THE DOUBLE-EDGED SWORD:
EXAMINING PERCEPTIONS OF TECHNOLOGY
AS A PROCESS OF ENABLEMENT AND CONSTRAINT
WITHIN AN ACADEMIC ORGANIZATION

by
Vikki Nicole Mercer

A Master’s paper submitted to the faculty
of the School of Information and Library Science
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science in
Information Science.

Chapel Hill, North Carolina
October, 2001

Approved by

____________________________
Advisor
The purpose of this thesis is to examine end users’ perceptions of the enabling and constraining aspects of computer technology. I argue that technology can be understood best when one examines both forces. Eleven faculty and staff members within four academic departments at a mid-sized Southeastern university participated in the study. Participants were asked to discuss their use of and perceptions about technology in general and upgrades, including a recent campus-wide upgrade.

Three major conclusions emerged. First, technology use is efficient when it is accessible, easy, quick, reliable, and backed by support, but these qualities must be combined with stability, constancy, and certainty of purpose in order to realize technology’s full potential. Secondly, the study supports structuration theory by showing that even technology’s most positively perceived attributes possess both enabling and constraining features. Thirdly, user types do not significantly affect the overall enablement and constraint perceived in technology.

Headings:

Technology

Technology, Dialectics of

Technology, Perceptions of
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>A. Statement of the Problem</td>
<td>2</td>
</tr>
<tr>
<td>1. The Ubiquity of Technology</td>
<td>2</td>
</tr>
<tr>
<td>2. A Productivity Paradox?</td>
<td>3</td>
</tr>
<tr>
<td>3. The Specific Case of “Tech U.”</td>
<td>8</td>
</tr>
<tr>
<td>a. Resistance to technology</td>
<td>9</td>
</tr>
<tr>
<td>B. Study Purpose</td>
<td>10</td>
</tr>
<tr>
<td>C. Preview of the Thesis</td>
<td>12</td>
</tr>
<tr>
<td>II. THEORETICAL FRAMEWORK</td>
<td>13</td>
</tr>
<tr>
<td>A. The Interpretive Perspective</td>
<td>13</td>
</tr>
<tr>
<td>B. The Dialectical Perspective</td>
<td>14</td>
</tr>
<tr>
<td>C. Structuration Theory</td>
<td>19</td>
</tr>
<tr>
<td>III. REVIEW OF LITERATURE ON TECHNOLOGY USE</td>
<td>22</td>
</tr>
<tr>
<td>A. Applications of Structuration Theory to Technology</td>
<td>23</td>
</tr>
<tr>
<td>B. Factors That Affect Use</td>
<td>28</td>
</tr>
<tr>
<td>1. Rogers’ Perceived Attributes of Innovation</td>
<td>28</td>
</tr>
<tr>
<td>2. Social and Personal Factors</td>
<td>29</td>
</tr>
<tr>
<td>3. Applications of Rogers’ Attributes</td>
<td>32</td>
</tr>
<tr>
<td>4. The Technology Acceptance Model and the Theory of Planned Behavior</td>
<td>33</td>
</tr>
<tr>
<td>5. Support</td>
<td>35</td>
</tr>
<tr>
<td>6. Summary of Factors</td>
<td>35</td>
</tr>
<tr>
<td>C. Research Questions</td>
<td>36</td>
</tr>
<tr>
<td>1. Definition of Terms</td>
<td>37</td>
</tr>
</tbody>
</table>
IV. METHODS .......................................................................................................................... 39
   A. Research Site ................................................................................................................. 39
   B. Participants .................................................................................................................... 40
   C. Apparatus ..................................................................................................................... 42
   D. Procedure ..................................................................................................................... 42
      1. Confidentiality Measures ......................................................................................... 43
      2. Data Analysis ............................................................................................................ 43
V. RESULTS ............................................................................................................................ 45
   A. Research Question 1: Technological Experience ......................................................... 45
      1. Past Experience ........................................................................................................ 45
      2. Current Usage ......................................................................................................... 48
   B. Research Question 2: Enablement and Constraint Within General Technology Usage ........................................................................................................ 48
      1. Accessibility via Email ............................................................................................. 50
         a. Enabling aspects ............................................................................................... 50
         b. Constraining aspects ......................................................................................... 51
      2. Reliability ................................................................................................................ 53
         a. Enabling aspects ............................................................................................... 54
         b. Constraining aspects ......................................................................................... 54
      3. Ease ......................................................................................................................... 55
         a. Enabling aspects ............................................................................................... 55
         b. Constraining aspects ......................................................................................... 57
      4. Time/Speed ............................................................................................................. 58
         a. Enabling aspects ............................................................................................... 58
         b. Constraining aspects ......................................................................................... 58
   C. Research Question 3: Enablement and Constraint Within Technological Change (Upgrades) ........................................................................................................ 59
1. Upgrades .......................................................................................................................... 59
   a. Enabling aspects ........................................................................................................ 59
   b. Constraining aspects ............................................................................................. 61
2. The Carolina Computing Initiative (CCI) ..................................................................... 62
   a. Enabling aspects ........................................................................................................ 62
   b. Constraining aspects ............................................................................................. 64

D. Technology and the Issue of Control ......................................................................... 68

VI. DISCUSSION AND CONCLUSION ............................................................................. 70
   A. Significant Findings ................................................................................................. 70
      1. A Technology Road Map ....................................................................................... 70
         a. Relationship to current literature ...................................................................... 71
      2. The Duality of Technology .................................................................................... 73
      3. Similarity in Perceptions Across User Types ......................................................... 74
   B. Conclusion ................................................................................................................ 76
      1. Implications for Practice ....................................................................................... 76
      2. Implications for Research and Theory ................................................................. 80
      3. Study Limitations ................................................................................................. 81

VII. APPENDIX A: INTERVIEW SCHEDULE .................................................................. 83

VIII. APPENDIX B: MINIMAL RISK PROCEDURE FORM (CONSENT) ....................... 85

IX. REFERENCES ............................................................................................................. 87
CHAPTER ONE: INTRODUCTION

From 1995 to 1998, I was a copy editor and page designer at a newspaper in eastern North Carolina. In an era where papers are moving from antiquated methods of page paste-up to full pagination (building pages using computers and layout software), my colleagues and I experienced the fast-paced, ubiquitous nature of technology everyday. Not only did we have to master the hardware and software on deadline, but we also had to experience a great amount of technological change. Within that brief period, three different computers sat atop my desk, each one faster and supposedly better than its predecessor.

We also underwent a major software upgrade, in which the very nature of the pagination process radically changed, and several smaller software upgrades as well. I also participated in radical hardware and software installations at two sister newspapers in the region.

Throughout this process, an overwhelming irony became apparent. Though the technology always progressed and offered more features, many of my colleagues did not perceive an increase in its positive effects. Upgrades in particular were almost never considered to be positive experiences or to effect positive change. I always wondered why. This phenomenon is what led me to focus my research on the role of technology within organizations. As a student I particularly was interested in examining the phenomenon in a university setting.

In this study I propose technology to be, and examine it as, a double-edged sword. That is, I believe technology possesses both a positive and negative side that can be teased out of end users’ attitudes and opinions.
Statement of the Problem

As I began my research, I quickly learned that my personal experience with technology proliferation was not an isolated one. Statistics indicate that technology is a defining characteristic of work and study for millions of Americans. With technology touching so many lives, trying to discover how people feel — both negatively and positively — about the hardware and software they use became my first reason for wanting to study its effects.

The Ubiquity of Technology

Virtually no organization is untouched by computer technology. Personal computers sit atop the desks of tens of thousands of employees in various fields and industries. In 1997 a European Information Technology Observatory survey found that U.S. companies owned 105 personal computers (PCs) per 100 white-collar workers (Info Tech …, 1999). That’s more than one per worker.

Worldwide, the numbers are staggering. A World Information Technology and Services Alliance (WITSA) study found that organizations spent more than $2 trillion on computer hardware, software, services, telecommunications, and related expenditures in 1999 alone (Thibodeau, 2000). This represented a $5 billion increase in spending since 1995. The United States was third in per-capita spending behind Switzerland and Japan, with the top ten nations spending between $2,000 and $3,250 per person on information technology (IT) in 1999. Furthermore, WITSA expected technology spending to top $3 trillion dollars by 2004 (Thibodeau, 2000).

Additionally, spending on computers and IT in the workplace has enjoyed phenomenal growth in the past 30 years. The share of fixed investment by businesses in computers increased from less than 0.1% in 1970 to 12.8% in 1995 (Lightfoot, 1998). The proportion of business equipment budgets spent on information processing equipment rose from 7.6% to 37.6% in the same period (Lightfoot, 1998). Important to note is that these numbers did not count software as
investment, only hardware. In reality then, the amount spent on computer technology was even more than what the numbers report.

Corporations are not the only types of American organizations contributing to the technology boom. The government’s information technology budget for 2000 was $38.2 billion, and the Clinton administration wanted to increase this figure by 4% for 2001. This proposal would raise federal spending on technology to almost $40 billion (Dorobek, 2000).

Institutions of higher learner are following suit with increases of their own. Market studies projected that two- and four-year postsecondary institutions spent $2.7 billion for computer hardware and software for the 1999-2000 school year (Heller & Associates, 2000). This was up $1 billion from the previous academic year’s spending.

Thus, workers in all sectors are using computers for everything from simple data entry and word processing to designing new pharmaceuticals. Additionally, new technologies and upgrades of old technologies are arriving everyday to redefine how work is done. This makes it important to understand the effects of this technology use on those who employ it to complete their daily tasks.

Clearly, there is no lack of statistics that show the widespread use of technology. I argue that these numbers reveal a “romance of technology,” whereby organizations continue to purchase a proliferation of computers in an effort to get work done faster and more efficiently and to disseminate information to more and more people. Technology is seen as the best way to improve productivity.

A Productivity Paradox?

Aside from this “romance,” however, lies another reason for studying the effects of technology. Thus far, the jury remains out on the specific contribution computer hardware and software makes to worker productivity. This presents the so-called “productivity paradox.” This idea of a paradox suggests that there is no evidence to support the notion of increased productivity on par with the aforementioned boom in technology spending (McCune, 1998).
Though the thinking in current years speculates that this paradox is false, questions have yet to be answered about what the future holds. This uncertainty may mean that technology’s role in organizations is still not completely known.

Academic and practitioner literature (for example, McCune, 1998 & Adams, 1997) has frequently referred to the productivity paradox. In the 70s, 80s, and early 90s, there was no evidence that greater technology spending led to more productivity. Statistics showed productivity growth sluggish, even amid what some described as out-of-control IT spending. For example, in the period from 1970 to 1995, information processing investment grew at 12.5% a year, while productivity growth grew by only 1.3% (Lightfoot, 1998).

More alarming was that this seemed to be of little importance to those spending the money. A London School of Economics survey found that only one-third of the chief executives surveyed could measure the contribution of IT to profit (Black, 1998).

Additionally, IT planning seemed to be lacking at universities. Chen (1999, p.71) cited a 1998 survey which found that only “48% of institutions had a strategic plan for IT.” A little less than 40% had a financial plan for IT. Therefore, it seemed impossible to even measure IT contributions on campuses at all!

Thus, economists and academicians agreed that the paradox existed during the 25-year period from 1970 to 1995. Robert Solow, a Nobel Prize winner in economics, articulated this sentiment when he said, “… you can see the computer age everywhere but in the productivity statistics” (as qtd. in Triplett, 1999, p. 309).

However, the late 90s brought a change in opinions. For example, labor productivity grew an average of about 2% for the years 1996 to 1998 (Sichel, 1999). Computer hardware’s contributions to output grew as well. Sichel, who is an economist, found that computer hardware contributed a much larger share of capital contribution to growth than any other type of capital during this period (1999).
Other turnarounds abounded. Economist and former Secretary of Labor Robert Reich, citing aforementioned statistics, said productivity increases from the early 80s to the late 90s corresponded almost directly to companies investing more in IT (McGee, 2000). A March 2000 Federal Reserve study showed that IT usage and production has contributed $50 billion in productivity output per year since the mid-1990s, a sum which represents about two-thirds of the overall U.S. business productivity gain (McGee, 2000).

Additionally, many corporations are case studies in IT-induced productivity gains. For example, UnitedHealth Group, a health care services provider, cited gains in the double digits due to IT purchases. Weirton Steel saw the number of worker hours it takes to produce a ton of steel fall from 6.5 to 1.3 in the last decade — and that was in the midst of cutting its work force in half. The CEO attributed the productivity gains to increased technology investments over the same amount of time (McGee, 2000).

Despite the good news, the literature still offers no consensus explanation for the heightened productivity gains. Sichel (1999) hypothesizes that the relatively recent show of productivity may be the product of benefits that simply take a long time to show results. He borrows from the argument of economist Paul David, who suggests that because new technologies take time to diffuse, it also takes time to see their benefits. Powell makes a similar point:

> It can take years for the way we work to catch up with the technology’s true potential. Although the first dynamo was introduced around 1870, it took more than 40 years for electricity to supplant steam as the industrial energy source of choice. (2000, p. 42)

Sichel also hypothesizes that current productivity may be a product of the low price of acquiring technology in the late 90s, a factor which would encourage organizations to purchase more and thus increase the contribution to overall growth (1999). Still others argue that the productivity paradox arose from an economic mismeasurement of outputs (Diewert & Fox, 1999).
Finally, questions continue to be asked about whether increased investment in IT can lead to even greater gains in output in the future.

The Canadian Journal of Economics dedicated a significant portion of its April 1999 volume 32, issue 2, to the productivity paradox. The research found a mixed bag of answers, which served to move us further from consensus on the subject. While some of the studies and literature provided firm evidence against the paradox, others confirmed it.

For example, Gera, Gu, and Lee (1999), studying IT and research and development investments across several industries in the United States and Canada, found these investments to contribute greatly to labor productivity growth. Comparing and analyzing statistical data from 1971 and 1990, they found that IT investments brought a return rate of about 30% a year.

Triplett (1999) suggested several explanations for why there is no paradox. These ranged from inaccurate or incorrect measurement of IT investment and output to the aforementioned lag time explanation. Diewert and Fox (1999) suggested the paradox arose from three measurement errors: lack of adjustment for inflation, failure to deal with cost allocation problems, and statistical agencies’ mismeasurement of inputs and outputs.

Lehr and Lichtenberg’s study (1999) presented somewhat of a crossroads, as it intersected positive results of computer-related productivity with continued concern. In their study they examined trends in computer usage and the effect on productivity growth across several industries during the period between 1977 and 1993. They concluded that computers yielded excess returns, thus contributing positively to productivity growth. However, they also discovered that this trend peaked around 1986 or 1987. This directly contradicted Sichel and others who said the paradox existed in the 80s because of a lag time between innovation diffusion and benefit.

Even more enlightening than the results that poke a hole in the paradox, however, was Lehr and Lichtenberg’s more cautious conclusion:
Although demonstrating that computers yield excess returns serves to cast doubt on the traditional version of the productivity paradox, there are still a number of interesting questions. For example, why is there such variability across firms in the productivity of computers and how computers are used? Or, why is it the case that productivity gains which are clearly realized at the business-unit level often seem to fail to flow through to the firm’s bottom line? (1999, p. 357)

Other studies published in that issue found absolutely no productivity growth at all in relation to IT investments. For example, Wolff (1999), who studied IT’s effects in the American service sector, found that computerization did not have a positive effect on productivity growth. Furthermore, he concluded that the influx of technology use to jobs actually had a negative effect on productivity.

Licht and Moch’s study (1999) of the European service sector found that IT had an effect on the quality of service innovations but not on productivity. They also reported that managers of service firms were not confident of IT’s role. These conclusions led them to state, “… our results are consistent with pessimistic views on the productivity effects of IT” (Licht & Moch, 1999, p. 378).

Thus, it is difficult to know whether computer technology really does help us to do our jobs better, more effectively, and with increased production. In light of this question mark, it is important to continue searching for the answer. If it is true that the paradox exists, then it means that workers are not reaping big benefits. This could explain some of the negative feelings I experienced at the newspaper.

If, however, the paradox is an illusion, for example, because of lag time between the diffusion of the technology and productivity increases, are we not still accountable for the effects it has on workers during that waiting period? In other words, until we are certain of technology’s contributions, we must continue our attempts to illuminate this area of work. My research seeks to do that by examining users’ perceptions.
The Specific Case of "Tech U."

Nowhere is the technology phenomenon being experienced and exacting more radical change than within the halls of colleges and universities. Academic institutions across the country are getting “wired” in an effort to keep their students connected to campus services, offer more classes, and prepare graduates for the work world. Several trends are now prevalent at many academic institutions in the United States.

For example, entering freshmen are receiving e-mail accounts and being required to own a computer (Hickman, 1998). Dorm rooms are being wired for Internet access. Modem pools are providing Internet access for students living off-campus. Online services, such as registration, are increasing. Technology is bringing changes for faculty and staff, too, as professors are accessing research materials from their office instead of having to travel to get it (Hickman, 1998).

In concurrence with this trend, Roach describes a “higher education technology revolution,” in which information technology has changed the face of a university education (1999, p. 92). He outlines 15 developments which have led to this high-tech landscape, ranging from the introduction of the Apple Macintosh on campuses in 1984 and the emergence of the Internet to the widespread availability of services such as electronic mail, electronic journals and digital databases, and distance education (Roach, 1999).

As with corporations, technology investment at universities ranges in the millions. For example, the University of Miami in Florida spent $7 million on a T3 network, while UCLA’s business school invested $12 million in a high-speed network (Other Colleges Investing ..., 1998). The Harvard Business School has spent $11 million on an intranet that gives students, faculty, and staff members access to course materials, online registration, and other services (Chen, 1999). Some community colleges also are making similar expenditures. In Denver, Colorado Electronic Community College spent $10 million on a multimedia lab (Other Colleges Investing ..., 1998).
Other schools are trying to jump on the technology bandwagon, too. For example, the Massachusetts Board of Higher Education has proposed that all incoming college freshmen in the state have a laptop computer (Caywood, 2000). Under the proposal-in-progress (as of June 2000), students would pay approximately $90 per year to lease the machines. The plan would issue about 20,000 laptops beginning in fall of 2001.

**Resistance to technology.** Despite the proliferation of new technologies at universities, there is a growing resistance on campuses. Some of the arguments against technology proliferation are as follows (Rickard, 1999; Adams, 1997; McKinney, 1996):

a. Universities are not supporting professors with the proper policy to ensure intellectual property rights, which may have effects on careers and faculty tenure possibilities.

b. Technology’s fast pace of change makes it difficult to keep ahead of obsolescence.

c. The increased effort of faculty does not equate the benefits that technology brings to educational quality.

d. Technology is used to improve administrative systems more so than teaching systems.

e. As more teaching goes online, teaching and education will lose the benefit of the creative forces which occur when people come together to interact and learn.

f. Distance education may create more financial stress on universities.

g. In the face of the alleged productivity paradox, legislatures and boards of trustees may pull funds for information technology.

h. The future of university libraries and presses is at risk.

i. Professors fear being replaced with technology, as institutions will not be able to economically support both.

j. Technology may create a greater class distinction in several ways. First, students who lives in poor areas may have less access. Secondly, distance education students
will not receive the same assistance as those who are physically at the campus.

Finally, matriculating students with no exposure to computers will be disadvantaged when entering programs that employ great amounts of technology.

We must address this resistance. I argue that it is important because it suggests a negativity in technology that we have not studied adequately. In other words, it provides further evidence that technology has both enabling and constraining qualities. This is the crux of my thesis.

Study Purpose

Thus, the following concerns emerge. First, American organizations are investing great amounts of money in technology, yet there does not seem to be a corresponding emphasis on returns. Additionally, organizations do not fully understand the effects of the technology. I argue we need to determine exactly what the technology payoff is and what it means for organizations’ end users. I propose we can do this by examining specifically how users perceive technology.

I want to make it clear that I am not attempting to solve the productivity paradox nor quantify the usefulness of computer hardware and software. My purpose, however, is to explore what the technology means for those who use it to perform their jobs. I specifically want to know the effects of technology proliferation on end user’s perceptions of hardware and software and their relationship to work completion.

I feel that organizations need to know how the massive amounts of technology they purchase help or hinder their employees. In this way they can maximize hardware and software’s positive effects and minimize the negative ones.

To explore these purposes, I have formulated three research questions. The first addresses end users' past and present experiences with technology in order to determine their relationships with hardware and software. The second and third questions specifically examine users’ perceptions of technology and technological change. Here, users are asked about the prominent
qualities they perceive in the hardware and software and upgrades, and how these qualities are both enabling and constraining for them.

Through my study I also hope to augment the body of literature that seeks to understand technology through the experiences and perceptions of the end user. As an end user at the newspaper, I was never asked how technology helped or hindered me. I want to give others a chance to speak out.

The literature offers us instances of measuring IT’s productivity through people’s perceptions. For example, Tallon, Kraemer, and Gurbaxani (2000) studied 304 business executives worldwide in an effort to examine the value of information technology. They stated that this was a valid way to study IT’s contributions for several reasons, one being that business executives are often exposed to the views of their peers and subordinates regarding the performance of technology. In this manner, they are apt to have their finger on the pulse of technology’s output or potential. Based on this reasoning, I argue that one also can go directly to the aforementioned peers and subordinates in order to determine IT’s impact. When combined with objective measures of its value, we can draw a broader and more accurate picture of the contributions of technology in the workplace.

Mellon, who has studied educational trends for more than 30 years, agrees with the importance of people when discussing technology’s place in education today (1999). She says that technology alone cannot determine learning or a high quality of education. She points out that other considerations must be taken into account. For example, the presence of technology does not automatically imply that learning is occurring. She also suggests that technology may not always be the best method of learning and teaching to reach all students.

Finally, Mellon (1999) argues that more important than the technology are the factors of student motivation and the impact of a good teacher, neither of which can be replaced or supplanted by a computer. Mellon has been a primary education teacher and is now a professor
and director of Graduate Programs in the Department of Broadcasting, Librarianship, and Education Technology at East Carolina University in North Carolina.

Practitioners also advocate a focus on users. McGrane, a vice president at the paper company Mead Corporation who is responsible for implementing a worldwide planning system across the organization, warns the paper industry to become more aware of the “people side” of technology (2000). He offers the following anecdote:

I remember a bank in the early 1980s that introduced email. Resistance was high — executives viewed keyboard skills as clerical. However, a small group was elected to be the first to use the technology. Instead of a stigma, email became a status symbol, and soon, everyone wanted it. A technology challenge? No, a people challenge that was solved through a careful analysis of overcoming human barriers. (McGrane, 2000, p. 31)

Thus, the clarion call is there for attention to the user. I hope to answer this call through a square focus on the “people side.”

Preview of the Thesis

In the next five chapters I will further strengthen my argument that technology both enables and constrains its users in organizations. Chapters 2 and 3 lay down a theoretical framework and review of literature that suggests enablement and constraint. Chapter 4 provides the methods by which I conducted my research. Chapter 5 presents and analyzes the results of my research, while Chapter 6 offers implications and possibilities for future research in this area.
CHAPTER 2: THEORETICAL FRAMEWORK

The interpretive perspective, dialectics, and structuration theory provide a framework for my study. While the interpretive perspective offers a broad lens through which to understand the world, dialectics and structuration define more specific ways to examine technology in organizations.

The Interpretive Perspective

Putnam (1982) characterizes the interpretive perspective as studying the way people make sense of their world. The perspective comes out of the works of philosophers such as Husserl, Kant, Weber, and Schultz (Anderson, 1987). Interpretivists in general believe that meaning is located in social actions (Putnam, 1982). Thus, reality is a socially constructed concept. At the center of their studies is the effort to discover how individuals make sense of their worlds through communication (Putnam, 1982).

The interpretive perspective informs qualitative research, which subsumes many of the same concepts. For example, qualitative research is inductive, meaning it is based on the human experience with disregards to preconceived notions (Anderson, 1987). In other words, it advocates the process of gathering data and then interpreting it as opposed to starting with a hypothesis and/or preconceived notion and trying to confirm or deny it.

Qualitative research also holds at its core the basic concepts of subjectivity, contextuality, textuality and interactivity. It also studies the mundane (Anderson, 1987). When taken together, these concepts point toward research that studies people in their social settings performing social actions and bases its findings upon the interpretation taken from the participants’ viewpoints.

Thus, the interpretive perspective provides a way of understanding the social side of technology because it allows participants to explain in their own words and their own feelings
how they perceive their everyday experiences. Interpretivism also allows us to focus attention on
the tensions that traditional deterministic ways of viewing technology have not addressed. In
other words, through this perspective, I can examine technology as a social entity based on my
participants’ perceptions rather than as mere hardware and software with one certain purpose and
outcome. This is very significant in that it gives me the opportunity to argue that technology can
be interpreted in multiple ways (some enabling and others constraining). This opportunity is only
possible because interpretivism takes the lens of examination off the technology itself and
refocuses it on the users.

In turn, the dialectical perspective provides a useful framework for identifying the
tensions inherent in technology.

The Dialectical Perspective

Dialectics dates back to eastern philosophy. The “Diagram of the Supreme Ultimate”
shows how Chinese philosophers believed the energies of the opposing yin and yang came
together to complement each other (Morgan, 1997b). Most associated dialectics with Hegel and
Marx, who took many of Hegel’s ideas of dialectics and formed dialectical materialism.

Hegel believed in philosophical idealism. His dialectics consists of the three concepts of
“Being,” “Nothing,” and “Becoming” (Hegel, 1929). “Being” is the finite, fixed knowledge of a
phenomenon, a concept Hegel did not believe. Instead, he advocated “Nothing,” which
incorporates the ideas of flux and that perception of a phenomenon comes from our knowledge of
its opposite. The flux evolves from the dynamics occurring between a phenomenon and its
opposite. “Becoming,” the higher truth, is a synthesis of “Being” and “Nothing” (Hegel, 1929).

Marx, in developing dialectical materialism, rejected Hegel’s idealism. Cornforth, a
dialectical materialist, goes to great lengths to describe the difference between idealism and
materialism, which he says are direct opposites. According to Cornforth the opposition of the two
was an “opposition between different ways of understanding and interpreting every issue” (1976,
He claimed that idealists looked to the spiritual for explanation and interpretation, while materialists explained and interpreted situations based on matter and science.

This follows directly with the class struggle Marx saw as the principle contradiction in capitalism. It was not that God or some other supernatural being made some people rich and others poor, an explanation that is more idealist. Instead, it was that capitalists profited by exploiting labor and keeping the surplus value, a very materialist way of explaining the situation. Marx’s dialectical materialism can be categorized into three main tenets: struggle and the unity of opposites; the negation of the negation, or negating a previous form while retaining some of its qualities; and the transformation of quantity into quality. Quantity into quality implies that with enough negations (quantity), something new will emerge (quality) (Jordan, 1967).

According to Baxter and Montgomery, dialectics is not a theory, but a set of conceptual assumptions (1996). Though dialectics has many variations and alternatives uses, there are four main assumptions which underlie all dialectic perspectives — contradiction, change, praxis, and totality (Baxter & Montgomery, 1996).

Contradiction is “the dynamic interplay between unified oppositions” (1996, p. 8). Opposition can either be seen as logically defined and or functionally defined. A logically defined opposition is one that consists of a feature and the absence of that feature. An example would be “loving” and “not loving.” A functionally defined opposition consists of two features that function in incompatible ways to each other. “Love” and “hate” would be an example (Baxter & Montgomery, 1996). Opposition is unified under two conditions — a) if the existence of one opposite depends upon the existence of the other or b) if both opposing features are interdependent within a larger situation.

Cornforth (1976) takes the relationship of opposites two steps further by describing the struggle of oppositions and the interpenetration of oppositions. According to Cornforth, the interdependence of the oppositions makes a struggle between them inevitable. He sees this struggle as internal and necessary. Interpenetration refers to the idea that “each (opposition) is
always affected by its relationship with the other” (Cornforth, 1976, p. 85). Cornforth says struggle and contradiction are inherent in all processes. He states, “We can only understand, and can only control and master the processes of nature and of society by understanding their contradictions and the consequences of those contradictions — the way they work out. Contradiction is the driving force of change” (1976, p. 85). Cornforth also makes a differentiation between principal and secondary contradictions.

Another assumption is change. From a dialectical perspective, contradiction is good because it leads to change and growth. Specifically from a dialectical materialism perspective, change can only come from that struggle between unified opposites. Baxter & Montgomery define dialectical change as the “interplay of stability and flux” (1996, p. 10). Change can be viewed from either a one-way or reciprocal “cause and effect” perspective (such as Cornforth and other dialectical materialists do in differentiating their principle contradiction that causes other contradictions) — this is called efficient cause — or by looking at how patterns shift and change and how features fit into that pattern.

Change can also be viewed in terms of thesis-antithesis-synthesis (a Hegelian and Marxian point of view), in which one feature changes, which causes a change in its opposite, and when the contradiction is solved, the system reaches synthesis. An opposing view sees change as spiraling, or a combination of cyclical and linear change (Werner & Baxter, 1994). Cyclical implies a back-and-forth change, where a system may revert to a previous state and then change back to the other state, etc. Linear implies permanent, always-new change.

Praxis is yet another assumption of dialectics. According to Baxter and Montgomery (1996), praxis refers to the idea that people are actors and objects of human action simultaneously. It recognizes the fact that we can create contradictions and at the same time be constrained by contradictions. It implies that the future can come from what is done in the past.

Finally, totality is the assumption that things can only be understood in relation to other things (Baxter & Montgomery, 1996). To quote Stalin, who followed Marx’s dialectical
Dialectics considers things as “connected with, dependent upon, and determined by each other” (as qtd. in Cornforth, 1976, p. 63).

Dialectics has been applied specifically to organizations. This literature focuses on understanding the dialectical contradictions at the center of many recurring problems in the modern world and how to address and manage them (Morgan, 1997a, p. 418). Through a dialectical analysis, for example, we can see how the existence of one organizational phenomenon (for instance, industrialization) will lead to the existence of its opposite (a unionized work force). Braverman’s (1974) still-influential work on the divisive relationship between labor and capitalism exemplifies this approach well.

In his efforts to develop a dialectical method for studying organizations, Benson says the purpose of dialectical analysis is to search “for those basic contradictions that potentially (not inevitably) destroy a system and bring alternative arrangements into view as possibilities” (1983, p. 346). He outlines a paradigm for accomplishing this via three guides. The first describes the organization as an entity that is produced and sustained by people historically and also on an everyday basis. Thus, he suggests that a dialectical analysis must not only examine the practices and discourse that have been set in the organization in years past, but also study the structures that are created daily by its people.

The second guide states that the ongoing production of these practices and discourse inherently will lead to contradictions within an organization (Benson, 1983). These contradictions then may override the current limits of the system to create new structures. Here, Benson suggests that the people and practices within an organization not only have the power to reproduce the current structure, but also have the ability to forge a new order.

Benson’s last guide states that the actions and productions of an organization are connected to the larger system (i.e., its competitors, the community, the world, etc.) (1983). Thus, what occurs outside the organization has the ability to produce or reproduce the organizational structures as well. An example would be how the environmental movement has caused many
companies to rethink the effects their products and practices may have on the water and land. Thus, Bensons suggests that a dialectical study must take into account the effects the larger dialectical process has on the organization.

Heydebrand emphasizes the importance of change to organizational dialectics in his re-definition of praxis. He describes it as the “conscious self-transformation” of people acting collectively (Heydebrand, 1983, p. 306). It is change that is motivated internally, not by what the organization or the environment wants. Whereas change influenced by the organization or environment may merely serve to reproduce the status quo, Heydebrand argues that praxis allows for the creation of truly new structures and change (1983). His definition forces us to realize the ultimate importance of the social nature of organizations and of human agency, especially when people unite.

These elements of dialectics shape my study in four important ways. First, they suggest that contradiction is an inherent part of technology. Thus, it gives weight to my argument that enablement and constraint are both present within hardware and software usage. Secondly, dialectics also points toward the supposition that this enablement and constraint are intertwined and dependent upon each other for existence. This suggests that if technology is enabling, as research and experience show consistently, then it also must be constraining at the same time.

Thirdly, dialectics brings to the forefront the importance of human action in technology’s role in the workplace. In this manner, it re-emphasizes the subjectivity that is so integral to interpretivism. Finally, and perhaps most significantly, a dialectical view of contradiction as a predecessor of change suggests that studying the enabling and constraining aspects of technology can lead to improved ways of implementation. Thus, my study not only has the ability to describe the enabling and constraining aspects of technology, but also can then parlay those findings into suggestions for improved technology usage.
Structuration Theory

Structuration theory is grounded in many of the same basic conceptual assumptions as dialectics. The theory suggests that human action is both enabled and constrained by structures that result from that action (Giddens, 1984). Through action, structures are not only formed but also standardized through reproduction of action. This duality of structure combines the objectivity of organizations with the subjectivity of human agency. This theory presents a way of looking at change from a social point of view and has been adapted in several areas of research.

The primary elements of structuration theory are human agency, rules and resources, structures, systems, and the idea of duality (Giddens, 1984). From day to day, agency, or action, will produce and reproduce the structures (rules and resources) within an organization. Over time this duality will standardize these structures. Human action is an important element, and Giddens recognizes in his theory that agency is composed of both knowledge and capability, not intentionality. That is to say that human action can create and recreate without being articulated or intended.

According to Giddens, human action in organizations produces and reproduces meaning, power, and norms (1984). Meaning, on an organizational level, will lead to structures of signification, such as rules of interaction. Power, at the organizational level, will create structures of domination. Here, Giddens suggests a dialectic of control, whereby subordinates (by virtue of an asymmetrical power structure) can change the dominant structure. Giddens says, “.... all forms of dependence offer some resources whereby those who are subordinate can influence the activities of their superiors” (1984, p. 16). Finally, norms will lead to organizational structures of legitimation, or the morals and values which are upheld through rituals and practices.

Here follows a simple example: One of the institutionalized rules of Organization A is the dress code, which dictates that men wear ties everyday. Because it is a norm of the organization, all men for 20 years have adhered to this rule and, thus, wear a tie everyday. However, because the men comply, this reproduces and reinforces the dress code, thus keeping it in practice. The
fact that the dress code produces the human action and human action produces the code represents the idea of duality.

Howard and Geist (1995) illustrated the duality of structure and agency discussed in structuration theory. Using Giddens’ dialectic of control, they studied how employees at a gas and power company with 4,200 employees dealt with the contradictions inherent in an impending merger (which, incidentally, never occurred). They found four contradictions. The primary contradiction for the company was that between increasing profit while meeting the needs of its people during the merger. The secondary contradictions that participants discussed were stability vs. change, empowerment vs. powerlessness, and identification vs. estrangement.

Within this situation, four ideological positions emerged (Howard & Geist, 1995). They ranged from the active acceptance of those who were positive and enthusiastic about merger to the passive diplomatic acceptance of those who neither completely accepted or rejected it. Those who took the position of active rejection left the company, while those who discussed passive rejection stayed but resisted the change the merger would bring.

This study exemplified how power and agency, both elements of the dialectic of control, manifested themselves in the ideological positioning that occurred in the speculation of a merger (Howard & Geist, 1995). It also showed how the same situation fostered different interpretations based on the individual’s attitudes and perceptions (in effect, agency) of his or her place in the organization. Human action was enabled and constrained by the structures of the organizations (in this case, the merger). While some of the employees felt enabled, others felt constrained and acted accordingly.

This study also illustrated the dialectic of stability vs. change, which may occur in organizations undergoing radical technological change (Morrill, 1992). This is significant, as technological change is important to my research.

Structuration is important to my study for many of the same reasons as dialectics, such as human agency, contradiction, and change. However, an important addition is that structuration
emphasizes the specific relationship between structures and humans. In my study technology is the important structure. This relationship shows the importance of the interplay between objectivity and subjectivity.

Structuration theory, then, provides a framework that suggests technology both enables and constrains those who use it. It also makes possible, as dialectics does, the ability for humans to change the technology in ways that will benefit them (for instance, through better implementation). Furthermore, structuration theory has been extended to specifically address technology as a structure in organizations. These applications are discussed in detail in the next chapter.

Thus, the interpretive perspective, dialectics, and structuration theory provide a strong foundation by which to examine the varied interpretations of technology. These points of view suggest that hardware and software in themselves are not finite objects with a definite use or purpose. Instead, technology is a process dictated by individual perceptions and varying structures that lead to multiple outcomes. The next chapter will examine these perceptions and structures as delineated in the literature on technology adoption and usage.
CHAPTER 3: REVIEW OF LITERATURE ON TECHNOLOGY USE

As stated in the previous chapter, focusing on structuration theory (as well as interpretivism and dialectics) allows us to see technology as both objective and subjective. However, this has not always been the case. Some research has viewed technology as an external force, its impact and ability standing alone from those who use it. This school of thought, the decision-making school, believed in system rationalization (Rice, 1984), the idea that technology, if applied correctly, would effect positive change. Subsequently, if the technology failed to produce such a change, the problem lay in the technology or some aspect of the implementation or delivery of that technology (De Sanctis & Poole, 1994).

However, this body of work seems to leave something to be desired as it does not take into account the effects human agency has on technology use. It also does not explain the different levels of success which can result from the implementation of similar technologies within two different situations. If technology in itself has the ability to effect change, then why is its impact positive in some cases, yet slow or nonexistent in others, even when the implementation and delivery remain constant across situations?

Other research has focused on technology not as an external force, but as a social construction of those who use and design it. This institutional school advocates a strategic choice model (De Sanctis & Poole, 1994; Orlikowski, 1992, p.400). Here, technology is viewed as the outcome of human agency, design, and appropriation. Technology does not determine behavior; instead, the social norms existing within a larger institution that people employ determine the outcomes of usage.

Orlikowski (1992) suggests that this strategic choice model, like the deterministic view of technology as an external force, is incorrect. However, its incomplete nature is derived from the
fact that this research leans too much on the idea of human agency while disavowing other crucial factors, such as organizational structures. She says it also may be seen as completely rendering the user powerless altogether and subordinated to larger social forces.

Applications of Structuration Theory to Technology

More current research makes reference to the social technology perspective, which is a blending of the concepts of determinism and social construction (De Sanctis & Poole, 1994). Here, technology is seen as a structure that can promote change in an organization. Technology has structures of its own (the objective view), but these structures can change through social practices (the subjective view).

For example, Orlikowski (1992) has adapted Giddens’ structuration theory to recognize technology as a method of organizational change. Technology here is restricted to material artifacts (hardware and software) apart from social usage in order to make the point of duality, a crux of this model. She proposes that technology is a structural property of organizations that develop and/or use it (Orlikowski, 1992, p. 405).

The structurational model of technology is based upon two premises, the duality of technology and interpretive flexibility (Orlikowski, 1992). Just as Giddens speaks of other structures of organizations being created, recreated and thus, changed by human action, so does Orlikowski of technology. Technology is seen as a structure that affects the way people act but also is recreated and reconstituted through human action (Orlikowski, 1992). It is a product and producer, an enabler and a constrainer. This recursiveness refers not only to the action of those who use technology but also to those who design it.

Interpretive flexibility refers to the “flexibility in the design, use, and interpretation of technology” (Orlikowski, 1992, p. 409). Orlikowski suggests in this premise the gap between the designers and users of technology is nonexistent, that both participate in the constitution of technology.
Thus, the primary components of the structurational model are human agents, technology, and the institutional properties of organizations, which can range from business strategies to culture to division of labor (Orlikowski, 1992). These components lead to the following basic tenets of the model (Orlikowski, 1992):

a. Technology is the product of human action.
b. Technology is the medium of human action.
c. Human action in organizations is situated and thus, human agents are influenced by institutional properties of their settings.
d. Technology influences the institution by either reinforcing or changing the structures of signification, domination, and legitimation.

Hence, when human actors use technology according to embedded rules, they reinforce the institutional structures. When they use it in ways unlike these rules, they may change the structures in which the technology was originally deployed (without even knowing it).

Similar to Orlikowski, De Sanctis and Poole (1994) present Adaptive Structuration Theory (AST) as a way of studying organizational change through the effects of advanced information technologies. Some examples of this type of technology include electronic messaging systems, executive information systems, and group decision support systems (De Sanctis & Poole, 1994). They propose that AST can help explain variations in organizational change that result as advanced information technologies are used as well as interpret that change.

The central concepts of the theory are structuration and appropriations. Like Orlikowski, De Sanctis and Poole view technology as social structures — rules and resources — in organizations (1994). Their structures are composed of two components, structural features and spirit (collectively referred to as structural potential). Structural features are the capabilities of the systems which dictate how information can be gathered and manipulated. Spirit is the intent of the technology related to the values and goals of the features (De Sanctis & Poole, 1994).
Thus, an email system’s features may include an address book, a graphical user interface, and capability to send emails at set times. The spirit of the email system may be to keep you connected to the world with as much ease as possible (De Sanctis & Poole, 1994). These social structures will provide opportunity for structuring, and when applied, will produce and reproduce themselves. New structures may emerge, and if accepted, will become embedded in organizations and create change.

Scott, Quinn, Timmerman, and Garrett (1998) exemplified this notion in their study of a group decision support system (GDSS). Applying AST, they showed how people may use a GDSS in ways divergent from the “spirit” of the technology, thus creating a new structure. Studying the use of almost 200 students in a small group communication course at a major southwestern university, they found the technology to be used in ironic ways not intended by the system designers.

While the general intent of the GDSS (its spirit) was to facilitate anonymity and encourage the equality of participation and influence among users, Scott et al. (1998) found that students instead tried to use the system to accomplish just the opposite. For example, some students tried to identify the source of comments. Others went so far as to not even participate in order to remain anonymous. They also tried to influence each other by repeating comments, failing to read others’ comments, or using special capitalization/punctuation. Users also admitted to social loafing, in which they sat back and simply watched others express themselves. This violated system attempts to encourage equal participation. The researchers concluded that this may alter or re-invent the way the technology is used (Scott et al., 1998). In other words, a new structure may emerge that creates change in the way the students use the system.

Appropriations are the “immediate, visible actions that evidence deeper structuration” (De Sanctis & Poole, 1994, p. 128). Several factors will influence the appropriations of structures, such as group members’ styles of interaction and knowledge and experience with structures,
belief in others’ knowledge and acceptance of the use of structures, and the degree of agreement on whether structures should be appropriated.

AST suggests these following major proposals based on the idea of structuration and social structures (De Sanctis & Poole, 1994):

a. Different structural potential will lead to different social interactions with the technology.

b. Advanced IT structures will vary according to task, the environment, and other factors.

c. New sources of structure emerge as technology, task, environment, and other factors are applied during social interaction.

d. New social structures will emerge as technology structures are produced and reproduced.

The most important implication of these theories is the blending of the objectivity of technology with the subjectivity of human action in the social construction of their own worlds. In this manner I argue that technology usage has an inherent — and often overlooked — contradiction: It has the ability to make people’s jobs and work easier and more efficient, but it may also have negative effects as well. From a structuration point of view, I am suggesting that technology is both enabling and constraining.

A second major implication of structuration is the idea that people create and recreate their own technological realities. In his research on sensemaking in organizations, Karl Weick refers to technology as “equivoque,” defined as “something that admits of several possible or plausible interpretations and therefore, can be esoteric, subject to misunderstandings, uncertain, complex, and recondite” (1990, p. 2). Based on the concept of “equivoque,” I suggest that technology can be inherently dialectical in nature — for example, positive but also negative, easy but also difficult, a helpful force but also a hindrance. In other words I argue that a Weickian view shows technology to be both enabling and constraining.
If technology holds an air of uncertainty, then it is fair to posit that end users will create multiple interpretations of hardware and software. Howard and Geist’s merger study discussed in the previous chapter exemplifies the idea of multiple interpretations, though in a non-technology setting (1995). They studied how employees at a gas and power company with 4,200 employees dealt with the contradictions inherent in an impending merger. Employee reactions (or interpretations) to the merger ranged from positivity and enthusiasm to ambivalence to quiet resistance to company exit. I argue that the merger easily could have been a major technological innovation that produced those four different ideological positionings by employees within the organization.

However, in order to study these multiple interpretations, we first must examine the factors that help influence perceptions of technology use. Past literature has presented several factors that may influence how users perceive technology. However, these perceptions are seldom examined dialectically (interpreting how they might be both enabling and constraining in nature).

Through this lens we can help explain why some people are very happy with technology while others, using the same hardware and software, can be unhappy and view the technology in a negative manner. Examining user’s specific perceptions of technology and usage especially will lead to these explanations and show how these tensions are balanced.

In the same vein it also can show how the same technology can create different structures in different organizations. For example, Barley (1986) studied technology and structuring by observing the introduction of identical CT scanners to two community hospitals in Massachusetts. Though the scanners were the same, it led to different structures at each organization. For example, one hospital's radiology department became more decentralized than the other.

Thirdly, these theories provide a foundation of organizational change that I posit as a reason for the need for my research. In other words, I argue that technology as a trigger of change shows the importance of studying people’s perceptions.
Factors That Affect Use

The literature has elucidated numerous perceptions that end users hold of technology, especially in the early stages of use. However, most has not explicitly interpreted the enabling and constraining aspects of technology, as I propose to do in my study here. One such discussion that does examine this duality comes from Everett Rogers (1971 & 1983).

Rogers’ Perceived Attributes of Innovation

In his writings, Rogers outlines five perceived attributes of innovations (new ideas and practices) which affect their adoption — relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1971). Though he does not employ the language of dialectics, Rogers does recognize this perspective when defining each attribute’s relation to technology adoption.

For example, he defines compatibility as the "degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receivers (Rogers, 1971, p. 145). He goes on to suggest that an innovation perceived as being highly compatible will be adopted quickly by users. However, he offers examples of how an innovation may be compatible on many levels but still not be adopted into use. For example, introducing goats into India in the mid-1960s was compatible (enabling) with its need to feed millions of starving people and even keep the cow sacred. However, it clashed with other religious and status factors (constraining) and ultimately failed (Rogers, 1971). We can look at technology in the same manner.

Rogers also recognizes a dialectical perspective when categorizing adopters. In his scheme, adopters range from the innovator, who is "venturesome" and eager to try new ideas, to the laggard, who looks to the past and tradition and thus, resists adoption of innovation (1971, p. 183-185). When describing the innovator, for example, Rogers takes a dialectical approach. He says while the innovators’ venturesome nature helps them to accept new ideas quickly, it also is risky and my lead to failure (Rogers, 1971). In this manner Rogers is presenting both the enabling
and constraining qualities of being an innovator. He makes it clear in his work that innovation, no matter how positive, does not come without negatives as well.

Other literature has provided us with only a list of factors that affect technology usage. Though not presented in terms of simultaneous enablement and constraint, these factors lay a foundation for identifying the prominent qualities of technology. From these qualities, I can then delineate the advantages and disadvantages inherent in each.

**Social and Personal Factors**

Researchers applying social construction theories regard technology as a social process in which workers may learn through others within their work groups. These theories have been applied to technology. For example, Fulk, Schmitz, and Steinfield (1990) applied Bandura’s social learning theory to technology. Here, Bandura (1986) suggests that learning will occur in a model-observer situation. Thus, extending this idea to technology, those who watch the users of technology will adopt similar attitudes and behaviors as those they observe (Fulk et al., 1990).

Salancik and Pfeifer (1978), applying social information processing theory predicted that co-workers’ overt statements, interpretations, attention-raising communication, and stated judgments about standards will influence the attitudes and behaviors of others. Fulk et al. applied this prediction to technology in 1987. To extend this research, Fulk (1993) found that attraction to one’s work group affected technology attitudes and behavior.

Papa’s research (1990), dealing specifically with new technology and end user performance, also supports an influential nature amongst co-workers. Papa studied the major introduction of a new computer system at two regional offices of an insurance company in 1987. Using previous research to define key aspects of interpersonal communication networks, he hypothesized about the relationship between several aspects of networks and employees' performance with new technology.

Papa (1990) found a positive relationship between the activity, size, and diversity of networks and employees’ performance with new technology. Performance level was high when
employees frequently interacted with several members at different levels in the organization also dealing with the same new technology because they were able to exchange information during implementation.

In another study published in 1990, Papa and Papa found that employee productivity was likely to increase with the frequency of the number of messages received about how to use the new technology and the non-frequency of negative evaluations of the system. The findings came from the aforementioned 1987 study.

The same study also found other determinants concerning new technology usage. One such factor was communication competence, which Papa defined as “an individual’s ability and willingness to interact effectively and appropriately with others through communication” (1989, p. 89). His study of 289 claims adjusters undergoing a computer system change found that communication competence (specifically in the areas of listening, message clarity, and interpersonal ability) positively impacted employees’ productivity with new technology. He also found that communication competence training improved technology performance (Papa, 1989).

These theories and subsequent applications thereof as well as Papa and Papa’s work suggest that one of the determining factors of technology may well be the interpretation of peers and others in the organization with whom an individual works.

Malhotra (1999) suggests that personal constructs as well as social constructs affect the way users adopt (or decide to continue to use) IT. While the social constructivist perspective says humans make sense of phenomena based on their social world, the personal constructivist approach posits that individuals also use their own personal contexts that may or may not be common to a broader social view. Thus, it sees the individual as both part of a social context but also separate from it in that he or she also may make decisions based on his or her own particular construct of a situation.

Clearly, it does not attempt to say the social constructivist perspective is wrong, only incomplete. Users may adopt technology based on social norms, expectations, etc. but also bring
their own schema to the usage process. A personal constructivist theory attempts to explain the psychological attributes which affect technology adoption (Malhotra, 1999). The personal constructs, a set of past experiences used to make predictions and assessments of phenomena, help users to make sense of a new technology by attempting to align it with the individuals’ own set of experiences and predictions about the world.

The importance of this view, which integrates several personal construction themes (Malhotra, 1999), is that it affirms the duality of technology. That is, it allows for and explains how people may have different interpretations of the same technology. Users’ experiences can be different because they construe it in different ways.

Conducting multiple case studies of individuals undergoing the implementation of an information system in a clinical unit of a metropolitan hospital, Malhotra (1999) found clearly distinguishable personal and social constructs that affected the adoption of the new technology. For example, the purpose of the system was to reduce the amount of paperwork and improve productivity of patient treatment. This was a product of the social construction of the system. However, personal constructs led many individuals to a different conclusion. Some users said productivity had not increased and that the system was less efficient than its manual predecessor.

In another finding, individuals saw the system’s security and control build-ins as a cause of inefficiency (their personal construction) and tried to sidestep them (Malhotra, 1999). However, these controls were put in place for maintaining data integrity (a social construction). Thus, individuals’ own way of thinking in many cases superseded that intended by the social context (designers and implementers).

Scott et al.’s GDSS research also may confirm that personal constructs are important (1998). While the group decision support software was intended to have one effect, it led to other “unfaithful or ironic” uses in their study. From this I suggest that the way people use technology may be an effort to align its properties with their individual needs.
Applications of Rogers’ Attributes

Papa and Papa’s 1990 research confirmed other factors that influenced perceptions of new technology and affected productivity. Using Rogers’ definitions, the researchers found that relative advantage and trialability had a positive relationship with technology performance, while complexity had a negative effect. That is, the higher the perceived relative advantage and trialability, the better the technology performance was. High complexity, however, led to lower performance. These findings replicated Rogers’ generalizations (1971 & 1983).

According to Rogers (1983), relative advantage is the degree to which the new technology is perceived as being better than its predecessor. Trialability is the degree to which new technology may be experimented with on a limited basis. Complexity is the degree of perceived difficulty of understanding and use.

Karahanna and Straub (1999) also found that relative advantage as well as image were important factors in whether users adopted (continued to use) a new technology. They conducted a field study at a large financial institution in the Midwest in 1993 to determine the factors that influence pre-adopter individuals and post-adopter users. Using Rogers’ innovation attributes (relative advantage, trialability, compatibility, complexity, and observability) and the attribute of image, they found only two influenced continued use of the technology. These included relative advantage, which they referred to as perceived usefulness (the extent to which adopting or using the innovation is better than its predecessor) and image (the degree to which adopting or using the innovation is perceived to enhance status in the social system). These attitudinal factors worked in tandem with how voluntary the use of technology is. While the other factors were integral for pre-adopters, Karahanna and Straub (1999) concluded that their importance vanished after adoption.

The Technology Acceptance Model and the Theory of Planned Behavior

Davis and his colleagues (Davis, 1989 and Davis, Bagozzi, & Warshaw, 1989) found that perceived ease of use and perceived usefulness affected technology acceptance. The Technology
Acceptance Model (TAM) proposes that perceived ease of use and perceived usefulness will influence a person’s usage (Davis, 1989 and Davis et al., 1989). Perceived ease of use is seen as an influence on usefulness, which is presented as the key determinant of the two.

Kline and Gardiner (1997) also found ease of use to be a factor. Their study asked 30 end users of groupware systems to discuss their opinions in one-on-one interviews. When asked which variables foster effective use of the groupware system, 25 out of 30 users cited ease of use.

Davis and his colleagues (Davis et al., 1989 & 1992; Venkatesh & Davis, 1996) also suggest that training and motivation affect ease of use perceptions as well as technology acceptance and user behavior. Venkatesh (1999) champions the effects of perceived ease of use, characterized in his study as a strong indicator of acceptance when teamed with a training environment that enhances intrinsic motivation. He found that intrinsic motivation, or enjoyment, led to more perceived ease of use. His findings from this research were based on two studies that compared a traditional training method with a game-based training method (Venkatesh, 1999).

Applying TAM and the Theory of Planned Behavior (TPB), Venkatesh and Morris (2000) found that gender also played a role in technology acceptance and usage. TPB is similar to TAM in its suggestions of influence. When TPB is applied to technology, it states that a user’s evaluation of the costs and benefits, his peer and superior influence, and his perception of ease of difficulty of use affect adoption and usage (Ajzen, 1991). A study of 445 individuals from five organizations found that men were more influenced by perceived usefulness than women. In contrast, women were more influenced by perceived ease of use and, initially, by peer and superior influence, referred to as subjective norm in TPB. However, over time, subjective norm disappeared as a factor.

Applying TPB again, Morris and Venkatesh (2000) found that age also affects technology usage in the long and short term. They studied 130 customer account representatives in a medium-sized financial accounting firm in a large Midwestern city. These users were undergoing a voluntary implementation of a new technology at the time of study. Researchers
collected data immediately after an initial two-day training program and again after three months of usage, with actual usage behavior being measured for five months. Controlling for income, education, and occupation variables, the researchers found that the factors suggested by TPB had a relationship with age.

For example, younger workers (those in their 20s and 30s) depended more upon their evaluation of the costs and benefits of using the technology as a factor in initial usage than older workers. This confirms that perceived usefulness (relative advantage) affects technology adoption. Conversely, peer and superior influence (subjective norm) and perceived ease influenced the initial usage more of workers 40 and older. The influences of perceived usefulness and ease remained as influences after three months, although subjective norm became a non-factor for older workers as it always had been for those in their 20s and 30s. This suggests that the opinions and attitudes of others become less important as a person uses the technology more.

**Support**

Researchers also have studied the importance of technical support and assistance on technology adoption. The literature indicates that the availability of support encourages usage. For example, in Karahanna and Straub’s study of influences on post-adoption users, computer specialists and experts were found to be a part of the referent group for users (1999). Results showed that peers, local computer specialists, top management, and supervisors significantly influenced usage. Local computer experts in particular were important, suggesting that support and assistance with problems affected sustained usage of the technology (Karahanna & Straub, 1999).

Similarly, Groves and Zemel (2000) concluded that a support infrastructure must be in place to encourage new technology adoption. They drew this conclusion after studying technology knowledge and usage of 66 faculty members and graduate teaching assistants in one college at a southeastern university. Their study examined the technologies that the participants knew, what they used, and why they had selected to use it.
In a 1998 repeat survey of staff members at three academic libraries conducted for the first time a decade earlier, Jones (1999) found high marks for support. Of 118 respondents, 96 (81%) rated the support as “moderately good,” “very good,” or “excellent.” For Jones this was significant:

… adequate assistance and availability of trouble-shooting technical experts are part of the learning process. Good technical support certainly raises employee comfort level during intensive change. (1999, p. 718)

Summary of Factors

Thus, the literature shows us that many factors have the ability to affect technology usage. Categorically, these include social interaction, personal constructs, Rogers’ innovation attributes, ease of use, usefulness, and support. When these factors are combined with Giddens’ structuration theory and specific applications to technology thereof, we can propose that users’ adoption of technology can vary widely from person to person. Different users will have different experiences with technology because these factors will be experienced and interpreted in multiple ways. Furthermore, some of these interpretations will be positive, while others will be negative as users attempt to make sense of the technology they use.

Thus, the goal of my study is twofold. The first is to examine people’s perceptions of the technology and determine which factors affect their usage. The second is to examine the tensions that are inherent in these factors. In other words, I want to determine the enabling and constraining interpretations of the factors present.

Additionally, I want users to speak for themselves. With the growth in the number of end users — 50% to 90% a year at the beginning of the decade (Cronan & Douglas, 1990) — I feel this is an important endeavor.

Research Questions

In order to assess end users’ perceptions of enablement and constraint, I believe it is important to first examine their past and present experiences with technology. This will provide a
clear backdrop against which I can then examine their perceptions. Thus, my research questions are as follows:

RQ1: What are end users’ past and present experiences with the technology they use to perform daily tasks?

RQ2: What are the prominent qualities that end users perceive in the technology they use to perform daily tasks, and how are those qualities both enabling and constraining for them?

RQ3: What are the enabling and constraining aspects that end users perceive in major technological change (upgrades)?

**Definition of Terms**

The concept of technology has many definitions in academia. However, I will be using Orlikowski’s definition of technology in my thesis: “material artifacts (various configurations of hardware and software)” (1992, p. 403). This may seem contradictory to my argument that technology is a structure; however, it is not. Because I want users' opinions, I feel I must narrow the definition just to those physical objects they use to accomplish their work.

Hardware refers to physical items, such as disk drives, monitors, keyboards, printers, scanners, and other equipment (ZDNet, 2000). Software supplies computers with data or instructions and is stored electronically (ZDNet, 2000). It is broadly divided into two categories. Systems software enables computers to function. This includes operating systems such as MacOS and Windows98. Applications software performs work for users. Word processing programs (such as Microsoft Word), spreadsheets (such as Lotus 1-2-3) and graphics programs (such as Adobe PhotoShop) are examples of applications. I am more interested in applications because they are the software that is most actively employed in everyday work. Upgrades involve introducing new versions of hardware or software to replace an older version of the same product (ZDNet, 2000).
An end user is a person who uses a product after it has been fully developed and marketed. Additionally, an end user usually possesses a relatively low level of computer expertise (ZDNet, 2000). For my project specifically, I am using the term to describe all technology users in an organization except the technical support staff and managers/executives who make decisions about technology (for example, the manager of an information systems department). I have excluded such people because they usually possess higher levels of knowledge about technology that I speculate would make their experiences different than those of users who hold non-technical positions.

Finally, I have defined the terms “enablement” and “constraint.” An enabling quality is anything the participant speaks of as an advantage or aid to doing his or her work. Conversely, a constraining quality is anything spoken of as a disadvantage or hindrance. Terms such as “advantageous,” “helpful,” or “positive” will be synonymous with the concept of enablement. Terms such as “disadvantageous,” “hindering,” or “negative” will be synonymous with the concept of constraint.
CHAPTER 4: METHODS

To examine the enabling and constraining aspects prevalent in technology, I conducted my study within a setting undergoing a large upgrade. Upgrades of hardware and software offer a specific situation in which to examine how workers adopt and use technologies. Upgrades are the introduction of new versions of hardware or software to replace an older version of the same product (ZDNet, 2000). I speculate that during and soon after an upgrade, users will have a heightened sense of awareness of their feelings about and perceptions of technology and, thus, yield richer data.

Research Site

The University of North Carolina at Chapel Hill (UNC-CH) is a public four-year research institution in the southeastern United States with approximately 24,180 undergraduate and graduate students and 2,420 faculty members (University of North Carolina at Chapel Hill, 2000b). Like many schools of its caliber today, it is teeming with technological proliferation. Online registration, email accounts, and Internet access from dormitory rooms are some of the technology services prevalent on campus.

Most recently, in line with its mission to prepare students intellectually and professionally, UNC-CH introduced a campus-wide technology plan called the Carolina Computing Initiative (CCI) (University of North Carolina at Chapel Hill, 2000a).

One of the key elements of the plan is a requirement that all undergraduates, beginning with freshmen in the fall of 2000, must own laptop computers that meet university standards (University of North Carolina at Chapel Hill, 2000a). To prepare for 15,000 laptop-equipped students, faculty and staff, starting with those in the College of Arts and Sciences (CAS), received
the latest computer hardware and software as well (University of North Carolina at Chapel Hill, 2000a).

UNC-CH selected IBM as its computer vendor (University of North Carolina at Chapel Hill, 2000a). Current students, faculty, and staff, though not required to own a computer, could purchase IBM laptops or desktops at the campus bookstore. Initiative upgrades began for CAS in December of 1998 and were completed in February of 2000. University schools followed.

Another key element of CCI is continuity. As part of the plan, CCI will upgrade campus machines every three to four years in the future (University of North Carolina at Chapel Hill, 2000a).

Within the university I selected four departments in which to solicit participants. I chose these particular departments because 75% of their members underwent the upgrade process only about three months prior to my study. Thus, their perceptions pertained to relatively recent events. This eliminated the need for many participants to have to remember events that had happened a long time ago. My decision to narrow my participant pool to only four departments also was based on the amount of time I had to conduct the study.

Participants

To find participants I distributed a letter outlining my study’s purpose, requirements, and procedures to approximately 100 faculty and staff members within the four chosen departments. The letter made it clear that all faculty and staff who worked with computer hardware and software on a daily basis to complete their tasks but did not hold technology-related jobs were eligible for the study. The letter also informed potential participants of their confidentiality and anonymity in the study in return for their honest answers to the interview questions. No payment was offered.

Eleven people of the approximate 100 who received the letter returned the voluntary participation notification form indicating interest in the study. All 11 met the criteria described
above and were asked to join the study. These participants are referred to in this thesis as
Deborah, Elizabeth, Gerald, Joseph, Lucy, Marie, Mark, Marlene, Marshall, Ross, and Xavier.

The average age of the 11 participants was 48 years old. Five were female, and six were
male. All participants were white.

The participants were multi-faceted, busy people. Of the 11, nine were professors or
instructors. Thus, the chief duties of participants were teaching both graduate and undergraduate
students and conducting research. Seven also held additional positions as directors of their
departments or various programs and committees within and without the university. Thus,
administrative duties also occupied much of their time.

Based on their own estimates, participants spent approximately 55% of their daily
working time using computer hardware and software. This average included time spent working
at home as well as at their offices (and often, even while traveling). Participants’ specific use of
the technology, both currently and in the past, is discussed in the next chapter.

As implied earlier, this study employed a volunteer sample in which people chose to
participate in the study. Though research has shown that volunteers often differ from
nonvolunteer participants in ways that may affect findings, I argue that this did not affect the
quality of my data (Frey, Botan, & Kreps, 2000). My participants, though self-selected,
represented diverse viewpoints and perspectives. These can be evidenced in the data. They also
expressed an array of different reasons for choosing to participate. While some participated
because they were interested in the topic, others said they volunteered because they had the time
and wanted to help. Some people had very positive experiences to share, while others
emphatically discussed more negative points of technology. Similarly, some were well versed in
technology use, while others tried to avoid it. In short, there is no one commonality about this
group that results from the voluntary nature of the sample. There also is no consensus in this
group on any aspect of technology use. Thus, I believe the self-selection does not diminish the
significance of the data.
Apparatus

The study required few materials. I created a 10-question interview schedule that focused on participants’ general technology use, past experiences with computers, and their specific experiences with CCI (see Appendix A). The questions encouraged participants to explore how technology enabled and constrained their work and their lives in general. I tested the questions for clarity and correctness (gathering the desired information, for instance) by conducting two pilot interviews prior to the beginning of my study. Interviews lasted approximately 45 minutes to 1 hour. I tape recorded participants’ interviews and then transcribed them in order to analyze the data.

I also used a university-sanctioned informed consent form to record interviewees’ formal compliance to participate in the study. This document is included in Appendix B.

Procedure

The first step in executing my research involved acquiring approval from the university’s Institutional Review Board. Upon receiving approval, I conducted my interviews and analyzed the data according to a specific coding scheme.

Instructions to the participants directly prior to beginning the interviews were brief yet crucial to the breadth of the data gathered. I informed each participant to answer all questions honestly and in the manner he or she deemed appropriate, adding that there were no right and wrong answers. I also asked participants to feel free to ask me to repeat or clarify any question, as I had taken steps to ensure their confidentiality. Finally, I instructed each participant to read and sign an informed consent form prior to the start of his or her interview.

Confidentiality Measures

To ensure confidentiality I assigned each participant a code name and number by which he or she is referred to in the interviews as well as in this thesis. The key matching the real names of the participants with their code names was destroyed. All references made in their interviews
to specific departments, programs, curricula, etc. with which participants are affiliated also have been removed from the data.

Data Analysis

I analyzed my interview texts using the grounded theory approach first developed by Glaser and Strauss (1967) and extended by Strauss and Corbin (1990). Grounded theory is a qualitative research method that involves systematic data collection and analysis of the studied phenomenon. In this method, “one does not begin with a theory, then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge” (Strauss & Corbin, 1990, p. 23). A significant portion of the approach is open coding and axial coding. Open coding dissects the data to form categories and subcategories. Axial coding then puts the data back together in a new picture created by making connections between the categories and between the subcategories and categories (Strauss & Corbin, 1990). In this manner, one can analyze the data and build new theory.

Following the procedures for open coding, I first labeled the phenomena in a line-by-line analysis of each interview (Strauss & Corbin, 1990). I then placed concepts that related to the same phenomena into categories. This process yielded six categories of data. Next, I named the categories using a more abstract concept that served as a referent to the data in each category. Finally, I further reduced the categories by re-examining them in terms of their enabling and constraining properties and dimensions.

I then performed an axial coding of the data. Here, I examined the casual conditions, context, intervening conditions, strategies, and consequences related to the phenomenon (Strauss & Corbin, 1990). This allowed me to link the categories together into broader themes. These themes are reported and discussed in chapters 5 and 6.
CHAPTER 5: RESULTS

My research questions examined users’ past and present experiences with technology (RQ1) and their perceptions of its enabling and constraining aspects (RQ2 and RQ3).

Research Question 1: Technological Experience

Analysis of the data revealed that collectively, the participants had a long history of using and upgrading technology for work as well as a laundry list of current uses (see Table 1).

Past Experience

Participants described their technology experiences as mostly positive, though the adoption rate for new technologies varied. Rogers (1971) defined five categories of users, relative to their adoption of an innovation (new idea or practice). According to Rogers, the earliest to adopt a new idea is the innovator, who is always anxious to try new ideas. Innovators are followed by the early adopter, the respected user to whom others may turn for advice before they accept the new idea. The early majority adopts just before the average user, while the late majority, which is skeptical, adopts just after the average user. Finally, the laggard is the last to adopt, as he or she hangs on to tradition and only accepts the innovation when it is absolutely necessary.

Participants’ acceptance of new technology ranged from those who described themselves as early adopters to individuals who resisted technological change altogether or didn’t upgrade machinery and software until it was absolutely necessary. There also were those participants in the middle who felt comfortable with technology. I categorized these individuals as average users.
### Table 1

**User Descriptions and Technology Usage**

<table>
<thead>
<tr>
<th>User type&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Major usage&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Duties&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Time&lt;sup&gt;d&lt;/sup&gt; (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early adopters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark</td>
<td>Email, word</td>
<td>Instruction, research,</td>
<td>25</td>
</tr>
<tr>
<td>Marshall</td>
<td>processing,</td>
<td>administration,</td>
<td>60</td>
</tr>
<tr>
<td>Ross</td>
<td>Web research</td>
<td>committee work</td>
<td>85</td>
</tr>
<tr>
<td><strong>Average users</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elizabeth</td>
<td>Email, word</td>
<td>Instruction, administration,</td>
<td>67</td>
</tr>
<tr>
<td>Lucy</td>
<td>processing,</td>
<td>newspaper and annual</td>
<td>50</td>
</tr>
<tr>
<td>Xavier</td>
<td>Web research</td>
<td>report production, Web &amp; information</td>
<td>35 direction, workshops</td>
</tr>
<tr>
<td><strong>Laggards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deborah</td>
<td>Email, word</td>
<td>Instruction, research,</td>
<td>50</td>
</tr>
<tr>
<td>Gerald</td>
<td>processing,</td>
<td>administration,</td>
<td>40</td>
</tr>
<tr>
<td>Joseph</td>
<td>Web</td>
<td>program director</td>
<td>75</td>
</tr>
<tr>
<td>Marie</td>
<td>research,</td>
<td>assistance, typing,</td>
<td>90</td>
</tr>
<tr>
<td>Marlene</td>
<td>data analysis</td>
<td>editing, support</td>
<td>30</td>
</tr>
</tbody>
</table>

<sup>a</sup> User types are based on Rogers’ adopter categories for innovations.

<sup>b</sup> The list of usages in each category pertains to the entire group of users in that category.

<sup>c</sup> The list of duties in each category pertains to the entire group of users in that category.

<sup>d</sup> The percentages of time spent using technology are self-reported.
Three of the 11 participants could be categorized as early adopters. Mark was characteristic of this category:

… I’m happy to get upgraded because I’m a technology pioneer. Back in the old days, I was one of the first to get the PC and the first to get a bigger hard drive. I was one of the first people probably in the department to have a modem. … I’m always looking forward to new generations of technology …

Though Mark’s words may sound like those of an innovator, he is characterized as an early adopter because he is not a zealot who seeks the daring and risky venturesomeness that Rogers describes to be a prerequisite for the former category (1971). Instead he, and the others characterized as early adopters, simply embrace technology very early and look forward to the possibilities it brings.

Conversely, three participants characterized the opposite end of Rogers’ innovation spectrum, the laggards. This group made decisions based on what worked or was done in the past. Rogers (1971) generalized that earlier adopters viewed change in a more favorable way than later adopters did. Thus, we can speculate that a characteristic of laggards is that they do not like change. This was certainly the case in my laggard group, especially in terms of what they characterized many times as unnecessary change. Marie exemplified this idea well, even though she said she used computer hardware and software to perform 90% of her work.

I just don’t like change. You learn how to do it one way and then you get an upgrade and things change. As long as what you’re using is adequate for your needs … you don’t just throw it away. If it no longer meets your needs or it wears out or it breaks, ok, then you go get another one.

Three participants symbolized the average user, as they did not fit into either the early or late majority categories, according to their description of technology usage.

Current Usage

Based on their own averages, participants spent approximately 55% of their daily working time using computer hardware and software. This included work performed at home and on campus.
Participants’ computer use was concentrated in a few key areas. All participants reported using email and word processing on a daily basis. Eight of 11 used technology to conduct research via the World Wide Web as well as use the Internet for non-research purposes. Four participants used presentation and spreadsheet software. Four also used data analysis software.

These uses of the technology allowed participants to complete several tasks integral to their positions and work duties. For example, email allowed them to stay in contact with students and to answer their questions and send them information. Email also allowed collaboration and contact with colleagues, especially those in distant locations. Word processing capabilities enabled participants to produce multiple types of documents. For example, many participants used word processing to produce materials for use in the classroom.

Finally, the Web allowed participants to conduct research and find information right from their offices, often reducing or eliminating trips to the library to find many sources. Sometimes this information would be timely and costly to access otherwise. For example, Ross said he read newspapers from Iran and other countries in relation to his research. Without the Web, he would have to wait several months and go to distant universities to access these papers.

Research Question 2: Enablement and Constraint
Within General Technology Usage

Participants discussed four major themes that exemplify how technology in general enables and constrains their work efforts and lives. Most of the findings were positive. In other words, participants mostly spoke of technology as an enabler. However, distinct constraints did emerge.

Participants most frequently discussed accessibility (via email), reliability, ease, and time. All four themes yielded both enabling and constraining aspects (see Table 2).
Table 2
User Perceptions of Technology in General and Its Enabling and Constraining Aspects

<table>
<thead>
<tr>
<th>Perceived qualities</th>
<th>Enabling aspects</th>
<th>Constraining aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility (via email)</td>
<td>Expanded colleague base</td>
<td>Time-consuming</td>
</tr>
<tr>
<td></td>
<td>Increased student contact</td>
<td>Overwhelming</td>
</tr>
<tr>
<td></td>
<td>Increased “others” contact$^a$</td>
<td>Ubiquitous$^b$</td>
</tr>
<tr>
<td></td>
<td>Information accessibility</td>
<td>Effects on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>communication$^c$</td>
</tr>
<tr>
<td>Reliability</td>
<td>Expected operation$^d$</td>
<td>Dependence leads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to frustration</td>
</tr>
<tr>
<td>Ease</td>
<td>Ease of (re)production</td>
<td>Added expectations$^e$</td>
</tr>
<tr>
<td></td>
<td>Ease of learning</td>
<td>Added difficulty$^e$</td>
</tr>
<tr>
<td></td>
<td>Enjoyment$^e$</td>
<td></td>
</tr>
<tr>
<td>Time/Speed</td>
<td>Faster work</td>
<td>More work$^e$</td>
</tr>
</tbody>
</table>

Note. Enabling and constraining aspects are not a 1-to-1 match. Do not read the table as if an enabling aspect, for example, directly matches with the constraining aspect on the same line.

$^a$“Others” included friends, family members, and even doctors in one case.

$^b$Participants expressed the idea that email was always “on.”

$^c$Four or fewer participants discussed this aspect.

$^d$Participants expected technology to work and perform the tasks that they required.
Accessibility via Email

Participants spoke of email frequently and in rich detail. They reported that it increased their accessibility to people and information. This was perceived both positively and negatively.

Enabling aspects. As academicians, many participants spoke of how email has expanded their colleague base because it allows them to collaborate with people who are geographically disperse. Here, participants recognized an almost certain impossibility of some of their communication if email did not exist.

Gerald said email changed the community to which he belongs. “[Email has] changed my whole idea of who my colleagues are to some extent,” he said. “I mean, there are people who live in other states and, too, in other countries that I'm communicating with, more or less, daily.”

Joseph echoed that thought, saying “I have colleagues around the world. Every week … I am communicating with colleagues in Israel, New Zealand, Australia, and I do it for free. What a concept. That’s an advantage.” Xavier said accessibility is the biggest advantage of technology for him because “it allows me to do work and remain in contact with people virtually any time of day or night, regardless of geography.”

Accessibility to students also increased. Deborah called this the biggest advantage of her technology use. “I think the computer, the email, particularly, allows me to have a connection with my students …” Gerald said his students never hesitated to communicate with him via email. “It’s made it much more interactive in that way. That’s good,” he said.

Some participants said that while their communication with certain people was possible without email, it certainly would not be probable. For example, Gerald said he was hearing from his high school classmates because of email and World Wide Web capabilities. Lucy directly stated that she could not stay in contact as much with people without email. Joseph spoke of communication with his family.
I am more continuously in touch with my nieces and nephews because we’re all on email, and one of my brothers. One of my brothers is not on email, but the other one is, and we’re in touch daily. If we were paying for telephone calls, rest assured these things would not take place.

Marlene even went so far as to say, “I’m always frustrated when I can’t communicate with someone by email. I even communicate with some of my doctors by email.”

Another advantage or enabling aspect of email was that it gave participants increased accessibility to information and the ability to disperse it to others. Elizabeth talked about this ability:

The idea of email, and especially attaching to email, is great. For our seminar program I will oftentimes post papers that our guest speakers are going to be discussing. I will often put it on the Web, and so it’s accessible. But sometimes what I’ve often done is if the professors, the guest speakers have email, [I will] attach the papers to an email.

Marlene, who collaborates with other authors, also spoke of this capability. “It’s so easy now because we just send documents back and forth,” she said. Xavier added to this sentiment, saying that he felt a vast amount of work was done via email.

Constraining aspects. While participants acknowledged accessibility as a great advantage, it clearly presented disadvantages, too. With such increased accessibility, participants said they felt that email was time-consuming as well as overwhelming at times.

For example, Xavier, who is a member of at least two listservs that send “very important information,” said he receives between 200 and 250 emails per day. It’s even worse when he is traveling. “If you don’t log in and keep up with it, then it’s almost overwhelming when you get home and log in and open up your email and you’ve got somewhere between 4(00) and 5(00) or 600 messages waiting for you. At that point and time, it’s really almost intimidating.” He weeds through them by looking at the tag lines to decide which ones are critical and need an immediate response. Gerald had the same experience when he left the country for a week. He returned to find 200 email messages waiting for him.

Ross agreed that email can become voluminous, even when one is checking his mail daily. “… I now get probably a hundred emails a day substantive, you know, things I need to
respond to,” he said. “So I spend a large part of the day sort of swatting these things away, and I have to make sure now that I schedule time to … check the email.” He said without this scheduling, his entire day would be dedicated to checking email because of the various projects and connections he has with colleagues via the medium.

Marlene echoed the same sentiment. “Sometimes I feel overwhelmed by how accessible I am. It just sometimes feels as if I’m too much in contact,” she said. “Undergraduates will email me, and I’m glad they will, but if it’s the night before the paper is due … On the one hand I’m glad that they can reach me, but on the other hand, a little downtime is nice.”

For Marshall email took up his time in another way — in the form of long questions from his students. “They will ask me to respond to questions that they have, and it’s often the case that the responses would require no more than 5 to 10 minutes face-to-face conversation,” he said. “… [They] will take 40 to 50 minutes of composing an email response.”

Participants also complained that the ubiquity of email, i.e., the fact that it is always “on” even though one’s machine may be off, was a hindrance. Xavier summed up most participants’ thoughts and feelings about its constraint. “It also, I think, is an enormous disadvantage and headache in that there’s no place of refuge, if you will, anymore. … It’s just you can’t get away from it.” This, for him, was coupled with the fact “that there is an expectation that you should respond immediately and that given the number of emails that I have to deal with on a daily basis, that’s almost impossible.”

Marshall felt the same way. “I miss my privacy. I miss being able to go home and not feel like there are people knocking at my door all the time,” he said. “I really miss just being able to concentrate on something without having a lot of noise in the background.” He reiterated his frustration with email’s ubiquity, adding, “The second you flip on your computer, of course, you have to check your email.”

Thus, it is obvious that email’s accessibility is both an advantage and disadvantage in participants’ work and personal lives. One can surmise that while being able to reach and be
reached is an aspect of email that has transformed participants’ lives, this accessibility can be limiting as well when there is too much of it.

Three participants also found that email affected the quality and/or quantity of other forms of communication in negative ways. For example, Gerald wondered how archives would look in a century or so, as people are writing more emails and fewer letters now. “If somebody wants to write about the [university in] the year 2000, what they’re going to find in the archives is a lot of memos,” he said. As someone who has been saving correspondence about his work and travels for three decades that someday will be archived, Gerald said he doesn’t save emails. “Frankly, there’s not a lot worth saving.”

Mark disliked that the use of email has led to a lack of documentation. “I do try to save important emails,” he said. “But it isn’t like with paper letters … So at times there is an ephemeral characteristic [to email] that is a little troublesome.” He also felt that the email could not catch the same subtleties in meaning, etc. as written communication does.

For Lucy, email curtailed another form of communication, face-to-face interaction. She said she missed the in-person contact she had with students when they came to office hours more. That contact was the one thing she missed from the time before technological proliferation.

Reliability

Participants expressed this theme in two ways. One was as an expectation that technology worked when one needed it. The other was an expectation that it did what one wanted it to do.

Enabling aspects. Participants were succinct and exact in their expression of what reliability meant to them. For example, Ross said, “I expect it to do everything I’m using it for, and I expect it to do it flawlessly.” Deborah said, “I expect there to be the Internet when I click on Netscape. … I don’t have high expectations, just that it functions.”

Lucy said she expected “that it will work, number one. Number two, that it will enable me to do my job more effectively, competently.” Joseph expected his hardware and software to “provide me with the service that it is supposed to provide,” he said. “When I pull up [a statistical
program], I expect it to do the statistical analysis. When I pull up Word, I expect it to do the kind of word processing that I do, and so on and so forth.”

Xavier was just as specific when discussing how reliability for him meant being able to use it when he needed and wanted to use it. “I don’t (want to) have problems getting connected when I’m at home, that the servers are up and running, that the machine is relatively reliable, the software packages don’t crash,” he said.

**Constraining aspects.** The disadvantages or constraint of reliability came in terms of participants being dependent upon technology always working. They expressed being frustrated when it did not work or was not available because they were so dependent upon its reliability.

In a frustrated manner Marshall described why dependence upon reliability was not good. “What I’ve got is undependable, limited, highly constrained,” he said emphatically. “The operating system, I think, is poorly designed. It crashes all the time. I think that the server connections for access to, for example, network services here, is undependable. Sometimes it’s up, sometimes it’s down.” Ross expressed similar frustration, saying “When it crashes or I lose something, I don’t expect that. I’m very angry.”

Elizabeth acknowledged that while she knew computers were not perfect, she still felt frustration when she was directly confronted with that reality. “It can be frustrating dealing with something that you expect to be perfect, and then it isn’t and having to find out what’s wrong.”

Marlene mirrored the feelings of the majority of the participants. “The frustration is when it doesn’t work because I am so dependent on it to get things done,” she said. However, interestingly enough, she also found an enabler within this disadvantage. “Actually, every once in a while,” she said, “if the system’s down, it’s relaxing because I can’t do all that other stuff (work).”

Thus, participants expected reliability from the technology they use to complete their task. When this expectation that the hardware and software work continuously and correctly panned out, the ability to perform tasks efficiently and with the ease participants also spoke of
(see the next section) made their lives easier. However, when the dependence which resulted from reliability left users frustrated, searching for help, and in some cases, unable to work, it ceased to be an advantage of technology.

Ease

All participants expressed this theme repeatedly in their interviews. The use of the word “easy” or such phrases as “easy to use,” “easy to learn,” and “easy to operate” appeared often. Specifically, participants defined ease in two ways. One was as technology’s ability to easily produce and reproduce material, such as in word processing programs. The other was simplicity in learning.

Enabling aspects. Elizabeth expressed this sentiment well when saying, “It (technology) makes my job easier. In letter-writing, for example, it’s so much easier to work something up on the computer, as opposed to the old-fashioned typewriter or writing it out longhand and then typing it.” For her, she said, the ease of the computer led to efficiency.

Gerald made a similar point when discussing how he performed his work before word processors and technology were so prevalent. He described a long process that has been reduced in difficulty by word processing as well as the effect that the ease of production has had on his writing style.

You know, I wrote for 20 years without a word processor, with a typewriter. Literally cut and pasted with Scotch tape paragraphs together and retyped. Well, it’s so much easier to write now. Just bang out the drafts … I used to have to know what I wanted to say before I said it, and now I just say something and say, ‘Does that look right?’ It’s changed the way I write.

Not only did participants talk about how easy it was to produce material using technology, but they also discussed the simplicity, too, with which they manipulated and changed that material and saved it for future use. Deborah, a lecturer who uses her class notes multiple times, called this a huge advantage. “What’s really nice is being able to type them (her notes) up, rearrange them, edit them, do all kinds of things with them,” she said. “I can create very
organized notes and double-check them, and they’re on the computer, and I can use them forever.”

Marie, who spends most of her working time using a word processor, discussed how this factor made her job easier. She said word processing cut down on the amount of work she used to do because making changes and corrections was now easier. She, like so many of the participants, remembered the days when making changes to a document meant having to retype it in its entirety. “You type a manuscript and then you can go in and make changes, where on the typewriter, you had to type it all over again, even the correct part,” she said.

Marlene remembered the difficulty that change used to bring as well when she was writing her book manuscripts. She recalled either typing it or handwriting it and then handing it off to a secretary to type. Changes were difficult after proofreading and finding errors. She also spoke of the difficulty with her dissertation changes.

The final draft of your dissertation, oh boy. The person who typed it for me was on call that day that I took it to the library, where they measured the margins. And we had to change some sentences so we could arrange a couple of pages because the margins were just a little bit too small.

In addition to the ease word processing brought to the production and reproduction of documents, participants also specifically talked about how technology should be simple to learn. As Lucy said, it should be “not so difficult to figure out.” Gerald elaborated on that thought, saying “I like this stuff to be point-and-click. I like it to be transparent and easy to learn. I resent time spent learning to do something as opposed to simply doing it.”

While Xavier recognized that some learning was always necessary, he wanted that learning to not be time-consuming. “It (technology) should be relatively easy to use, he said. “I understand the importance of the learning curve and paying attention, but some of my most serious frustrations have been when I’ve been trying to learn new software.”

These results contradict those of Karahanna and Straub (1999). While they found that complexity, which is the extent to which a new innovation is easy or difficult to use, was not an
important influence once users adopted the new technology, my participants suggested the opposite to be true. Their responses indicated that ease of use continued to be an important factor, even after months of use of the new technology.

Three participants felt that the ease of computing made their work more enjoyable. Gerald said, “It’s changed the way I write, not necessarily made me a better writer, but it’s made writing more fun.” Lucy echoed the enjoyment sentiment. “I enjoy using [technology]. It makes [working] even more enjoyable in many ways.”

Deborah, a lecturer, spoke of how word processing gave her an outlet to be creative with the materials she prepared for her classes. “I really enjoyed getting into different fonts, even on my syllabus. [With word processing] I can have more fun with it. I can be more creative because of it.”

**Constraining aspects.** Participants expressed no overall disadvantages to the ease of technology. However, two significant but more individual constraints did emerge.

Two participants said that ease led to increased expectations in the quality and quantity of work that had negative effects. For Joseph heightened standards created disappointment if those expectations were not met. For example, he expects error-free documents because of the ease of word processing. Thus, simple mistakes such as typographical errors upset him greatly. “When I see typos, … I go fucking crazy! And I go fucking crazy because there is absolutely no excuse for it since there is a spell-check on the thing.” Ross said the technology led him to do more work. “The technology has raised the expectations as well as … I think I now do more tasks. We’re required to be so much more productive than was the case 20 years ago.”

One participant, Marshall, asserted that technology made his job harder, not easier. He stated that it was difficult to manage and operate, complicated, counterintuitive, and hard to learn. “I would like to have a Jaguar, a technological Jaguar, and what I’ve got is a Model T,” he said.
Time/Speed

Time/speed was an intuitive and self-explanatory theme. Participants stated that technology enabled them to work faster and quicker without feeling much need to elaborate.

Enabling aspects. Joseph summed up this theme best when he compared doing work now to his college days before the prevalence of technology. It (technology) saves me time. … When I did both my master’s and my Ph.D. dissertation, there were no computers. There was no online, nothing. The concept didn’t exist,” he said. “I can now do in an hour or two at my desk what would have taken me, literally, two 8-hour days in the library at [college].”

Some participants expressed technology’s time-saving properties in terms of human interaction, especially with students. For example, Deborah said technology saved her time in terms of office hours or after-class time. “I probably would have to have more office hours because some of the questions that they would have asked me over email would’ve had to suddenly be dealt with in person,” she said. “Or after class, I’d have to allow 15 minutes for the barrage of questions that inevitably come.”

Constraining aspects. While technology saved participants’ time, for a few, it also caused them to have to work longer. For example, Marshall said he spent more time preparing for class when using technology than when he was not using it. “I feel like I’ve been sort of sucked into a vortex where I can’t do without this stuff, but in order to get along with it, I have to put a lot more time into doing the same tasks than … I did before I had [the technology].”

Research Question 3: Enablement and Constraint Within Technological Change (Upgrades)

Participants expressed both positive and negative feelings about the upgrades they had experienced (see Table 3). They were especially adamant about the perceived enabling and constraining aspects of the Carolina Computing Initiative (CCI) and its effects on the university and education. As stated earlier, CCI is a campus-wide plan that has upgraded faculty and staff’s
computers and required new students at the university to own a laptop that meets UNC-CH’s specifications.

Note here that the setup of RQ3 is different than that of the previous question. Participants were not asked about the prominent qualities of upgrades. The wording of the question reflected the suspicion that the answers would be similar to those given for the first part of RQ2 (the results confirmed this). The impetus behind this question was not to encourage participants to break down the process of upgrades into little pieces. By asking participants about qualities of technology in general in RQ2, I had already accomplished that breakdown. Instead, I wanted participants to tell me the enabling and constraining aspects they perceived in upgrades as whole entities in hopes that they would focus on larger issues that may be exclusive to that process. While participants did reiterate many qualities of technology, several solid issues did emerge, as hoped.

**Upgrades**

**Enabling aspects.** Two qualities resurfaced as enabling and constraining aspects when participants discussed upgrades. These were time and ease. Participants said technological change brought faster machines and easier methods of achieving their work. Joseph said for him, the purpose of upgrades was to make things faster and often easier. “The upgrades that are important to me are the ones that take what I already do and make it better and easier.” Gerald also thought the increased speed was an advantage.

Participants also discussed as an advantage the often-numerous new features that accompanied upgrades. The features contributed to making their work easier. For instance, Mark said he liked upgrades because he always discovered helpful features within them.
Table 3
User Perceptions of the Enabling and Constraining Aspects of Upgrades and CCI

<table>
<thead>
<tr>
<th>Technological change</th>
<th>Enabling aspects</th>
<th>Constraining aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrades in general</td>
<td>Time/speed</td>
<td>Change</td>
</tr>
<tr>
<td></td>
<td>Ease of doing work</td>
<td>Frequency of change</td>
</tr>
<tr>
<td></td>
<td>New features</td>
<td>Cost&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Compatibility&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Incompatibility&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>CCI</td>
<td>Time/speed</td>
<td>Uncertainty of purpose</td>
</tr>
<tr>
<td></td>
<td>New features</td>
<td>Uncertainty of effect</td>
</tr>
<tr>
<td></td>
<td>Increased accessibility</td>
<td>on education</td>
</tr>
<tr>
<td></td>
<td>Support</td>
<td>Uncertainty of effect</td>
</tr>
<tr>
<td></td>
<td>Symbol of commitment</td>
<td>on students’ skills</td>
</tr>
<tr>
<td></td>
<td>Standardization&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cost&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Comfort&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compatibility&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note. Enabling and constraining aspects are not a 1-to-1 match. Do not read the table as if an enabling aspect, for example, directly matches with the constraining aspect on the same line.

<sup>a</sup>Four or fewer participants discussed this theme.
He talked about a specific advantage he received in Microsoft Word:

Features of Word have made it easier and easier to work with my students because you have the ability to insert comments you couldn’t do before. I can get a document from a student, I can track changes on certain comments, for example. If I had to do that before, by hand, it would have meant writing out stuff, either writing in the margins or, you know, the person’s going to have to understand my handwriting.

Marshall, who was happy about word processing programs’ current graphic and Web authoring capabilities, agreed. Lucy felt the same way about Microsoft Word and PowerPoint, Microsoft’s presentation software.

Three participants also mentioned increased compatibility as an advantage of upgrading. Marshall said upgrades gave him more compatibility between programs. “You can cut and paste from one program to another. [Or] if you have a good email program, you can open up a Web browser from your email program by simply clicking on links in your email.” Xavier agreed with the enablement brought on by integrated functions between programs.

For Gerald, upgrades brought compatibility in terms of allowing him to using what others were using to create and send documents. Without having the same programs as others, “you’ve got to print everything out and fax it or mail it or something. You can’t send things as attachments or disk so then they can read it.” He compared his use of WordPerfect as opposed to Microsoft Word to having Betamax when the rest of the world had chosen VHS.

Constraining aspects. The major disadvantage to upgrades that a majority of participants discussed was change. For some participants it was the change itself that was bothersome. “I just don’t like change,” said Marie, who perceives change as a constant starting-over. “You learn how to do it one way and then you get an upgrade, and things change. You just get your program all set up with your personal idiosyncrasies … and then they upgrade it and you start all over again.” Marlene echoed this sentiment. “It’s always scary when there’s a change because you have to learn new things and worry about things disappearing,” she said.
For others the change wasn’t as bothersome as the frequency of the upgrades. Lucy felt that “being able to upgrade a software program because they keep coming out every two or three years is always a problem.”

A lesser-expressed disadvantage was the costliness of upgrades. Participants expressed an ironic aspect of upgrades in terms of money. While four said an advantage of upgrades for hardware and software manufacturers was increased revenue, just as many viewed it from the opposite standpoint. They said the disadvantage to themselves and other users was that upgrades can be expensive.

While some participants gained compatibility from upgrades, others lost it when they moved to later versions of software. “We have a lot of professors that are working in Word 5, and their stuff cannot be translated into 2000 because it’s just too big of a gap in there. So unless you keep up with it, you’re lost,” said Marie. Elizabeth spoke of incompatibility, too, especially if one has the latest software or hardware. “If … you have something that’s very, very upgraded, most people wouldn’t have it.”

The Carolina Computing Initiative (CCI)

Enabling aspects. Participants spoke of CCI and undergoing the upgrade in mostly positive terms. Not surprisingly, participants reiterated several themes when discussing CCI. These included time/speed, new features, increased accessibility, and also compatibility. However, two solid new themes did emerge. The first was the support that participants received during the upgrade. The second was the perception that the university is committed to the latest technology and educational excellence.

Lucy gave part of the credit for her initial positive feelings concerning CCI to her knowledge about the support she would receive during the transition. When asked what she thought when she first heard of CCI, she said, “I was excited because I knew … there’d be support to help me, that there were going to be people who I could call on at any time to get help. They’ve (support staff members) been very helpful. They’re very good.”
Additionally, the knowledge of ongoing support after the upgrade gave Lucy a sense of certainty and comfort. “The obviousness of it, I mean, you got the list right up here, you always know what to call.”

Ross was positive about the support he was receiving through CCI as well. “The tech support is getting better and better, more and more systematic, and I like the idea of them getting licenses for the whole campus to have the same software, with them having people who know the software inside and out,” he said.

Even Marie, who openly expressed several times that she did not like change, applauded the support. “They provided very good staff people. They came by, and they backed up all our files,” she said. “Then when the new machines came, they transferred the files. Then somebody came by, you know, your “comfort” person, and they answered all your questions.” (“Technocomfort” and “comfort” were CCI adjectives used to describe the role of the support staff members as they helped individuals make the transition from their old technology to the new.)

Gerald felt that continuing support was a key to CCI’s future success. “We’ve got a lot of investment in this … and I hope we’ve got the resources to provide a fairly high level of support,” he said, “because I think that’s important in actually realizing the potential of this.”

Perhaps Marlene’s remark summed up best how much of an advantage support was during the CCI upgrade. When asked if there was anything she wished she had been told that she was not prior to the upgrade, she said, “Perhaps that they really were going to live up to their promises to give as much support as necessary. That is essential. The “technocomfort” people were very [helpful] … When [a support staff member] was in here, he showed me some things I didn’t know.”

According to participants, CCI also symbolized the university’s commitment to keep up with technological advancement, and in turn, increase students’ quality of education. For example, Ross said he felt better knowing that the university made this commitment. Mark felt
the same. “I’m really pleased the university has made technology more important, not just with [a center that is a major source of technical support on campus] but … [another center that is a major source of technical support on campus]. It’s a very important development.”

Lucy spoke of how others would see the university because of CCI. “I think the university is going to be perceived as, along with many other universities, taking a hold of this technology advancement, doing something about it and getting on board, not being left behind,” she said. “I think one of the biggest perceptions people have of the university is that they will be up to speed.” Xavier summed it up by saying, “My suspicion is that … CCI and similar investments in technology are probably critical for this institution and others who invest in it if they’re willing to maintain educational excellence.”

Three participants also mentioned standardization as an enabling aspect of CCI. For example, Ross felt that CCI “is simply equalizing the computers that are on the desks or bringing them within a narrower band of diversity.”

Another minor theme was comfort, the idea that CCI would increase people’s interaction with technology and thus, make usage easier and more effective. Gerald, for whom comfort was important, found this to be an enabling part of CCI for students who were averse to using technology. “… If we can sort of elbow people into being comfortable with computers, if that’s what it takes, we’re doing them a service because they’re going to be dealing with them the rest of their lives, unless they’re selling hamburgers.” Elizabeth thought CCI was making faculty more comfortable with technology as well.

**Constraining aspects.** Though participants perceived CCI to have several advantages, they were not so certain about how the plan would affect the quality of teaching and students’ educational and social skills. For example, many participants did not understand the complete purpose of CCI. Lucy said, “I still don’t understand how this is supposed to transform anything.” Xavier speculated that this might be a prevalent attitude about the initiative.
What I don’t think we have a good sense of is what it means as an institution and in terms of teaching practices when 3,000 undergraduates hit the campus with laptops in the fall of 2000 and we ultimately reach the point where virtually everybody on the campus is going to have some sort of computer. I don’t think we know quite what the implications of that are. I think it has enormous implications that we are not aware of.

This is significant because research has shown that this uncertainty could impact CCI’s payoff. Tallon et al. (2000) proposed that higher IT impact results from clear goals for IT investment. Tallon et al.’s results suggest that the university should clarify the plan’s goals in order to maximize returns.

Participants went even further to say they didn’t think technology would help professors teach better or students learn more. Deborah agreed about the learning aspect. “I don’t think technology really helps people learn. And I don’t think that it produces high-quality learning,” she said. “I just don’t think it’s made them (students) any brighter.”

Joseph spoke of what he considered the dangers of distance learning, in which technology is used to reach those not physically in the classroom. He drew a distinction between learning and what he calls “distance information transmission.”

Distance education, in many ways, is an oxymoron. You can have distance information transmission, but distance learning is an entirely different concept. I feel that what will happen is that as the technology [continues], the whole notion of distance education will become more important … and more students will be sold a bill of goods that they are getting an education, and they are not getting an education. It’s not learning because learning requires an interaction which is much more fluid. It requires being touched, maybe even physically touched. It requires being in a small space where ideas can be shared quickly and freely and easily, and we have complete access to each other. It requires that kind of face-to-face to take it from information to learning.

Joseph, who has done distance learning himself in the past and is considered a success story, felt that distance education was “abdicating the responsibility for learning … abdicating the responsibility for wisdom. We just shove information down people’s throats in prettier and prettier packages …”

Still others felt that CCI’s future upgrades, as they bring more technology to the campus, could have a negative impact on students’ skills. For example, some speculated that students may
lose valuable research and evaluation skills because technology offered increased accessibility to more — and more questionable — information more easily.

Deborah expressed worry for students’ ability to find credible and solid information. “I’m concerned about how rigorous and how critical are students going to be,” she said. “And even if they do become critical, do they know where to find a good source cite? Do they know how to make a legitimate argument? And thinking that just because it’s out there, it’s good.

“I definitely had reservations about technology, not just replacing instruction but replacing actual library research,” Deborah continued. “Replacing the kind of thought processes that go into drafting a paper on paper versus just typing it up so that the first draft is the paper …” She also expressed reservations about students’ overreliance upon the computer to check their work for them (such as using grammar and spell checks), fearing students may know less if they don’t have to use it.

Xavier reiterated this concern. “I think it makes teaching students critical evaluation, how to evaluate information critically, that much more important. I think it becomes even more critical given the increased access to information.”

Elizabeth speculated about the effects of vast use of the Web for information. “As far as education goes, there might be a reliance on the Web or new technologies to such an extent that it might … reduce one’s exposure to some sort of old-fashioned instructional materials, such as reading a book,” she said. “… With technology making information so accessible and so easy to get … it can make people a little bit reluctant to read a newspaper (for example). The New York Times on the Web isn’t the same as the New York Times ...”

Marie felt, too, that students’ research and library skills may be in jeopardy because of technology. “They never really learn how to use the library, which I think is part of any scholar’s education,” she said. “If you can’t go to the library and learn how to find original material in your own field, what kind of a scholar are you?”
Additionally, Marie expressed concern about technology’s impact on students’ social interaction skills. “I think it’s (technology) very isolating,” she said. “People don’t have to interact with each other, with their fellow students. They can sit in their dorm room with their computer. It doesn’t help them build social skills for when they get out in the work world.”

Marshall saw a more long-term deeper-cutting effect of technology, one that reached students well before college. He felt that, at the college level, pumping money into technology would erode funds for hiring more faculty in order to reduce class size, in turn diminishing the quality of students’ educational experiences. He then speculated this behavior at the university level would trickle down to K-12 schools.

By making technology a centerpiece of higher education initiatives of various kinds, what institutions of higher education do is they send a message to public schools … that the most important thing to do is to acquire and teach students how to use technology. And what’s going to happen is that American schools, which are already strapped for money, are going to cut back on other programs that might actually be better for students in the long term in order to pay for short-term purchases of and upgrades of hardware. And in order to get the money to maintain them, they have to cut back on physical education programs, art programs, music programs … science labs go by the wayside.

Finally, cost re-emerged as a perceived disadvantage of CCI, as it was for upgrades in general. Four participants were concerned about the expense of properly implementing and maintaining CCI. This included concern about retaining the outside funding that UNC-CH is using to implement the plan. “I hope, knock on wood … that we’ve ridden the right horse,” said Ross, referring to the university’s decision to work with one vendor to supply the necessary equipment to upgrade machines every four years.

Technology and the Issue of Control

Participants often mentioned the idea of control as they discussed their interaction with technology in general as well as during and after upgrades. Though this concept was not discussed particularly as an enabler or a constraint, it is important because it contextualizes the
way participants view their hardware and software. This is particularly enlightening because the interview schedule did not directly address this issue.

From the data, two unspoken questions arose. First, does technology, particularly email, take away control over who and how much one communicates, and secondly, does technology control how one works? Though many people spoke of how the contact that email affords could be overwhelming, five participants said they still retained control over the constant barrage. As Deborah said, “I check [email] when I want to check it, and I’m not constantly available to [students].”

Joseph echoed this sentiment. “I can choose when to be online and when not to be online,” he said. He also thought the email problem was simple to solve if one did not want to be swamped. “Don’t use email.” Perhaps an oversimplified option, that suggestion does represent Joseph’s immense sense of control over the technology he uses.

Ross said he had no sympathy for people who say their computers have taken over their lives. He felt, too, that ultimately there was a simple solution. He characterized his ideas about being in complete control of the technology in the following quote:

… what I hear is, ‘Oh, computers have sped things up, my life is no longer leisurely,’ and [people] bemoan that. I’m like, ‘Well, unplug it.’ I mean, you don’t have to have it on. … it’s not the computer making your life harried. It’s you making your life harried because you have a computer.

Lucy said technology increased her control over her work. “[The technology] has provided me with … more freedom than it did 10 years ago.”

Though only one participant, Marie, said she felt less in control as she received more technology, she was quite adamant and consistent in expressing this idea. For example, she felt out of control because she could not fix the technology. This was in contrast to the days when she used a typewriter and could tinker with it herself to repair it. Additionally, she felt vulnerable to the technology not working. “The server goes down, there’s nothing you can do about it,” she
said. “Your hard drive crashes, and until you get another one, there’s nothing you can do about it.”

She also spoke of a lack of control concerning upgrades. “You’re forced to keep up,” she said.
CHAPTER 6: DISCUSSION AND CONCLUSION

Based on the results of this study, we can draw specific conclusions about technology use. I propose that the research bears out three significant findings.

Significant Findings

A Technology Road Map

One important result of this study is that the data provides us with a rubric for maximizing technology’s positive and enabling aspects. Broadly, this study shows us that technology use is efficient when it is accessible, easy, quick, reliable, and combined with support. There also must be a recognition of the fact that technology usage is subjective and will vary from person to person.

While important to remember, the aforementioned conclusion is certainly nothing earth-shattering. However, a more original and enlightening finding emerges when we examine this information against the backdrop of the data on upgrades and CCI in specific. Here, two other small conclusions arose. First, participants spoke about how change was a disadvantage to upgrading. Many either disliked the change in general or the constant nature of change that upgrading often brought. Thus, we can conclude that constancy and stability are important to users. In other words, users want systems that are consistent and retain some similarity across time. They do not want radical upheaval.

Secondly, participants also discussed their uncertainty of the full purpose and impact of CCI. Many said they did not understand the effect it was intended to have on teaching, learning, and education in general. I argue that from this data, we can conclude that certainty also plays a part in technology use. In other words the more that users understand the purpose of technology,
the more efficiently they will use it. Tallon et al. (2000) also support the notion that clear IT goals will affect its impact.

When examined individually, these three small conclusions seem unimportant. However, I suggest that when they are integrated, a far more significant outcome is born. This larger conclusion tells us that it is not enough for technology to simply be accessible, easy, quick, reliable, and supported. While these factors make technology use efficient, they alone cannot maximize that efficiency. To reach full potential, those factors must be combined with stability, constancy, and certainty of purpose. This helps to explain why my colleagues at the newspaper I discussed in the beginning of this thesis were not happy with their technology, even though they continued to get the best and newest. Their technology had the first set of factors, but it did not possess stability, constancy, or any certainty of purpose. In other words, the technology was getting faster and easier and more reliable, but it was changing too often, and my co-workers did not understand how it was supposed to help them improve their performance.

**Relationship to current literature.** This rubric confirms many technology usage factors found in the current body of literature. These would include personal constructs, ease of use (or complexity), relative advantage (or perceived usefulness), and support.

For example, the use of personal constructs, or the schema or contexts an individual uses to interpret a situation, is clear in my data (Malhotra, 1999). While it is evident that the social construction of the technology (to enable people to do their work more efficiently) was in effect, one cannot deny the fact that users also perceived constraining aspects of the technology not intended by those who designed or implemented it. This supports Malhotra’s findings (1999). Similarly, participants reiterated the importance of ease of use frequently in the data. While this contradicts Karahanna and Straub (1999), who found that complexity was not an important influence for users after adoption, it confirms the work of various others (Rogers, 1971; Davis, 1989; Davis et al., 1989; Kline and Gardiner, 1997; etc.). Furthermore, participants’ expression of enjoyability as an enabling aspect of ease confirms the work of Venkatesh, who
found that enjoyment led to increased perceived ease of use (1999). However, there were no differences in use discernible by participant age or gender, as some researchers suggest.

Participants also showed that relative advantage, or perceived usefulness, was a strong indicator as to why they used technology. Relative advantage, according to Rogers, is the degree to which an innovation is better than its predecessor (1971). This is evidenced in the fact that most participants found technology to be more enabling than constraining in their work. One also can see this in the fact that most participants said they did not miss any aspects of work that had disappeared when technology became prevalent. Thus, the effect of relative advantage shown in my data confirms the work of Rogers (1971), Karahanna and Straub (1999), Davis and his colleagues (1989 and 1992), and others.

Finally, my data overwhelmingly confirmed the literature that finds support to be important to technology adoption and usage. Support was the most overwhelming enabling aspect of CCI, according to participants. Even Marie, the laggard user who reiterated many times that she did not like change and felt out of control of technology because of constant upgrading, accepted CCI, at least in part, because of the level and amount of support.

My data is similar to that of others who have studied technology usage on college campuses. For example, my results correspond to those of Groves and Zemel (2000) in a study of 66 faculty members and graduate teaching assistants in one college at a southeastern university. In their study they found that respondents rated themselves as having “good” or “expert” knowledge with word processing (86%), email (62%), computer spreadsheets (46%), Internet/World Wide Web technologies (42%), statistical computing (41%), and presentation software (41%). This corresponded with the five most often-used technologies in their teaching (word processing, Internet/World Wide Web, presentation software, email for student contact, and computer spreadsheet). This occurred in my study as well.

Several factors in my study also correspond with those Groves and Zemel found to influence the use of these instructional technologies (ranked as “important,” “very important,” or
“critically important”). These would include ease of use (91%), time needed to learn (91%), and available training (87%). Improved student learning, a factor of concern for many of my participants, especially in light of CCI, influenced 97% of Groves and Zemel’s respondents (2000).

From their study, Groves and Zemel (2000) made two significant conclusions. The first was that the respondents were more comfortable with technologies such as word processing and spreadsheets (tools for completing their tasks) than new technologies, such as multimedia, distance learning, and computer-aided instruction. Secondly, they concluded that a support infrastructure must be in place to encourage new technology adoption. This confirms once again how integral support was to the CCI effort.

The Duality of Technology

Secondly, my data shows that technology indeed does possess both enabling and constraining qualities, thus confirming structuration theory and specific applications of that theory to technology. More significant, however, is that the study shows that even technology’s most positively perceived attributes hold both advantages and disadvantages. Furthermore, some of those disadvantages are large in scope.

The issue of accessibility via email provides the perfect example. Most would agree that the accessibility email affords to information and people is a positive force in our lives. However, my participants showed, too, that accessibility is sometimes not all it is cracked up to be. Thus, it is not enough to simply say that technology is accessible, and that this is an advantage. Instead, we must go further, as my study does, and understand all aspects of what it means for a system to be described as accessible.

This conclusion arises from the fact that participants discussed the existence of the dual nature of computers and software in all areas of technology, upgrades, and CCI in specific. In the 1998 repeat survey of support staff at three academic libraries mentioned earlier, Jones (1999) also found that respondents judged technology as both positive and negative. When asked if
technological expansion made them feel better or worse about work, 48% of respondents checked a mixture of positive and negative feelings. Positive feelings included “excitement,” “enjoyment,” “pleasure,” and “competency.” Words such as “frustration,” “inadequacy,” “dislike,” “irritation,” and “tolerance” represented respondents’ choice of negative feelings.

Furthermore, as structuration theory suggests, the structure of technology and the actions of my participants both affected and were affected by one another. They helped to create, sustain, and in many cases change the way work was done in these four departments.

Results also showed that while technology was perceived as both enabling and constraining, it overwhelmingly produced a positive effect on participants’ work habits. This was supported, too, by the fact that many participants specifically said they did not miss any aspects of work that existed before technology became such a prevalent part of their jobs.

Important to remember, however, is that while the enabling qualities outnumbered the constraints, the disadvantages remain important to consider and acknowledge because they hinder the way users work. Participants made it clear that these constraints cannot be overlooked. For example, the fact that email offers great access to people and information should not be overshadowed by the fact that sometimes it is time-consuming because the medium is used so much. Similarly, the fact that upgrades bring positive change should be measured against the perception that constant change is not good.

**Similarity in Perceptions Across User Types**

Lastly, the study found that users’ rate of technology adoption did not affect their overall perceptions of enablement and constraint. This arose from the fact that most enabling and constraining aspects transcended Rogers’ innovator categories. In other words there were no distinct differences between the overall perceptions and feelings of early adopters, average users, or laggards. This is surprising, considering that each of Rogers’ categories subscribes to a different view of innovation adoption and use (1971). Thus, we might have suspected that each type of user would perceive a different set of enablements and constraints.
This was not the case at all. The only slight difference emerged in reference to CCI. While the majority of participants perceived uncertainty in CCI, there was a difference in the nature of the uncertainties early adopters discussed and those that laggards pointed out. As a group, early adopters talked more about possible monetary concerns and constraints they saw in CCI. For example, they wondered if the necessary funding would continue. Laggards, on the other hand, spoke more of an uncertainty about the effects of the technology itself. They worried, for instance, about how the technology would affect students’ library skills or learning overall. While this does not mean laggards were unconcerned about funding or early adopters did not think about CCI’s effects on learning, it was overwhelmingly the other way around.

This difference in uncertainty worries intuitively suggests that average users and laggards may require more direction in using technology. Whereas early adopters, simply by definition, are more comfortable and independent with the technology, those who are not so quick to embrace hardware and software may need more guidance in the form of information about intended impact to elicit its maximum output.

More significantly, however, this finding also may lead us to conclude that other factors of technology, such as those discussed in my first finding, are more important than adoption rate in determining successful use. Many of my participants exemplified this. For example, the notion of support had a bigger effect on Marie’s adoption of CCI than the fact that she is a laggard, and thus, late to embrace technology. By focusing on these other factors, we may find the key to encouraging those who adopt technology late to start realizing and using its potential sooner.

Conclusion

The results of my research clearly support the current literature in many areas. Several factors already found to influence technology adoption and usage, such as personal constructs, ease of use (or complexity), relative advantage (or perceived usefulness), and support, appeared in the data.
Most importantly, however, the data confirmed the structurational nature of technology. Participants reiterated constantly the abilities they gained from technology while also lamenting the unwelcome side effects of computers’ prevalent nature. Thus, the data shows that technology is a double-edged sword, one that is certainly sharper on the positive edge but that can still cut deep with the negative edge as well. These findings have several implications for practice as well as research and theory.

**Implications for Practice**

This research produced three significant implications for practice. These include the need to manage the constraining aspects of technology, a recognition of the integral nature of support to adoption and use, and the need to construct multiple communication strategies to address technology concerns. I suggest that these issues shed additional light on technology use for organizations.

Morgan (1997b) discusses the need to manage the contradictions inherent in organizations. He suggests that in many cases, oppositional forces are at work. For example, employees may be told to increase their productivity at the same time that their company is enforcing a no-overtime policy. Or the company may urge an increase in morale while going through a period of downsizing. Both scenarios can present contradictory situations. It is difficult, for example, for employees to feel positive about their workplace and jobs when their co-workers and friends are being fired. Morgan (1997b) suggests that while these contradictions cannot be completely eliminated, they can and should be addressed. The good manager is one who recognizes the contradictory forces and attempts to confront them instead of pretending they do not exist.

Obviously, the participants in my study feel the same contradictory pull from the technology they use. While the university cannot eliminate these forces, it must seek to acknowledge, understand, and consider them when making decisions about technology implementation and changes. For example, my results show that ease is an important factor in the
use of technology. Similarly, accessibility is another factor that enables users. Thus, the university should take steps to acquire systems that are easy to learn and operate and offer great access to colleagues, students, and others. However, the university also should address the downsides to this technology and help users find ways to manage it to their advantage.

Secondly, my research also points to the invaluable role that support played in CCI. Participants did not merely speak about the success of the upgrade support; they applauded it. They were impressed with the prevalence of the support and the helpfulness of the staff. It also appeared that just the knowledge that a support structure existed during and after the upgrade created an air of certainty and comfort for users. Thus, the data clearly shows that support is a significant portion of the success of technology adoption and use.

This contains three considerations for the way the university implements technology. First, officials should make sure that any future upgrades and new installations include a high level of support for its users both during and after the event. Secondly, because the knowledge of the support is just as integral as the support itself, officials should inform users of the assistance that will be provided as early as possible. In this manner, the university may enable users, especially those who do not like technology or change, to view the upgrades in a more positive light. This early knowledge may reassure them that the upgrade will not necessarily upset their work balance. Additionally, reluctant users will begin to understand early in the process that they do not have to endure change alone or with no assistance.

Thirdly, the support finding forces us to speculate about the outcomes of an upgrade performed without large amounts of support. Would CCI have been as successful without the “technocomfort” staff that doled out individual help to so many users? Though this study cannot provide a direct answer to that question, the findings suggest no. Additionally, as the implementation of a campus-wide technology plan costs millions, the university should not take the chance to find out.
The last significant issue to emerge from my research was the different uncertainty concerns that emerged about CCI. This information is important, as it may affect the exact form the aforementioned support takes. As stated earlier in this chapter, the early adopters mostly expressed monetary concerns, such as whether CCI’s funding would continue. Laggards, however, worried about the effects of increased technology on teaching and learning at the university and for education in general.

These differences imply that the university should use a variety of communication strategies to encourage technology adoption among users. For example, support staff may approach the laggard in a manner that shows her all of the positive possibilities that technology holds for her teaching. Consider the following scenario:

A laggard user does not think the technology will improve the quality of her class. Thus, she is not sure how the technology and capabilities she received from CCI will benefit her. Furthermore, she thinks it is a waste of time. She has always taught her classes without the use of technology and, therefore, sees no need to trade in her trusty yet very old and incompatible machine that she has been using for years.

It is easy to see that the support staff’s approach in this case can not be the same as it would be for a user who likes and embraces technology. The support staff would have to show this person how to use the technology in ways she did not know about or use before. Perhaps they could give her a hands-on demonstration of setting up a listserv, for example. The focus of the support would encourage use of the listserv to make communication with students easier and faster but also, more importantly, to increase the amount of communication between students. Even for someone who does not see the effects of technology, she would probably agree that increased communication between students enriches the learning experience and expands the learning environment beyond the classroom.
In this way the support staff has encouraged the user to adopt the technology by showing the connection between it and learning. It also provides the certainty and comfort some participants indicated they need when using technology.

This strategy, however, may appear redundant and useless to an early adopter, who probably has been employing listservs and other technology-driven teaching tools (or at least knows about them) for years. It is especially useless if the user is concerned about the continuation of upgrades in the future, which is a vastly different concern. Thus, this user may need less hands-on support and more literature on how CCI will be continued.

No matter the type of user, however, the support staff also should talk with people about the potential downsides of their technology and help them to find ways to minimize this negativity. For example, support members should discuss the possible pitfalls of email, such as high volume. They also can suggest ways to manage volume, such as autoresponse systems that users can implement while they are on vacation. In this manner, they can help users maximize email’s efficiency. This suggestion is in keeping with the purpose of this thesis, which is to recognize both the positive and negative aspects of technology.

These implications can be applied not only to CCI, but also to “Tech U.” in general. As universities continue to spend large amounts of money to acquire technology, it is important that they be aware of the factors that help to ensure its full and best use. Non-academic organizations also can benefit from considering these implications. For instance, managers at the newspaper where I worked should try to understand the contradictions inherent in technology use. For instance, workers may feel pressure to produce more on a new system but find that difficult to accomplish because they do not completely understand all of its functions. Managers can then find ways to address those contradictions. For example, increased training may help workers overcome productivity obstacles in a more effective way. Finally, managers should also make efforts to understand the concerns of their users. This will ensure that technical support staff members can tailor their training and communication messages for maximum comprehension of
the new technology’s functions, features, and purposes. In this manner positive change can occur in the form of better implementation and subsequent use.

**Implications for Research and Theory**

My study provides much room for future research on the enabling and constraining aspects of technology. For example, a replication of this study with a larger and more diverse participant pool that spans several departments or several campuses may confirm the current literature and this study as well as provide more information about technology usage. Additional benefits and constraints may be found that can help organizations better manage their technology.

Further research of my study’s significant findings also could extend our knowledge. For example, the overwhelming response to CCI support should be studied. As technical support can be costly to maintain, it is important to confirm its benefits. There are several ways to study this. A longitudinal study of each periodic CCI upgrade that focuses on this specific issue could track the importance of support in the plan’s success. Another way to approach support research would be to study two universities that are upgrading at the same time. Support structures could be the same or different at the two schools (although I believe it would be more interesting if one school had lots of support and the other had little). Either scenario could provide more information about the role support plays in the upgrade process.

The differences in perception and usage between those who embrace technology and those who do not like technological change or computers in general present yet another area for research. While my study indicates little difference in concerns, I still believe this issue deserves further inquiry.

I also believe methods of data collection other than interviews can be employed to research people’s use of technology. For instance, one could set up an experiment to test the effects of having support versus receiving none as people use technology. Other types of data also can be studied. Analyzing the conversations and questions people have when they call a technology help center or hotline for assistance, for example, may yield particularly rich data.
Finally, we must consider the importance of user perceptions to the theorizing process. There is no substitute for the words of a human being. Within these words can lie the answer to many of our questions about our world. If social and personal constructivist theories ring true, as much of the literature and this very study suggest, this indicates we are missing out on valuable methods of learning if we do not add human voices to the equation when generating new theory. Interpretivism dictates this as well.

Study Limitations

The study’s limitations focus mainly on the participant pool. The most significant limitation was the size of the pool. I only interviewed 11 people. This was the result of a low acceptance rate among participants. While my 11 respondents’ opinions and perspectives certainly were invaluable, one can speculate that a larger group would provide more data, perhaps backing up my findings or contributing different information. The former would have made my findings more significant, while the latter may have depicted alternate views to further expand our knowledge of usage.

Additionally, my pool was limited in terms of departmental diversity. I chose to request participants only from four departments on a campus that hosts more than 60 departments and schools. I also only chose to interview participants at only one university. Two situations dictated these decisions. The first was general time and cost. I did not have the time nor the money to solicit participants across the campus or across several campuses. Secondly, the scope of the project (a thesis) placed additional constraints on my research. For example, it limited the amount of time I had to complete the project.

The homogenous demographic make-up of my participant pool also limited the scope of my findings. All participants were Caucasian, and 9 of 11 were professors or instructors. Again, this limitation arose from the low number of respondents who decided to participate. One can speculate that a larger pool would have included more participants who were not professors.
Despite these limitations, I still argue that my study contributes significantly to the current body of literature on technology. While it does serve to reconfirm previous findings, it also accomplishes a much more important task. It brings the issue of technology usage full-circle by clearly delineating the constraining nature of a phenomenon we usually think of and write about only in positive and enabling terms.

Furthermore, this information is not offered simply to discredit the wonderful things technology does for us. I, and many others, would gladly argue that computers have improved our lives. However, this is not the total picture, and we can never make completely correct decisions when we do not possess all the facts. In this manner of thinking, I sincerely hope that the implications listed above will encourage organizations to not only confront the negative aspects of technology, but also to consider them when designing and implementing technology in the workplace.
APPENDIX A

INTERVIEW SCHEDULE

GENERAL INFORMATION

Age, sex, title/position, job description

GENERAL QUESTIONS

1. Describe your use of computers and any software you may use on a daily basis.
   a. What kinds of tasks or duties do you complete using computers and software?

2. How do you feel about the computer technology you use to complete your daily tasks?
   a. What are your expectations of technology?

3. Based on your own experiences, what are the advantages and disadvantages of technology?

4. How does the use of computers and software applications affect the way you perform daily tasks?
   a. For example, does it make your work easier or harder or make no difference?
   b. Contemplate doing your work without computers. Describe that situation in comparison to your current technological situation.

TECHNOLOGICAL CHANGE

5. Describe your past experiences with hardware and software upgrades.
   a. What is your earliest memory?
   b. Can you remember a time when you were introduced to something new concerning hardware and software?

6. In your opinion what are the purposes of hardware and software upgrades?
   a. What are the advantages and disadvantages of upgrades?

7. What were some of your thoughts when you first learned that you would be receiving new hardware and software through the Carolina Computing Initiative (CCI)?
   a. Were you anxious? Why or why not?
   b. Did you feel the upgrade would be positive or negative? Why?
8. Describe your feelings concerning the new hardware and software you received through CCI.

9. Compare your thoughts, feelings, and opinions about technology before the upgrade with your current feelings about the hardware and software.
   a. Did the upgrade change your thoughts and feelings about technology? If so, how?

**SPECULATION ABOUT THE FUTURE**

10. What do you think will be the outcome or results of this CCI upgrade for you, your colleagues, the department, and the university?
   a. Have you experienced any immediate outcomes since receiving your new machinery?

11. Now that you’ve gone through the CCI upgrade, how would you prepare other users for the experience? What would you say to them?
APPENDIX B

MINIMAL RISK PROCEDURE FORM (CONSENT)

Introduction to the Study

You are invited to participate in a master's degree research study on perceptions of technology. The study will involve people receiving new hardware and software through the Carolina Computer Initiative (CCI) at the University of North Carolina at Chapel Hill. There will be 10-20 participants.

As you already know, CCI is outfitting faculty and staff with the latest computer hardware and software.

Vikki N. Mercer, a master's candidate in the Department of Communication Studies at the University of North Carolina at Chapel Hill, is conducting this study.

Purpose

The purpose of this study is to determine how people perceive technology. I hope to use what we learn from the study to help organizations such as universities and corporations increase the positive effects of technology and minimize the negative effects.

What Will Happen During the Study

This is what will happen during the study:

1. You will participate in an interview approximately one hour in length.

2. I may ask you to answer follow-up questions (via email) should any arise after your interview has been completed.

3. If you have any questions or concerns about being in this study, you should call Vikki N. Mercer at (919) 933-3136 or (919) 962-0012 or email her at makrok@aol.com. You also can contact Ms. Mercer’s thesis adviser, Dr. Patricia Parker, at (919) 962-4939 or psparker@email.unc.edu.

Your Privacy is Important

I will make every effort to protect your privacy.

I will not use your name in any of the information I get from this study or in any of the research reports.

Any information I get in the study will be recorded with a code number that will let me know who you are.

When the study is finished, the key that shows which code number goes with your name will be destroyed.
Since I will be making efforts to protect your privacy, I ask you to agree that I may use any information I get from this research study in any way I think is best for publication or education.

**Risks and Discomforts**

I do not know of any personal risk or discomfort you will have from being in this study.

**Your Rights**

You decide on your own whether you want to be in this study.

You will not be punished or treated any differently if you decide not to be in the study.

If you decide to be in the study, you will have the right to stop being in the study at any time.

If you decide not to be in the study or to stop being in the study, this will not affect the regular services you get from CCI.

**Institutional Review Board Approval**

The Academic Affairs Institutional Review Board (AA-IRB) of the University of North Carolina at Chapel Hill has approved this study.

If you have any concerns about your rights in this study, you may contact the Chair of the AA-IRB, David A. Eckerman, at CB# 4100, 201 Bynum Hall, UNC-CH, Chapel Hill, NC 27599-4100, (919) 962-7761, or aa-irb@unc.edu

**Summary**

I understand this is a research study to determine how people perceive technology.

If I agree to be in the study, two things will happen:

1. I will participate in an interview approximately one hour in length.

2. I may be asked to answer follow-up questions (via email) should any arise after my interview has been completed

I have had the chance to ask any questions I have about this study, and they have been answered for me.

I have read the information in this consent form, and I agree to be in the study. There are two copies of this form. I will keep one copy and return the other to the investigator.

________________________________  ________________________________
(Signature of Participant)                  (Date)
REFERENCES


