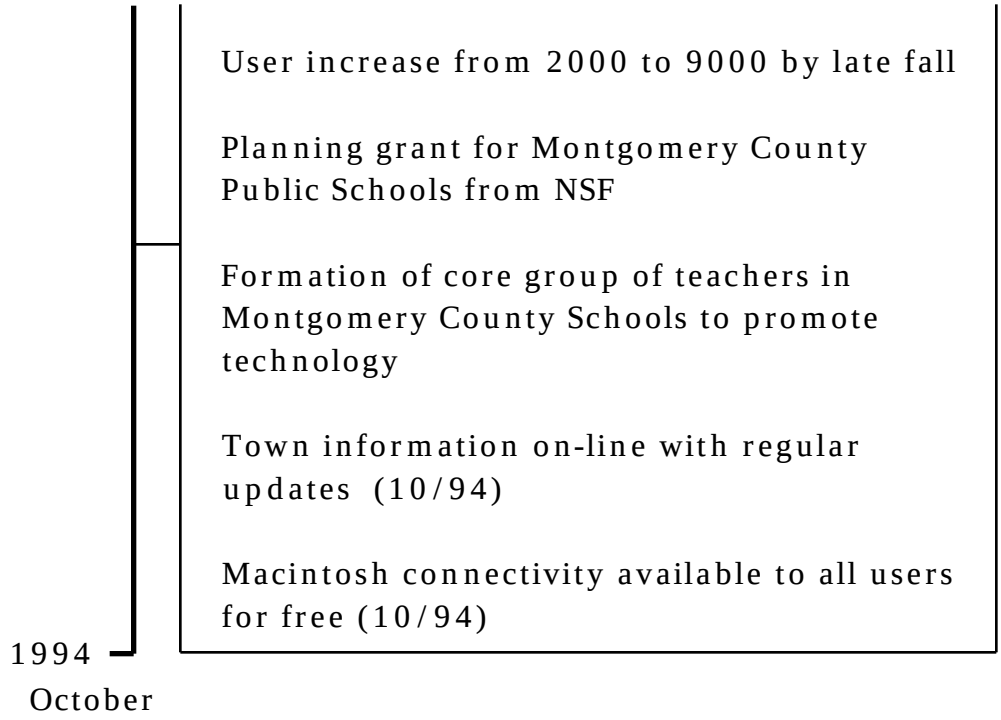


Figure 2. Events Timeline

Upon further review of the timeline, events identified across the ten years of development and implementation reveal several interesting observations. These observations are examined in depth in the narrative section but are introduced at this point. First, it took six years for Virginia Tech to lay the groundwork before other stakeholders became involved with the project. Secondly, development essentially was begun by Virginia Tech in the mid-nineteen eighties, joined by Bell Atlantic and the Town of Blacksburg in the early nineties and continues through the present time. Thirdly, implementation began with the beta test in early 1993 and officially began when BEV opened its doors October 25, 1993.

While these events summarize all of the events identified across data sources, there were several critical events that truly were crucial to the development and implementation of BEV. That is, if these events had not occurred when and how they did, the entire project could have been jeopardized. The following narrative identifies these events and explains why these events were so important.

Narrative

Introduction

Throughout the history of the BEV project the underlying base or foundation can be divided into two facets, namely, physical and political components. The physical component deals primarily with facilities, equipment, and installations needed for the functioning of BEV.

The political components are comprised of community, University, and business forces. The ensuing narrative discusses crucial critical events in light of these physical and political ramifications.

By reviewing the timeline, events deemed as essential to the development of BEV were identified across all data sources. These major events were:

- Building the campus network
- Formation of the BEV partnership
- The press conferences
- Use of serial line internet protocol (SLIP)
- The digital switch
- Formation of the BEV development group
- The official opening of BEV and the BEV office
- The Montgomery-Floyd Regional Library grant
- NBC Nightly News coverage

These events will be woven through the structure of the narrative with other identified events placed in supporting roles.

The BEV Story

Historically the discussions to determine the feasibly of building a Virginia Tech campus network could be called the beginning. According to Bob Heterick, "...the seeds for the Electronic Village were sown in the 1983, '84, '85 time frame when Virginia Tech was debating the efficacy of moving to its own campus network and campus telephone switch" (Interview, 1/13/95). The University's interests in developing its own network were based on what was perceived as a lack of quality, primarily due to aging technology, and a costly telephone bill. Primary discussions on this issue were between Heterick and Earving Blythe. According to Blythe (1/20/95), solving the campus network problem was easy because it could be justified on the basis that "it's in the best interests of the University to have a very powerful, robust data network that reaches everyone." As a result "a sixteen million dollar bond issue with authorization from the General Assembly" was made "and we wired the campus and put in our satellite uplink facilities and our high band width connectivity… (Heterick, Interview, 1/13/95)." The building of the campus network was done in the years 1986 through 1988 and put in place the catalyst and capability for the BEV.

Political tensions were created between Virginia Tech, Bell Atlantic, and the Town of Blacksburg due to this decision. In an unpublished paper by Theta Bowden (1994), the time frame of network construction and indication of the political difficulties are documented. The paper states:

> However, in the 1986-1988 time frame, a setback in the relationship between Bell Atlantic and Virginia Tech occurred. During that time frame, Virginia Tech implemented a major replacement of their on-campus communications systems. ... This resulted in some consternation on the part of the telephone company from a business perspective.

The friction was over money. Bell Atlantic lost a revenue stream since it no longer operated the campus telephone system and the town lost money in utility taxes that Bell Atlantic paid. These points are confirmed by Blacksburg's Town Manager, Ron Secrist's (Interview, 1/4/95) statement:

> When Virginia Tech created its telephone system and its cable system and so forth, it was at the expense of private companies who were providing those services on the campus and at the expense of the local government who received tax revenues from those private companies providing those services on campus to this local government alone. When C & P Telephone, now Bell Atlantic, was removed from campus providing telephone services on campus the loss in revenues in our consumer utility tax was upward of $90,000.00 (Interview, 1/4/95).

This event created some difficulties for the relationships of all parties concerned. In addition Secrist states: "C&P Telephone didn't want to be removed and wanted to be a partner in whatever was done on campus and it was not done that way" (Interview, 1/4/95). It is important to keep these tensions mind, since eventually these same players became partners.

Tying these events with the innovation literature, Rogers (1983) suggests that it is a perceived problem which instigates an innovation. In this case, the perceived problem was the disparity in quality of network services available on campus and off campus. During the 1989-1990 time frame a demand was developing for availability of high quality network services off campus. A responsibility by the University to provide these services was developing as indicated by Heterick:

> In order to achieve the university's goals of a broader infusion and diffusion of technology throughout, campus life, student life, curricular learning activities, research activities that we not only had to provide high band width connectivity for all campus-based activities but that it was going to be critical to provide high band width connectivity for people who were not on campus (Interview, 1/13/95).

This demand was fueled by faculty, staff and students of the University. Secrist referred to this demand:

> I mean here you have Virginia Tech which literally is in the geographic center of the community, that for ten years has had the opportunity for people to network. Then those very same people, whether they be the 8500 students on campus who live in the dormitories or the 6000 faculty and staff members and whatever large percentage of those who were using the networking system. When they would go home at night, those faculty and staff members, or when those students would move off campus, then all of a sudden it's like they're going to prehistoric times. They could not utilize computer networking at the same levels. And again because Virginia Tech is geographically the center it truly made tremendous sense to devise a way to expand this capability (Interview, 1/4/95).

A third comment documenting equity of service off-campus was made by John Knapp, manager of external affairs for Bell Atlantic, "I guess it would be in the late eighties we had some people

that thought it would be an interesting idea to pursue (BEV), probably along about the same time Virginia Tech was being challenged to find ways to improve equity of services off-campus" (Interview, 6/6/96).

Increased service demand was expected to rise sharply particularly for students since the majority live off campus combined with the increasing expectation of student computer ownership at the University. This perceived problem on the part of some at the University initiated discussions on possible solutions for providing on campus network services to off campus locations.

As Blythe, one of the original architects of BEV, put it in an interview "...everyone was in a quandary as to how we would solve the, the last mile problem. The problem of getting communities linked into that same network" (Interview, 1/20/95). The possible solutions included a partnership with the cable TV company or a partnership with Bell Atlantic. Another possible solution was for Virginia Tech and the town to develop a communications utility to take the campus services off campus. The town/Virginia Tech idea included developing some kind of municipal communications authority by floating a bond issue to fund it. These were internal discussions at the University followed up by contacting the possible partners. These ideas had a very lukewarm reception from the prospective partners. It was not until a little bit later in the year (1990) when Bell Atlantic in Richmond thought the idea might have possibilities. Subsequently a meeting was scheduled with Virginia Tech and Bell Atlantic in Blacksburg to discuss the possibilities of a community network.

The initial Virginia Tech/Bell Atlantic meeting was an informal meeting at which it was decided that the dialogue would continue about the possibilities of developing and implementing a community network. It must be noted that this was the first meeting of any type between Virginia Tech and Bell Atlantic since the schism of the late eighties. At ensuing meetings Joe Wiencko, at that time the Senior Network Consultant for Virginia Tech, was brought in and given primary responsibility for relations with Bell Atlantic in Richmond. Wiencko developed several white papers on ideas of why it would be to Bell Atlantic's advantage to become involved in this project. The culmination of these talks was a presentation by Wiencko on April 17, 1991, at the Bell Atlantic of Virginia main office in Richmond, when an agreement in principal on a shared vision for the "Blacksburg Community Network" and the assurance of continued serious negotiation was reached between Virginia Tech and Bell Atlantic. According to Wiencko "the main point of the presentation was to outline formation of a community network project that would serve as a test bed for industry and a stimulus for personal and regional enrichment for Blacksburg" (Meeting Minutes, The Blacksburg Community Network, 4/17/91).

During this same time frame, according to Heterick, efforts were being made to include the town of Blacksburg as a principal partner in the project particularly if it was truly going to be a community network. Secrist recalls:

> The very initial contact, the idea of the electronic village came from Bob Heterick to Mayor Hedgepath and the Mayor… brought it to my attention immediately after some

> preliminary discussions with Bob and asked that I get a sense of the rest of the elected body (Interview, 1/4/95).

The inclusion of the Town, as an eventual partner, incorporated the last organizational player for what would eventually become the BEV.

As 1991 progressed, there were several meetings, however, firm commitments for a plan of action were not made. According to Blythe:

> It seems to me it was almost nine to twelve months we were just discussing whether we would or would not do a study. And somewhere along the line Bob and I were talking about this and we agreed that we need to bring this discussion stage to an end and actually do something. And we agreed that we should work to get Bell Atlantic, Congressman Boucher (House Representative of the Ninth District of Virginia) to agree to a press conference where we would announce that we would do this study (Interview, 1/20/95).

The result of this discussion was the first press conference held January 20, 1992 at the Continuing Education Center (CEC) on the campus of Virginia Tech. This press conference was the first public announcement of the potential for the formation of the BEV partnership and also disclosed the intention of the future partners to conduct a feasibility study. Several excerpts from the press release issued on that date by David Nutter of University Relations/ Public Affairs of Virginia Tech, titled Blacksburg, Tech, C&P, Explore "Electronic Village" Concept follow:

> A university town nestled in the scenic Virginia mountains could become one of the nation's first "electronic villages" if a shared vision by Virginia Tech, the Town of Blacksburg, and the C&P Telephone Company of Virginia becomes reality.
>
> Project officials from C&P Telephone, Virginia Tech's Office of Information systems, and the town of Blacksburg unveiled the 21st century communications plan before several dozen community leaders gathered today at Virginia Tech. Along with Congressman Rick Boucher (D-9th), chairman of the House Subcommittee on Science, former Virginia Governor and Center for Innovative Technology President Linwood Holton, C&P President Hugh Stallard, Virginia Tech President James C. McComas and Blacksburg Mayor Roger Hedgepeth also took part in the briefing.
>
> Before the project can be deployed, supporters plan to conduct a comprehensive study which will seek to identify sources of funding available for the project and explore other public policy implications associated with its installation. Project leaders will solicit comprehensive community involvement in the study which is expected to be completed in the summer of 1992.

The intention was to determine whether this would be a viable project for all the partners and the community. Involvement by Congressman Rick Boucher, at this point, lent a political aspect and prestige to the project that it had not had prior to this time. Rick Boucher was chairman of NSF

subcommittee on Science at that time and later was instrumental in procuring a NSF grant for the "Virtual Schools."

Heterick (Interview, 1/13/95) sums up the outcome of the press conference by saying, "I think the impact of that was that, after it was over, a lot of people suddenly realized they were committed. That they were now on TV, on the six o'clock news having said, 'This is a marvelous idea.'"

During the following months Virginia Tech and Bell Atlantic worked closely together through a series of meetings, both in Richmond and in Blacksburg, to develop a "shared vision" and how that vision might be implemented. Bell Atlantic demonstrated good faith by committing resources in the form of a full-time person, for five months, in Blacksburg to examine the possibilities of project development. Robert Morris, the Project Manager Planning and Engineering for Bell Atlantic, stated during his interview:

> In February of 1992, I was asked to do the feasibility study and make a recommendation of whether Bell Atlantic should participate in the Blacksburg Electronic Village project.
>
> And I went to Blacksburg (from Richmond) and stayed, I guess three or four months… .

Morris's main objective was to determine "some of the things that I thought Bell Atlantic would like to get out of the project."

While Morris was determining Bell Atlantic's position, Secrist was approaching the Blacksburg City Council with the project idea. This was not an easy activity to explain, this developing project. Secrist remembers:

> that (it) was a very challenging project because you're describing a project that is like nailing Jell-O to a tree. I mean you couldn't get your arms around it. But I could see the benefits of a whole new area of communication and of empowering citizens to communicate with their local government and participate in local government."

Secrist's charge from the Council was "Yes, let's do it, but you stay close to it, Ron." The concern was that the project might not go in a direction consistent with community expectations and what was expected of their town government.

Also during this time the decision was made by the future partners to make this network totally internet protocol (IP) compatible. In other words computers connected to this network would essentially be nodes on the Internet. Serial line internet protocol (SLIP) was implemented for dial up access and over the central branch exchange (CBX) on campus as well as ethernet on campus and to some apartment complexes in town.

Adding credibility to the project, in this time frame, were the national discussions concerning the Internet and National Information Infrastructure (NII). The national debate about the electronic future of the country, while not directly affecting the project, helped the local project by raising public awareness of future national needs for high speed information networks.

The name, The Blacksburg Electronic Village, evolved in early 1992 as the collaborators worked on the extent and types of involvement they would bring to the project. The original idea of a community networking capability transitioned to the Blacksburg Community Network and

finally became the Blacksburg Electronic Village (BEV) (The Blacksburg Electronic Village, document, 2/5/92).

Once the negotiations between the partners and the feasibility study were complete a second press conference was held January 11, 1993. According to Blythe (Interview, 1/20/95), this press conference was a result of a meeting that took place in Richmond near the end of 1992 where Virginia Tech's and Blacksburg's position was stated in the following manner:

> Look, we need to go to the next stage. We need to actually start doing something, because the whole point of all this is that Blacksburg and Virginia Tech need some sort of off-campus communications network capability to be developed. We're getting pressure to solve the problem other ways if C&P is not going to be able to do this. What we agreed is that we should have another press conference announcing that we've decided to do this (BEV).

The resultant press conference, January 11, 1993, announced the partners' intentions to implement the Blacksburg Electronic Village. Included in the Virginia Tech press release, titled America's First Electronic Village To Become A Reality were these comments:

> C&P Telephone, a subsidiary of Bell Atlantic Corp., the Town of Blacksburg, and Virginia Tech today announce the formation of a partnership to create the most comprehensive "electronic village" in the nation.
>
> "Our ultimate vision is to see Blacksburg become a community interconnected by a network that is the envy of the world," said C&P President Hugh Stallard whose company has already invested $6 million in the project.
>
> "This is the first time a local government, major state university, and a local telephone company have joined together for the purpose of making information services available for an entire community," said U.S. Congressman Rick Boucher (D-VA).

It must be added that the investment of $6 million by C&P was in the form of installing a digital switch in Blacksburg. The switch, according to Blythe (Interview, 1/20/950 and Cohill (Interview, 12/19/94) was essential to the implementation of a high-speed data network. According to these sources, without the digital switch, access from town via modem, would have been virtually impossible at high speeds. The apparent problem was the analog switch which had mechanically operated switches producing enough line noise when operated that it would have interfered with high-speed modem data transfer. A digital switch produces no such noise and was necessary to eliminate the noise problem. The town was already scheduled to receive a new switch but the time table was moved up to facilitate the electronic village. Again as Blythe puts it, "If you (C&P) are willing to accelerate that (digital switch capabilities time table), it could be announced that it is an initial commitment (by C&P) and would position us to do a lot of things we couldn't do before, that is how the digital switch capability came into place

(Interview, 1/20/95)." The absolute necessity of the digital switch has been debated but it was the belief of several sources that it was paramount.

An early version of the software called BEVNETPC was developed in the spring of 1993 and was disseminated for a beta test. This beta test group included 250 individuals from the university and local community by the end of the summer of 1993 according to Kim Homer (Interview, 12/5/94), a BEV project member. The purpose of the beta test was to refine BEVNETPC software before the official release in the fall. One hundred eighty-three individuals from the beta test were included in A Preliminary Evaluation of the Blacksburg Electronic Village study conducted in August of 1993 by Patterson, Bishop, and Kavanaugh. Feedback from the beta testers was gathered by self-report background questionnaires, self-report survey of experiences with BEV, and focus group interviews. The areas of interest were: motivation for joining; uses; problems, improvements and support; and impacts. Pertinent information gathered in these areas was then used by the development group for redesigning the software package and support system implemented in the fall of 1993.

Coincidentally the Instructional Development Initiative began in the summer of 1993 at Virginia Tech. According to the Instructional Development Initiative interim report (August, 1993), the series of developed workshops "were part of an overall strategy to invest in our faculty by providing them with the opportunity to rethink their teaching and explore the potential of technology for improving the effectiveness of the teaching and learning process." An integral part of these workshops was instruction in network applications. The implication for BEV was a growing set of users within the University with networking skills thus increasing the user base both from on and off-campus. This ready-made user base complemented the growing group of faculty with the desire and ability to telecommute (i.e., the ability to use telecommunications to go to work instead of commuting by car). These workshops, beginning with pilot sessions during the summer of 1993 and continuing through the summer of 1994, trained over 300 faculty members in 40 academic departments (Instructional Development Initiative: Annual Report, 1994).

July 1, 1993 marked a key event in the development and implementation of BEV. On this date, Virginia Tech created, an official BEV project. The formation of this group gave a persona to BEV as well as staffing resources. Up to this point development had been on ad hoc basis within the University community. Certainly several people had been working on the project but BEV wasn't their only assignment, therefore their time and responsibilities were divided between BEV and other projects. This changed when the BEV group was formed. Andrew Cohill, named the director of BEV at this time, and some members from a related project group (ERIS), at Virginia Tech, were brought in and became responsible for the development and implementation of BEV on a full-time basis.

One of the first things that was established by the BEV group was documentation for the project. Users' manuals, registration forms, and brochures were produced. Previously some documentation had been available but it was not complete and was not available from one source. These documents were essential for the impending implementation of the project. Ironically,

according to Cohill (Interview, 12/19/94), the largest first-year expense for BEV, an electronic media, were printing costs for documentation.

At this point, Bell Atlantic made another key contribution to BEV, through their negotiations with several apartment owners to bring ethernet, or true computer network capability, to four apartment complexes by the fall of 1993. This true networking capability allowed computers at high rates of speed to communicate with each other and exchange voice, data, and video information. This capability is much different than a modem connection which runs at 14,400 bits per second. T1 type ethernet connections run at 1.5 megabits a second or approximately 100 times faster than a modem connection. According to Cohill, now Director of the Blacksburg Electronic Village, "Ethernet in apartments is one of the success stories of the Blacksburg Electronic Village" (BEV Bi-Monthly Meeting, 5/18/94).

The previous event brings up some early discussions between Virginia Tech and Bell Atlantic about the type of service to be implemented in Blacksburg. The heart of the debate was true computer networking capability. True computer network capability is not practical and sometimes not possible at modem speeds. One side of the argument advanced by Blythe and Heterick supported nothing short of an ethernet connection so the full capability of computer networking could be experienced. It was felt that if full capability was not experienced, networking would seem like a toy and deter the project. The other side of the argument, represented by Bell Atlantic, was very few people could afford or even would be accessible by ethernet, therefore a critical mass of users would not be attained to sustain the project. The idea was with modem access people would have a means to at least get a taste or a feel for computer networking.

The later group prevailed and a high speed modem pool was implemented in the summer of 1993 by Virginia Tech. A beta test of the high-speed modem pool was initiated by Virginia Tech in mid-July and continued through September. The beta test was designed to test the high-speed connections, SLIP access and IP addresses over the modem pool before the official opening of BEV. It is interesting to note that while the operation of the modem pool was essential for dial up access to BEV, none of the individuals interviewed identified it as a salient or critical event. A few technological problems cropped up but were resolved quickly. For the most part, technically speaking, the modem pool functioned well by the beginning of the 1993/1994 academic year.

BEV, much more organized by fall, opened its doors officially on October 25, 1993. Among others, Brad Nash, the Internet trainer for the Blacksburg Public Library, said "…in some respects I should say that the grand opening that they had in October of '93 was a critical event" (Interview, 12/29/94). Hendricks commented that "Opening the BEV office for the community at the Information Systems Building office was, I think a critical thing, to have public access…" (Interview, 1/11/95). According to Homer, "Andrew (Andrew Cohill) taking over and opening up the office and working on brochures and publicity and things like that was a good step forward" (Interview, 12/5/94). Additionally, Cohill said "I would say the next significant

date would be October 25, '93 when we finally opened our doors for business" (Interview, 12/19/94).

Not only had a definite BEV group been formed, giving a sense that some one was in charge, but a physical presence was established by the creation of an office in the foyer of the Information Systems Building. According to Cortney Vargo Martin Martin, BEV operations manager, when asked to identify critical events "Definitely the opening of the office. Nobody will deny that. That really gave us a formal presence" (Interview, 1/11/95). The office was open during publicized hours and individuals could go there receive software, register for a personal identification code (PID), set up a modem pool account and begin the process for obtaining and IP address in one location. People could walk in and see there was a BEV office with signs advertising the open hours. The only drawback was the remoteness of the location from campus and the downtown area.

Shortly after the opening of the BEV office the town provided information on town schedules and typical community activities which were put on a gopher server (Gopher is a menu-driven, text-based system for exploring Internet resources). The information was established on the server in November of 1993. Unfortunately it was not updated for another year. Vargo Martin supports this in her interview:

> Another critical event was getting the Town information up the second time. I mean, there was kind of that one set initially and then it was just outdated and it didn't look very good. Just recently, a couple of weeks ago the Town information was released. That gives us much more credibility. I mean, you can't be much of a community network without community information (Interview, 1/11/95).

The town did not have the personnel to update the information nor did BEV have the resources to provide regular postings. This problem was rectified a year latter when the town hired BizNet Technologies to maintain the server for them and to updated town information weekly. Doug Mauer, BizNet owner, confirms this: "The Town of Blacksburg is making a real effort of late to get some current information up and to keep on top of it. They're one of our clients and so they're paying money to make sure that they do the right job" (Interview, 1/15/95).

Some difficulties began to arise as BEV was implemented primarily from software configuration. Users were having difficulty configuring the software properly particularly for first time network users. Many users did not have the knowledge to be able to identify what type of problem they had. It was also very difficult for the BEV group to actually sort out what the problems were since there were so many different computers and modems being used. These kinds of problems continued for quite a while and still appear on occasion. As the software was redeveloped and released combined with better documentation and the involvement of User Services these difficulties were reduced. At that time though, it was very frustrating for first-time users because they were expecting to receive network connectivity.

In addition, the second press conference projected the availability of the following services in next few years:

* civic forums and town meetings could be held electronically;

* people could conduct transactions electronically with stores, banks, and travel agencies from their homes;

* students could receive class assignments, read special articles or even their text books in the comfort of their apartments;

* teachers could provide parents with regular updates on the progress of children in the classroom;
* a patient convalescing at home could transmit his blood pressure, temperature and other symptoms to a doctor for diagnosis (from "America's First Electronic Village to Become a Reality," Virginia Tech press release, 1/11/93).

The announcement of these services built an expectation of services on the part of the user. These expectations were frustrated when these services were non-existent on the network. These announcements did have a positive side though.

When the village officially opened, a new DOS software package was made available which attempted to rectify user complaints and frustrations. The original DOS package had been redesigned and was considerably easier. According to Luke Ward, BEV programmer at that time:

> My task was pretty much reduced to figuring which pieces (of software) to offer and to try to come up with as simple as possible a combination and embed those in a framework that allowed you to set the thing up with a minimum amount of effort on the users part. The perception was that using a menu kind of an interface would be easier for the general population and therefore easier for us to support. Every time we had to make a decision about something the strategy was let's do something supportable" (Interview, 12/16/94).

There were some Macintosh software pieces available but there was no integrated self-installing package until early 1994. Gay Diz, BEV office manager, mentioned in an interview (12/16/94) that an improved Mac version and a Windows version were released in the fall of 1994 when Bob Gage began working full time on software development. Mauer also mentions the software releases:

> Originally they came out with the DOS software which worked for a lot of people and then they came out with Mac software and a lot more people got on and then when the Windows software got on I think it really made things easier for a lot of people (Interview, 1/15/95).

As the project started to gain a little momentum the willingness of user services increased to field questions by both Tech users and community users. Again, according to Diz:

> The University hired student technical consultants and they started handling all of our technical calls. This was in January 1994 and they've been really good I think. It has been one vehicle that I believe the Computing Center has used to offer technical assistance to the non-Virginia Tech user. Users of BEV have slid in there" (Interview, 12/16/94).

It was not the best support, but services improved dramatically over the next year and at least there was some way to get your questions answered. Burt Moyers, a Virginia Tech faculty member, sums the transition up in these words, “BEV apparently has a dedicated staff that’s very willing to go the extra distance to try to make things run smoothly and to get people on line the easiest way” (Interview, 1/4/95).

Several months after the opening of the BEV office a program called Mosaic designed by the National Center for Super Computing Applications (NCSA) began to become popular. This program was a World Wide Web browser providing a graphical interface with in-line graphics, text and hypertext, combined with the means to download and view graphics and video as well as sound. This opportunistic event impacted the Blacksburg Electronic Village by creating a desire on the part of users to access BEV using this program. According to Vargo Martin early in 1994, the first BEV web pages were established and have been revised and updated ever since. The inclusion of a web browser in BEV released software did not occur until fall of 1994 with the first Windows release and with Mac version 1.3 release September 30, 1994 (Macintosh Installation Guide, Version 1.3).

Another opportunistic event, independent of BEV, was a grant to the Blacksburg Area Branch of the Montgomery-Floyd Regional Library system. Nash (1994), " the BEV librarian", of the Blacksburg Area Branch of the Montgomery-Floyd Regional Library states in a report to the grant agency:

> With the assistance of a Library Services Construction Act (LSCA) grant, administered by the Library of Virginia, and along with the cooperative efforts of several private and public organizations, the Blacksburg Library has been able to provide its patrons with access to the Internet via the experimental Blacksburg Electronic Village (BEV) project (p. 1).

The grant provided six computer terminals connected to the Internet for public use located in the Blacksburg Public Library. These computers became available to the public January 15, 1994 during regular library hours (Nash interview, 12/19/94). This was a tremendous help to the Blacksburg Electronic Village. BEV did not have the resources to provide public terminals or the personnel to provide any training. An additional part of the grant included money to train users and conduct public workshops. In the next six months the Library trained 500 users, according to Nash (Interview, 12/19/94), and offered courses in e-mail, gopher, and a general overview of how to use the Internet. Later on that year the Library was able to install MOSAIC on the public terminals and provide additional classes on how to use Web browsers. Quotes from multiple sources illustrate the importance of this event:

> Cohill: “We didn’t plan to have the library involved as heavily as they have been, but in retrospect they have been a critical resource. They went out and got some grant money to buy computers and support personnel in the library and have offered lots of seminars. They’ve taken a lot of the training responsibility in the project, we just haven’t had the staff here to do it ourselves. I think that there’s is a very important community project

to have free access to the network and to address the debate of the information haves and have nots. In Blacksburg you can be homeless and have an address on the Internet" (Interview, 12/19/94).

Secrist: "…more critical probably than anything and luck wise perhaps, was the whole Electronic Village access in the Library. Without a doubt that has stimulated and birthed so many users. People who have gone there tried it, got trained, moved home and used it" (Interview, 1/4/95).

Steve Helm (Technology Director for Floyd/Montgomery County Public Libraries): "…the Library coming on board January 15, 1994. I think that was critical in that it offered a place that was visual that people could access and could actually see what was happening with the Village. It wasn't an abstraction any more. It was something concrete" (Interview, 1/13/95).

Linda Waggaman (Montgomery County Coordinator for Gifted and Talented Programs): "The one I thought was wonderful were the computers in the Library, really involving the community. I think that's real important. I've heard a lot of people talk about the access and being able to train people through the Library, I think is important" (Interview, 2/20/95).

Shortly after the Library opening, the first big national event occurred when the Blacksburg Electronic Village was featured on the NBC Nightly News with a 3-minute segment February 10, 1994. This caught the imagination of the town as well as the country. BEV personnel were bombarded for the next six weeks by people interested in how to do it, what it was, could they do it, and all types of questions that related to the idea of an electronic village. In a sense, it was a coming out party for BEV. Interviewees volunteered the following comments about the news broadcast:

Jack Davis (Virginia Tech faculty member): The critical event was the formation of the Village and that, at the time, was quite unique. I think it's increasingly becoming less unique which, of course, is good in the sense that other communities and organizations are doing it. However, the most critical development was when the Village got national press on NBC (Interview, 1/10/95).

Susanne Huff (Town liaison to BEV and Station Manager of KTOB, e.g., the Town of Blacksburg public service TV station): "I think when BEV was featured on NBC news" was a critical event. "I heard a lot of feedback from that one" (Interview, 12/29/94).

> Nash: When NBC came down, it was a key event, not because I was in the film, but I mean we had opened in January and they came down late January a week or two after we had opened at the Library. From the library's perspective on things which in some respects might differ from others that was great. It's like here we've opened up and we're already on NBC. You know, the first seven months (January through July, 1994) besides NBC we've had numerous TV stations there, the Lieutenant Governor and magazine articles. There have been a lot of media events through the year" (Interview, 12/29/94).

Incidentally, part of the NBC Nightly News coverage of the Blacksburg Electronic Village included people using the public terminals at the Library. It foreshadowed how important the Library became at that point in view of the training which was provided.

Several events the spring of 1994 really encouraged the Electronic Village. One was the increased exposure created when BEV put up their own World Wide Web Home Page. It came up in early spring and was revamped during the summer at which point it was continuously updated. According to Vargo Martin:

> Personally, a critical event for me was taking over the Web … we started putting up Internet resources including Dr. Hendricks medical data base. He's a local doctor with a lot of name recognition and I think that's far more valuable than just the Baylor School of Medicine. It brings information closer to home and it's more usable and it's not quite so huge. The web pix (a weekly posting of user recommended web sites) was actually a net thing. That was Andrew's (Cohill) idea and that was a good way to get involvement and let people contribute in a really easy way (Interview, 1/11/95).

A second critical event occurred that spring when Busch Entertainment Corporation became involved in the BEV project. This corporation made a commitment of resources for the next two to three years for the transfer of K-12 educational materials to be put on the World Wide Web. According to Cohill:

> … We (BEV) received a letter of support from the Busch Entertainment Corporation agreeing to commit significant resources over the next two or three years to completely transfer a very large base of K-12 educational materials to World Wide Web format and test them in Blacksburg. This gave us a good deal of credibility with the public schools because of the potential availability of material (Interview, 12/19/94).

Andrea Kavanaugh, director of research for the BEV, reinforces this point when she says "…Busch Entertainment has been very important" (Interview, 1/16/95).

During the same time frame, Bell Atlantic made a commitment to donate four T-1 lines (high-speed internet connections) to the public schools. Cohill identifies this event as critical to BEV:

> Also in the spring of '94 we got a commitment from Bell Atlantic to provide four, free, T-1 lines for a year to the schools and that was also very helpful in helping get the local public schools on board with the project. They didn't have a lot of resources to invest in

> the project themselves and I think they were waiting for us to help them bring some resources before they were willing to commit heavily to it. The combination of the Busch material and the T-1 lines from Bell Atlantic made a significant difference in getting full participation of the public schools (Interview, 12/19/94).

Helms identifies this event as critical as well, "The donation of the T-1 lines to the schools and schools coming on line I think will prove to be a critical turning point for the Village" (Interview, 1/13/95). While these lines did not get installed until late fall of 1994, the donation of the T-1's did increase school participation and the recognition by the project that the public schools needed to be included in the project. This was made evident by the observed increase of school personnel at regular BEV planning meetings beginning in the spring and early summer and the concern on the part of the project leaders to get the lines operational over the summer and through the fall of 1994.

Another critical event the spring '94 was the development of BizNet Technologies. BizNet was a private entrepreneurial enterprise started by several men in Blacksburg to provide World Wide Web services to businesses in Blacksburg. Although they got off to a slow start, they've come on very strongly over the past year. Several interview comments follow:

> Kavanaugh: Obviously the involvement of BizNet technologies has been very important in bringing along the business community and being able to distinguish what is going on here for the business community as opposed to other localities (Interview, 1/16/95).
>
> Helms: Of course when BizNet Technologies was created I think that really gave a push to the community because now there are over fifty or sixty business on line (Interview, 1/13/95).
>
> Ward: Another milestone I would think would be BizNet Technologies when they put a machine on line and actually started providing services to the first businesses (Interview, 12/16/94).

BizNet provided net access and design expertise to anyone who was not affiliated with Virginia Tech. Part of the difficulty for Virginia Tech, prior to BizNet's inception, was they could not provide server or design support to businesses in town. Virginia Tech, as a state-owned university, was simply not in the business of providing commercial services. Virginia Tech's role was to experiment and develop not to become an Internet service provider. BizNet identified and filled a niche in the community that was a direct result of the development of the electronic village. It has evolved into a successful business and other spin-off businesses are expected.

An additional boost came in May/June '94 when Information Systems at Virginia Tech decided to use BEV software for all on and off-campus users. According to Cohill, as a result of this decision,

> User Services and the Computing Center took over much of the software testing and client software testing development which help us a great deal and they were able to finally finish up a Windows version we had been working on and we began to work much more closely with them. As it stands now they manage the Mac and Windows client

> software and we provide documentation so there's a sharing of tasks involved (Interview, 12/19/94).

An indirect result of this decision was an increase in the resources available to BEV since the BEV development team no longer had to deal with software testing and development.

Finally in the fall of 1994 the user base took a giant leap, due partially to the increase in student users (attributed to the availability of Windows software), and counting all users at Virginia Tech, as well as the larger community. Cohill explains:

> At the start of fall semester '94 we went from having about 2,000 users that we knew of with the BEV software in the summer, to signing up and distributing well over 2,000 copies of the software the first three weeks of school and because of the university support for the software we changed the way we counted BEV users. We decided that it was a community project and where you got the software was no longer important. So we started counting IP addresses in Blacksburg as the measure of how many people are on the system and by late fall of '94 we had over 9,000 IP addresses in use in Blacksburg at home or work (Interview, 12/19/94).

As implied by the growth in the number of users, BEV was beginning to take on a life of its own by the conclusion of the first year of implementation. The culminating activity for the first year was a third press conference October 12, 1994. Some of the same dignitaries from the other press conferences were involved, particularly Congressman Boucher. At this press conference a planning grant for Montgomery County Schools for $99,000 was given to the University to work on an plan the virtual schools project. Congressman Boucher announced:

> Today we mark the first anniversary of the Blacksburg Electronic Village with the provision of federal assistance for the joint project of the Blacksburg Electronic Village and the Montgomery County School Division. I am pleased to announce that the National Science Foundation, a federal government agency, is awarding a grant in the amount of $99,000 to the project to plan a "virtual school," comprised of a high-speed telecommunications education network in Montgomery County (Statement of Congressmen Boucher, 10/12/94).

In actuality, the planning grant ended up being used primarily for infrastructure installation in preparation for "virtual schools". Coincident with this planning grant, the schools formed a core group of teachers for Montgomery County Schools and started working on the technology plan for the county. At this point Montgomery County started looking at whether or not they would have a line item for technology in the schools and subsequently in the Spring budget they approved $400,000 for technology for Montgomery County Schools.

Also, with the close of the first year of implementation, the Town of Blacksburg hired BizNet Technologies to update their information on-line weekly as mentioned earlier. Consequently, the town became current with its information available on the servers presenting a more committed (financially) attitude to the project.

In addition, about this same time, a Macintosh version of the BEV software became available to the general public. Up to this point BEV Mac software was only distributed to university affiliated personnel through a site licensee agreement. This changed with university software development support and Mac platform was supported for the community.

The first year of implementation bridged a critical period in the evolution of BEV. BEV had been made public officially, and had dealt with variety of changes that seemed to make it stronger. With the inclusion of the schools, the business community, cooperate sponsors and increased town commitment, Blacksburg had truly become an electronic village.

The subsequent section discusses effect of BEV upon the community and the university. In addition, some of the problems BEV has encountered through 1994 are discussed.

Consequences/Influences

Several events precipitated important consequences for the success of the BEV project. They included: reaching critical mass, influence of the national press, increased information resource awareness, Montgomery County Schools, the Town of Blacksburg, new social groups and spin-off businesses.

It has been my observation that a critical mass (Markus, 1987) has been reached by the Virginia Tech affiliated users but not in community users. According to Cohill (Interview, 12/19/94), at the end of the first year of implementation only 1000 of the 9000 claimed users were from the community. The remaining 8000 were from the university which indicates less community involvement compared to a higher level of involvement by Tech affiliated users. This is not true for the community at large. As a result Tech's critical mass has reached a point where, for faculty and staff, electronic mail (e-mail) has been determined to be an excellent way to communicate and conduct daily business. The comment "send me e-mail, I don't answer voice mail" is indicative of the change that has taken place just in interpersonal communication.

The national press generated by BEV was another meaningful impact identified by several interviewees. During the course of the study, there were numerous newspaper and magazine articles dealing with BEV. The first national article was in the New York Times, January 16, 1994, titled: Virginia's Electronic Village. It was followed closely by a NBC news spot February 10, 1994, as well as many local articles in the Roanoke Times and World News, several Internet magazines such as NetGuide, January, 1995. This publicity has given Blacksburg a name recognizable across the country. An example of generating national and international interest is given by Burt Moyers (Interview, 1/4/94):

> I was at a meeting in New Orleans in late October (1993) and I sat at a table with a bunch of people but the ones that I was talking to included a professor from MIT and a professor from the University of Bath in England. …I mentioned the Blacksburg Electronic Village and just sketched it to them, anyway the description I gave them really excited them and they were impressed that Blacksburg had done so much already. The fellow from England wanted to know more and more.

An additional consequence of national publicity has been an increase in town pride. Basically the Electronic Village, in certain circles, has put Blacksburg on the map.

One more consequence of BEV has been the raising the awareness of community users, Tech affiliated users, and the partners in the project to the possibilities of global telecommunications, searchable information services, and what connecting to the Internet can provide. In some sense, the Internet can put the world at your finger tips. An example from Diz's interview is when she overheard several people talking in coffee house downtown about information they had just gotten from a remote server. A further quote from Cohill (Interview, 12/19/94).

> It is my understanding that this has really raised the awareness of the people here at least to the fact that there is a national information infrastructure and that there is a super highway out there and it isn't as scary as it might have been if there had been no project in Blacksburg.

An additional area of influence by the Blacksburg Electronic Village has been with the Montgomery County School District through an NSF grant that was awarded October 12, 1994. Unfortunately, over the history of the Electronic Village project, the schools had not been significantly involved until this grant was awarded. The schools had been talked to, worked with, some planning had been done but not much collaboration had taken place. According to Butch Morris, former Montgomery County Schools BEV liaison (Interview, 1/10/95):

> I think if we'd start it all over again and did this differently, in the development of it, we didn't communicate, we ended up communicating a lot, but it was after everybody's sitting, thinking that everybody else is doing something without us (the schools) and that we were doing stuff without them and we weren't. We weren't talking to each other and finally we started talking to each other, but we had different agendas.

With the award of the planning grant and the donation of the T-1 lines, the schools received the ability to get ethernet into classrooms and became seriously involved. Just the ability of real time capability in the classroom to show what this system could do was a tremendous advance. Certainly the schools are hopeful that this technology will be useful and help with the curriculum issues, bring in more resources, and provide some distance education possibilities but that has yet to be seen.

An additional consequence for the schools was that technology was declared as important to the school district and appears as a $400,000 line item in the 1994-1995 district budget. There had never been a line item for technology in the budget before (Arrington, Technology Coordinator for Montgomery County Schools, interview 12/13/94). This was an important change in the Montgomery County School system.

The town has also been directly influenced. As a result of this influence, the town developed a three-year technology plan and that plan has been implemented. The town government has put current information on a World Wide Web server and continues to add information regularly for community users. In the next two to three years, individuals in the community will be able to access areas to pay their taxes, get dog licenses, get city stickers for their cars, and so forth. At the present time (4/97), these services are available but the interactive

portion is not there. The information is available but a consumer can not yet pay fees for these services on-line.

There certainly has been an effect on the town, said Bonnie Svrcek, assistant town manager (Interview, 1/4/95), “It's changed the way we do business.” Since the server went up, part of each department’s responsibilities has been to produce pertinent information that can be accessed from the World Wide Web by community members. This has been a significant change for the town. The town's commitment to this form of communication was demonstrated by hiring BizNet Technologies to take care of their informational needs and to provide that information to community users of BEV in a timely manner.

An additional impact of BEV has been the creation of a new community of people in Blacksburg. Individuals are communicating through BEV news groups dealing with local issues; there has even been a group of BEV users who met at Bogan’s restaurant to plan socials. These groups of people would not have gotten together without having been Internet users. BEV has created new socially organized groups, a virtual community, which would not have occurred without BEV. An example of these new connections is demonstrated by a friend of mine, in Blacksburg, who met somebody online, through a news group, and actually visited them when they traveled to San Francisco. Heterick (interview 1/13/95) reinforces this example by saying, “The Electronic Village shows enormous potential for creating connections and links between community members and members in the country, and even internationally that did not exist before.”

A further consequence effected by BEV, has been on Blacksburg area businesses and their presence on the Internet. In a recent review (1/3/97) over 300 area businesses were listed in the “Village Mall” and at least four businesses specialized in developing Internet electronic media. Prior to BEV this presence, and these specialized businesses did not exist.

Problems

The most frequently identified problem areas for BEV have been money, staff, and resources. Money was identified as being the most significant problem facing BEV at present and in the future. Simply having the ability to develop new programs, employ new staff, and provide resources has been very difficult. At the BEV bi-monthly meeting (September 1993) Cohill that BEV’s biggest expense during the first year of implementation was development of printed materials documenting installation procedures and publicity brochures.

Since resources and staff are costly, it has been the intent of the University to move these responsibilities to the community and/or other businesses. This migration of services to another provider and/or to the community has been a goal that was stated from the very beginning of the project: although at that time, it was a background issue. The University’s position has been that the BEV project is an experiment to see what it means to connect an entire community to the Internet in cooperation with major partners Bell Atlantic and the town of Blacksburg. The intention had never been for BEV to be a commercial service provider. The BEV project was simply to see if a project like this was viable in a community.

Consistent with this philosophy has been the move by the University to divest itself of the modem pool servicing community users (non-Tech affiliated users). The original intent of the University had been to get things up and running and to see if it would work. Ideally, spin-off businesses such as administration of the community modem pool would migrate to commercial providers or create new businesses similar to BizNet Technology.

Early on, credibility problems arose from the promises that were made during the press conference held on January 11, 1993. Touted services were banking on line, ordering groceries, getting a pizza, and writing your friends across the country. When people began connecting to BEV, in the fall of 1993, most of these services were not available. E-mail certainly was available and access to information sources around the country but banking and the other interactive services were not available. In addition there was and still is the significant problem of using a credit card or e-money on the Internet and having it secured so "snoopers" cannot get your credit card number. One town employee suggested that even though these were empty promises in the beginning, it did cause them to move ahead and try to provide those services sooner than if they hadn't been promised in the first place. My observation was that it caused early frustration for new users and impeded the growth of BEV (BEV Public Demonstration and Forum, CEC, Sept., 1993).

An additional problem identified by a majority of interviewees and mentioned in several documents has been the training and education issue relating to the use of the BEV software. Early on, it was very difficulty to connect to BEV with the available BEV software. Compounding this problem was as the pool of users wanting to connect increased, their average computer literacy ability decreased, making it less likely they would successfully connect to BEV. Thus, the issue of training and network education became important as well as having a direct effect on achieving a critical mass of users. Prior to February, 1994, when the library offered public access and training, connecting to BEV was essentially by trial and error. I believe this kept the number of users low at the beginning of the project.

Mauer (BizNet Technologies) and several interviewees felt that training and network education would come through the public schools. That, in addition to the public library, the public schools, with the new T-1 lines, would teach students how to use the Internet. In turn, these students would teach and/or put pressure on their parents to get computers at home. Essentially, there would be a trickle-down effect from the schools to homes.

An alternative approach to training and another significant problem brought up by quite a number of interviewees was the ease of use of the BEV software. For BEV to succeed in Blacksburg the software has to be easy to use and easy to install. According to Roger Erhich (Interview, 1/5/95), people who are not very computer literate are going to need turnkey software. If it isn't turnkey, they are going to need training opportunities. The easier the software is to use, the more likely it is to diffuse successfully. The original BEV software was very difficult to use, difficult to configure and required relatively high-end equipment. With the development of a Windows package and freely available Macintosh package, ease of use has improved drastically but it still does not qualify as turnkey software. Moreover, BEV requires

high-speed computer processing and relatively new equipment which may limit the number of people in the community capable of connecting to BEV.

A key problem tied to early implementation, was user support. It was very difficult to get any user support before the BEV office opened. The individual user had to "know someone" to obtain any information. It was very difficult to get answers about the software or configuration procedures. After the BEV office opened, there was a point of contact for users and when the University decided to support the software many of the nagging support problems were resolved. To date problems still exist, but there are now ways to deal with them.

Another concern, particularly of the town government and of the public library personnel was the creation of a group of "haves" and "have-nots" (information, hardware, and software disadvantaged) as far as availability and access to this technology. The library tried to prevent this by providing public terminals and access to those terminals. Unfortunately, this certainly was not as convenient as if a computer was in the home. A real fear existed that an electronic class elite would be created if equal opportunity access was not provided.

Some of the town government people indicated that there was a problem in just reaching the people in the community. The assumption had been that BEV was a widely known fact in the community but this was not necessarily the case. Susan Huff, town liaison to BEV and station manager of WTOB, (Interview, 12/29/94) mentioned that there were people that she runs into even now (at the time of the interview) that have never heard of BEV. She explained BEV to them and they say, "Well, where was I." It appeared that publicity had been difficult to get it out.

A further problem identified in several documents, and by quite a few interviewees, was keeping the price down. Connecting to and using BEV needs to be an affordably priced service. It can't be just for people who want to surf continuously and can afford it. Affordability and usability are critical to continued use and to increase the user base as well as influencing the issue of the information disadvantaged.

Related to the issue of affordability was determining what people were willing to pay for this service and which services they would want. According to Knapp (Manager of External Affairs for Bell Atlantic, interview, 2/6/95), nowhere in this project was it said to be a free net. At some point individuals will have to pay for these services. I see this as a difficulty since access and services were inexpensive for so long. It is going to be difficult to implement a service rate and to continue to make the user base grow. That is a problem that has to be faced as the university divests itself of the modem pool and possibly other server maintenance operations. Also it will be very interesting to see which services will be available, which ones the public will actually pay for, and which ones they have to buy but do not want.

Summary

As evidenced in the previous section, BEV seems to have established itself as a viable electronic entity both in the community and on the World Wide Web. The beginning of an idea

that originated in the early 1980's evolved, by the end of the first year of implementation (October, 1994), into a sustainable electronic village project.

The preliminary goals of each partner appear to have been realized. Early tensions created by the construction of the campus network were overcome and a working partnership provided each member with experience, pertinent information, and an electronic presence. Through the planning of this partnership (i.e., the feasibility study, press conferences, and the formation of the BEV group), BEV became a reality officially on October 25, 1993.

In addition to reaching some of the partnership goals, the demand for high quality off-campus electronic services was starting to be met. With the continued development of better software, the involvement of the public library for training, and the developing potential for businesses the demand continued to increased. When user support services were provided, another barrier for users was reduced ease of access.

At the conclusion of the first year of implementation (October, 1994), BEV appeared to be on its' way. The grant for school T1 lines was in place, an agreement with Busch Entertainment provided educational materials and development possibilities, and positive press produced national interest. At this juncture, BEV appears to be a success.

CHAPTER 5
Conclusion

The evidence observed through interviews, observations and documents suggest that the development of BEV closely follows Roger's (1983) models of the innovation-development process and the innovation-decision process. Furthermore, it also seems that BEV aligns with the observations on innovations made by Schroeder, Van de Ven, Scudder, and Polley (1989). The following section relates the development and implementation of BEV to these models, offers some additional observations, and an epilogue which updates the current status of BEV. The following figure provides and advanced organizer for comparing BEV to these models.

Rogers Innovation Model	Needs/ Problem	Research	Develop-ment	Commer-cialization	Diffusion/ Adoption	Consequen-ces
BEV compliance with model	Yes	Yes	Yes	Yes	Yes	Yes

Schroeder and colleagues, observations on innovations	Observa-tion 1	Observa-tion 2	Observa-tion 3	Observa-tion 4	Observa-tion 5	Observa-tion 6
BEV compliance with observations	Yes	Yes	Yes	No	Yes	No

Figure 3. Conclusion Matrix (Observations, page 18 & 19)

Discussion

Connections with the Literature

After reviewing all the data sources I had the distinct impression that the partnership of Bell Atlantic, the Town of Blacksburg and Virginia Tech, with the resultant BEV project, was a political solution to a difficult situation. As mentioned in the narrative, a critical event was Virginia Tech building its own network on campus. Prior to the campus network Bell Atlantic had operated all communications on campus. Consequently, Virginia Tech eliminated a fairly significant cash flow for Bell Atlantic when it built and operated its own campus network. The campus network impacted the town as well through the loss of utility taxes Bell Atlantic had been paying. My observation is that as a result of this, serious friction was created between the Town and Bell Atlantic with Virginia Tech.

When pressure developed for provision of computer mediated communications services off campus, BEV gained impetus on campus, fueled by the desire of faculty, students, and some towns people to be able to get quality service. Virginia Tech was forced to reconsider its

position. A political problem had been created because of the difficulties that occurred during network construction. The main problem for Virginia Tech was prohibition, by state law, from providing services beyond the physical confines of the campus. The problem for Bell Atlantic and the Town was inclusion and a piece of the market. The resulting partnership eased these tensions and was a beneficial political solution for all.

Three reasons drove the partnership. First, Virginia Tech was very sensitive to the fact that it really wasn't in the business of providing an essentially public utility to off campus users, however, Bell Atlantic could. Second, Bell Atlantic was able to get back into the local market. Since the breakup of the Bell System into baby Bells, Bell Atlantic was very sensitive to regulatory issues which could be avoided by being involved in an experiment with Virginia Tech. Finally, the Town provided community credibility to the whole project. It was a very advantageous solution for all concerned, resolving previous difficulties and providing an opportunity for the partners to advance their own agendas within the local context. While these agendas were different for each partner, BEV enabled them to advance them in their areas of interest. It was a win-win situation for all concerned.

These events directly relate to Rogers (1983) model of the innovation-development process. Essentially, the partnership was a convergence of forces necessary to initiate the innovation (BEV), which was the needs/problem stage according to Rogers or the first observation, to initiate novel action, by Schroeder and colleagues (1989). If this partnership had not occurred BEV would not have been developed.

Adopters were also involved at this point since the campus network system had been in existence prior to the formation of the partnership. These early adopters had knowledge of the innovation, had used some of the services on campus, and wanted them offered off campus. For this group the first three stages of Rogers' (1983) innovation-decision process, (i.e., knowledge, persuasion, and decision) had occurred. These adopters wanted implementation of similar services in town. Later adopters would progress through these stages as they gained knowledge of the innovation.

The next phase, marked by several press conferences, coincides with Rogers' (1983) research and development stages. Once agreement to form a loose partnership occurred, the partners initiated a feasibility study (research) deciding if the project could be done and if they wanted to do it. The subsequent press conference announcing the BEV project and a formal partnership, in January of 1993, ended the research stage and began the development stage.

This development stage included installation of the digital switch by Bell Atlantic, software development, and beta testing of the BEV software package. The time frame for this development was January, 1993 to October, 1994. Focus group interviews of beta testers, part of a study of local users (Patterson, Kavanaugh & Bishop, 1994), provided feedback for software developers and an idea of what services were being used prior to implementation.

This time period included the access discussions. How were users going to access the project? The debate was centered around modem access, integrated systems digital network (ISDN), and ethernet. While the question was settled with the cheapest solution for the most

users (i.e. modem) this debate is an example of observation 2, by Schroeder and colleagues (1989). They suggest innovations take several developmental paths, and it is impossible to know which might be successful. In this case, the modem became the initial primary means for access, but as prices decrease and the availability of the other methods increases, the modem may be displaced.

Another parallel that exists between Schroeder and colleagues (1989) observations and BEV. During software development there were numerous problems to solve, not the least of which was direct Internet access. Direct Internet access using SLIP was very new and the amount of computer expertise necessary to configure the software was very high. Reducing this level of expertise was a challenge and, early on, kept the number of users low. When BEV was formally organized from an ad hoc group in July of 1993, the primary charge was to produce literature to facilitate software configuration.

This time period could also be considered as Rogers' (1983) commercialization stage. The beta test was a pre-market test of the software and the system. As a result of this test changes were made to improve the software preceding the official release of BEVNETPC version 1.0. In addition, the BEV office open in September of 1993 to establish an official presence and to aid early diffusion to early adopters. This was essentially a pre-opening, prior to the official opening of BEV October 10, 1993 which marked the diffusion and adoption stage (Rogers, 1983).

The "grand opening" made BEV available to everyone in the community. The BEV office was the official point of contact where community and faculty could sign-up and receive the necessary information to connect to BEV. Basically, the office was the diffusion point and adopters came to try out the innovation. A secondary diffusion point was the developed at the Blacksburg Library in February, 1994. Adopters could go to the Library and fill in the necessary forms which were then delivered to the BEV office once or twice a week by Brad Nash.

The Blacksburg Library became an essential resource for BEV adopters. The library was the place an adopter/user could pass through all the stages in Rogers innovation-decision process. Classes were offered for the knowledge stage, in-depth information was available for the persuasion stage. Computers connected to BEV were available for trials in aiding the decision process and also available for implementation of personal accounts and further experimentation. Additionally classes were offered in using the BEV and how to configure the software at home reinforcing the confirmation stage. The library proved to be an extremely valuable resource for the diffusion of BEV and for the adoption process.

An additional boost for the confirmation stage came in the fall of 1994 when an official help line was established by Computing Network Services. Students were hired to monitor these lines and soon became quite knowledgeable in fielding a wide variety of help questions. This support service was critical for establishing and maintaining the user base (adopters). User support helped to prevent discontinuance by new users and resolved difficulties for earlier user/adopters.

In terms of adoption, a critical mass of users has been reached by BEV. Reaching critical mass can be defined as the point where individuals feel it is absolutely necessary to have the

services to conduct their daily lives and business. The case of the telephone serves as an illustrative example. An easy way to describe it would be if there were 400 people in a town and only 10 people were using a telephone to communicate, the other 390 wouldn't feel much need for a telephone. If the reverse were true and there were 390 people using the telephone, the 10 people without would feel a lot of pressure to have a telephone to be able to communicate. This idea of critical mass, for BEV, was when people felt it was necessary to have BEV services to be able to function efficiently on local, national and international levels. Having reached a critical mass of user/adopters indicates that this project is now most likely self sustaining. According to Rogers (1993), this would constitute placing the current adopters, on the continuum of adopter categories (innovators, early adopters, early majority, late majority, laggards), as the latter part of early majority.

Consequences of this innovation are still occurring since this is an on-going project. Several consequences that have been observed to this point are: the formation of a new social group of BEV users, the towns' commitment to provide up-to-date information on the web with the intent to provide interactive services, several spin-off business that deal only with commercial web page development, and the presence of over 300 businesses advertising via BEV.

Additional Observations

Addition observations follow that were taken from all data sources. Theses additional observations were not identified by a majority of interviewees but based on my experience and analysis of the other data sources were important to the development and implementation of the BEV project.

When reviewing the data sources, no source indicated the importance of the modem-pool beta test. Although I interviewed users that were involved as beta testers or had been involved with of the beta test, no one identified it as a critical event. Having been involved as a beta tester, I see this as a very critical event. If the high-speed modem-pool had not operated effectively, with the new digital switch, there would have been no dial-up service, no way to test software and therefore no access from off campus.

Another observation is, since it seems community support has grown primarily from Tech affiliated users, this group has sent a message to the schools that technology is important. This is based on the number of people from Tech that have gotten involved, in some form or other, with the local schools. Hands-on examples are the network wiring of Margaret Beeks Elementary School by volunteers from Tech, volunteer training of Gilbert Linkous Elementary School staff in the use of CMC, and other faculty members such as Roger Ehrich and Bob Stephens who have worked with the school districts. These individuals have worked to facilitate computer-mediated communication (CMC) in local schools. It appears the support from Tech individuals and other community members has given a clear message to the schools that this kind of technology is important and that it needs to be included in the schools.

The schools have actually reacted well to this influence by providing money earmarked for technology in the next annual budget (Larry Arrington, interview 12/13/94). I think it is also evidenced by the fact that the local Superintendent's original vision was to have some form of

real-time video to provide instruction and has now abandoned this idea in favor of CMC which is less expensive and uses less band width.

The planners had hoped, when developing the vision for BEV, to create a replicable model for electronic villages. I believe this has occurred in this community. As far as this model is concerned, it seems that a utility provider is absolutely necessary, whether it is a cable company, a phone company, an electric utility. The utility provider must be coupled with the expertise to provide the computer technology (as it is here at the university) plus persons or groups with desirable information (the community and the university). The components of the model are a provider, CMC expertise, and desirable information. These elements seem to be basic to the function of an electronic village and could be replicated anywhere as long as all three are present. Blacksburg has three separate partners which represent each element but it is conceivable that these elements could exist in one or two sources.

Another observation discovered from conversations with Bell Atlantic officials, from the Bell Atlantic feasibility study, and from what I have observed was Bell Atlantic did not originally approve of the BEV project. The project was slated to be funded by Bell Atlantic for $5 million dollars but it was rejected. A scaled down version was submitted later for $2 million dollars and it was not formally approved or disapproved. The budget of $2 million for the project was never approved or disapproved, but it was allowed to progress. Interestingly enough only $700,000 dollars were spent on the project and not the $2 million budgeted. The statement was just "to do what you think is best" from the Bell Atlantic review board to Bob Morris (Bob Morris, interview 2/28/95). This occurred, I believe, because Wiencko, who had been the liaison from Virginia Tech to Bell Atlantic was not appointed the director of the Blacksburg Electronic Village in July of 1993. It seemed Bell Atlantic was very concerned about the future of the project without a known factor in control. Consequently, the remaining money was held back until, in their opinion, the new personnel stabilized. It appears that any fears that existed have been resolved and full support is now maintained (Bob Morris, interview 2/28/95).

Finally, I wish to point out that the hardware and software problems, for the present, have been resolved but as new technology is installed and new software issued, problems will arise. According to Blythe (Interview, 1/20/95), the technology has not been the problem. The real problems that need to be addressed in BEV are political, psychological, and philosophical in nature. It is the mix of individuals and institutions that is the biggest barrier to the success and the continued growth of the Blacksburg Electronic Village.

Epilogue

This epilogue provides a review of events that have taken place with BEV since data collection for this study ended March 1, 1995. The sources for this information are BEV Newsletters (electronic) from January, 1995 to April, 1997, BEV homepages, telephone interviews with Cohill (6/19/97) and Secrist (6/23/97), and observations taken before I left Virginia in August, 1995.

A positive change occurred when BEV moved to the Virginia Museum of Natural History, 428 North Main, in downtown Blacksburg January 18, 1995. Access for the general public was greatly increased since BEV's previous location in the Andrews Information Systems Building was very remote. Personnel at the BEV office reported a increase in community user registration in the months following the move (BEV Newsletters, February, March and April, 1995). According to Cohill (Interview, 6/17/95), "The increase in foot traffic at the new BEV office was very high until modem pool accounts where no longer issued to users in March of 1996."

Software continues to be updated and upgraded. According to the BEV Newsletters of February and March 1995, version 2.2 of BEVnet windows, DOS 1.2a, and Mac 1.3 were made available at the BEV office. These versions are fully supported and offer Netscape in for those affiliated with Virginia Tech.

An issue that continues to be addressed in the past two years is Internet training. Internet training continues to be offer by the Montgomery-Floyd Regional Libraries. While training first began in Blacksburg (February, 1993), all library branches now offer free courses to the public on use of the Internet (BEV Newsletter, April, 1997). In addition, classes were available at the Auburn Community Internet Training and Resource Center April, 1996 through July, 1996, and BEV offered a variety of quick courses to sharpen user Internet skills in March 1997 (BEV Newsletters, February 1997). According to Secrist (Interview, 6/23/97), "The schools have been aggressive in the area of integration of the internet into the curriculum and have made their computer labs available to the public."

Modem access to the Internet has changed in the past several years. The service offered by Virginia Tech is now being provided by private businesses. Privately provided access was offered in November, 1995 at 28.8 by NRVnet in the Blacksburg area November, 1996. Services were provided by Citizens Telephone Coop for Floyd, Radford and the New River Valley (BEV Newsletters, November, 1995). NRVnet eventually merged with U. S. Internet in November, 1996. Even Bell Atlantic entered the market in August, 1996 with a public offering of ISDN services (http://www.bell-atl.com/isdn/consumer).

Changes in modem access initiated a rumor that BEV was being disbanded. This was and is not the case. Several issues of the BEV Newsletter dealt with reassuring users that BEV was not going away but only modem access was changing. Cohill stated in the BEV Newsletter, December, 1995:

> There are persistent rumors that the BEV has been or will be sold, given away, or shut down soon. Nothing is farther from the truth, and if you hear people repeating these stories please take a moment to correct them. … The Blacksburg Electronic Village office in the Virginia Museum of Natural History on Main Street will remain open, and as most folks begin to purchase their Internet access from one of the private companies, we will focus more on community education (more on classes on how to use the Internet), better documentation, and enhanced services.

Support services continue to improve and users are now queued for help services on a first-come, first-served basis (BEV Newsletter, December, 1995). The process begins with a call to a receptionist who electronically forwards your short description of the problem to a group of technical consultants. Optimally, the consultants diagnose the problem and call you back with 5 to 20 minutes depending on the demand at the time.

Internet businesses continue to evolve as BEVs' user base increases. Currently there are 18 Computer Consulting and Training Services listed under Computer and Information Services in the Village Mall (http://www.bev.net/mall/index.html#Computers, May 11, 1997). These services were not in existence prior to BEVs inception. While these services are not endorsed or screened by BEV, their existence is identified to provide services for those who need them.

Public schools have become more involved with the Internet and BEV in the past two years. Examples are: Fifth-Graders created and maintain web pages in Christiansburg (BEV Newsletter, January, 1996), Christiansburg High School's Art Department published their students art on the web (BEV Newsletter, February, 1996), Montgomery County Public Schools went on-line (http://www.bev.net/education/schools), and the Blacksburg Middle School has its own homepage (http://www.bev.net/education/schools/bms/) (BEV Newsletter, February, 1997). In addition to these activities a National Science Foundation grant for $151,000 was awarded to BEV and the Department of Teaching and Learning, College of Human Resources and Education titled "The Impact of Networking on K-12 Education Reform" (BEV Newsletter, November, 1996). "The purpose of the grant is to evaluate the impact of Internet resources in combination with different teaching strategies on student performance, including motivation".

In August, 1996, desktop videoconferencing over the Internet was tested between the BEV office and the Andrews Information Systems Building on the Virginia Tech campus (BEV Newsletter, August, 1996). The videoconferencing system allowed the two locations to see and hear each other and provided a shared space where participants could co-edit documents and demonstrate software. The equipment necessary for videoconferencing is a computer with enough memory (RAM), a video camera, a microphone, videoconferencing software, and a high-speed connection (dialup is not adequate). While the connection speed and costs has inhibited some users this capability is something to watch for, in the future, as the industry develops.

Recently, Town Chats have been featured on BEV. Chats with the Town Manager took place the third Tuesday of the month beginning in January, 1997 and continuing in February and March (BEV Newsletter, December, 1996). "This 'civic networking' project is intended to further demonstrate the Town's commitment to 'An open accessible government, where citizen involvement, collectively and individually, is vital.'" According to Secrist (Interview, 6/23/97), "These Town Chats have been a significant development for local government." In addition to the Town Chats, the Town implemented the "24 Hour Local Government." This is a commitment by the Town to respond to e-mail within 24 hours. Most e-mail requests are for information but occasionally compliments or complaints are received. Departments receiving e-mail include Planning and Engineering, the Town Manager, the Police, Public Works and WTOB-

Channel 2. "The Town is very pleased to be a part of the information age and to be able to provide this additional communication tool to its citizens."

In conclusion, it appears that the three partners involved have done a fairly good job of advancing BEV and their individual areas of interest. The Town has become nationally recognized and provides accurate and up to date information for the community, Virginia Tech has been able to experiment with CMC use and applications as well as provide off campus services, and Bell Atlantic has created a test market for services and CMC delivery systems. A final note on BEV, try the electronic village for yourself, universal resource locator (URL), http://www.bev.net and for access to the BEV HistoryBase, http://ccrd1.cc.vt.edu/bevhist/.

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Appendices

Appendix A

BEV Documents

1. Enhanced Communications for the Town of Blacksburg, Oct/Nov, 1990

2. The Blacksburg Electronic Village Vision Statement, Feb. 1994

3. Theta Bowden-The Blacksburg Electronic Village Partnership, Fall 1993 (unpub)

4&5 The Blacksburg Electronic Village (first time statement from Blacksburg Community Network), February 5, 1992

6. Blacksburg, Tech, C & P Telephone, Explore "Electronic Village" Concept , First Press release, January 20, 1992

7. Summary of BEV Background Questionnaire, March 1994

8. Preliminary Evaluation of the Blacksburg Electronic Village, conducted in August 1993, Final report April 1994

9. BEV Implementation Components, late 1991 before press conference 1/20/92

10. The Blacksburg Electronic Village: A Replicable Model for National Infrastructure, Andrea Kavanaugh, May 12, 1994

11&12 Structured Systems Development Group Project: The Blacksburg Electronic Village, by Gay Diz and friends, April 22, 1994

13. Blacksburg Community Network Memorandum of Understanding, 1991

14. Advantages of C&P Telephone of Virginia Involvement in the Blacksburg Community Network, May 2, 1991

15. BEV Macintosh Installation Guide, Version 1.3, September 30, 1994

16. The Blacksburg Electronic Village: The Information Superhighway Arrives in Blacksburg, Joe Wiencko, Spring 1994

17. The Information Superhighway Arrives in Blacksburg, Joe Wiencko, "About Town", April 1994

18. Modem Pool Information, Faculty/Staff of Outside Agency, CNS, Fall 1993

19. BEV Windows User's Guide, Version 1.0, April 22, 1994 (Beta Release)

20. BEV DOS User's Guide, Version 1.1, March 9, 1994

21. Rural Users' Expectations of the Information Superhighway, Scott Patterson and Andrea Kavanaugh, Media Information Australia, October 1994

22. Statement of Congressman Rick Boucher, Wednesday, October 12, 1994, Blacksburg Virginia, Press release about NSF grant to plan a "Virtual School"

23. AMERICA'S FIRST ELECTRONIC VILLAGE TO BECOME A REALITY Nation's laboratory to be built in Virginia, Virginia Tech Press Release, January 11, 1993

24. Busch Garden, Scholastic Join with Virginia Tech to Create "Virtual School" Program in County Schools, Virginia Tech Press Release, October 12, 1994

25. Notes from Open BEV Meeting 9/21/94, Andrea Kavanaugh

26. BEV Newsletter, October 4,1994, editor Cortney Vargo Martin

27. BEV Newsletter, November 2, 1994, editor Cortney Vargo Martin

28. Highlights of Blacksburg Electronic Village Survey, Scott Patterson Ph.D. and Andrea Kavanaugh Ph.D., About Town, April 1994

29. Plan of Action for Bringing the Town Up-to-Date on the Blacksburg Electronic Village and Implementation of Phased Approach to Services Offered on the Electronic Village, Bonnie Svrcek, Town Technology Plan, October 10, 1994

30. Update on the Blacksburg Electronic Village, About Town, January 1994

31. Montgomery-Floyd Regional Library Blacksburg Electronic Village Evaluation Tools, May 2. 1994

32&33 Patron Usage of the Intenet at the Blacksburg Area Library, Brad Nash, Fall 1994

34. Electronic Village: Blacksburg, Robert Morris (Bell Atlantic), September 1992

35. Status Report on the Blacksburg Electronic Village after 20 months of Partnership, Robert Morris (Bell Atlantic), October 12, 1994

Appendix B

Participant Observations

1. Blacksburg Public Library community room-Overview of Gopher-4/18/94-7-8:30PM
2. BEV Bi-Monthly meeting-212 ISB-4/20/94-1:30-3:00PM
3. Volunteer Training Session-1008 Pamplin-4/20/94-7-9:00PM
4. BEV Office Signup-Lobby ISB-4/21/94-9-10:00AM
5. BEV Office Signup-Lobby ISB-4/28/94-9-10:00AM
6. BEV Bi-Monthly meeting-212 ISB-5/4/94-1:30-3:00PM
7. BEV Office Signup-Lobby ISB-5/5/94-9-10:30AM
8. Blacksburg Public Library Gopher Workshop-5/6/94-9-10:30
9. Blacksburg Public Library E-Mail Workshop-5/6/94-11:30-1:00PM
10. BEV Bi-Monthly meeting-212 ISB-5/18/94-1:30-3:00PM
11. BEV Bi-monthly meeting-212 ISB-7/6/94-1:30-3:00PM
12. BEV History Project meeting-558 McBryde-9/19/94-9-11AM
13. BEV History Project meeting-558 McBryde-10/7/94-9:00-11:00AM
14. Press Conference at Margaret Beeks Elementary School-10/12/94-10-12:00AM
15. BEV monthly meeting-212 ISB-10/19/94-4-5:00PM
16. BEV Seminar given by Scott Patterson-102 Johnston Student Center-10/27/94-4-5:00PM
17. BEV monthly meeting-212 ISB-11/16/94-4-5:00PM
18. BEV Seminar given by Dr. Bromley-102 Johnston Student Center-11/17/94-4-5:00PM
19. BEV History Project meeting-558 McBryde-12/14/94-9:00- 11:00AM

20. BEV Seminar given by Stuart Laughton-102 Johnston Student Center-12/14/94-4-5:00PM

21. BEV monthly meeting-212 ISB-1/18/95-4-5:00PM

22. BEV monthly meeting-212 ISB-2/15/95-4-5:00PM

Appendix C

Interviews

1. Kim Homer, 9:00AM 12/5/94-Conference room at ISB-level 2-Former BEV staff

2. Larry Arrington, 1:30PM 12/13/94-Montgomery County Schools District Office-level 3-Technology Coordinator for Montgomery Count Schools

3. Gay Diz, 9:00AM 12/16/94-Conference room at ISB-level 3-BEV office staff

4. Luke Ward, 10:30AM 12/16/94-Conference room at ISB-level 3-BEV development

5. Anonymous, 11:00AM 12/19/94-Newman Library-level 1

6. Andrew Cohill, 1:30PM 12/19/94 & 1:30PM 6/17/97-Conference room at ISB-level 3-BEV Director

7. Susanne Huff, 1:00PM 12/29/94-Municipal Building Annex Office-level 3-Town liaison to BEV and Station Manager of WTOB

8. Brad Nash, 3:00PM 12/29/94-Newman Library-level 3-BEV librarian at MFRL Blacksburg/user

9. Ron Secrist, 9:00AM 1/4/95 & 11:00AM 6/23/97-Municiple Building Office-level 3-Town Manager

10. Bert Moyer, 11:00AM 1/4/95-At home-level 3-VT user

11. Bonnie Svcrek, 2:00PM 1/4/95-Municipal Building Office-level 3-Assistant Town Manager

12. Roger Ehrich, 11:00AM 1/5/95-McBryde Office-level 3-VT user

13. Anonymous, 11:00AM 1/9/95-Architecture Annex Office-level 1-VT user

14. Suzanne Reisinger, 1:30PM 1/9/95-Williams Office-level 3-VT user

15. Theta Bowden, 4:00PM 1/9/95-ISB Office-level 3-Former BEV coordinator

16. Jack Davis, 10:00AM 1/10/95-Cowgill Office-level 3-VT user

17. Butch Morris, 1:00PM 1/10/95-Christiansburg High School Office-level 3-Former Montgomery County Schools BEV liaison, user

18. Bob Steffen, 9:00AM 1/11/95-Conference room at ISB-level 3-BEV staff

19. Cortney Vargo Martin, 1:30PM 1/11/95-Conference room at ISB-level 3-BEV staff

20. Bill Hendricks, MD., 4:15PM 1/11/95-Office-level 3-Community user

21. Herman Bartlett, 3:30PM 1/12/95-110 War Memorial Hall-level 3-Montgomery County Superintendent of Schools

22. Stuart Laughton, 9:00AM 1/13/95-McBryde 124B-level 3-VT user

23. Bob Heterick, 11:00AM 1/13/95-Home Office-level 3-Former Vice President of Communications for VT

24. Steve Helm, 1:30PM 1/13/95-MFRL Christiansburg-level 3-MFRL Technology Coordinator/user

25. Doug Mauer, 7:00PM 1/15/95-At home-level 3-Partner in BizNet/user

26. Andrea Kavanaugh, 3:30PM 1/16/95-Conference room at ISB-level 3-BEV staff

27. Heidi Bernard, 2:00PM 1/17/95-Christiansburg High School Office-level 3-Curriculum Coordinator for programs for the Gifted and Talented/user

28. Earving Blythe, 3:00PM 1/20/95-201 Burrus Hall-level 3-VP Information Systems

29. Bob Smith, 10:30AM 1/23/95-212 War Memorial Hall-level 3-VT user

30. Anonymous, 11:30AM 1/23/95-220 War Memorial Hall-level 1-VT user

31. Paul Gherman, 5:00PM 2/1/95 & 5:00PM 3/8/95-by telephone to Kenyon College, Gambier, Ohio-level 3-Former VP of Telecommunications, VT

32. John Knapp, 10:30AM 2/6/95-Bell Atlantic Office, Richmond, VA-level 3-Manager of External Affairs for Bell Atlantic of Virginia

33. Suzan Mauney, 3:00PM 2/13/95-Blacksburg Middle School (203)-level 3-Science teacher/user

34. Kenneth Wade Wilson, 1:00PM 2/14/95-MFRL Blacksburg-level 3-Public terminal user

35. Roy Jameson, 2:00PM 2/14/95-MFRL Blacksburg-level 3-Public terminal user

36. Laura Byrd, 1:00PM 2/16/95-110 War Memorial Hall-level 3-Former BEV Office Manager

37. Linda Waggaman, 9:30AM 2/20/95-Montgomery County Schools District Office-level 3-County Coordinator for Gifted and Talented Programs/user

38. Ed Keen, 3:00PM 2/28/95-Bell Atlantic Central Office. Blacksburg-level 2-System Administrator for Bell

39. Bob Morris, 5:00PM 2/28/95-by telephone to Bell Atlantic Offices, Richmond, VA-level 3-Project Engineer for Bell Atlantic

40. Joe Wiencko, offered a written response but did not respond

Appendix D

Semi-Structured Interview Questions

1. How would you describe your current involvement and role in relation to the Blacksburg Electronic Village?

2. What is your vision for the Blacksburg Electronic Village?

3. Would you describe the history of your involvement with the Blacksburg Electronic Village from your initial contact to the present time?

4. How do you learn about new developments in the Blacksburg Electronic Village? (Examples: Newspaper, telephone, Usenet...) Which communications medium do you find most helpful and/or informative?

5. Considering your experience with the Blacksburg Electronic Village could you identify what you consider to be the critical events in the development of the Village?

6. In your opinion, what are the strengths of Blacksburg Electronic Village?

7. What do consider to be the main challenges that the Blacksburg Electronic Village faces?

8. How do you see the Blacksburg Electronic Village impacting the community?

9. Similarly, how do you see the Blacksburg Electronic Village impacting the schools and Education in the community?

10. Is there anything else you would like to add that will help me trace the development of BEV?

Appendix E

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Research and Graduate Studies

Office of the Associate Provost for Research
306 Burruss Hall
Blacksburg, VA 24061-0244
(703) 231-9359 FAX: (703) 231-7522

MEMORANDUM

TO: John R. Schorger
Curriculum and Instruction

FROM: Ernest R. Stout
Associate Provost for Research

DATE: November 3, 1994

SUBJECT: IRB EXEMPTION/"If We Build It Will They Come? The Blacksburg Electronic Village: Development and Implementation"
Ref. 94-261

I have reviewed your request to the IRB for exemption for the above referenced project. I concur with Dr. Nespor that the research fall within the exempt status.

Best wishes.

ERS/php

c: Dr. Nespor

CERTIFICATION OF EXEMPTION OF PROJECTS
INVOLVING HUMAN SUBJECTS

94-261

Principal Investigator(s): John R. Schorger

Department(s): EDCI

Project Title: If We Build it Will They Come? The Blacksburg Electronic Village: Development and Implementation

Source of Support: Departmental Research _____ Sponsored Research _____ Proposal No. _____

1. The criteria for "exemption" from review by the IRB for a project involving the use of human subjects and with no risk to the subject is listed below. Please initial all applicable conditions and provide the substantiating statement of protocol.

☐ a. The research will be conducted in established or commonly established educational settings, involving normal education practices. For example:

1) Research on regular and special education instructional strategies;

2) Research on effectiveness of instructional techniques, curricula or classroom management techniques.

☐ b. The research involves use of education tests (__ cognitive, __ diagnostic, __ aptitude, __ achievement), and the subject cannot be identified directly or through identifiers with the information.

☒ c. The research involves survey or interview procedures, in which:

☐ 1) Subjects cannot be identified directly or through identifiers with the information;

☒ 2) Subject's responses, if known, will not place the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability;

☒ 3) The research does not deal with sensitive aspects of subject's own behavior (illegal conduct, drug use, sexual behavior or alcohol use);

☐ 4) The research involves survey or interview procedures with elected or appointed public officials, or candidates for public office.

☐ d. The research involves the observation of public behavior, in which:

☐ 1) The subjects cannot be identified directly or through identifiers;

☐ 2) The observations recorded about an individual could not put the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability;

☐ 3) The research does not deal with sensitive aspects of the subject's behavior (illegal conduct, drug use, sexual behavior or use of alcohol).

☐ e. The research involves collection or study of existing data, documents, recording pathological specimens or diagnostic specimens, of which:

☐ 1) The sources are publicly available; or

☐ 2) The information is recorded such that the subject cannot be identified directly or indirectly through identifiers.

2. I further certify that the project will not be changed to increase the risk or exceed exempt condition(s) without filing an additional certification or application for use by the Human Subjects Review Board.

Note: If children are in any way at risk while this project is underway, the chairman of IRB should be notified immediately in order to take corrective action.

John R. Schorger Jr. 9/16/94
Principal Investigator(s) Date

Principal Investigator(s) Date

Departmental Reviewer Date

C. R. Stout 11/3/94
Chair, Institutional Review Board Date

Curriculum Vitae

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Teacher Education
Adams State College

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HOME ADDRESS:

217 LaVeta Avenue
Alamosa, Colorado 81101-2161
Telephone: 719-589-4882

EDUCATIONAL BACKGROUND:

Ph.D. in Instructional Systems Design/Curriculum and Instruction
Dissertation: A Qualitative Study of the Development and First Year of Implementation of the Blacksburg Electronic Village
Virginia Polytechnic Institute and State University, June, 1997
Blacksburg, Virginia 24061

M.S. in Technology Education
Thesis: Personal Computer Data Telecommunications Development in Montana High Schools
Montana State University, 1992.
Bozeman, Montana 59717

B.A. in Liberal Arts
Metropolitan State University, 1976.
St. Paul, Minnesota 55101

PROFESSIONAL EXPERIENCE:

1995-Present: Adams State College

Assistant Professor: Assistant Professor of Teacher Education and Director of the School of Education and Graduate Studies computer laboratory. Instruction responsibilities include Secondary Classroom Management, Introduction to Research and Microcomputers in Education. Computer laboratory responsibilities include hiring, organizing and the scheduling of ten to fifteen work study students as lab assistants for open lab hours; some maintenance of equipment and software; ordering and installing hardware and software; installation of upgrades; trouble shooting printers and computers; facilitating lab access for instruction; and planning for the future to attempt to stay current with technological innovation. In addition computer related assistance is provided to faculty and staff (8/95-present).

1992-1995: Virginia Polytechnic Institute and State University

Graduate Assistant: Assists Coordinator of Graduate Studies for the Division of Curriculum and Instruction. This position requires the facilitation of the information flow and record maintenance for more than five hundred graduate students (8/94-7/95 & 8/93-5/94).

Instructor: Faculty Development Institute (FDI). Responsibilities included instructing faculty on how to use the Macintosh, and assisting in the use of many Macintosh applications, including MS Word, Power Point, Authorware, and PhotoShop, as well as several network applications including Eudora, TurboGopher, and Mosaic (5/94-8/94).

Internship: Program training designer and instructor for the Blacksburg Electronic Village. This program is designed to enable faculty, students, and community members to connect and use the Blacksburg Electronic Village. The Blacksburg Electronic Village provides client/server software programs, computer services, and support for access to local services and information including Internet access (1/94-5/94).

Graduate Research Assistant: The Evaluation of the Blacksburg Electronic Village Pilot Group, sponsored by The Council for Library Resources. Duties included telephone interviews, organization of focus group interview sessions, attending the

focus group interview sessions, and submission of written observational notes from the sessions to the principal investigator (8/93-9/93).

Graduate Teaching Assistant: Spring semester of 1993 teaching duties included sole responsibility for one section of "Introduction to 3-D Cadkey Drawing" as well as forming a sub section of this course which covered "Introduction to Auto-Cad" for a group of architecture students. Other duties during this semester were assistance in a Technology Education Construction course. Fall semester 1992 teaching duties included sole responsibility for the instruction of two sections of "Introduction to Cadkey" (8/92-5/93).

1991-1992: Montana State University

Graduate Teaching Assistant: Responsibilities included assisting in teaching classes in Technology Education.

Graduate Research Assistant: Project assistant in developing and organizing a Workplace Literacy Conference including mission and vision statements, as well as fundamental and detailed objectives. A group of experts in the fields of Technology Education and Vocational Education, and Technology Education teachers were brought together in a three day conference to develop the content.

1987-1991: Bigfork Public Schools, Bigfork, Montana

Technology Education/ Industrial Arts Teacher: Teaching responsibilities included instruction in carpentry, drafting, and modern wood technology for grades 7-12. Additional assignments were: trainer for Teacher Expectation Student Awareness (TESA) program for the School District, assistant wrestling coach, and Community Awareness Responsive Education (CARE) group facilitator.

1977-1987: Whitefish Woodworking and Cabinetry, Whitefish, Montana

Sole Proprietor: Product design, development, production, and marketing at a local and national level.

HONORS AND SCHOLARSHIPS:

1994-1995: Virginia Instructional Fee Scholarship

1994: The Honor Society of Phi Kappa Phi

1993-1994: Virginia Instructional Fee Scholarship

1992-1993: Virginia Instructional Fee Scholarship

PROFESSIONAL PRESENTATIONS, PARTICIPATION, AND PUBLICATIONS:

Schorger, J., & Koshak, K. (1997). "Lets Play Puters'…: Developmental Implications of Computer Use in Preschool." Paper presented at the Eastern Educational Research Association (EERA) annual conference, Hilton Head, SC.

Schorger, J., & Koshak, K. (1997). "Plug and Play': Developmental Implications of Computer Use in Preschool." Paper presented to the Council for Exceptional Children "Courage to Risk" Conference Colorado Springs, CO.

Schorger, J. R. (1996). "Educational Resources via the Internet." Paper presented at the Faculty Advisory Council to the Trustees (FACT) of the State Colleges in Colorado, Crested Butte, CO.

Carroll, J., Rosson, M., Cohill, A., & Schorger, J. (1995). Building a history of the Blacksburg Electronic Village. Proceedings of the Association of Computing Machinery.

Schorger, J. R. (1995). "The Blacksburg Electronic Village: Development and Implementation" (symposium). A paper accepted to be presented at the American Educational Research Association (AERA) conference, San Francisco, CA.

Schorger, J. R. (1995). "The Blacksburg Electronic Village: Revisited". A paper presented at the Eastern Educational Research Association (EERA) conference, Hilton Head, South Carolina.

Chair, session on Designing Computerized Systems at the annual meeting of the Eastern Educational Research Association, 1995

Schorger, J. R. (1994). "Introductions to Applications That Can Turn You, Your Students and Staff into Multimedia Users and Where to Look for Help" (symposium). One of several presenters from Virginia Tech, Faculty and Graduate Students, presenting for Virginia Educational Media Association (VEMA), Richmond, Virginia.

Schorger, J. R. (1994). "Client/Server Applications: Eudora, TurboGopher, and Mosaic". A presentation given June 25, 1994 for the Virginia Society for Technology in Education (VSTE), Charlottesville, Virginia.

Schorger, J. R. (1994). "The Blacksburg Electronic Village: What is it?" Paper presented at the Eastern Educational Research Association (EERA) conference, Sarasota, FL.

Chair, session on Higher Education at the annual meeting of the Eastern Educational Research Association, 1994.

Dodl, N. L., Schorger, J. R., & Burton, J. K. (1994). "Telecommunications in the 21st Century: The Blacksburg Electronic Village". Paper presented at the Association for Educational Communications and Technology (AECT), Nashville TN.

Schorger, J. R. (1992). "Technology and Telecommunications". A presentation given February 10, 1992 for Columbia Falls School District 6, Columbia Falls, Montana.

PROFESSIONAL MEMBERSHIPS:

American Educational Research Association

Association for Educational Communications and Technology

Eastern Educational Research Association

International Technology Education Association

Phi Delta Kappa

Virginia Society for Technology in Education

RESEARCH REPORTS TO SPONSORS:

"The Evaluation of the Blacksburg Electronic Village Pilot Group", sponsored by The Council for Library Resources, New York City, NY (1994).

"Report on Survey of Recent Graduates of Montana State University's Agricultural and Technology Education Department", sponsored by the Montana State University Agricultural and Technology Education Department (1992).

"Final Report on Workplace Literacy Conference", sponsored by the Office of Public Instruction of Montana (1992).

COMMITTEES:

Adams State College:

Instructional Technology Center Committee

North Central Accreditation Financial Resource Committee: Co-chair of sub committee on Revenue and Expenditures

School of Education and Behavioral Sciences Computer Laboratory Advisory Committee: Chairman

Utah, Colorado, Arizona, New Mexico, Rural Systemic Initiative (UCANRSI) Advisory Committee

Community:

Alamosa School District Gifted and Talented Program, Desires of the Heart Project: Mentor

San Luis Valley Rural Telecommunications Project

Virginia Tech:

Blacksburg Electronic Village Development Committee

Network Education: subcommittee of University Communications Resources

Committee

Teleserve Committee for the College of Education

University Communications Resources Committee

MULICULTURAL EXPERIENCES:

8/92-Present--Teaching and working in a multicultural environment

9/79-6/80--Lived and worked on the Blackfeet Reservation, Browning, Montana

1/77-3/77--Travels through Mexico, Guatamala, and Belize

10/70-4/72--Extensive travels in Europe and North Africa

SPECIAL COMPETENCIES:

Cross platform skills: Macintosh & IBM

Distance Education

Network applications

Versed in both quantitative and qualitative research methods

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