

1994

Diffusion of electronic mail in a university setting

Lynda Swanson Wilson
San Jose State University

Follow this and additional works at: https://scholarworks.sjsu.edu/etd_theses

Recommended Citation

Wilson, Lynda Swanson, "Diffusion of electronic mail in a university setting" (1994). *Master's Theses*. 814.
DOI: <https://doi.org/10.31979/etd.sha2-mtjs>
https://scholarworks.sjsu.edu/etd_theses/814

This Thesis is brought to you for free and open access by the Master's Theses and Graduate Research at SJSU ScholarWorks. It has been accepted for inclusion in Master's Theses by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

U·M·I

University Microfilms International
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
313/761-4700 800/521-0600



Order Number 1358238

Diffusion of electronic mail in a university setting

Wilson, Lynda Swanson, M.S.

San Jose State University, 1994

Copyright ©1994 by Wilson, Lynda Swanson. All rights reserved.

U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106



DIFFUSION OF ELECTRONIC MAIL IN A UNIVERSITY SETTING

A Thesis

Presented to

The Faculty of the School of Journalism and Mass Communications

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Lynda Swanson Wilson

May, 1994

© 1994

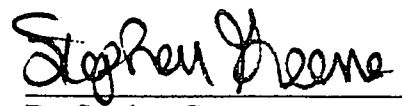
Lynda Swanson Wilson

ALL RIGHTS RESERVED

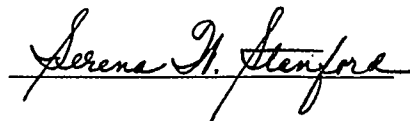
APPROVED FOR THE SCHOOL OF JOURNALISM AND MASS
COMMUNICATIONS


Dr. Diana Stover


Dr. Dennis Wilcox


Dr. Stephen Green

APPROVED FOR THE UNIVERSITY



ABSTRACT

DIFFUSION OF ELECTRONIC MAIL IN A UNIVERSITY SETTING

by Lynda Swanson Wilson

This case study's purpose was to uncover traits and usage patterns of early adopters of E-mail at a California university. Availability did not contribute to low adoption; however, the accessibility to, and capability of the E-mail system has hampered diffusion. Large scale university information dissemination programs have been curtailed because of the perception that mass adoption would overload the system. From group and individual perspectives, adoption was influenced more by outside professional peer networks rather than by supervisory pressure or use. Complexity appeared to be one major deterrent in adoption, and most early adopters agreed that the mainframe was very user unfriendly. To combat complexity, local area networks were established by academic units which could afford them. Very few SJSU administrators or professors have incorporated E-mail into either communication or educational processes. This study found that students had re-invented E-mail so that it was used as a sophisticated replacement for the telephone.

TABLE OF CONTENTS

| | |
|--|----|
| I. INTRODUCTION..... | 1 |
| Purpose of Study | 3 |
| Research Questions | 3 |
| Case Study Overview..... | 3 |
| II. LITERATURE REVIEW | 7 |
| Electronic Communication a New Reality | 7 |
| E-Mail's Benefits Attract Organizational Interest..... | 9 |
| Universities Drawn to E-Mail and Internet..... | 11 |
| E-Mail's Critics Point to Privacy Issues | 14 |
| Consequences of E-Mail: Positive And Negative..... | 18 |
| Diffusion of E-Mail in a University | 19 |
| Computer Becoming a Mass Media Tool..... | 23 |
| III. RESEARCH METHOD..... | 24 |
| Overview | 24 |
| SJSU Chosen as Case Study | 25 |
| Organizational Participants | 26 |
| Student Profile | 26 |
| Faculty Profile | 27 |
| Method | 27 |
| Clark Library: A Separate Profile..... | 29 |
| Examination of Communication Tools | 30 |

| | |
|--|-----------|
| IV. RESULTS AND DISCUSSION. | 31 |
| Overview | 31 |
| Availability and Accessibility | 31 |
| User E-Mail Address Listings | 33 |
| System Logistics | 35 |
| Academic Administrative Support For Electronic Communications | 39 |
| Faculty Adoption and Usage Patterns | 40 |
| Forced Adoption Within Faculty Ranks | 45 |
| Clark Library Profile | 49 |
| Student Adoption and Usage Patterns | 54 |
| Re-Invention Occurred in Student Population | 59 |
| Privacy Issues and Concerns | 61 |
| V. SUMMARY AND CONCLUSION | 62 |
| Overview | 62 |
| Organizational Level of Analysis | 62 |
| Individual Level of Analysis | 64 |
| Conclusion | 66 |
| Contributions to the Literature | 67 |
| Directions for Future Research | 68 |
| Recommendations for Majority Adoption at SJSU | 68 |
| VI. REFERENCES | 70 |
| VII. APPENDICES | 76 |
| Appendix A-Faculty E-mail Questions | 77 |

| | |
|--|----|
| Appendix B-Student E-mail Questions | 79 |
| Appendix C-Clark Library Staff Questions | 81 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1: Faculty Adoption of E-mail by Department. | 41 |
| Figure 2: Total Enrollment as Compared to E-mail Accounts per Academic Unit. | 55 |
| Figure 3: Total Enrollment at SJSU Compared to E-mail Use On Campus by Students . | 56 |

ACKNOWLEDGMENTS

It is with deep appreciation and gratitude that I thank several individuals who have been instrumental in the completion of this thesis:

First of all, I want to thank my SJSU committee members, especially Dr. Diana Stover, whose enthusiasm for technology helped and guided me through the thesis topic selection process and kept me focused during the long process, and to Dr. Dennis Wilcox for his academic guidance for the past three years.

Secondly, to the many educators, both in Louisiana and California, who, throughout my many years in public school, pushed and challenged me to better myself through personal growth and the continued pursuit of learning.

To my parents, Jim and Shirley Swanson, I say "thank you" from the bottom of my heart for their many sacrifices of time and money, thus allowing me to follow my dreams and build a strong foundation which has enabled me to achieve many career and academic goals.

Finally, I want to thank my husband, James Wilson, for his never-ending support of my educational and career goals. His love, sacrifices and constant support over the past 10 years have enabled me to not only realize my dream of completing this master's thesis, but have helped me to grow, both personally and professionally.

CHAPTER 1

INTRODUCTION

New communication technologies are making and breaking old rules in mass communication, and the introduction of computers, in particular, has had a tremendous impact in expanding traditional interpersonal, organizational, and worldwide communication. Computers are a communication technology because they are used to create, store, and transmit messages between individuals in a variety of ways (Dutton et al., 1987, p. 220). Electronic mail (E-mail) is attracting the attention of computer users worldwide, and it is changing all facets of internal communication within organizations, both business and academic.

E-mail, introduced to the world in the 1960s, is quickly becoming a part of internal and external communications programs in corporations, academic institutions, and government offices, and a large number of individuals now view electronic communication as an easy and inexpensive way to communicate across the hallway, across town, or even across the globe. With the development of such technological advances as fiber optics and networks in the early 1980s, these new communication media have become available to practically anyone having access to a computer and a modem.

Personal computers (PC's) have transformed communication by becoming information pathways or gatekeepers. By simply having access to a PC and a network such as Internet, one can access information with a simple push of a key, thus instantly accomplishing electronic communication regardless of geographical barriers.

Electronic communication and the development of an information superhighway is still evolving, and figures suggest that the data highway which enables computer communication is growing and expanding at great speeds. Today, E-mail is becoming one

of the most popular forms of mass communication, capable of creating and circulating information around the world within seconds.

E-mail has the ability to break down both geographical and hierarchical barriers, and this ability is greatly affecting the way in which organizational members communicate both inside and outside of the organization. With this in mind, this case study of an organization in the process of adopting an electronic mail system was conducted to illustrate how the diffusion process had occurred. Also, because an academic institution's organizational members usually have a higher degree of autonomy as compared to business institutions, compliance, acceptance, and application of a new communication technology for the purposes of internal communication and educational instruction is left up to each faculty or staff member.

San Jose State University is in the midst of adopting E-mail on a university-wide basis. Although the Cyber System of electronic mail was first introduced on campus in the mid-1980s, it was a limited system, and available primarily to administrators. By late 1988, PROFS, an E-mail software created by IBM, replaced Cyber, but was still utilized primarily by the administration. In 1990, RICE-mail was installed, and became available to everyone, including students. Joining networks became a reality by 1991, and by the fall of that year, Internet, a national government and academic network, became accessible to any faculty, student, or administrator who had access to a computer and/or modem. Today, the SJSU system offers several communication systems to users, including RICEMAIL, GOPHER, PROFS, INTERNET, BITNET, and LIST SERVERS.

Nationally, about 60% of colleges and universities have some kind of computer communication system, or are in the process of installing one (Watkins, 1992). Even though the SJSU electronic mail system is available to anyone on campus, adoption of this technology appears to be slow, with 25% of faculty and staff, and 5 1/2% of students

connected to the network. Studies have noted that although there is usually a high degree of computer literacy in educational institutions, some university populations have been unwilling to alter their existing communication patterns to include electronic mail (Komsky, 1991, p. 311).

Purpose of Study

Because of the low percentage of E-mail adoption at SJSU, an excellent opportunity was provided to conduct a case study into the diffusion of a technological innovation. Therefore, the purpose of this case study at SJSU was to examine, if any, common traits of early adopters as well as to establish any common usage patterns of the E-mail system. Because adoption on the VM system of the mainframe has been limited to 25% of staff and faculty, and 10% of students, the results of this case study may suggest reasons as to why E-mail has caught the attention of relatively few SJSU faculty, staff, and students. It should be noted that this particular case study is descriptive and exploratory in nature and that the results can not be generalized to other universities or business organizations.

Research Questions

This case study is based on three research questions: (1) How have the five attributes of innovation: relative advantage, compatibility, complexity, trialability, and observability, affected adoption rates; (2) Are there common traits and usage patterns of the SJSU early adopters; and (3) What impact has E-mail had on the communication and educational process at SJSU.

Case Study Overview

Everett Rogers (1983) noted that early adopters usually have a great degree of opinion leadership, and serve as role models for future adopters; however, when a university is studied, three separate social systems including faculty, administration and

students combine to form one larger unit, and autonomy for each group tends to allow for a greater flexibility in adoption as compared to more structured organizations. This study examined whether this type of academic organization would produce clear role models, and if they would convey E-mail's advantages to near-peers or subordinates (p. 249). Because Rogers stated that early adopters are usually more educated than later adopters, evidence gathered herein examined how this finding would be altered in a learning institution. Also, if a large portion of organizational members in a university have both a high level of education and unlimited access to computer information and data bases, would Rogers' theory apply, and if so, which members would adopt the new technology, and why? Recent research on diffusion has called into question Rogers' earlier findings, especially about diffusion of innovation in a world that is better connected by vast amounts of computer stored information (Anderson & Reagan, 1992; Bach, 1989; Komsky, 1991; Ormrod, 1990) .

This case study, which is analytical and exploratory, paid special attention to the following variables: (1) availability and accessibility of E-mail on the SJSU campus, (2) technical suitability of the VM system, (3) system usage patterns, (4) prior knowledge of E-mail, supervisory and/or peer usage of the E-mail system, (5) supervisory and peer influence in adoption, (6) perceived benefits of E-mail, and (7) privacy concerns. This study also examined the electronic learning and distance learning environment on campus, and searched for evidence on any changes or new innovations in either classroom design and/or traditional on-campus communication that have resulted from adopting E-mail.

This case study also developed a separate profile of users at Clark Library, the first academic unit to be encouraged or forced into mass adoption with pressure from the University Librarian. Rogers has suggested that the consequences of innovation have been understudied, and noted that, when all members of a social system adopt a new

technology, total production or efficiency increases. The library staff profile looked at this assumption, and examined the technology's effect on perceived productivity by staff members. The library, which had a staff of 84 at the time of the research, had 50 employees with current E-mail addresses. This library profile also examined post-adoption of E-mail's impact on employee communications, both within the department, and outside the department with other university co-workers and colleagues, as well as communication with colleagues outside SJSU.

In-depth personal, telephone, and electronic interviews were conducted with students, faculty, and staff who were connected to the system by mainframe accounts. From the interviews, a portrait of early adopters' characteristics was created. Because the electronic mail adoption rate was low at the time of the research, future diffusion studies of the majority adopters and laggards is recommended.

Cyert (1987) noted that diffusion rates vary among organizations, but that there appeared to be more rapid adoption in firms that have engineering and scientific staffs. Because a university has many staff members and students concentrated in the scientific and engineering fields, comparisons of department usage were conducted to see if any particular SJSU college, school, or department had unique adoption and usage patterns. For example, comparisons between the humanities, arts, music, and journalism departments were made with the science, engineering, and mathematics departments to see if established adoption and usage could be predicted by major areas of study.

Data obtained in this case study will add to the current and past diffusion literature. As Rogers (1983) noted, there have been many diffusion studies of individual adopters, but organizational diffusion is unique, and the oversimplified nature of past studies of organizational innovativeness failed to capture the complex, timely nature of the innovation process. Van de Ven and Rogers (1988) noted that some diffusion studies do

not examine the process of adoption over time in organizations. Because E-mail has been available on the SJSU campus for nine years, this case study looked at adoption over time, thus preventing earlier shortcomings of diffusion research.

CHAPTER 2

LITERATURE REVIEW

Electronic Communication a New Reality

With the widespread use of personal computers and computer networks, electronic communication has become a reality. They have revolutionized the way in which individuals and organizations function and communicate. As with any new innovation, adoption of a technology can mean the difference between success and failure, especially in today's competitive media environment. The theory of diffusion of an innovation is concerned with the rate at which a social unit accepts a technology, and the possible consequences of that adoption. Although many of the early diffusion studies primarily looked at individual adoption rates, many of the more recent studies have examined the adoption of innovations by organizations.

Organizations are complex social units which must integrate communication tools into several hierarchical levels. Creating a mass communication program that meets the needs of lateral, downward, and upward communication can be quite frustrating. "The absence of job-related information can create unnecessary stress among organizational members" (Donnelly, Gibson, & Ivancevich, 1990, p. 247). This stress can manifest itself in poor employee performance, high absenteeism, high employee turnover, low company productivity, and in some extreme cases, employee sabotage. Therefore, communication managers must continually examine all available tools to provide for an on-going and productive discussion between employees.

Finding the right combination of tools that meet the communication needs of all organizational members can be a challenge. One study noted that "60% of employees in a

variety of organizations said that lateral communication was ineffective and 45% said communication between peers within departments was inadequate. The study also claimed that respondents said 70% of communication between departments must also improve" (McClelland & Wilmot, 1990, p. 32). Realization of the importance of talking to, and with one another in organizations is growing, and O'Connor (1990) contended that there is a revolutionary movement in internal communication. Cutlip (1982) stated that "there is no reason acceptable to employees to confine communication to memos and bulletins" (p. 300).

Today, technology and information are combining to give organizations many communication channel options. Communication channels, according to Schmitz and Fulk (1991) range in richness and effectiveness in the following order: face-to-face, telephone (including voice mail), electronic mail, personal written text (letters and memos), formal written text (documents and bulletins), and formal numeric text (computer output). Today's communication is transglobal, and although face-to-face communication is preferred, it is becoming more difficult, especially in organizations that have geographically dispersed offices. Therefore, electronic mail has emerged as a favored communication tool for the 1990s and beyond.

Large organizations, both business and academic, are incorporating electronic communication into their internal communication systems. Ray (1991) also noted that "memos and newsletters have traditionally been used to keep employees up-to-date, but today these mediums no longer cut the mustard, because they are too slow in an environment of ever-faster, high-tech business transactions" (p. 16).

Parker (1983) stated that business is now involved in a rapidly emerging electronic marketplace made up of communicating computers and terminals for the exchange of intellectual products and services. Noted economist Peter Drucker (1989) seemed to

agree when he stated that "organizations will have little choice but to become information based, and they must engage in an analysis and diagnosis of that information" (p. 207).

E-mail's Benefits Attract Organizational Interest

E-mail is the most popular form of communication via the computer, but Mortensen (1992) noted that other forms include: fax, telex, electronic distribution, and voice storage-and-forward technologies. Why has electronic mail become so popular that it now ranks second only to face-to-face communication? A recent magazine article stated that E-mail, "takes away many regulators of behavior that exist among in-person groups, is not highly structured, cuts across hierarchies, makes users invisible, and puts emphasis on the message" (Staff, 1992, p. 10).

Other benefits of electronic mail include its ability to communicate easily and quickly across time zones, as well as the fact that it allows employees the luxury of not having to constantly face interruptions caused by telephone calls or drop-in visitors (Buerger, 1992).

Zahn (1991) examined positions in organizations as related to communication satisfaction, and found that face-to-face communication can be affected by hierarchical and chain-of-command relationships and by the physical arrangement of offices, which can hinder employees' access to information. Electronic mail can break many of these barriers, thus providing access to information for every organization member, not by increasing face-to-face communication, but by allowing for instant access via the computer.

Because communicating via the computer seems easy and painless, one drawback quickly emerging is electronic communication's inability to demonstrate emotion of both the sender and receiver. A recent magazine article stated that "E-mail combines the immediacy of the spoken word with the solid impression of the written word, and that can be a problem" (Vaughan-Nichols, 1993, p. 656). To new and veteran cyber

communicators, the emergence of emoticons, a computer version of electronic shorthand, demonstrates that electronic communicators want to somehow use symbols and acronyms to express the emotions behind their messages.

A popular handbook on the Internet network created do's and don'ts for E-mail, and suggested that a message represents the sender to the receiver, and should not be flippant, annoying, sarcastic or have insulting replies (Tennent, Ober, and Lipow, 1993, p. 41). The handbook also noted that E-mail's ease and informality can lure a user into complacency, and can potentially damage electronic friendships.

For the disabled, expressing oneself in face-to-face encounters can be difficult; therefore, computer communications have caught the attention of many disabled persons, who sometimes feel that they are isolated in the typical communication process, either physically or emotionally. Schuda (1993) stated that electronic communication is readily available to all employees, even those with handicaps. According to Schuda, it appears that with small additions or modifications to computer memory, hardware, and software, a blind employee can access and use E-mail very effectively. Currently, federal employees with hearing and visual disabilities are being trained to use this new media and since 1985 about 100 employees have received electronic mail training.

Some companies are fully embracing E-mail and are making efficient use of its communication capabilities. A few corporations worth mentioning are: UNUM Corp., Colgate-Palmolive, GM's Saginaw Division, and Citicorp. UNUM CEO James Orr has invited all of his 5,500 employees to communicate through the E-mail system, and each evening he reads the day's messages and tries to personally answer employees' questions and concerns the next day (Rice, 1991). Colgate-Palmolive has invested time and money for the past five years in linking dozens of incompatible E-mail systems at many of its global locations with the corporate office to create a corporate wide messaging system

(LaPlante, 1993). GM's Saginaw Division has been described as being a model system for diversifying the needs of its 14,000 employees by combining both new media with improved print media and increased face-to-face communication (Smith, 1990). Citicorp has revolutionized its way of communicating with employees by offering information via computer information disks, telephone hotlines, take-home videotapes, as well as the more traditional communication tools, such as brochures and seminars.

Although these examples spotlight only four companies, electronic communications are becoming very popular in organizations, and the numbers speak for themselves. A Computerland article recently stated that the number of electronic mailboxes grew from 430,000 in 1980 to about 19 million in 1992 (Kallan, 1992).

Universities Drawn to E-mail and Internet

One type of organization, the academic institution, is currently embracing E-mail and is changing how students, faculty, and administrators communicate and learn. Dallas Beal, president of Connecticut State University, noted that "colleges must not be left behind as the world becomes linked by a superhighway of information networks." He also noted that there will be a change in how the world works, recreates, and learns because of this new technology (Farrish, 1993, p. B1). Although the figures are somewhat outdated, a 1987 report estimated that electronic mail and computer conferencing were being used by 27% of all colleges, and the principal application of E-mail was for administration (Savage, 1987). This report also estimated that 37% of colleges offered students access to the electronic mail system; however, in the last six years, E-mail's popularity has risen on campuses.

One reason behind the emergence of electronic mail at universities is the availability of data superhighways which connect supercomputer centers, allowing them to share massive amounts of data (Flanders, 1991). There are two superhighways that the

educators are most likely to use: Internet and BITNET. Anthes (1992) described Internet as a global mosaic of interconnected, multiprotocol networks supporting collaboration in research and education. He also stated that Internet's data traffic is doubling every six months, and current figures suggest there are approximately 7 million Internet users.

A recent article estimated that "the number of users of Internet is doubling each year, and use of Internet in the past two years has exploded out of computer science departments, and into the rest of the university" (DeBare, 1993, p. F1). One attraction for universities could be cost, and the fact that students and professors get to use Internet for free has become an attractive feature for everyone.

Lukanuski (1992) noted that there is an overwhelming amount of information available to anyone with a PC and a modem, including electronic newspapers, picture libraries, corporate libraries, and electronic text libraries, just to name a few. Students and faculty who have access to computers can now have instant information without ever having to leave their offices or dorm rooms.

The impact of cyber communications on teaching and learning has not yet been fully realized. When the full potential of this new communication is realized, professors, administrators, staff, and students who gain access to one or more of the data superhighways will discover that their educational potential is unlimited. Realization of E-mail's potential has not yet reached its peak, and Savage (1987) noted that the utilization of E-mail and electronic conferencing for non-administrative work has been low because faculty and students have a relatively limited access to the system. Savage also noted that proper access can open up doors on campuses around the world.

Blankenhorn (1993) noted that technology will enable educators to scrap their 19th century ways of teaching, and assist them in preparing their students for the

competitive 21st century by connecting to large networks and integrating technology to explore learning through CD-ROM databases. Rogers (1987) noted that electronic media can have powerful influences in research, thus unfreezing old methods from prior assumptions and past paradigms.

One information superhighway not yet available, but certainly worth mentioning is NREN. This computer network will be federally funded under the 1989 National High Performance Computing Technology Act, which was introduced by then-Senator Al Gore. The act established the National Research and Education Network (NREN), which is set for completion in 1996, and would advance communication to a speed of three-gigabits-per-second, or 100,000 typed pages per second. By comparison, Internet's capacity is 1,500 pages per second (Flanders, 1991, p. 572). Once NREN is fully operational, the flow of information within and between educational institutions will surely revolutionize how learning and research are accomplished.

Komsky (1991) studied E-mail usage at California State University-Northridge and suggested that, although universities appear to be conducive settings for new communication and information technologies, they have not exploited them to the extent that other organizations have. The study also noted that frequent users of E-mail tend to be predisposed toward mediated communication in general, and they accept electronic mail as an alternative to telephone communication because it eliminates time-wasting telephone tag and is a convenient way to leave longer and more complex messages for others. Frequent users tended to be tolerant of system problems, and perceived electronic mail as easy to use or to teach to others.

The effects of electronic mail and other high-powered communications and information systems are already being felt at academic institutions around the country. A case in point is Case Western Reserve University in Cleveland. Watkins (1992) noted

that this university desired the most advanced electronic-learning environment. Today, students who are on the network can send E-mail and text anywhere, search the university's library catalogs, borrow commercial software from a network program bank, use Cleveland's metropolitan-area computer system from which they can get news from leading newspapers, and can even review Supreme Court decisions as soon as they are handed down. The faculty can post assignments and grades easier via the network, as well as answer students' questions via E-mail at any time of the day. Administrators have streamlined the admission process by sending, via E-mail, enrollment figures every afternoon to administrators. The university has become almost paper-free in some areas.

Reinhardt (1993) noted that "organizations that have implemented enterprise-wide E-mail find that it flattens the management hierarchy, improves project tracking, and speeds time-to-market for new products and services, and will continue to alter traditional work structures, and could dramatically boost productivity" (p. 90). One good example of how computers are altering traditional structures in the world of academics is Memphis State University. Officials at this institution are distributing computer disks to high school counselors which contain information about admissions, financial aid, and scholarships. Now, high school students can simply transmit information instantly back to the college, and reduce the time in the application process (Staff, 1992, p. A18).

E-mail's Critics Point to Privacy Issues

Although there is excitement surrounding E-mail, it is not without its critics. Recently concerns have begun to surface, and these concerns include the issues of privacy, security, and ethics. Peterson (1990) noted that "misinformation travels just as quickly as established fact, and vandalism hovers over fragile networks" (p. 90). Peterson added that the technology required for the long-term care, feeding, and storage of electronic information remains rudimentary and largely untested.

The U.S. Department of Justice noted that computer-related crimes are growing and are causing an increased demand for prosecution strategies and technical expertise (Conley, 1989, p. 1). It has profiled the typical computer felon who is said to have some of the following attributes: 15-45 years of age, usually male, ranges widely from the highly experienced technician to a minimally experienced professional with little or no technical experience, usually has no previous contact with the law, targets both government and business, is bright, motivated, and ready to accept technical challenges, and fears exposure, ridicule, and loss of status within the community.

The federal government in 1986 recognized the threat of computer crime, and passed two laws pertaining to this issue. The Electronic Communication Privacy Act was written to protect computer users, and made interception of electronic information and messages, by a third party, a crime. Honan (1987) stated that a second law, The Computer Fraud and Abuse Act, recognized the contents of a computer as property, and made it a federal crime to snoop into someone's on-line mail or into a company's data and communication network.

At least six cases involving computer crime are currently working their way through the court system (Kallman, 1992). One of the more interesting cases involved Cornell University graduate student, Robert T. Morris, who in 1988, wrote a self-propagating program called a worm, and injected it into Internet. The end result was the jamming of an estimated 6,000 computers, including several universities, NASA, and the Air Force. Flanagan (1992) wrote that the price of this worm was an estimated \$185 million. Another case worth mentioning involved a west German hacker who, during a 10-month period, attacked 450 international computers, including universities and military installations. This hacker was eventually tried on espionage charges for selling "hacked" information to the KGB.

Although these incidents involved tampering by unknown individual hackers, invasion of privacy is occurring in organizations, and the hackers are both employees and managers. Can hacking occur just as easily in business and academic institutions? Unfortunately, the answer is yes. There appears to be more freedom of expression on college campuses, but students as well as faculty must realize that E-mail has far less security attached to its messages than regular mail, which is protected by U.S. laws and regulations.

It has been written that "the fact is that there is no absolute privacy in computer systems" (Elmer-Dewitt, 1993, p. 46). A 1990 law journal stated that "laws generally prevent unauthorized access to E-mail, but in an employer-employee situation, 'unauthorized' is not always clear" (DeBeneditis, 1990, p. 27). All types of organizations must examine privacy rights of employees and/or students. In 1992, a Cornell student filed a complaint with campus police charging that computer center officials were tracking his computer use (Staff, 1992, p. A18). Monitoring organizational members is not a new phenomenon, and Flynn (1993) stated that today it has become easier to monitor what's happening on employees' screens. Flynn added that sophisticated network software has made access to data stored on a company's PC easier.

Questions still remain as to who owns equipment, and who has ultimate rights when computers are involved. Presently, the 1986 Electronic Communications Privacy Act excludes employers and law enforcement agencies, but new legislation, particularly the Privacy for Consumers and Workers Act, is making its way through Congress and will try to restrict the surveillance of personal computer use.

Other ethical issues have recently surfaced which warrant the attention of students, faculty, and administrators. A few incidents worth mentioning include a Brown University student who solicited safe gay sex via the college's E-mail system, and University of

Michigan students who used bulletin boards for the sharing of questionable and tasteless jokes (Turner, 1990).

Lerner (1992) said that electronic mail has the same security level as postcards. Tennent, Ober and Lipow (1993) suggested that users write their messages as if they would appear on the front page of the New York Times, and avoid getting lulled into complacency with regard to what they say and do over the computer lines. With this in mind, it is obvious that anyone who gains access to a computer database can virtually see, hear, and use that information for good or ill. For organizations with E-mail, it is a good idea to consider an E-mail policy; however, there is a fine line between good E-mail policies and invasion of privacy.

Formal groups have been developed that will work with organizations and government to establish policies and guidelines for electronic mail. The Electronic Mail Association, located in Arlington, VA, has designed an E-mail privacy kit, which is available to any organization. Also, Flanagan (1992) noted that the Electronic Frontier Foundation was established by Lotus developer Mitchell Kapor and Grateful Dead lyricist John Perry to defend the constitutional rights of computer users. This organization, founded in July, 1990, has become an organized voice for the burgeoning community of nationally and internationally networked computer users, and whose mission is to serve and protect the public interest in the information age (Staff, 1993, p. 1).

Regardless of recent developments, laws can't protect every user. Drucker (1989) noted that "information is now transnational, and like money, has no fatherland and can no longer be controlled by government" (p. 258). It may be only a matter of time before international laws govern computer usage and rules of conduct.

A prime example of international law superseding national law began January 1, 1993, when the European Community (EC) enacted laws and regulations regarding

privacy and information protection. These laws state that information cannot be moved out of one EC country into another unless the target country has adequate privacy protection (Kallman, 1992, p. 87). E-mail's impact extends beyond the traditional business realm. Its impact on higher education is still unknown, but information is appearing that signals changes, not only in the classroom, but in labs and research areas as well.

Consequences of E-mail: Positive and Negative

Updegrave (1993) noted the possible consequences of this technology, which will include: researchers collaborating with distant colleagues, students checking homework assignments, and administrators planning meetings via the E-mail. Abbott (1991) anticipated that E-mail will promote inter-institutional communication, especially between librarians who will be able to share on-line catalogs, circulation systems, indexes and abstracts, and who, when faced with budget cuts to library funds, will use E-mail and the networks to run more cost-effective operations. Hawkins (1991) noted that new computer technology is providing the academic community with access to one another and to informational resources in a fashion that is unparalleled in history.

New technologies geared toward organizational communication are evolving daily, and employees and other organizational members will be repeatedly asked to adapt to new work procedures, many of which are of a high-tech nature (Papa & Tracy, 1988). Although universities are considered a place for learning, Updegrave (1993) stressed that, "as the twenty-first century approaches, universities must be prepared for, and prepare students for the challenges of an increasingly information-rich, multimedia, international, multicultural world" (p. 15).

Hawkins (1991) noted that "campuses need leadership to facilitate the changes for what was once relatively static, to the highly dynamic environment of today, and that the leader must realize that computing today is big business" (p. 29). One example of how the

computer is helping universities become big business is the telecourse. For example, Michigan State University offers an on-line computer science course, which won a 1993 Computerworld-Smithsonian Award, to anyone who has access to a network. The university promises students that this new approach to teaching will integrate the computing exercises, video, text, and class. The class is taught by a member of the university faculty, and out-of-state students are offered lower-than-usual tuition rates.

Cyert and Mowery (1987) noted that "the economic effects of new technology, whether revealed in production growth, creation or loss of jobs, or changes in wages and profits, are realized only through adoption" (p. 40). However, Fine (1986) found that no matter how much benefit a proposed change will bring to the organization, no matter how meticulous the planning strategy, some individuals will resist the change, either through active aggression or passive retreat (pp. 83-84), and organizational administrators and communication experts must be prepared to usher in and promote cyber communication.

Diffusion of E-Mail in a University

Everett Rogers (1983) developed diffusion theory to explain the acceptance of innovations and their rate of adoption. Rogers noted that diffusion is the process by which an innovation is communicated through certain channels, over time, among the members of a social system (p. 5). He also noted that diffusion is a kind of social change.

Most diffusion studies prior to 1970 concentrated on individuals and their decisions to adopt a new technology. However, up until the 1970s, the tendency was to simply transfer to the study of organizations the models and methods of innovativeness originally developed for individuals, often without carefully thinking through the ways in which the two systems were similar or dissimilar (Rogers, 1983 p. 355). Today, as Van de Ven and Rogers (1988) noted, individual adoption research has shifted from adoption of the innovation, to implementation, or the putting to use of the innovation.

Rogers (1983) outlined three types of innovation-decisions which included: optional innovation-decisions, which are choices to adopt or reject made by an individual independent of the decisions of other members of the system; collective innovation-decisions, which are choices to adopt or reject an innovation that are made by consensus among the members of a system; and, authority innovation-decisions, which are choices to adopt or reject an innovation made by relatively few individuals in a system who possess power, status, or technical expertise (p. 347).

Rogers also noted that there are five stages of innovation which are broken down into two processes: initiation and implementation. During these processes, an organization goes from information gathering and conceptualizing of the innovation, to the stage where the innovation loses its separate identity and becomes an element in the organization's ongoing activities. However, as Van de Ven and Rogers (1988) noted, the field of innovation in organizations has been invigorated by the study of new technologies on the adoption process, because the new media represented a different type of communication that uses traditional face-to-face communication, but which also utilizes some type of hardware or equipment that enables communication exchange among many members.

Diffusion studies have examined adoption variables such as communication links' effects on innovation (Bach, 1989), as well as supervisory influence on adoption (Roberts & O'Reilly, 1974; Schmitz & Fulk, 1991). Snyder (1984) found that there was a strong relationship between organizational performance, supervisor communication, and group information exchange.

Cyert and Mowery (1987) found that organization size affected the speed at which an innovation is adopted, and speculated that adoption rates increase in larger firms because they usually have larger in-house engineering and scientific staff and financial

resources. However, Bach (1989) studied adoption by a profession in the medical field, and found that the medical community adopts technology in order to maintain equivalence with their peers.

In regard to diffusion of electronic mail, Schmitz and Fulk (1991) found that the subordinates' use of an innovation was predicted by their supervisors' use of the media. These researchers also discovered that co-workers' attitudes towards the usefulness of E-mail may influence the attitudes of their close associates. Because these studies suggest that communication between co-workers and superiors affect adoption, this is one area that should be of prime concern when implementing a transition to electronic mail. Papa and Tracy (1988) recommended that managers must have a knowledge of the communication abilities of their employees to anticipate potential problems during the transition.

Komsky (1991) noted that adoption was influenced by the users' belief in a new technology's potential benefits and/or personal benefits, and by the perception of a system's ease in use and ease of access. Similarly, Anderson and Reagan (1992) found that innovation adoption, or lack thereof, can be explained by employees' perceptions of that technology's application as a component of their regular job roles.

There are some inventions or innovations that have gone through a transformation or re-invention (Rogers, 1983), and adopters have actually changed or modified the innovation to meet their specific needs. E-mail has the potential for re-invention, and as communication technology expands, the original purpose and use of this innovation will certainly change and grow too. The Internet is a perfect example of this re-invention, and it has grown from its original purpose as a government and military data bank to the global communication tool of today.

Dalton (1989) found that in diffusion of a new technology with educators, the structure of the typical school is quite hierarchical, and since power is a function of influence, not position, the power relationships are constantly in flux. Dalton also discovered that adoption decisions are made by a centralized authority, and usually in response to external pressures. Also, a study of university students found that technophobia is a major predictor of who will use technology (Gloady, 1994), and a quarter to a half of the entire population is technophobic. If this is the case, adoption of technology, especially computers, may be more influenced by fear rather than by perception of benefits.

Rogers (1983) classified adopters into five categories of individuals, and suggested that typical patterns exist in each adoption category, which include: innovators, who are venturesome and eager to try new ideas; early adopters, who usually have a higher degree of opinion-leadership within a social system; the early majority, who are deliberate and interact frequently with their peers, but seldom hold leadership positions; the late majority, who are skeptical, often adopting an innovation because of economic necessity or increasing network pressure; and, laggards, who are traditionalists and near-isolates whose point of reference is usually in the past. Knowledge of the diffusion process can prepare management and communication professionals for the introduction and implementation of programs for new technologies within organizations.

New communication technologies are evolving at a rapid pace, and organizations must continue to adopt these new technologies to remain competitive. Research indicates that management must consider how this technology will change the workforce. Smeltzer, Glab and Golen (1983) noted that tremendous technological changes will alter the skills necessary to communicate, and blue collar employees will be increasingly required to interact with computer technology (p. 73). This fact added another dimension to

adoption, and indicated that training may be vital in the adoption process of E-mail, or any other type of computer innovation in the very near future.

Computers Becoming a Mass Media Tool

Pharr (1990) noted that "challenges for communicators will be to communicate in a vast, global public without the help of mass communication, because no longer is there such a thing as a mass medium" (p. 18). Severin and Tankard (1992) also noted that "one of the consequences of new technology is that it is no longer quite so easy to say what is mass communication and what is not" (p. 8). They also suggested that there is a changing media landscape, and computers are having great effects on mass media. Computers are quickly becoming a common communication medium because they are general, all purpose communication devices; therefore, Severin and Tankard noted that the boundary between mass communication and other forms of communication is becoming blurred, and is no longer clear as to what constitutes mass media and what does not" (pp. 7-10).

Looking into the future, one sees a vast, changing world that will include computers as a permanent part of each person's life, at home, work, and school. Adopting and making full use of the computer, and all that it has to offer, will be the only way to survive in a competitive global world in the 21st century. Therefore, if adoption of electronic communication by students, faculty, and staff in academic institutions is critical, which universities will adopt E-mail and why, which organizational members will adopt quickly and why, what resources and systems will foster rapid adoption of E-mail, and how will E-mail alter traditional social interaction, communication and educational processes?

CHAPTER 3

RESEARCH METHOD

Overview

This research is a case study of the diffusion of E-mail within a university. Since Rogers (1983) suggested that not enough attention had been paid to the consequences of innovations, this exploratory case study examined E-mail's changes to SJSU's social interaction system, administrative process, and educational procedures. Also, Patton (1980) stated that this type of research searches out patterns within a particular setting, and a case evaluation can be drawn on the individual, group, or institutional level. Data collected in a case study can draw conclusions on all three levels: individual user level, group/department level, and the institutional level.

Rogers (1983) and others have examined adoption within large social units and although a university could be considered a large unit, it still remains as one organization. Others, including Bach (1989), have suggested that few researchers of innovation adoption have emphasized individual relationships and communication roles in the innovation process within a single, and perhaps, small organization. Therefore, this case study of a large academic organization, in the midst of adopting a new communications technology, offers a compromise between the many schools, and will identify not only communication roles, but also interactive communication roles between organizational members.

The use of interactive investigation technologies for research purposes has shown promise (Rogers, 1987), and electronic surveys have been found to be as effective for data collection as traditional pencil-and-paper surveys (Komsky, 1991). Therefore, electronic surveying and interviewing was incorporated into this study; the results are expected to add to the growing body of research that has utilized interactive investigations. In

addition to the interactive research approach to E-mail usage and patterns at this university, more traditional research methods were also employed, including face-to-face interviews, telephone interviews, and group interviews.

Since usage was still in the lower range at the time of the study, about 5% of the total organization population, the findings provided a holistic picture of SJSU's on and off-campus communication system. The study's conclusion will aid administrators in determining the extent of electronic mail's attraction and perceived benefits to the current university's staff and student users, and may provide information for a later diffusion study at SJSU, once adoption rates reach the majority level.

Because electronic mail is not a new technology, introduction of the technology had already occurred through a variety of media channels, and information from nine years of adoption and implementation was studied. Availability of this technology was examined, along with system capacity.

SJSU Chosen as Case Study

Since earlier research (Cyert & Mowery, 1987) stated that adoption of E-mail technology occurs in organizations with large scientific or engineering facilities, selecting a university for a case study of E-mail diffusion was considered ideal. The university is located in the heart of Silicon Valley, and computer technologies are part of the community, and are not new to SJSU organizational members. Therefore, this study examined if E-mail adoption occurred as a result of the technology's attributes.

This university was also chosen for the case study because of the independent and autonomous nature of decision making in academic institutions by both professors and administrators. A university is unique as compared to more structured organizations, because diffusion is more optional than forced. The results may aid the SJSU

administration in examining which element of innovation played a major role in adoption of this technology on campus.

Organizational Participants

San Jose State University, part of the California State University system, is the system's oldest campus, and was founded in 1857. This university's student population, in the fall of 1993, was 27,057. The faculty at SJSU totaled 1,056, administrators numbered 49, and support administrative staff totaled 241. Since electronic mail was available to students, professors, and administrators, interviews and surveys were conducted with each group of early users. Analysis was conducted on two different levels: organizational and individual.

Student Profile

In terms of student demographics, 48% are male and 52% are female. The student overall median age is 27, with an undergraduate median age of 25, and a graduate student median age of 33. SJSU, according to university publications, is a university campus of pluralities, not majorities. The ethnic breakdown of students is as follows: White, 47%; Asian, 23%; Hispanic, 10%; African American, 4%; Filipino, 5%; American Indian/Alaskan, 1%; Pacific Islander, .5%; and Unknown, 11%.

Since a comparison by major will be made in the student population, an understanding of enrollment by college is needed. This college breakdown is as follows: Applied Sciences and Arts, 20%; Social Sciences, 12%; Business, 16%; Humanities and Arts, 13%; Education, 4%; Engineering, 14%; Science, 9%; and Social Work, 2%. In addition, graduate student enrollment under Graduate Studies and Research is 6% and Undergraduate Studies enrollment is 4%.

Faculty Profile

The mean age of the SJSU faculty is 47. In 1993, the numerical breakdown of faculty in terms of years of service was as follows: 1-5 years, 31%; 6-10 years, 22%; 11-20 years, 20%; 21-30 years, 23%; and 30 or more years, 4%.

A comparison of E-mail use by academic departments and other University units was made for both faculty and staff. In 1993, the full-time faculty (FTEF) at SJSU totaled 1,064, with the breakdown as follows: Applied Sciences and Arts, 15%; Business, 9%; Education, 7%; Engineering, 9%; Library and Information Science, 10%; Humanities and the Arts, 22%; Science, 17%; Social Work, 3%; Monterey Campus, 8%.

Method

At the time of the research, the university did not publish a listing of SJSU student/faculty/administration E-mail addresses. Therefore, special permission was obtained from the university's computer information department so the researcher could gain access to user identification codes and begin the interviewing process. Securing early adopters' electronic addresses took about one month; the lack of information for user addresses will be discussed later, since this appears to be one major variable hindering the expansion of electronic mail for on-campus communication.

As part of this case study, the researcher acquired an E-mail account in an effort to contact users electronically via the university E-mail system, and to better understand the mainframe system, especially in regard to hardware and software capabilities.

To begin the case study, preliminary interviews were conducted with key computer center administrators which included: Lee Vandiver, Academic Vice President of Computing; Jim Schmidt, University Librarian; and Tim Torres, Computer Information Center Manager. Information received from the preliminary interviews included logistics

of the SJSU mainframe system, current university policy on E-mail use, and individual departmental use patterns.

After the interviews, all 1,496 early adopters listed as current account holders with VM access were E-mailed a brief summary of the case study and asked to respond to a series of questions. It must be noted that the university offers both UNIX and VM access, and a listing of UNIX account holders was not available from the university computer center. Out of the 1,496 mainframe users contacted, 120 responded, which helped identify early adopters, provide background on adoption rates, and helped in the selection of final interviewees. Additional follow-up questions were then sent back and forth from researcher to E-mail users from December 1993 through March 1994. The data provided an initial look at E-mail users and their system usage patterns.

A total of 50 persons were selected for personal interviews--40 were personally interviewed and 10 were interviewed via the telephone. Additional follow-up was conducted with interviewees electronically via E-mail. Interviewees included university president, J. Handel Evans, academic administrators, administrative staff members, professors who have incorporated electronic mail into their classrooms, Clark Library staff, computer information center service technicians, and selected students who used E-mail. Each dean's office was polled as to usage by the deans and their staff members. In addition, every academic administrator's office was called to determine whether the use of this technology was filtering down from the administrative arm of the university.

Personal interviews were conducted with two professors currently using or designing classes that incorporate electronic communication. These classes are in the Business School and in the Division of Technology in Applied Sciences and Arts . The professor in the Division of Technology was selected for questioning because she has been

awarded a fellowship to design future courses that will incorporate E-mail into the classroom.

The researcher also spoke to one college computing committee, and had contact with two staff members responsible for administrative duties. Administrative assistants were chosen after it was found that many deans' secretaries and administrative staff utilize E-mail more than the academic deans themselves.

Personal interviews with six students, chosen from a list of early student adopters, were conducted. Of the six, two were graduate students and four were undergraduate students. Two international students were selected for personal interviews because of the potential for utilizing E-mail to communicate with friends, family, or colleagues in other parts of the world. Their comments were integrated with responses received by 100 student E-mail users to provide a portrait of usage among students who were early adopters.

Clark Library: A Separate Profile

To construct a profile of Clark Library, 20 interviewees were selected from the 50 E-mail account holders, and each was individually interviewed for about one hour. A separate profile of one academic unit, Clark Library, was completed because of all of the SJSU departments, the library appeared to be more progressive in its adoption and use of electronic mail. The profile examined the issue of a policy of forced adoption as carried out by the University Librarian, Jim Schmidt, and whether the staff perceived adoption as being forced or simply encouraged. The degree of enforcement was examined to see if it played a major role in the library adopting this technology, and if it paralleled earlier research (Dalton, 1989; Komsky, 1991; Schmitz & Fulk, 1991), which found that less enthusiastic users tended to use an innovation even though they were pressured into it, although they may not consider it as their primary communication media.

Examination of Communication Tools

The researcher also examined information distributed at SJSU about E-mail's availability and use to determine whether usage was low due to a lack of communication about this technology. Another facet of this case study involved the examination of relevant primary source documents related to E-mail. Because adoption was low, the research focused on both formal and informal communication networks/channels to determine which of these two communication channels helped or hindered adoption by early users. The primary document examined was the SJSU User's Guide to Centralized Computing Resources. Secondary sources examined included: a university newsletter, OnCampus, published by the Office of Public Affairs; CyberNews, the Computing Center's campus news/information publication; and a student newspaper article, written 2/28/94. Analysis of this information provided background on the university's communication strategies for promotion of E-mail as a new communication/research tool at SJSU. E-mail users and interviewees were asked to note which form of communication increased their knowledge of this innovation, and eventually led to its adoption.

Interview guides were created for this case study, and are included in the Appendices. Questions centered on early adoption patterns within departments, and between students and faculty. All questions were geared to developing a profile of early users, and an analysis of department adoption, both by force, and by choice.

CHAPTER 4

RESULTS AND DISCUSSION

Overview

This case study looked at several levels of analysis on the diffusion process of electronic mail. Rogers (1983) found that there were three types of innovation-decisions: optional, collective, and authoritative. Data collected from interviews and survey responses indicated that all three types of innovation-decisions were present at the university.

Also, Van de Ven and Rogers (1988) found that an interactive innovation such as electronic mail is often adopted very slowly at first in an organization until a critical mass of adopters is achieved, after which time further diffusion occurs quickly (p. 633). This definitely appeared to be the case at SJSU, where some form of electronic communication has been accessible for the past nine years. The system is available to any SJSU member who applies for an account, yet questions remain as to why adoption and use of electronic communication is low. By conducting an analysis on different organizational levels, a clear picture of adoption patterns was drawn, and as Van de Ven and Rogers stated, adoption can be linked at the micro and macro levels.

Availability and Accessibility

The availability of electronic communications does not appear to be a factor in the university's low adoption rate, and with everyone having access to the system, the current process of securing an account, which only requires a trip to the computer information system, was reported to be a simple procedure by all respondents. Time for processing account requests was as long as three weeks, but the university recently added more staff to the computer center, and time required to secure an account was reduced to one week.

Availability of a computer does appear to a possible factor in adoption. There are some faculty and staff who must share an office computer, and others who must use a faculty computer lab, so that lack of equipment has hampered adoption to some degree. The majority of the early adopters either have a personal computer, or share one with another staff/faculty member. Members required to travel to a computer lab appeared less likely to use E-mail on a regular basis because traveling to the lab was inconvenient and the telephone was a quicker and more efficient mode of communication.

Accessibility to the mainframe was a factor in adoption and use, and at the time of this case study, individual, faculty, and department accessibility to the campus VM was limited by the number of auxiliary ports; SJSU was unable to provide each faculty member with a personal hook-up. Competition for available ports appeared to be a major factor in delaying majority adoption, and this competitive atmosphere actually appeared to foster greater usage by the early adopters because ports are transferred to and from account holders, depending on their usage. The danger of losing a port was motivation enough to increase usage by early adopters so as not to lose access.

There are three ways that students can gain access to the mainframe. Student access was available at 28 computer stations located around the SJSU campus. However, if a student lived in one of the university dorms, he/she had the option of purchasing an ADI hook-up box, at a cost of \$40 a year. Also, if a student owned and operated a home computer with a modem, he/she could access the mainframe from home; however, if accessed from a home outside of the immediate San Jose area, students paid for long distance phone use, because at the time of research no toll-free access numbers were being offered by the university. There are indications that the early student adopters were willing to pay the extra charges, both the ADI charge, and toll charges, to have access to the mainframe, E-mail capabilities, Internet connection, and to have the opportunity to

complete required class projects via the system. However, the cost has not prevented early adopters from acquiring and using electronic communications, even those who may live outside the local area.

The innovation-decision to adopt this technology was made several years ago at SJSU. Today's university E-mail policy issues and system design are controlled by administrative personnel in Computing Services, who have both power and technical expertise. The organization appeared comfortable with technical personnel managing the computer mainframe system, and many of the questions were referred to the computer systems department from the President's office downward. The decisions about many aspects of electronic communication appeared to rest in the hands of a few technical experts, and resemble what Rogers (1983) called an authoritative innovation-decision.

User E-mail Address Listings

One major obstacle in collecting data for this case study was the absence of a complete user identification/mailbox listing. Although there is a directory of faculty and staff users on the VM system, students are not listed electronically, and information on how to access the faculty listing has not been made readily available. Data obtained from interviews and from those who responded to the E-mail queries revealed that most early adopters have had little formal training on the system, and were not aware of the availability of an on-line directory. The absence of a complete E-mail directory appeared to have no bearing on adoption, but it did appear to be an obstacle as related to increased usage on a larger scale at SJSU. Also worth noting was the fact that most users reported that they would prefer a directory that followed a more traditional printed form, and these responses were echoed from one dean's office downward. It was not clear whether users had known about the electronic listing, if the demand for a printed listing would have been as strong as it was.

The only listing of users was found in Clark Library. University Librarian Jim Schmidt noted that "it was only natural for the telephone extensions and E-mail addresses to be found together on our internal listing." Schmidt stated that he had used a similar combined list at another California university prior to joining SJSU, and found that such a list promoted adoption because if a staff member was left off of that list, he/she usually asked about being included on future list revisions. Schmidt also stated that this subtle encouragement of E-mail usage has worked well in fostering adoption over the past two years. When the list was first printed, about 5 to 10 staff members had addresses; that number at the time of research had increased to 50. These findings suggested that adoption can be attributed to observability. Non-users of E-mail were motivated to adopt the system after observing co-workers' usage of E-mail.

Almost all of the early adopters noted that they were unaware of the actual percentage of fellow E-mail users at SJSU, and exact estimates of fellow organizational adopters were scattered across the board from 5% to 50%. To acquire a fellow user's mailbox address, most users made a telephone call to the E-mail user first, which seemed to defeat the purpose of E-mail, and added another step in the process of communication. One staff member commented: " Why use E-mail, when I have to first make a call to get an address. I 'm just doubling my work, so I still prefer voice mail at this stage of the adoption process."

Also worth noting is the fact that the student users are given encrypted numerical user mailbox addresses, and searching for specific students, by name, is virtually impossible with the current software. One student remarked that it is much easier to search Internet and Gopher for students at other universities around the country than to search for a fellow student at SJSU. With the SJSU numerical address system for all student users, the directory appeared to have actually hindered campus communication of

not only students, but also by professors who did not know how to locate a student from the numerical listing. At least with staff and faculty, if a name was known, any user could begin a search to find an address. With numbers as addresses, it appeared virtually impossible to locate a student with the current set-up.

System Logistics

As noted earlier, hook-ups to the system have played a role in delaying majority adoption and, according to the computer system manager, there are several areas of concern related to the universal adoption of E-mail. At the time of the research, the university had a limited number of mainframe access ports (160), ADI dial up lines (8), and terminal servers or telenet lines for modem users (40). With the number of users, both VM and UNIX, numbering about 3,400, the limited number of 208 access ports to the mainframe appeared to be one possible system problem which has slowed majority adoption. The current system would simply be unable to handle 30,000-plus users. There appeared to be a perception that port size is a problem for early adopters, and they have noted that they are willing to accept a slow system. However, if the majority of the university adopted this technology, both for communication and education purposes, the present system would be not be able to handle the use, and access to the mainframe would take longer periods of time, thus forcing users to resort to more traditional modes of communication, particularly the telephone.

SJSU E-mail administrators admitted that the current capability of the system, especially in regard to available ports, has been a factor in the minimal publication of the availability of the system. According to one of the administrators of the system, mass communication and advertising campaigns for E-mail on a large scale would be detrimental because it would theoretically overload the system if every faculty, staff, and student tried to access his/her account. Therefore, part of the reason for slow diffusion

appears to be related to hardware, and until the system's ability to handle campus wide adoption is realized, publication of its availability through mass communication channels will be minimal.

Because of current state budgetary conditions, money to improve system capability is not available. An interviewee remarked that severe earthquake damage experienced by CSU-Northridge in early 1994 made the situation even more uncertain in regard to upgrading the SJSU communications and fiber optics systems, which would potentially delay arrival of the data superhighway at San Jose State. If individual departments want to adopt on a large scale, they must invest monies from their departmental budgets to provide access via LAN (local area networks) or ADI hook-ups. It appears that appropriated money for these hook-ups has been limited, and other educational projects or needs are taking a higher priority financially; therefore, funding can be cited as another reason for low adoption. To date, financial emphasis has been placed on more traditional educational needs.

However, budgetary restrictions have promoted the use of E-mail as an off-campus communication tool. The free access to friends, family, and colleagues appeared to be one major factor in adoption of E-mail by both students and faculty. Students have actually appeared to, as Rogers (1983) stated, re-invent this innovation into a sophisticated person to person messaging system because it saved them expensive phone bills. Many faculty seemed to agree, but they also realized other benefits of Internet and were taking advantage of several of the network's features. Students appeared to not have been as educated on all that Internet could do for them in terms of accessing information and data from around the world. Therefore, these findings suggested that at SJSU E-mail appeared to have a relative advantage over the traditional telephone system which has contributed to student adoption.

The computer system administrator stated that only a few departments have invested in developing LANs. This departmental piece-by-piece adoption demonstrated priorities, but cannot be traced back to supervisory use, or at this level, use by the Dean. Additionally, in order to get the entire infrastructure of SJSU ready for the access to the information data superhighway, much more money will have to be allocated from the state's general fund. Therefore, majority adoption may be influenced more by outside factors than from inside the campus walls, and may ultimately be controlled not by supervisory use or peer pressure, but by state and federal government.

System and technical support to all users appeared to be limited, and seemed to have a negative effect on adopters attempting to use the system to its fullest extent. For some users, their knowledge of the system restricts full adoption, and some users only access the VM system for electronic communication, because they do not feel confident in exploring the other systems like Internet. One computer center technician remarked in her interview that students are using the system, and there was frustration experienced by most computer staff members because E-mail was the only system students wanted to use. However, as stated earlier, there was evidence from both the user queries and interviews that most users are self-taught on a trial and error basis. There appears to be an under-utilization of the system because of a lack of formal training and technical support. Classes have been offered to faculty, but no formal instruction has been made available to students. Also, the computer information center advertises that a help line is available, but hours are restricted to Monday through Friday from 9 a.m. to 6 p.m., and some users, especially students, remarked that they are unable to use the system support because the hours did not suit their schedules. Another concern conveyed is that many of the technical assistants are students. At one time the computer information system was run by students, and SJSU still uses a large student staff, but the university has added seven full-

time computer system analysts. However, early adopters still appear to be concerned about inconsistencies and reliability as related to the center's technical advice, especially the faculty and staff members, and respondents reported that they turn to fellow staff members, colleagues, or friends for answers to their questions, rather than ask the university's technical staff.

Several comments also reflected some frustration regarding technical assistance with the current User's Guide. There were some users who expressed frustration about the guide, and suggested that, if a computer user did not have a DOS based program, the system was very unfriendly, and the guide was somewhat worthless. In a large organization such as a university, there are a variety of computer operating systems being used, including DOS, Windows, and Macintosh. The perception by many early adopters was that current reference materials do not address the particular needs of each system. Users suggested that the lack of compatibility with several computer operating systems hampered wider adoption and appeared to be negatively related to adoption.

Also, the user's guide was offered at a charge for students, and some students reported that they were never made aware of the availability of the guide. Some students refused to purchase the guide, and are learning the system on their own, or through a peer-teaching method. The lack of formal training on the mainframe had some negative effects on internal use, and most students appear to be learning by trial and error, and from other Internet users via the reference and help lines on the network. This bypassing of university technicians appeared not to hamper adoption, but rather hamper internal campus usage.

There appears to be low confidence in the current SJSU system, and one professor even remarked that he kept his account at another university, because the other E-mail system was much more user-friendly and superior in its capacity. This perception of a

slow and archaic electronic communication system has hampered early adopters from, as Rogers pointed out, conveying a subjective evaluation of the innovation to peers:

Academic Administrative Support for Electronic Communications

Blankenhorn (1993) noted that technology will enable educators to scrap their 19th century teaching methods, and assist in preparing students for the competitive 21st century. In a November, 1993 campus newsletter, OnCampus, J. Handel Evans, president of SJSU, communicated his goals for bringing technology into the classroom. He outlined several projects and pilot programs which were incorporating distance learning into the curriculums, and announced 25 fellowships which would be awarded to professors who were developing ways to include electronic communication in more traditional teaching methods.

This move clearly showed that multimedia and communication technologies have caught the university's attention, but in his remarks, the president also commented that technology was not a panacea, and that it would take time to learn how to use the new technologies in the classroom. Fear that this technology will become an intrusion into learning is one possible factor that is keeping some faculty from adopting E-mail. It may also be a reason why some laggards will wait and adopt at a later date.

After contacting individual departments, it appeared that the university president's enthusiasm had not filtered down to deans and associate deans. At the time of this study, there were 16 vice presidents/deans. Of these top administrators, only six, or 38% have E-mail accounts and, of this total, only three, or 19% responded that they use electronic mail on a regular basis. Two of the deans, who reported that they had accounts, stated that they only occasionally used this form of communication, and preferred to use memos and faxes. Also, many deans have accounts, but actually their administrative and secretarial staff utilize E-mail and other communication functions of the system. One

reason given for preferring other traditional methods of communication, as compared to electronic communication, was that numeric data were difficult to transmit via electronic mail, and that the system was slow, and productivity was increased by using other methods. Of the university's 14 associate deans, a total of seven, or 50% had E-mail addresses.

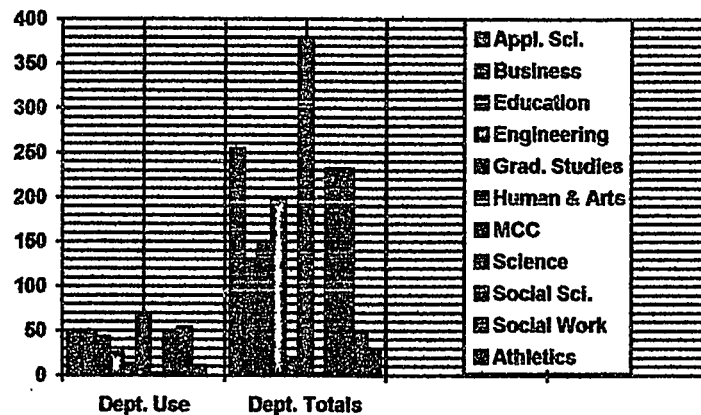
Phone interviews with each dean's office administrative staff conveyed minimal interest in electronic communications technology as a tool for either on-campus or off-campus communication. Also, low adoption by supervisory academic personnel can possibly be attributed to several issues, including limited system capacity and low interest in Internet and/or E-mail in general. On the issue of system capacity, several statements made by users indicated that the system was too complicated and/or too difficult to access because of limited ports. Therefore, the negative remarks clearly demonstrated a lack of interest in adoption resulting from both system and logistical concerns. More traditional means of communication, especially fax and voice mail, were still preferred to E-mail, and only two departments appeared excited about electronic communications possibilities. Some of the respondents noted that they would be interested in learning about this technology, but needed additional training in the mainframe, and would possibly utilize electronic communication if they understood how to maneuver in and out of Internet.

Faculty Adoption and Usage Patterns

Adoption by faculty was studied to determine if the usage of E-mail was primarily for internal campus communication, external communication, student communication, or research purposes. The faculty's use of electronic communication was also broken down by department, and the following chart depicts which academic units had more frequent adopters of the VM system. As can be seen in Figure 1, the numbers reflect the variance in E-mail usage by faculty departments.

Figure 1.

Faculty Adoption of E-mail by Department



| <u>SJSU SCHOOL E-mail TOTALS</u> | <u>TOTAL FACULTY</u> | <u>TOP USERS #1</u> | <u>TOP USERS #2</u> |
|----------------------------------|----------------------|---------------------|---------------------|
| Applied Sciences & Arts (50) | 225 | Journalism (12) | Human Perf. (11) |
| Business (48) | 130 | Org & Mgt (15) | Marketing (15) |
| Education (43) | 146 | Teacher Ed (19) | Special Ed (11) |
| Engineering (26) | 198 | Electrical (5) | Materials (5) |
| Graduate Studies (13) | 20 | Library & Info (11) | Other (2) |
| Humanities & Arts (68) | 380 | English (19) | Art & Design (8) |
| Science (48) | 232 | Chemistry (12) | Geo(11)/Phy (11) |
| Social Sciences (54) | 232 | Sociology (11) | Hist(7)/Psy (7) |
| Social Work (11) | 50 | Social Work (11) | |

There appeared to be a limited number of faculty using the system for internal communication or educational purposes. Some early adopters stated that they were not required to get accounts to perform their jobs, and most said that their supervisors did not use E-mail. Many users also stated that the diffusion of E-mail had already taken place at other institutions, and that they simply transferred their usage to SJSU, and demanded its

availability at this university. The university's system administrator noted that many of the new faculty/staff members have described E-mail as an essential tool, as related to effectively performing their jobs.

The School of Library and Information Science faculty members showed significant support for electronic communication, both for interpersonal and educational purposes. Student users consistently reported that E-mail was a part of the curriculum and served as a communication tool between fellow students and professors. The new director favored distance learning and had developed programs that have forced faculty and students to adopt E-mail for classes. There are several core courses on microcomputers and networking through the Internet, and one course in particular uses E-mail for a satellite course at another CSU campus in Southern California, where students pair up and complete class projects over the Internet. It was apparent from faculty and student comments that mastering electronic communications, on-line research, and the Internet will be crucial for the survival of this profession, and that the school's staff recognizes this fact and is preparing students for this technological reality. Also, the urgency of adopting this technology is well known throughout SJSU, and professional library groups and associations have promoted adoption through conferences and other means, which have supplemented and reinforced SJSU adoption efforts.

Where adoption was not forced by department or supervisory staff members, the survey results pointed out that the primary motivating factor in acquiring an electronic mailbox was external and off-campus communication, via the Internet, with colleagues and friends. Most users stated that they primarily adopted this technology for the purpose of communicating off-campus. Unlike Schmitz and Fulk's (1991) findings, SJSU's adoption did not follow the pattern of supervisory use of a technology influencing adoption and use by subordinates; rather, the stimuli for adoption grew out of pressures from professional

colleagues and peers, which seemed to agree with Komsky (1991), who found that peer pressure can function as a form of forced compliance.

Users also suggested that they had received information about E-mail from peers, as well as from attending professional conferences and meetings. Some users also stated that they acquired E-mail to coordinate professional meetings, collaborate on research, and register for conferences. There was a great deal of promotion of this technology outside of the university. Some faculty remarked that at all professional meetings there was a certain amount of pressure to keep up with the Joneses, which has served as one of the more powerful motivational tools in encouraging a large portion of the early adoption at SJSU. One reference librarian stated that the main topic at a recent library conference was Internet, and that she was happy to have already been familiar with the network so as not to be considered lagging in the technological advances of her profession. The data from this case study followed earlier research that stated interconnected individuals in peer networks usually turn to each other in order to interpret and influence one another in adoption of a new technology (Rogers, 1983, p. 292).

These findings were also similar to Rogers' earlier findings in regard to relative advantage, and most professors who had adopted saw E-mail as being better than the idea it superseded. This was especially true for library staff members who acknowledged that electronic communication and the electronic transfer of information is more cost effective, more efficient, and is becoming the primary method of academic communication.

Internal or on-campus communication via this technology is still surprisingly low, and most early adopters perceived on-campus communication via E-mail as being non-existent. As Komsky (1991) stated in her research, there have been faculty who have been unwilling to alter their existing communication patterns to include electronic mail, despite a high degree of computer literacy and a frequent use of computing for other

applications (p. 311). Several professors noted that on-campus use of E-mail is ineffective because most account holders do not check their messages often enough. A large number of respondents stated that with the present system at SJSU, it was much easier and reliable to use voice mail. Early adopters stated that until the majority adopts E-mail at SJSU, they will not actively integrate E-mail into daily internal communication on campus. Also, many remarked that they cannot afford to bypass the more traditional forms of internal communication, such as written memos or the telephone, if they want to stay in touch with their colleagues.

System Manager, John Sroka, stated that as more campus activities come on line, daily use of the mainframe, including E-mail, will increase. He also stated that the university has intentions of integrating voice and data into the mainframe so that the computer will be recognized as a communication tool as well as a word processing tool. However, this total integration is planned for the future because of budgetary constraints.

When asked about external or off-campus use, users praised E-mail for its ability to eliminate telephone tag, reduce expensive phone bills, and break down geographical barriers. Earlier studies (Komsky, 1991) also noted these benefits of E-mail, so that the benefits of this communication tool appeared to be universal for users at SJSU. The perception existed that E-mail is not necessary for internal communication purposes, but is essential for external communication and access into Internet's unlimited informational data bases.

Very few faculty members stated that they had ever communicated with a student via E-mail, and some respondents did not know that students could get E-mail accounts. A few interviewees remarked that communicating with the researcher for this case study was their first experience communicating with SJSU students via E-mail. While communication via E-mail promises to revolutionize educational processes, this

university's administration and faculty members have not yet fully embraced it. However, SJSU has begun to realize its potential, and has recently established a limited number of virtual classrooms, and recently awarded 25 faculty fellowships. These SJSU Innovation in Teaching and Learning Fellowships began in Spring, 1994, and were awarded to a cross-section of curriculum including: communication studies, business, education, engineering, industrial technology, health sciences, humanities, library science, mathematics, Mexican-American studies, music, nutrition, physics, psychology, and sociology. This demonstrated that the university has initiated a process to incorporate not only E-mail, but also other computer-based teaching alternatives, which can potentially accelerate the diffusion process on the campus.

Unlocking electronic communication's potential for off-campus use is a different story for faculty members, and most early adopters said that they communicated with other computer users and colleagues, outside of SJSU, on a regular basis. Some respondents remarked that they communicated electronically several times a day with colleagues. Another contributing factor in electronic communication adoption is both the enthusiasm and need for free access into Internet's unlimited data bases.

Forced Adoption Within Faculty Ranks

Unlike Clark Library, which used subtle pressure to encourage adoption, early adopters in the faculty ranks noted that no type of force was used, subtle or non-subtle, by their supervisors, to use E-mail. Additionally, most users stated that they were not required to adopt this technology, and most had never communicated with their immediate supervisor via E-mail. When asked how they learned of E-mail's availability to faculty, answers varied, but many users stated that they learned of its availability from other SJSU instructors or colleagues. There were other forms of information about this technology that came from computer center classes/presentations or from department heads.

However, a large portion stated that they had actually searched out this technology for themselves, and their adoption stemmed from previous usage at other institutions or from professional colleagues who had E-mail accounts at other institutions.

The School of Library Information Science has progressed much quicker in terms of adopting and incorporating electronic communications and networking on the Internet into the classroom. It requires all students to acquire an E-mail account before enrolling in several courses, thus forcing adoption by the students. Electronic communication between faculty, students, and list server subscribers occurs on a regular basis and, in one particular course, students communicate and coordinate group projects with library science classmates at another CSU campus. These findings appeared to duplicate earlier findings by Abbott (1991) which stated that librarians realize E-mail's applications in their jobs, and recognize electronic communication's potential through the sharing of on-line catalogs, circulation systems, indexes, abstracts, and also by using it as an effective management tool.

Other courses have surfaced at the university which have also forced adoption on the part of the students. These classes include an upper level course in hypermedia, a multimedia class which archives images on the Internet, and a lower division business class which utilizes the VM system for simulation purposes. One of the SJSU Innovation and Technology Fellowship winners noted: "Some professors have recognized that teaching no longer requires a lectern or face-to-face contact with students, and that the class of the future might be conducted via computers and modems. It is unrealistic to think that education will not be changed by technology."

There are a limited number of professors who publicize their E-mail addresses to their students, and some faculty noted that they did not know why students would need their E-mail addresses. However, one professor stated that his graduate students have

convinced him that publicizing his E-mail address was a benefit to them because they were rarely on campus, and needed alternate ways of reaching him. One of the undergraduate student interviewees commented that E-mailing a professor did not appear to be needed because they were seen in the classroom two or three times a week. It appeared that graduate students and their professors may be more motivated to adopt E-mail because it does provide a relative advantage of having virtual office hours.

Only a small number of the early adopters have realized E-mail's potential as a communication media between faculty and students. Some faculty interviewees even questioned student enthusiasm for this technology, and doubted its ability to improve the overall effectiveness of a course. However, once the fellowship winners begin developing courses which integrate electronic communication into the educational process, diffusion may accelerate at SJSU.

On a personal level, most faculty interviewees remarked that they did not use electronic mail primarily for on-campus communication, but rather for communication with professional colleagues and research purposes. As Rogers (1983) noted, early majority adopters realize that adoption is necessary for them to maintain the respect of their colleagues. However, at this university, adoption appeared to be brought about by the necessity to earn the esteem of professional colleagues who were outside of the communication structure of SJSU, and that with the adoption of this technology, one's position within the university organization was secondary as related to motivating factors in adopting E-mail. Also, receptiveness, discussed by Ormrod (1990), may have played a part in the diffusion of E-mail, because professional groups and associations around the world are now linked electronically and have created a positive receptivity to E-mail as a communication tool. Therefore, local receptivity, which is limited at this university, has not shaped adoption decisions.

If research by Schmitz and Fulk (1991) is accurate in assuming supervisor's use predicts subordinates' use of a technology, this academic institution will not adopt quickly if current administrative users at the higher level of the university remain below the 50% mark. Also, it appeared as if Dalton (1989) was accurate, and that diffusion of a new technology with educators is hierarchical in nature, with more adoption at the academic administrative level needed if majority adoption is to occur.

As Komsky (1991) found in a study of another California university, electronic mail proved attractive to adopters because it eliminated the need for telephone tag and helped to save time in retrieving lengthy voice mail messages. Several of the respondents at this university suggested that they also felt that electronic communications technology gave them more flexibility in their options, and that it helped to save time lost in traditional phone tag. However, the telephone is still the most preferred method for on-campus communication at this university.

One major hurdle in adoption appeared to be that electronic communication is still very limited at the university, and user satisfaction of E-mail will remain low until all university members have and use their E-mail accounts on a regular basis. At this early adoption phase, the benefits of the technology have not yet been fully realized, and the early adopters seem to be actually adding additional tasks to their daily jobs, because they still use the telephone, and are trying to incorporate electronic communications as well. One problem they have with the E-mail system is having to decipher who has an electronic mail account, and who does not. Although there is a way to look up E-mail addresses on-line, most respondents did not know how to use this feature, and without a published E-mail directory, a telephone call is required to obtain the E-mail address. Most users agreed that there was a relative advantage in using E-mail for internal uses, but the lack of an E-mail address listing had contributed to feelings of frustration and incompatibility as

compared to more traditional communication tools, especially the telephone and voice mail. Until electronic communication becomes the major method of internal communication, E-mail users seem destined to cover both bases with every message they send or receive.

Dutton et al. (1987) described a feature of computer communication as asynchronicity, which is the degree to which a new communication technology has the capability for receiving a message at a time convenient for the individual user rather than when it is sent by a source. The idea of asynchronicity and its ability to create virtual office hours appeared to be attracting the attention of some of the SJSU educators. Watkins (1992) noted that this technology has encouraged faculty communication with students via E-mail. However, SJSU has not yet reached this level with either an appreciation of asynchronicity, or a sophistication with the system's internal communication capabilities. Only a few professors give E-mail addresses to their students, and some have reported that they fear abuse of E-mail by their students. Until more professors utilize E-mail in the classroom or for communication with students, it appears that E-mail will be used primarily for external communication purposes.

Clark Library Profile

When Jim Schmidt, University Librarian of Clark Library, came to SJSU in July of 1992, he had used electronic communication at other universities for about nine years and was convinced of the benefits of E-mail. Therefore, for him, the diffusion of this technology had occurred at another academic institution before he brought this philosophy to SJSU.

Upon his arrival at SJSU, Schmidt found that about 15 staff members, or 17% of his new staff, had already adopted E-mail. Interviews with staff at Clark Library indicate that, through Schmidt's personal use and supervisory encouragement, 57% of the staff had

adopted E-mail, an increase of 40% in just one year. Not only do the numbers speak for themselves, but two-thirds of the staff members interviewed said that they feel that, because Schmidt used electronic mail as the standard media for regular internal communication, its adoption has accelerated.

Interviewees other than Clark Staff at SJSU all noted that Clark Library was the only academic unit on campus whose staff members had adopted E-mail. There was a perception that the University Librarian, Jim Schmidt, had somehow forced adoption upon his arrival from Stanford University, and the question of forced adoption was a main component of the Clark diffusion process. However, the library staff did not feel that Schmidt had forced them to adopt E-mail.

One explanation that was repeated in many interviews with staff members was that technology had forced adoption in the library, not overt pressure from Jim Schmidt. Alexander (1992) noted that libraries have been moving swiftly into the information age, and have the ability to make all of their library contents accessible from anywhere on campus and beyond. This will create research libraries that will not only be the center of the university, but will have a major impact on the quality of teaching and research.

Clark Library staff members appeared to have already accepted the fact that adopting electronic communication was imperative to stay on top of the latest in information technology, as well as service the needs of the university and stay abreast of their profession. Because of increased outside pressures from a world that is changing daily because of computer-based communication and information, Clark Library staff members appeared to be more progressive than any other SJSU academic unit in their approach and appreciation of electronic communication. Today, librarians access information from around the world and this information has become more and more accessible via the computer, therefore the university library has been forced to stay one

step ahead in its quest for accessibility to the SJSU mainframe. The library staff has also realized that they must be able to travel on the information superhighway in order to meet the needs of faculty and students. From this perspective, adoption of the technology has been forced more by job requirements than by supervisory or administrative pressures and, although the staff admitted that the university librarian's usage of E-mail had strongly influenced their usage, it had not been the only influence in diffusion. They agreed that adoption was a result of other factors, including technological advances in the field of library and information science and professional peer pressure.

The opinion of most of the library's electronic mail users was that they were more encouraged than forced to use E-mail. The discrepancy in forced vs. non-forced adoption needs further examination, and because many Library staff members commented that they were definitely not forced into adoption. There appeared to be two major factors in the majority's adoption of E-mail at Clark Library: (1) supervisory usage of E-mail facilitated widespread use of this technology for internal communication purposes, and (2) technological advances in the field of library and information science had played a significant role in forcing adoption.

Today, libraries are the nucleus of the university, and their ability to provide access to the latest information and data is critical. More and more libraries are becoming electronic by nature, and staff members are adopting computer technology as a necessity to access electronic catalogs, computer data bases, and networks. SJSU is no different, and Clark Library appears to have adopted the technology sooner than other academic units to stay abreast of developments in the field, and to keep up with the demands from the university. However, library interviewees stated that they feel they are no more advanced in usage as compared to other university libraries, even though they consider themselves advanced in comparison to other staff members around the SJSU campus.

Again, electronic communication is primarily used for communication between other libraries, so on-campus communication is almost non-existent via E-mail. The comment was made several times in the interviews that not enough SJSU faculty and staff have E-mail, so communication with this technology is too inefficient and the telephone was the more preferred communication tool.

It must be noted that Clark Library's communication still includes more traditional media, especially telephone and voice mail. However, the university librarian does use E-mail regularly with his immediate subordinates, and is increasing his E-mail messages more and more in an effort to encourage adoption by all staff members. His prior use of this technology was transferred to SJSU, and even though staff members had VM accounts, his personal usage of E-mail for internal communication has increased usage in the library within a short period of time. The internal publication of the combined telephone and E-mail listings encouraged staff members to seek out information about acquiring their own accounts. However, according to the university librarian, he does not use E-mail much for internal SJSU communication because, beyond his staff members, few high ranking colleagues on campus have and/or use E-mail on a regular basis.

At the time of research, Clark Library had 84 salaried employees, of which 55, or 65%, had mainframe accounts. The majority of adopters received their accounts in 1992, and 58% had been using the mainframe system well before Jim Schmidt arrived at SJSU. Internal communication was important at Clark Library, but communication with libraries and research requests by students and faculty became motivating factors for adopting this technology. Many of the interviewees stated that the motivating factors for adopting electronic communication were evenly split between keeping up with technology, keeping in contact with colleagues, and encouragement from supervisors. Supervisory utilization of a technology has been shown to affect organizational adoption, but the nature of library

work makes it a necessity to adopt this technology to perform job duties. This factor played as equal a part as did supervisory usage in majority adoption. However, at Clark Library, supervisory usage and subordinate encouragement have both played roles in the adoption of E-mail. Schmitz and Fulk (1991) found that subordinates' use of an innovation was predicted by their supervisors' use of the medium, and that co-workers' attitudes towards the usefulness of E-mail may influence the attitudes of their close associates. Clark Library followed this pattern in its adoption of electronic mail.

The phrase, forced adoption, was viewed by all staff members as being too strong of an adjective as applied to their situations, and all members, including Schmidt, responded that mandatory usage of electronic communication was not applied here. Instead, strong encouragement, coupled with regular supervisory use and support of E-mail has had an impact, and E-mail is now part of the library's internal communications program. The majority of Clark interviewees said that they were encouraged to adopt this new internal communication tool, but would have adopted it anyway at their own pace even without supervisory encouragement.

Clark Library appeared to be the first academic unit on campus which encouraged staff to adopt and use E-mail; therefore, the supervisor's use of this innovation was a definite influence on the subordinates' use for internal purposes, and agrees with the early findings of Schmitz and Fulk (1991). Consequences of this innovation's adoption include increased communications with colleagues and internal departmental staff members, via E-mail, as well as increased comfort with electronic communications in general. However, it should be noted that because librarians are in the forefront of adoption of this technology for their daily jobs, consequences of adoption may be minimal, and results may be more profound in another academic unit which does not use electronic communications on a regular basis. Although some library staff members were users of the system before the

supervisor used it, their usage of E-mail has extended beyond external communication and research, to also include peer and supervisory communication.

Student Adoption and Usage Patterns

The user numbers clearly show that SJSU is still in the early adoption phase of electronic communications. Out of a total student population of 27,075, only 1,496 students had active student accounts for the E-mail on the VM mainframe system. However, it must be noted that some students, especially in computer science and engineering, have access to Sun Workstations and UNIX systems, which allow them to bypass the mainframe and communicate directly on the Internet.

In the following charts, Figure 2 depicts a comparison of total enrollment in each college versus actual E-mail usage in that college. Figure 3, a pie chart, shows total enrollment at SJSU compared to E-mail use on campus by students. These charts help to visually depict the numerical breakdowns as stated above, and it should be noted that there is quite a variance in participation numbers from each of the respective colleges, which is a reflection of how electronic communication is adopted as related to fields of specialty. It is also interesting to note that the total number of E-mail accounts at SJSU is a relatively small percentage of the university's total enrollment population, thus leaving a great potential for growth of system usage in the future.

It should be noted that although Applied Sciences and Arts as well as Business had the largest number of students, E-mail usage among students was low in comparison to the size of their colleges. Additionally, it was interesting to see that Library and Information Science graduate students included in the Graduate Studies College had a small amount of students, but a proportionately higher number of E-mail accounts. The same can be said about the faculty in these areas.

Figure 2.

Total Enrollment as Compared to E-mail Accounts Per Academic Unit

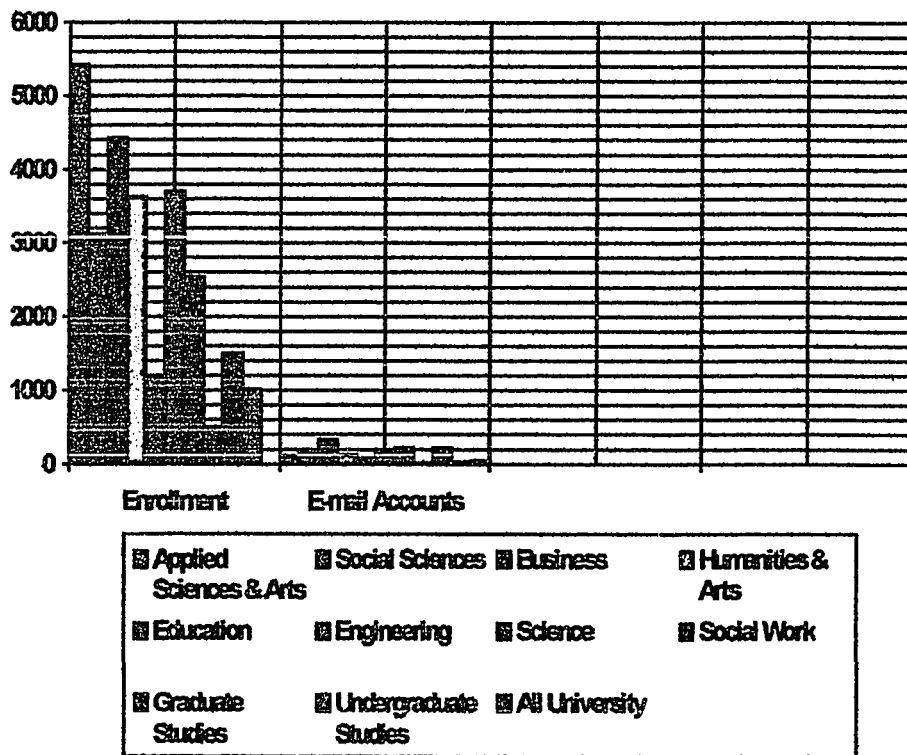
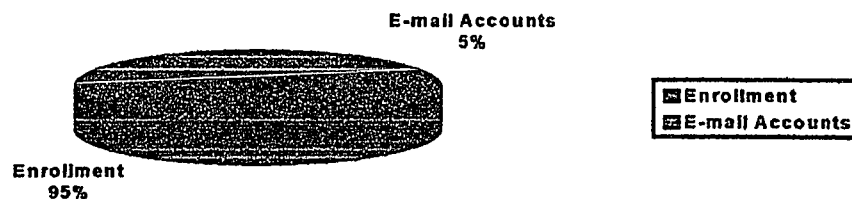


Figure 3.
Total Enrollment at SJSU Compared to E-mail Use on Campus by Students



Within each academic unit, there appeared to be one or two major areas of study where the number of E-mail account holders was higher. The following graph illustrates usage patterns by academic unit, and denotes which two student major groups had the higher numbers of E-mail users:

| <u>SJSU ACADEMIC UNITS</u> | <u>TOP USERS #1</u> | <u>TOP USERS #2</u> |
|----------------------------|-------------------------|--------------------------|
| Business (335) | Marketing (115) | Accounting/Finance (113) |
| Science (221) | Math/Comp. Sci. (112) | Biology (38) |
| Engineering (165) | Electrical Eng. (44) | Comp. Eng. (40) |
| Social Sciences (144) | Sociology (64) | Psychology (26) |
| Humanities and Arts (128) | Art & Design (63) | Linguistics (22) |
| Applied Sciences and Arts | Journalism (32) | Div. of Technology (32) |
| Education (81) | Ed. Leader Dev. (43) | Teacher Education (34) |
| Social Work (9) | Social Work (7) | Urban Planning (2) |
| Graduate Studies (226) | Library/Info Sys. (209) | All College (17) |

Responses from personal interviews with SJSU students provided information to create a portrait of usage among both graduate and undergraduate students who were early adopters. By far, the motivating factor for student adoption was having a free way to communicate with friends and family. Interviews with foreign students indicated that this was the motivating factor in acquiring an account. A student from Iceland noted that the foreign students stay in touch with home via Internet at a very inexpensive price, and not only communicated, but accessed news from home which helped keep them connected to their homelands. Another student from Russia stated that computer communication back to Russia is limited, but that she does stay in touch with a sibling and several friends who are studying at other American universities. Unlike the student from Iceland, the Russian student is unable to connect to her homeland because of limited computer accessibility, but she plans to transfer her knowledge and appreciation for this newfound communication channel once she returns there. There were also many students who noted that they were motivated by spouses or parents who also had access to Internet and wanted a cheap and easy way to communicate.

Most of the early student adopters learned of E-mail's communication potential from other university students, who were also friends. Again, there was a trend with students, which resembled faculty adopters, that peers and colleagues influenced adoption of this technology, and put pressure on the SJSU student to search out Internet. Some examples of this type of outside pressure came not from personal friends, but from student clubs and organizations which communicate across the country via E-mail. Some students remarked that they did not even know of this technology's potential, and would probably not have adopted had it not been for peer influence and friends' recommendations.

Few students communicate with their professors via electronic mail, but they indicated that they would use this media if encouraged to do so by their professors.

Undergraduates who saw their professors two to three times a week felt communicating with them face-to-face in class was more effective than through electronic mail. One interviewee stated that he had been criticized by his fellow students for using E-mail with his professors because this form of communication was much too informal for the professor/student relationship.

However, graduate students, who usually work full-time jobs and come to campus less frequently, considered having electronic mail a great benefit; they wished all professors offered E-mail addresses so that they could have instant access to them during the day. The idea of having access to a professor 24 hours a day was one benefit that commuting students wished their professors would recognize. Surprisingly, the majority of classes which have incorporated E-mail both in and out of the classroom have been graduate level classes.

The fact that there was no student E-mail listing directory did surface as a hindrance to increased usage for the early student adopters, and most stated that they did not communicate with one another because there was no way to access their accounts. The only students who appeared to communicate with one another were the library science students who were forced into using this technology by course requirements. Otherwise, communication was almost non-existent between SJSU students. Some students commented that responding to this case study's electronic queries was the first time that they had communicated with another SJSU student via E-mail.

What appeared in this case study was that, when students were forced into adoption by class requirements, they tended to use the technology for class assignments only, and did not explore other features of Internet. A case in point was the large percentage of Library and Information Science graduate students who stated that they only used E-mail for educational purposes such as class projects. However, students who

adopted at will for personal communication reasons tended to explore the system in their free time, used this technology more for recreational purposes, and learned about better utilization from friends who were more experienced on the Internet.

The students had some frustrations with the system, but student complaints were fewer than those from faculty. One possible reason for this was that students appeared to be recreational users of the system, tended to only use the simpler functions of E-mail, and did not have the same time restraints or deadlines that faculty and staff experience. However, there were complaints about the VM system not being user-friendly, and that it was geared more to DOS than Mac systems. The frustration about access was limited to a few students, but as more of the majority adopters join and use the system, and as more professors use the system in courses, frustration levels will probably rise unless system capacity is expanded. The findings of individual use clearly pointed to adoption decisions being of a type that Rogers (1983) called optional innovation-decisions, and most of the early adopters did make a decision to adopt from friends and peers outside of the SJSU system.

Re-Invention Occurred in Student Population

As Rogers (1983) noted there are some innovations with many applications, such as computers, that are changed or modified by users throughout the adoption process (p. 180). Students at SJSU appeared to have re-invented E-mail into a sophisticated telephone and messaging system. Students have remarked that they particularly liked using E-mail because of access to specialty networks and list servers. These list servers are somewhat like electronic party lines, but are not yet interactive. However, they provide a communication link to other students with similar interests or academic goals. One engineering student stated that as a chairman of a student organization, she communicated often with the national headquarters, alumni, and other industry

professionals at no charge. Another student has had success in advertising on E-mail, and has sold items to other students throughout the country. For this student, E-mail had become a successful classified advertisement tool.

According to one Computer Center employee, many of the students with accounts have not taken advantage of Internet's vast information capabilities. This issue was raised during the personal interviews, and most students agreed that they saw the greatest benefit of this innovation as being a free way to communicate with friends and colleagues. They also stated that they had acquired an E-mail account primarily because they saw it as being more beneficial than the telephone. A few students noted that they got E-mail because it saved them time in terms of waiting in line at the computer center.

Most students noted that they were satisfied with E-mail being used as their communication link to friends and family, and that they were not interested in exploring the Internet. However, many of these interviewees said that they really did not have enough knowledge about the mainframe and Internet's features. The majority of students stated that they were self taught, and would have liked to have had formal training from the university so that they could better utilize the entire system.

For some students, E-mail was viewed as a time saving tool. For others, it was viewed as a time waster. One student remarked that he enjoyed getting on-line in the evenings, and was encouraged to finish his homework so that he could play around with E-mail and talk with other friends who were on the Internet. One graduate student noted that E-mail could be a disadvantage because, if students were not careful, they would spend too much time reading list mail, or would stay up too late "chatting with overseas contacts."

The findings of this study indicated that E-mail more appropriately matched the economic needs of students rather than their educational needs for accessible research data

via the mainframe or Internet. Very few students felt that E-mail and Internet were important in data research, and most did not appear to have a working knowledge of the system, especially in research and education applications.

Privacy Issues and Concerns

One finding of this research was the lack of concern for privacy and other computer security issues by the majority of users and interviewees. Many responses from interviewees indicated that privacy was not a major concern for them. Most interviews revealed that undergraduate students were not worried about E-mail privacy. However, some of the graduate students were more aware of potential problems, but they did not mention this as a deterrent to adoption of this technology. These findings seemed to contradict other universities' concerns that have resulted in mainstreaming policies and standards (Flanagan & McMenamin, 1992 and Turner, 1990), and the lack of concern regarding security and privacy seems to contradict the level of concern for security in the private sector (DeBenedictis, 1990). The students' responses resembled faculty and staff responses in that the issue of privacy was of little or no concern. There appeared to be some naiveté on the part of the students, especially younger students, who have not experienced security of computer systems in the workplace, and most respondents, no matter what their age, felt that what they were putting on Internet was safe. If other universities' problems are felt at this university, a tighter security system and a stricter written policy about usage and misuse may someday become a necessity as the number of users increase on the SJSU campus.

CHAPTER 5

SUMMARY AND CONCLUSION

Overview

With only 25% of the faculty and staff and 10% of the students at San Jose State University acquiring VM system accounts over the past nine years, it is clear that adoption is still in an early phase. The purpose of this case study was to draw a portrait of the early adopters, examine motivations for adoption, and note perceptions of the benefits of E-mail. Based on personal interviews, telephone interviews, groups meetings, and electronic queries, data gathered from early adopters at SJSU suggested that adoption has been influenced on two distinct levels: organizational and individual.

Organizational Level of Analysis

SJSU has recognized the need for access into cyber communications and research, and it has offered mainframe accounts to all faculty, staff, and students. At this level of evaluation, accessibility does not appear to have been a factor in the slow adoption rates. However, the current budgetary situation at SJSU has hindered efforts to extend accessibility; therefore, adoption by the majority has been hampered, even though most administrative officials see the value of this technology for academic communication and education. Use has not been strongly encouraged because of limited system capacity, and information dissemination about E-mail has been minimal. For the university to reach majority adoption levels, it may be necessary to look at the hierarchical nature of diffusion processes common to educational organizations as noted by Dalton (1989), and to create an atmosphere of acceptance for E-mail, especially for long-time organizational or tenured individuals who have not yet been persuaded to adopt this technology.

As is typical in most organizations, information disseminates from the top downward, and has had effects on adoption rates. As was noted by Ormrod (1990), the world has become increasingly well-connected, and the potential for information movement to shape patterns of innovation adoption has weakened (p. 109). Therefore, as information travels across the information superhighway, faculty and students will continue to learn about this technology's benefits from two sources, the university and other computer users. Outside information about electronic communication's benefits are already affecting group level adoption, and because of this, diffusion has occurred at irregular intervals among academic units. There has been no clear plan from administrative levels to influence the use of electronic communications either for on-campus interpersonal purposes or for educational purposes in the classroom.

The sporadic adoption by faculty has been influenced more by outside professional groups or colleagues, so adoption has resulted from this form of influence, not from supervisory pressure or usage, but there is evidence that departmental usage by staff members is still sporadic, but is increasing. One fact worth mentioning here is that some academic units have opted to invest in internal E-mail systems, and facts and figures on usage patterns from these local area networks are not kept by the university. Therefore, diffusion of E-mail has taken place, but SJSU had not incorporated users into the mainframe and acquiring their E-mail addresses was impossible with the current SJSU system.

The major factors prohibiting majority adoption on the organizational level include system capacity, lack of supervisory usage, lack of regular widespread information dissemination, and lack of formal training programs. The university recognizes that the current system cannot handle majority adoption, and a total fiber optic equipped campus is prohibitive given the budgetary constraints. However, recognition of supervisory use as a

motivational factor for adoption has not been examined, and the lack of top-ranking supervisory/administrative staff who use and support electronic communication was hampering diffusion at the time of research.

There are a very few academic units, mainly Clark Library and the School of Library and Information Science, which have been forced to adopt by both supervisory use and by changes in course curriculums. These units have led the way, and appear to be the change agents for incorporating electronic communication into the educational process. These few group-level adoption patterns will presumably set an example for the majority adopters, once that level of adoption is achieved at the university. However, the results reported here indicate that influence from outside groups, such as professional group associations, had a greater impact on adoption than did departmental influence.

Individual Level of Analysis

On an individual level, peer networks that included personal friends and professional peers played a major role in the adoption of E-mail at SJSU, both for students and faculty, and the data in this case study clearly demonstrated that adoption took place without much internal organizational pressure from supervisors or peers. Personal communication links outside of the university appeared to have the greatest impact on individual adoption at SJSU, and if current projections are accurate about Internet's growth, the interconnected computer user networks will grow and E-mail adoption at this university will still be influenced by these peer networks in the very near future.

Because of professors' and students' relationships, adoption rates may rise when E-mail becomes associated with asynchronicity, for communication and educational purposes in the classroom. The potential for asynchronicity increasing the convenience of learning by expanding classroom discussions and office hours via cyber communication media may be the factor that could cause large scale diffusion of this technology on

campus. Through interview responses, it was apparent that the early adopters using electronic communication for educational purposes speak highly of its abilities to create virtual classrooms with access to professors. The ability to reach a professor after normal office hours was considered a benefit for students getting E-mail accounts. This access supplemented and even surpassed the benefits of voice mail because, unlike the telephone, students could leave detailed messages, submit homework assignments, and receive detailed responses back from the professors.

Also, more sophisticated early adopters who knew how to get into Internet for research materials expressed that this innovation would actually be a benefit to the educational process, because the accessing of information from any library in the world was seen as being advantageous.

The day when classes can meet on the information superhighway are not that far away, and some professors and students are already traveling on that highway. Several classes in Library and Information Science are now considered distance learning courses and are conducted via the mainframe. Several of the students enrolled in these distance learning environments remarked that they were favorable to this new concept, and there were many positive aspects in having classmates who actually lived several hundred miles from SJSU, because of the added dimension of an extended classroom.

Re-invention of E-mail appeared to be occurring at SJSU and, although many proponents of the mainframe and Internet point to the tremendous amounts of free data, students have re-invented this innovation as a sophisticated communication tool capable of extending traditional telephone communication capabilities. Free electronic communication, via Internet, to family and friends was consistently noted as the strongest motivational factor for adoption on all levels, and given the current financial status of the university, this factor will remain strong for majority adopters. Even the students who

have paid for ADI hook-ups, or who pay the phone toll charge for access to the mainframe, did not consider this to be an inconvenience or deterrent as related to the use of this technology.

As Drucker (1989) pointed out, information is transnational, and has no fatherland, and when individuals have access to a computer and to an information network, such as Internet, communication and information gathering is limitless. Therefore, networking with peers and colleagues seemed to have had more influence than any organizational influence exerted by SJSU. The recent discoveries about distance learning and electronic communication as elements of change in the educational processes occurring at SJSU have opened many doors, not only in terms of understanding new ways to accomplish daily tasks, but also in terms of developing innovative methods of looking at, and communicating with the world, not just on a small scale, but a scale that is almost beyond human comprehension.

Conclusion

In conclusion, diffusion of E-mail at SJSU appears to be on the verge of expanding to the next level, majority adoption. There have been a few steps made toward preparing for majority adoption at the university by administration, and they include: promoting creative and innovative teaching methods, and creating department computing committees. These steps are important, and suggest that with 75% of the faculty and 90% of the students left to adopt, both expansion of the present system and changes in information dissemination about this technology will be needed. System suitability and capability will generate from within the institution, but communication and information dissemination will not only come from within, but will most likely continue to come from personal and professional peer networks.

Contributions to the Literature

The findings in this case study add to the current literature by confirming that the adoption of E-mail can be equally influenced by communication links at two levels: organizational and individual. Also, this case study found that even within a traditional organization with a hierarchical structure, adoption and usage patterns can be greatly influenced from outside sources and networks. Earlier research by Schmitz and Fulk (1991) noted that supervisory use of an innovation predicted subordinate adoption and usage; however, this case study proved that influence in adoption came primarily from non-supervisory sources. Rogers (1983) noted five factors which affected adoption: relative advantage, compatibility, complexity, trialability, and observability. At SJSU, relative advantage and compatibility played major roles in adoption, especially when the early adopters had used E-mail at other institutions or at home.

This study also noted that students have re-invented E-mail as a sophisticated communication tool which is beginning to replace the telephone. The free access to worldwide communication via Internet was the major motivating factor in the adoption of this technology, and most students were unaware and/or uninterested in utilizing Internet for its information and research capabilities.

Early adopters at SJSU have not incorporated this technology into internal communication, and voice mail has remained the preferred method of communication within SJSU. However, outside of SJSU, E-mail has replaced the telephone, and toll free communication to any institution in the world served as the primary benefit of this technology, especially for professors and university researchers.

Although traditional educational processes have not been greatly affected by E-mail at SJSU, some progressive academic units are incorporating E-mail, and have discovered that distance learning can be successful and exciting. The university recently

awarded fellowships to professors in an effort to create courses which will incorporate this technology, and future adoption research will be needed to determine their effects on educational processes.

Directions for Future Research

With only 5% of students and 25% of faculty and staff having E-mail accounts, future research is needed to track changes in both internal and external communication processes as the university moves from early adoption into majority adoption. This study noted that adoption influences for early users were being generated more from outside sources than internal ones. When majority adoption occurs, a second case study could determine whether outside peers continue to be an important influence, or if internal SJSU influences will develop which affect diffusion. As diffusion continues to occur, a re-examination may be warranted of Rogers' (1983) factors to determine whether relative advantage and compatibility remain as the primary factors cited among early adopters.

Recommendations for Majority Adoption at SJSU

Based on the data collected during this case study, recommendations have been formulated to address some of the concerns of the interviewees and to encourage wider adoption of E-mail at SJSU. In order for the university to reach majority adoption levels, SJSU should:

1. Create and maintain a consistent and frequent information dissemination program of E-mail and its benefits.
 2. Offer structured new-user training classes for faculty, staff, and students on a regular basis.
 3. Provide periodic training sessions for current VM users to update them on Internet's changes and additions.
 4. Encourage faculty to incorporate mainframe and E-mail usage into their classrooms.
-

5. Encourage distance learning projects.
6. Offer toll-free connections to the SJSU mainframe for off-campus users.
7. Extend on-line technical assistance, which will include more evening and weekend hours.
8. Develop a combined telephone/E-mail directory and distribute it throughout SJSU.
9. Assign student users E-mail addresses which use codes which correspond more closely to students' names instead of the current numerical identification codes.
10. Provide consistent demonstrations of Internet's capabilities in high traffic areas, such as the bookstore or library, so as to promote this technology's benefits in both communication and research.
11. Create a User's Guide which is less technical in semantics, and which addresses the questions from users of several operating systems.
12. Supply a free User's Guide to all new E-mail account holders which will promote a greater understanding and usage of the system.
13. Emphasize a customer-service oriented approach at the Computer Information Center to ensure that all e-mail users, especially new users, will have access to a helpful and courteous service staff who will answer questions having varying degrees of complexity.
14. Continue to encourage E-mail's incorporation into the classroom by awarding technology grants and fellowships to professors who develop innovative curriculums using electronic communications.
15. Create and publicize a university E-mail privacy policy.
16. Expand the current SJSU VM system's capacity.

REFERENCES

- Abbott, Thomas (1991). E-mail use in two-year college libraries and LRC's. Community & Junior College Libraries, 7 (2) 59-68.
- Alexander, Michael (1992, March 2). University library enters information age. Computerworld, p. 31.
- Anderson, Ronald & Reagan, Joey (1992). Practitioner roles and uses of new technologies. Journalism Quarterly, 69, 156-165.
- Anthes, Gary (1992, November 30). Internet security risks. Computerland, p. 55.
- Bach, Betsy (1989). The effect of multiplex relationships upon innovation adoption: A reconsideration of Rogers' model. Communication Monographs, 56, 133-149.
- Blankenhorn, Dana (September 21-October 14, 1993). Economics, politics and technology. Bay Area Computer Currents, p. 12.
- Buerger, David (1992, December 14). Editor's view: Fighting the electronic mail avalanche. Communication, 9 (4), 323-336.
- Conley, Catherine (1989). Organizing for computer crime investigation and prosecution (Contract No. OJP-86-C-002). Washington, DC: National Institute of Justice.
- Cutlip, Scott & Center, Allen (1982). Effective public relations (rev. ed.). Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Cyert, Richard & Mowery, David (1987). Technology and employment: Innovation and growth in the U.S. economy (Report No. ISBN-0-309-03744-1). Washington, DC: National Academy of Science-National Research Council.
- Dalton, David (1989). Computers in the schools: A diffusion/adoption perspective. Educational Technology, 29, 20-27.
- DeBare, Ilana (1993, April 4). Internet links schools worldwide. Sacramento Bee, p. F1.
- DeBenedictis, Don (1980). E-mail snoops. ABA Journal, 76, 26-27.
- Donnelly, James, Gibson, James, & Ivancevich, John (1990). Fundamentals of management. Homewood, IL: BPI/Irwin.

- Drucker, Peter (1989). The new realities. New York: Harper & Row.
- Dutton, William; Rogers, Everett; & Jun, Suk-Ho (1987). Diffusion and social impacts of personal computers. Communication Research, 14, (2), 219-250.
- Elmer-Dewitt, Philip (1993, January 18). Who's reading your screen? Time, p. 46.
- Farrish, Katherine (1993, June 20). State university experiencing high-tech revolution. The Hartford Courant, p. B1.
- Fine, Sara (1986). Technological innovation, diffusion and resistance: An historical perspective. Journal of Library Administration, 7 (1), 83-108.
- Flanagan, William & McMenamin, Brigid (1992, December 21). The playground bullies are learning how to type. Forbes, pp. 184-189.
- Flanders, Bruce (1991, June). NREN: The big issues aren't technical. American Libraries, pp. 572-573.
- Flynn, Laurie (1993, June 13). Electronic surveillance of workers raises privacy concerns. San Jose Mercury News, p. D1
- Gloady, Rick (February, 1994). Fear of technology is widespread. CSU Stateline, pp. 4, 6.
- Hawkins, Brian (1991, January-February). Preparing for the next wave of computing on campus. Change, 1, 24-31.
- Honan, Patrick (1987, January). E-mail and the law. Personal Computing, pp. 105.
- Kallman, Ernest (1992, November 23). Private matters. Computerworld, pp. 85-87.
- Komsky, Susan (1991). A profile of users of electronic mail in a university. Management Communication Quarterly, 4 (3), 310-340.
- LaPlante, Alice (1993, February 8). Colgate goes global with integrated E-mail strategy. Infoworld, p. 42.
- Lerner, Reuben (1992). Protecting E-mail. Technology Review, 95, 11.
- Lukanuski, Mary (October, 1992). Help is on the WAIS. American Libraries, 23 (9), 742-744.

- McClelland, Valorie & Wilmot, Richard (1990, August). Improve lateral communications. Personnel Journal, pp. 32-38.
- Mortensen, Erik (1992, September). E-mail: Its impact on communication. The Office, pp. 60-61.
- O'Connor, James (1990, June). Building internal communication. Public Relations Journal, pp. 29-33.
- Ormrod, Richard (1990). Local context and innovation diffusion in a well-connected world. Economic Geography, 66, 109-114.
- Papa, Michael & Tracy, Karen (1988). Communication indices of employee performance with new technology. Communication Research, 15, 443-610.
- Peterson, Ivars (1990). The electronic grapevine. Science News, 138, 90-91.
- Pharr, Cynthia (1990, January). Capitalizing on splintering markets. Public Relations Journal, pp. 18-19, 35.
- Ray, Martha (1991, July). The new way to boost morale: Keep your staff informed. Working Woman, pp. 16-18.
- Reinhardt, Andy (1993, March). Smarter E-mail is coming. Byte, pp. 90-103.
- Rice, Fay (1991, June 3). Champions of communications. Fortune, pp. 111-120.
- Roberts, Karlene & O'Reilly, Charles (1974, June). Measuring organizational communication. Journal of Applied Psychology, 59, 321-326.
- Rogers, Everett (1983). Diffusion of innovation. (3rd ed.). London: The Free Press.
- Rogers, Everett (1987). Progress, problems, and prospects for network research: Investigating relationships in the age of electronic communication technologies. Social Networks, 9, (4), 285-310.
- Savage, Daniel (1987). High tech commonplace at America's community, technical and junior colleges. Community Technical and Junior College Journal, 58, 54-55.
- Schmitz, Joseph & Fulk, Janet (1991). Organizational colleagues, media richness and electronic mail. Communication Review, 18, 487-523.

- Schramm, Wilbur (1973). Men, messages, and media: A look at human communication. New York: Harper & Row.
- Schuda, Jo (1993, March/April). Alternative technologies for an adaptive workplace. Vanguard, pp. 8-9.
- Severin, Werner & Tankard, James (1992). Communication theories: Origins, methods, and uses in the mass media. (3rd ed.). New York: Longman.
- Smeltzer, Larry; Glab, Janice; & Golen, Steven (1983). Managerial communication: The merging of business communication, organizational communication and management. Journal of Business Communication, 20, 71-78.
- Smith, Alvie (1990). Bridging the gap between employees and cooperating to achieve corporate goals. Public Relations Journal, 46, 20-23.
- Snyder, Robert & Morris, James (1984). Organizational communication and performance. Journal of Applied Psychology, 69, (3), 461-465.
- Staff (1992, April 29). Online. Chronicle of Higher Education, 38, A18.
- Staff (1992, May-June). The warming of the workplace. Psychology Today, pp. 10.
- Staff (1993, November 26). Welcome to the Electronic Frontier Foundation's area on America On-Line. America On-Line, p. 1.
- Staff (1994, January 2). Computer Science from Michigan State University. America On-Line, p. 1.
- Tennent, Roy; Ober, John; & Lipow, Anne (1993). Crossing the Internet threshold. Berkeley, CA: Library Solutions Press.
- Turner, Judith (1990). Messages in questionable taste on computer networks pose thorny problems for college administrators. The Chronicle of Higher Education, 36, A-13, A-16.
- Updegrave, Daniel (1993, April). Wired: ResNet brings video, voice and data to the dorms. PennPrintout, pp. 1, 15.
- Van de Ven, Andres & Rogers, Everett (1988). Innovations and organizations: Critical perspectives. Communication Research, 15, (5), 632-651.

- Vaughan, Vicki (November 21, 1993). E-mail's burning up the electronic grapevine. Austin American Statesman, p. E13.
- Vaughan-Nichols, Steven J. (December, 1993). Acronyms and emoticons are grazing the E-mail byways. Online, p. 656.
- Watkins, Beverly (1992). University hopes campus wide network will help give it a competitive edge. The Chronicle of High Education, 38, A18-A20.
- Zahn, C. Lawrence (1991). Face-to-face communication in an office setting. Communication Research, 18, 737-754.

APPENDICES

Appendix A

| |
|---------------------------------|
| FACULTY E-MAIL QUESTIONS |
|---------------------------------|

1. When did you get your e-mail/VM account? _____
2. How or from whom did you learn about e-mail/VM's availability? _____

3. To get an account did you: a. fill out form only b. fill out form and make 1 trip to computer center
 c. fill our form and make several trips to computer center d. had someone do it for me
4. To what extent is the e-mail/VM system easy to use? a. very difficult b. somewhat difficult
 c. difficult d. somewhat easy e. easy f. very easy
5. What motivated you to get an account? _____

6. What percentage of your co-worker have accounts? _____
7. Were you required to get an account? a. yes b. no If so, by whom? _____
8. How often do you communicate with students via e-mail? _____
9. How often do you communicate with dept. faculty via e-mail? _____
10. How often do you communicate with other SJSU faculty/staff via e-mail? _____
11. How often do you communicate with colleagues or computer users outside of SJSU via e-mail? _____
12. Does e-mail? a. helps communication b. hinders communication c. does not affect communication.
 More comments: _____
13. Does e-mail? a. make job easier b. makes no difference in my job c. adds to my job responsibilities
 More comments: _____
14. What form of training did you have on e-mail/VM? a. self taught b. class c. computer center
 instruction d. co-worker/SJSU colleague assistance e. phone instruction f. other _____
15. Do you? a. send more messages b. receive more messages c. receive as many as send
16. Have you incorporated electronic communication into your classroom? a. yes b. no
 How? _____
17. Has having e-mail changed the learning process at SJSU? a. yes b. no
 How? _____

18. Do you use e-mail more for? a. on-campus communication b. off-campus communication c. access to networks d. access to databases e. other

Comments: _____

19. Are you on any bulletin boards/list serves? a. yes b. no Which ones? _____

20. Do you have access to a computer? a. on my desk b. share with department staff members

21. Do you usually prefer? a. electronic communication b. face-to-face communication c. telephone/voice mail communication d. written communication

Comments: _____

22. How concerned are you about e-mail privacy? a. not concerned b. concerned c. very concerned

Comments: _____

23. How concerned is SJSU about e-mail privacy? a. not concerned b. concerned c. very concerned

Comments: _____

24. List advantages or benefits of e-mail:

a. _____ b. _____

c. _____ d. _____

25. List disadvantages of e-mail:

a. _____ b. _____

c. _____ d. _____

26. Did you use e-mail before coming to SJSU? a. yes b. no

Where? _____ What system? _____

27. What is your familiarity with computers? a. very familiar/expert level b. familiar/frequent user of many applications c. somewhat familiar/know 1 or 2 applications d. other _____

28. Does your immediate supervisor use e-mail? a. daily b. weekly c. monthly d. never

29. How would you rate the instructional book on e-mail/VM? a. easy and very readable b. technical but understandable c. technical and too difficult to understand d. other _____

30. Have your recommended getting an e-mail account to any one else? a. yes b. no

Who? _____

Demographic Information:

Age _____

Department _____

School _____

Position _____

Years with SJSU _____

Ethnicity _____

Appendix B

| |
|---------------------------------|
| STUDENT E-MAIL QUESTIONS |
|---------------------------------|

1. When did you get your e-mail/mainframe access account?
2. How did you learn about e-mail's availability at SJSU?
3. Explain the process you went through to get an account? What was the easiest and hardest part of the process?
4. To what extent is the Spartacom system easy or difficult to use?
5. What was the motivating factor in you getting an e-mail/access account?
6. What percentage of your fellow students have e-mail accounts?
7. Were you required to get an e-mail address by faculty or administration? Explain.
8. How often have you communicated with your professors via e-mail?
9. How often have you communicated with SJSU administration via e-mail?
10. How often have you communicated with other students at SJSU via e-mail?
11. How often have you communicated with other computer users who are not affiliated with SJSU? How and by what electronic communication system?
12. How much time do you spend communicating via the computer per day?
13. Does using e-mail help or hinder communication on campus? Explain.
14. What form of training did you have in using the system?
15. Is there adequate documentation for the e-mail/mainframe system? What documentation do you have on Spartacom?
16. Do you send more messages, receive more messages, or do both equally?
17. Has having e-mail changed the learning process for you here at SJSU?

18. Have you encouraged another student to get on e-mail? Explain.
19. Are there any advantages to using electronic communication for you?
20. How concerned are you about e-mail privacy?
21. How concerned is SJSU about e-mail privacy?
22. Do you use the e-mail primarily for on-campus communication, or do you use it to get access to a network or other database? Explain.
23. Do you use the computer labs or do you access Spartacom from your dorm or home computer?
24. Do you prefer electronic communication to face-to-face or telephone communication? Explain.
25. Describe your familiarity with the computer and software programs.
26. Are you on any bulletin board services? Which ones?

Demographics

Age:

Major:

Ethnic Affiliation:

Class Level:

Country of Origin:

City of Residence:

Appendix C

Clark Library Staff Questions

| |
|--|
| This first set of questions deals with acquiring your e-mail account: |
|--|

When did you get your e-mail account?

When you got your account, what percentage of your co-workers had an e-mail account?

Did your immediate supervisor have an e-mail account before you? ____ If so, how long before? Why?

What was the largest motivating factor in your getting an e-mail account?

Did you try to get e-mail before Jim Schmidt came to Clark Library and required you to have it? ____ If so, how long before?

What was the procedure used to establish your e-mail account? What was the easiest step in this procedure? What was the hardest step?

To what extent were you forced into getting an e-mail account? a. very much b. strongly encouraged c. somewhat encourage, but not forced d. left to adopting at my own pace

Have you ever used e-mail anywhere else except at Clark Library? ____ If so, where? What system: a. PROFS b. Rice Mail c. Internet d. Other?

Did you have any assistance or training on e-mail? ____ What type? a. one-on-one b. library group c. university classroom By whom?

Do you feel there is adequate documentation for the e-mail system? a. yes b. no

What form of technical support do you most often use when you have questions pertaining to e-mail? a. Supervisory library staff b. Co-workers c. Computer center technical assistants d. Handbooks

How long did it take for you to feel comfortable with this system? _____

To what extent is this e-mail system easy to use? a. very easy b. somewhat easy c. somewhat difficult d. very difficult

To what extent do you feel that computers are dehumanizing? a. very much b. somewhat c. not at all

The next set of questions deal with your communication and work environment BEFORE e-mail was used by the Clark Library Staff:

What would you say was your favorite method of communication before e-mail? a. face to face b. written memos c. telephone d. voice mail Why?

Rank in order, from the above methods, your most preferred method of communication before e-mail.

What percentage of your time was spent communicating? a. face-to-face _____ b. written notes/memos _____ c. telephone _____ d. voice mail _____

When communicating with someone, do you need to see immediate feedback and/or responses from the person being communicated with?

How did your immediate supervisor most commonly communicate with you before e-mail?

How did your co-workers in Clark Library most commonly communicate with you before e-mail?

How did you most commonly communicate with SJSU colleagues, faculty and staff members before e-mail?

How did you communicate with colleagues, outside of SJSU, most often communicate with you before you had e-mail? a. telephone b. written notes/memos c. telephone d. voice mail e. e-mail

When dealing with sensitive or personal issues, how did you communicate with immediate supervisor before e-mail? a. face-to-face b. written memos c. telephone d. voice mail

When dealing with sensitive or personal issues, how did you communicate with subordinates before e-mail? a. face-to-face b. written memos c. telephone d. voice mail

When dealing with sensitive or personal issues, how did you communicate with peers before e-mail? a. face-to-face b. written memos c. telephone d. voice mail

Are computers required for your job here at the library? For what purpose?

How many hours a day did you spend at the computer before e-mail?

Did you have access to your own personal computer here at the library before e-mail?

Before e-mail, what was the most commonly used application on your computer?

Did you have a home computer before e-mail was adopted? _____ For how long?

Did you have a modem for your home computer?

How did you use your modem before e-mail was required? a. connect to the mainframe b. connect to a commercial e-mail system c. connect to Internet d. access student records e. do my job from home f. do research

The next series of questions deal with communication AFTER e-mail's adoption by the Clark Library Staff:

What is your favorite method of communication now? a. face-to-face b. written notes/memos c. telephone d. voice mail e. e-mail

How does your immediate supervisor communicate with you most often at the present time? a. face-to-face b. written notes/memos c. telephone d. voice mail e. e-mail

How do co-workers communicate with you most at the present time? a. face-to-face b. written notes/memos c. telephone d. voice mail e. e-mail

How do faculty and staff, outside of Clark Library, communicate with you most often? a. face-to-face b. written notes/memos c. telephone d. voice mail e. e-mail

How do you communicate with colleagues, outside of SJSU, most often now that you have e-mail? a. telephone b. written notes/memos c. telephone d. voice mail e. e-mail

With e-mail, how do you gauge response and feedback to your communications?

What percentage of your time is spent communicating? a. face-to-face _____ b. written notes/memos _____
c. telephone _____ d. voice mail _____ e. e-mail _____

How much time do you spend each day at the computer?

How much time is spent communicating each day via the computer?

With e-mail, do you? a. receive more messages than you send b. send more messages than you receive c. send about as many messages as you receive

When dealing with sensitive or personal matters, how do you communicate with your immediate supervisor? a. face-to-face b. written memos c. telephone d. voice mail e. e-mail

When dealing with sensitive or personnel matters, how do you communicate with your subordinates? a. face-to-face b. written memos c. telephone d. voice mail e. e-mail

When dealing with sensitive or personnel matters, how do you communicate with peer/co-workers? a. face-to-face b. written memos c. telephone d. voice mail e. e-mail

How has e-mail evolved and/or changed since you got an account?

The next section deals with BENEFITS of the e-mail system

In general, how user friendly is the SJSU e-mail system? a. very friendly b. somewhat friendly c. somewhat unfriendly d. very unfriendly

Has having e-mail made communication easier within this department?

Has having e-mail made communication easier throughout SJSU?

Has having e-mail freed you up to concentrate on other job responsibilities? Explain.

Has having e-mail made you more available to students or library visitors?

Has having e-mail made you more available to staff and faculty?

Who is the highest ranking staff member you communicate with on a regular basis?

Has the quality of communication changed since e-mail introduction? Explain.

Can you be as persuasive with e-mail as with other types of communication?

How would describe the feedback you receive when communicating via the computer? a. instant b. delayed by 1-8 hours c. delayed 1-2 days d. no feedback received

What was your reaction to everyone going onto e-mail at once?

If e-mail had not have been forced, how likely would you have been to get an account? a. very likely b. likely c. somewhat likely d. not likely e. never

Is there any other type of communication you prefer to e-mail? Which form? _____

Before e-mail was adopted what was your general enthusiasm for e-mail? a. very excited and trying to get this technology b. excited but not making efforts to get on line c. somewhat excited no plans to get an account d. not excited and no plans to get an account

What was the enthusiasm level over group adoption of e-mail by other staff members? a. very excited b. somewhat excited d. somewhat apprehensive e. rebellion to e-mail

How has e-mail changed your daily job?

What, if any, are the pros for e-mail?

What, if any, are the negatives of e-mail?

Do you feel that e-mail made the library progressive in its communications?

How does the library compare, in its e-mail use, to other SJSU departments?

How does Clark Library compare to other libraries located throughout the U.S.?

Have you influenced a fellow colleague or staff member in acquiring an e-mail account? Who? Which Department? When?

What percentage of faculty and staff, other than Clark Library, have e-mail accounts? _____

Do you use the mainframe for anything other than for e-mail? Explain.

| |
|---|
| The next section deals with e-mail's IMPACT on the educational process |
|---|

How has e-mail changed information gathering processes at Clark Library?

How has e-mail changed information gathering processes at SJSU?

Does e-mail give you access to information that would otherwise be inaccessible?

How would you describe e-mail's impact on the educational process here at the university?

Do you see e-mail impacting educational processes in general around the country?

Have you ever communicated with a student via SJSU e-mail system?

Does e-mail provide greater information avenues for you? If so, which ones?

Will the computer change the library as we know it? Explain.

Will CD ROM replace reference materials in the future?

Were you on any bulletin board services before e-mail? What types?

Have you recently subscribed to any bulletin board services since adopting e-mail? Which ones?

How important is electronic communication privacy to you? a. very important b. somewhat important c. somewhat unimportant d. not important at all

In general, would you say SJSU treats electronic privacy issues with? a. great importance b. average importance c. some importance d. no importance at all
Do you know what the EDUCOM Code is?

What is the largest electronic privacy issue today?

What is the most important ethical issue facing electronic communications today?

| |
|---------------------------------|
| Demographic Information: |
|---------------------------------|

Age: _____

Gender: _____

Ethnic Affiliation: _____

Years Employed at SJSU: _____

Department _____

Profession/Discipline: _____

Teaching Specialty: _____

Place of Residence: _____

Who heads the area that you are in: _____

THANK YOU for responding to this questionnaire. All answers will be treated confidentiality and will remain anonymous.