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Development and Analysis of a Model for Change in the Workplace, Using Quasi-Experimentation with Computer Professionals in Northwestern Investor Owned Utilities

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AN ABSTRACT OF THE DISSERTATION OF John Ronald Thompson for the Doctor of Philosophy in Systems Science: Business Administration presented March 7, 1991.

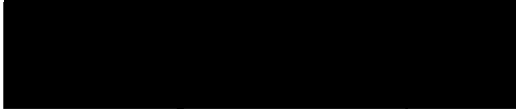Title: Development and Analysis of A Model for Change in the Workplace, Using Quasi-Experimentation with Computer Professionals in Northwestern Investor Owned Utilities.

APPROVED BY THE MEMBERS OF THE DISSERTATION COMMITTEE:

William Manning, Chair

Alan Cabelly

David Gerbing

Kish Sharma

Loyde Hales

Computer professionals have been agents of change in many organizations. In some cases the role inadvertently

became theirs as they were the ones at the vanguard of implementing the new information processing technology in organizations. While in other cases they were the catalysts for change, to force new methods/procedures onto lethargic organizations. While introducing change on others in the organization and adapting to new technological changes themselves, the computer professionals have not really had to face a significant change in their status, power, or importance to the organization.

The introduction of the personal computer has brought about significant change in the way the job of the computer professional is perceived by many in the business world. While this change is personally affecting the way they do their job, there has not been a noticeable attempt by those managing computer professionals to deal with the human emotions engendered by such a change. Part of the reason for this lack of attention may be due to the lack of a model as to how computer professionals react to change. Such a model would provide a system whereby it would be possible to recognize where efforts could be made to measure, predict, and modify situations so that a smooth transition can be made to the change.

Toward this end a model was developed which presents a system as to how computer professionals react to change. This dissertation presents the model, surveys a population

of computer professionals, and analyzes the model using data gathered from the population.

The data was gathered in the form of a self administered survey which was given to computer professionals working for six investor owned electric and gas utilities in the Northwestern United States. They answered questions on a scale of from one to five as to their emotions and perceptions about the introduction of personal computers into their organizations. These questions spanned the timeframe as the organizations migrated from the early beginnings of personal computer introduction, to a situation where the use of personal computers was widespread in the company. In the case of three of the companies the personal computer had not yet achieved widespread use at the time of the survey. The data gathered from the computer professionals was statistically analyzed to see if relationships exist between the model and the data.

Additionally, interesting demographic data was analyzed to see if certain other factors affected the computer professional's perception as to the impact of the personal computer on their quality of worklife.

DEVELOPMENT AND ANALYSIS OF A MODEL FOR CHANGE

IN THE WORKPLACE, USING QUASI-EXPERIMENTATION

WITH COMPUTER PROFESSIONALS IN NORTHWESTERN

INVESTOR OWNED UTILITIES

by

JOHN RONALD THOMPSON

A dissertation submitted in partial fulfillment of the
requirements for the degree of

DOCTOR OF PHILOSOPHY
in
SYSTEMS SCIENCE: BUSINESS ADMINISTRATION

TO THE OFFICE OF GRADUATE STUDIES:

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PREFACE

This dissertation is the end product of many years of
work experience in the information systems field. It is my
attempt at applying a systems science approach to the
problem of people accepting change in the workplace, by
developing and verifying a model as to how people move
through various stages of appraisals and psychological
responses when change is introduced into the workplace.

As a bright, eager youth of twenty-one, I entered the
professional ranks of the workforce as a scientific
programmer, after receiving my degree in mathematics. I
had much the same attitude as Robert McNamara and his "Whiz
Kids" regarding a scientific approach to problems. I
believed that most problems could be solved using a
logical, scientific approach, and that those people who
tended to arrive at decisions with little effort at
analysis were either too lazy or too ignorant to do the
necessary work. I worked my way into management and in 1974
started managing an information systems department for a
major company, and have since managed such departments for
three different companies. As I progressed in my career, I
began to encounter problems which defied logic, and it
seemed all of them were people related problems.

Eventually, I too gave up trying to analyze many people oriented problems and like many others resorted to hunches. I came to realize that most of these people related problems involved getting people to accept change in the workplace. I got better at using my hunches and intuition to handle people problems, but still found myself in lose/lose situations too often.

Frequently, good technical decisions would result in products which did not yield as high a level of return as was anticipated, nor did the execution of these decisions flow as smoothly as it seemed they should have. Much pondering of these types of situations seemed to always lead to people oriented problems, and frequently it seemed the root cause was the degree of acceptance of change. I became more humanistic in my approach to problem solving and began to recognize the human element in problems.

The worst (for my career) types of situations I faced were the cases when my department would develop a new system. Naturally, we involved the end users of the system in the development and implementation process. Then, after many months of work, many good technical decisions having been made, many hours spent on communications, many dollars having been spent, and much effort and attention being expended, the new system is implemented. All too often, the first week of new system implementation, a high

level manager or vice president would descend from their
abode and enthusiastically ask the overworked and confused
clerk in front of the video display terminal how he or she
liked the new system. In spite of efforts at involvement,
training, and familiarization to prepare the clerk for the
new system, operating it in the crush and pressures of the
real life work environment proved to be overwhelming, and
the clerk blurted out something to the effect: "This new
system is so confusing (complicated, hard to understand,
difficult to work with, not user friendly - you can
substitute any number of phrases in here), I wish we were
doing things the old way." Then if I were lucky, I would
receive an agitated phone call from the high level person
and be told that my department had failed in providing what
was needed, with the implication that I had personally
failed and had wasted hundreds of thousands (or even
millions) of dollars of the company's money. If I were
unlucky, the high level person would not tell me directly
but would go behind my back telling everyone who would
listen the same story. A few months later I would go and
visit that same clerk, and give them a "flinch test," by
saying that the system did not seem to be reaping the
benefits we had hoped for, and we were going to shut down
the new system, and go back to the old way of doing
business. Whereupon, the clerk would immediately defend

the system, and say something to the effect that without the system there was no way the current workload could be met, and they could not do their job without the system.

Somehow the people involved in the change had moved from non-acceptance to acceptance. I wondered how we could have done things differently so we could have avoided the non-acceptance phase, or at least have shortened the time duration leading to acceptance. Using a non-scientific sampling method, I determined for every system we installed that impacted a large number of people, we would always have some who readily embraced the new system, some who did not care whether we had a new system or not, and some who saw the new system as something bad. Those who saw the coming of a new system as something bad, sometimes rose to the occasion and became enthusiastic supporters of the system even before it was implemented, others took some time to finally accept the system, and even a very few seemed to never feel at ease with the system.

I sampled other work environments whenever I had the chance and asked people using video display devices how they liked the system when it was first installed, and what they thought of it now. I received the same sort of replies with the same breakout of assessments as I did at my workplace. For example, I asked a woman at a travel agency, a man behind the counter at an autowrecking yard, a

teller at a bank, a women auditing me at the IRS, a man taking my order at Sears, and employees at companies I visited. It was a universal problem, in as much as there were always a certain number of people who had trouble accepting the change, but eventually most of them had come to love the change, and could not imagine having to do the job the old way.

While taking a systems science class on information systems at Portland State University, Dr. George Lendaris presented us with a general model of an information system. His model represents a systems scientist's attempt to lay out the elements making up a complete information system and the relationships between the elements. His model was fairly simple, but was general enough in nature to be applicable to every type of information system we brought up in the class. As a term project in the class, I analyzed an information system which was the most poorly developed and implemented project I ever had the misfortune to be involved with in a company.

The system was developed by consultants who were experts in their field, ended up about two million dollars over budget, one year over schedule, missing some vital features which were in the original specifications, and was poorly received by the end users and my staff. Over the next two years my "maintenance programmers" spent their

time creating the capabilities the system was supposed to have in the first place. In spite of the problems, the new system did perform better than what was being done before, so it was not considered a failure by management, but for those who lived through the experience it would be hard to call it a success.

For Dr. Lendaris's class I went back to the beginning of the project and applied his model to the system. I looked for the points at which critical relationships between the elements of the model had been overlooked, and I came up with what I believe would have been a better approach to the whole project. A large part of the problem was not recognizing the importance of the context, environment, and users of the new system. The consultants, being technical experts in their field, had used their technical expertise and had developed something along the lines of a system which was being successfully used by two other companies in the same business as ours. Yet at our company, the great technical solution presented did not result in a great system.

Since Dr. Lendaris had a model to use for analyzing information systems, then a model for how people might react to changes in the workplace would be useful for analyzing resistance to change.

Toward this end I became interested in what had been done in the field of change analysis. I found that in spite of much research in the field of adjusting to change, there was not a good model which I found that had been verified through research. There was much in the way of empirical evidence as to what minimized resistance to change, and a lot of "armchair philosophizing" as to how people reacted to change, but I was unable to find anything researched which was along the lines of what I was seeking. I have put together from a synthesis of other researchers' work what I believe to be a model which shows the elements involved in people adjusting to change in the workplace, along with the relationships those elements exhibit among themselves. This model represents a system which can be used to analyze worker's adjusting to change. I have verified this model for a certain class of worker which I believe represents a worst case since they have never before had to adjust to such a major change in the workplace which could impact their status, role, pay grade, importance, or worklife. I likewise picked an industry which is noted for being resistant to change and having a history of stogy management. I feel if the model can be verified for this situation then it is very likely to be verifiable in almost all situations.

I have come to recognize that even the best technical solutions, with great promises of benefits to be reaped, are no good if they are not accepted by the people who need to use them.

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BACKGROUND AND INTRODUCTION

INTRODUCTION

Computers have brought about rapid change in our
society. The computer professional has been at the heart
of this change, but have been able to maintain their status
throughout all the changes that have taken place. The
advent of personal computers has changed their status more
than other changes. Job related change can lead to stress
on the job, yet a good model for how workers react to
change has not been developed and analyzed. This paper
proposes a model for change, and using a quasi-experiment
analyzes the model for the case of changes faced by
computer professionals associated with the introduction of
personal computers.

COMPUTER TECHNOLOGY HAS BEEN A CENTER OF RAPID CHANGE

Within the past four decades, the computer has gone
from a rare item of mystery and awe, to a commonplace tool
for the American business, and to an almost commonplace
ornament in the American household. With an unprecedented
rapidity, the computer has become pervasive in American

society and has touched the lives of literally every citizen.

During these four decades there has been one constant factor which the computer (and associated information processing technology) has manifested to the observer: change in the lives of the computer users and in society in general. Scanlong (1987) has reported that several years ago, researchers at the University of Minnesota asked companies how long they could survive if their data processing operations were destroyed. The survey, known as the "belly-up study," indicated that many companies felt they could only last for a matter of days. Part of the reason for the rapid change in our society is the rapidly emerging technology which we have all seen. But, the main reason for the change which people have experienced is because this technology is readily accepted and adapted as soon as it is available. Without the widespread adaptation rapidly changing technology would have little impact on the lives of the people in a society. Feeding on widespread adaptation, and subsequent rewards to be earned by selling the technology, growth in new technology has been continuous and has lead to a cycle of 1. introduction of new technology (hardware and software), 2. acceptance, 3. adaptation, 4. success in the marketplace, and 5. search for additional new technology to sell in the marketplace (which leads back to the introduction of new technology).

COMPUTER PROFESSIONALS AS AGENTS OF CHANGE

During this time of rapid introduction of computer technology, the computer professionals who work for the organizations that buy and use computers (as opposed to employees of IBM or Apple who make computers) have been used as agents of change, both to introduce the new technology into organizations and as catalysts for change to force new methods/procedures onto lethargic organizations (Forcht, Kulonda, and Moates, 1987). The computer types are quite familiar with walking into a department of their company and turning all the other employees upside down by requiring new techniques, procedures, lingo, skills, and even mind sets. Frequently, the computer professionals cannot understand why the other employees are so resistant to change, especially when the change is obviously so beneficial to the company and to the employee (Morrison 1988). It should be obvious that one is better off using a keyboard rather than a pencil! Or, looking at a CRT rather than leafing through paper. Often there is no recognition of the trauma associated with learning to use a keyboard, or of interfacing with a machine instead of real people, or of reading a video tube while its whirring fan deadens the audio senses, or reading dot matrix characters and white letters on a black background which is the opposite of black ink letters on

white paper. The computer professionals seem to enjoy their role as superior individuals bringing modernization to the more backward people of their company.

COMPUTER PROFESSIONALS FAMILIAR WITH TECHNOLOGICAL CHANGE

Because of the rapidly changing technology, computer technicians are accustomed to keeping abreast of the technology and learning the newest capabilities which are being introduced by the vendors of both hardware and software. It would seem that change is a part of their life. They not only change the worklife of others, but they must keep current with the latest changes as well. One professional said that he reads an average of over a hundred IBM change notices a month about modifications to operating system software and standard languages such as COBOL and FORTRAN. The one constant factor has been change. However, the change that the computer professionals have experienced the most is technological change, not change in their status, power, rank, and importance.

WHAT HAPPENS WHEN COMPUTER PROFESSIONALS FACE CHANGE IN THEIR JOBS?

An examination will be made as to the personal impact some of the newest technology has had on the people who have been past masters at imposing change on others, namely

the computer professionals themselves. The impact of the
microcomputer (and associated software and peripheral
hardware) has probably affected the information processing
specialist more than any other change in the technology
(Winkler 1986). It has freed the computer users from being
totally dependent upon the "computer gurus" and has allowed
the computer users a certain degree of liberty and new
creativity in the use of information processing technology.
One department head of a major corporation, whose
department had totally embraced the use of microcomputers
(hereafter referred to as PCs for Personal Computers),
stated that there was something entrepreneurial about the
use of PCs, in that they gave each of his staff the chance
to take the risk of creative use of the computer and have
the opportunity to reap the reward if successful. With
more and more of their formerly locked-in customers
becoming their own entrepreneurs of computer usage, the
computer professionals are seeing the largest change ever
in the way they do their work, the way they work with their
users, the power they had in the company, and the status
they enjoyed with their previously inapproachable,
technological priesthood (Leinfuss 1989).

JOB RELATED STRESS

One of the common psychological responses to change is
stress. Yet, Schar, Reeder and Dirken (1973) point out,

although the concept of stress is utilized with
considerable frequency, there is not a complete consensus
on the meaning of the term. Thus, it is necessary for the
author to define what this study will mean by the term
stress. Folkman, Lazarus, Gruen, and DeLongis (1986)
describe stress as being transactional in that the person
and the environment are viewed as being in a dynamic,
mutually reciprocal, bidirectional relationship. Stress is
conceptualized as a relationship between the person and the
environment that is appraised by the person as taxing or
exceeding his or her resources and as endangering
well-being. This is the definition which will be used for
stress.

To an individual, the stress which he or she is
experiencing is a summation of all relationships with the
environment, and thus it may be impossible to isolate the
stress which the individual experiences in the job
environment from that which the individual experiences from
the rest of the environment. However, it is possible to
identify those sources of stress which are coming from the
work environment. Job related stress is defined as stress
which is being caused by an individual's relationships with
the work environment. This definition of stress could
include stress caused by physical threats as well as
emotional threats. In the context of the study, the
subjects do not have jobs which are commonly thought of as

being physically dangerous such as police officers, coal
miners, or steeple jacks. Thus, the subjects' job related
stress will be analysed at the psychological level as
emotional distress, although physical and somatic symptoms
may appear as a result of the stress.

THE INVESTOR-OWNED PUBLIC UTILITY BUSINESS
(GAS AND ELECTRIC SPECIFICALLY)

This study will utilize the environment of
Investor-Owned Public Utilities (IOUs) for the examination
of change upon the information processing specialist
brought about by the introduction of PCs.

IOUs are a fairly homogeneous group of companies for a
variety of reasons. They are in a very mature industry
which has been selling the same product since the turn of
the century. Each is a government authorized monopoly
within a certain geographical area. That is, no one else
can offer or sell the same product as the IOU within a
legally set geographical area. Thus, within that territory
an IOU has no direct competitor. In exchange for this
exclusive monopoly, the IOU must submit to government
regulation to assure that the IOU does not use the monopoly
to abuse the people it serves. All fifty states have some
form of public utility commissioner(s), and these fifty
commissions share ideas, meet as part of regional and
national committees, and adopt one another's ideas. While

there are individual differences in commissions' rulings from state to state, these commissions have a lot in common, and the differences are minor when compared to the things they do and share in common. Hence, one has companies, without competition, selling the same product, being regulated with similar government bodies, in a very mature industry.

Additionally, the noncompetitiveness has led the IOUs to share good ideas among themselves, and they have formed the American Gas Association (AGA), and the Edison Electric Institute (EEI) as vehicles for sharing management and operational ideas. There are committees which meet regularly for these purposes on almost all aspects of the running of IOUs. There are committees for Information Systems, Accounting, Auditing, Power Transmission, Gas Transmission, Power Generation, Risk Management, Procurement, Regulatory Affairs, Marketing & Sales, Engineering, Public Affairs, Legal Affairs, and even one for the running of a Library. Many utilities, such as Pacific Gas and Electric (PG&E) and Sierra Pacific, have both gas and electric and as a result the AGA and EEI have combined committees for many areas. For example, the author was a member of the AGA/EEI Information Systems Committee for eleven years. This committee consists of 70 members who represent MIS management from IOUs in Canada and the United States. There were two meetings a year

where the 70 members met for three days to discuss common
situations, shared solutions, and even gave away free
software packages as a part of solutions. Additionally,
once a year there was a one week meeting, with seminars and
vendor exhibits, which was attended by around 600
information specialist from IOUs. The author discovered
during the eleven years, that both gas and electric
utilities faced much the same problems and had much the
same management responses, even though the end product
being sold was different. The problems of mass
distribution, large customer base with small average
billings, being government authorized monopolies, with the
same regulatory bodies, and other factors, tended to make
gas and electric utilities more alike than different.

There are two other significant items which helped to
make the IOUs homogeneous. First, because all gas
companies sell the same product and all electric companies
sell the same product, they are interconnected in their
respective channels of distribution (called T&D for
Transmission and Distribution). For example, all electric
utilities must have the same frequency, cycle, and quality
of product because of the interconnection. If one utility
on the grid goes down, it will impact the neighboring
utilities. In reality customers of Portland General
Electric Company (PGE) do not know if the electrons
entering their home through the wire were actually

generated in a PGE plant or if the electricity came from
Bonneville Power, or PG&E. Even PGE cannot tell where the
electrons came from, nor do they really care. In fact the
IOUs are merely responsible for keeping the pressure (for
gas) or potential (for electricity) up to some minimal
level on the system, and the customers essentially let the
product flow out the end when desired. Because of the
interconnectedness, all the IOUs with the same product must
cooperate and operate their systems in fairly similar
manners.

The second reason is an outgrowth of the fact that
they are selling the same product. Because the customer
does not view anything unique about the product from one
gas or electric IOU as being any different from another,
and in fact the customer is not really interested in buying
gas or electricity, but rather what that source of energy
provides, such as warmth, light, hot water, etc., the IOUs
have polled their research dollars and do not do much in
the way of individual scientific research. For example,
the electric IOUs have created the Electric Power Research
Institute (EPRI), and jointly fund research which all share
equally. PGE contributes around two million dollars a year
to EPRI, gains a voice in the direction of the research
performed, and shares equally with all other EPRI members
in the findings. With pooled research dollars, and common
sharing of new scientific discovers, all electric IOUs

migrate along the same path into the future.

Indicative of the homogeneous nature of the IOUs are some of the problems the industry faces. They all face pressure in the form of trying to hold their rates down. Utility commissions across the nation are at odds with the IOUs over their rates, and the commissions have been getting more aggressive in keeping rates down by rejecting some expenses as not being part of good, prudent operation and management. They also face problems of having long term supply problems. They both see a finite supply of natural gas (the electric utilities are concerned with gas also and see natural gas as the most trouble free, pollution free, thermal generation source of electricity). The electric IOUs can not find further rivers to dam, new nuclear power is not feasible today, and coal and oil burning pollutes the atmosphere in several ways. All IOUs are seen by the investment community as cash cows, and hence they are trying to minimize the amount of new investment being made (besides, the utility commissions nowadays tend to not allow much of the cost of new construction anyway).

It is not surprising that, because of the factors given in the above discussion, these homogeneous businesses are known for having developed a very conservative, stodgy, risk averse management style. IOUs are not known as the innovators of American industry.

GAS AND ELECTRIC IOUS IN THE NORTHWESTERN UNITED STATES

While the IOUs are fairly homogeneous, there are still some unique features about the IOUs in the Northwestern United states. What stands out the most is the existence of the federal government's involvement in the marketplace for electricity. Just as the Tennessee Valley Authority has provided government subsidized electricity to the populations in and around the Tennessee Valley, the Bonneville Power Authority has provided government subsidized electricity to the populations west of the continental divide in Montana, Idaho, Washington and Oregon. This has had the effect of lowering the rates paid by the customers of the IOUs in a couple of ways. First, the Northwestern electric IOUs can buy cheap, surplus electricity from Bonneville, thereby lowering the average cost of their product. Second, any Northwestern city, county, or municipality can establish their own public utility department (PUD) and buy cheap electricity from Bonneville and distribute it to their residents. If the electric IOUs' price is too far out of line with the PUDs around it, then their customers are liable to be motivated to form their own PUD. In fact this has happened to Pacific Power and Light Company (PP&L) several times in places like Tillamook, Hood River, and Lane County. This has had a similar effect on the gas IOUs because they try

to keep their rates on somewhat of a parity with
electricity for comparable uses in the form of heating. As
a result of this, the Northwestern United States has some
of the lowest rates in the nation.

The actual operation of the IOUs is much the same as
the other IOUs in the nation. There are some minor
differences. The Northwest does not have much in the way
of its own supply of natural gas nor does it have
petroleum, so the electric IOUs do not generate much with
gas or oil; and the gas IOUs are dependent upon long
pipelines for their supply. Also, the electric IOUs have
made use of the rivers for hydro generated electricity.
However, there are many IOUs across the nation with similar
situations, so the Northwestern IOUs has some aspects which
are atypical, but are not really very unique.

RATIONALE FOR A STUDY

The information processing professionals are change
agents, and have readily accepted technological change
where that change has not really impacted their own
personal value system or status. Indeed, in almost all
other cases, the technological change has increased their
status and worth. They also do not hesitate to implement
change where it will impact the quality of work life of
their customers and co-workers; the end-users of
application oriented information systems. From the

viewpoint of most managers, they see the computer
technician as being constantly involved in change, and so
they should readily accept change themselves. Of course,
computer professionals are not the dispassionate creatures
which some people perceive them to be; they are also human
with all the same problems of ego, hopes, aspirations,
phobias, and neuroses as other humans. If anything,
perhaps computer professionals are a bit more logical and
rational than the average person in the workforce, but that
logic does not do away with the emotions and entirely human
feelings that rest in the hearts of all mankind.

The author personally knows managers of information
systems departments from over seventy IOUs in Canada and
the United States, and does not know of a single case where
a really overt effort was made to help the computer
technicians adjust to the human aspects of the introduction
of PCs into their organizations. Every one of the IOUs
provided technical training on the use, care, and feeding
of PCs, but no attention was given to the human impact of
the changes which would occur in the quality of work life
for the computer professionals. Frequently, attention was
even given to training computer professionals on how to
handle the human aspects of their customers, the computer
end-users, who would now be doing their jobs using the PCs,
but no training for change, for the agents of change
themselves.

Part of the lack of attention can also be attributed to the lack of a good model for understanding the change process which a computer professional goes through when their status, power, importance, and value to the organization are challenged.

This study proposes and analysis a model as to the process which the computer professionals go through in adapting to such dramatic change. A model is presented which represents the change process, and analysis postulates are formulated to be used for analyzing the model. Measures and scales are developed to give a degree of measure and quantification towards explaining behavior and studying of relationships. A quasi-experiment is designed, performed, and evaluated to analyze the postulates.

While this model is general in nature, and could be applicable to change situations in many environments, it is outside of the scope of this study to validate the model for all situations and in all environments.

IOUs are selected to be the target environment for three primary reasons. The first is the author's familiarity with the industry, having spent over a decade as the MIS Director of the largest IOU in the Northwestern United States, and his familiarity with many other MIS departments in IOUs. Second, the IOU is an interesting

environment in which to study change, because the IOU as a whole is more resistant to change than most for-profit organizations. Thus, it provides a better controlled setting where other change factors are minimized. Third, because of the author's personal familiarity with the managers in IOUs, greater cooperation in conducting the study is possible.

The study presented in this research examines how computer professionals, working in certain Northwestern IOUs, react to the change brought about by the introduction of PCs into their organizations. This change has the possibility of impacting them in their concept of what their job entails, and threatens their quality of work life. A model is presented, and measurement scales are developed for the model. The scales are necessary in order to give a degree of measure and quantification to the model so that analysis may be performed which will go toward explaining behavior of people involved in occupational situations. A quasi-experiment is performed to analyze the model and investigate relationships between elements of the model. The model represents a process as to how these computer professionals react to change in the workplace.

CHAPTER II

LITERATURE ABOUT CHANGE AND A MODEL FOR CHANGE

INTRODUCTION

There has been much literature about change, and much
comment on how to implement change, but little has been
developed about models for change. With a model the
systems science approach can be used to analyze change. A
statement of analysis postulates will be made which will be
the basis of a model for change.

LITERATURE AND STATEMENTS ABOUT CHANGE

"Men are disturbed not by things, but by the views
which they take of things." The Roman philosopher
Epictetus made this observation two thousand years ago
(Ivancevich, et al. 1987), and in spite of all the changes
that have occurred in, with, and because of the human race,
this statement still reflects how people respond to change.
Each person brings their own propensity, temperament,
background, experiences, education, fears, and phobias into
the evaluation of change. Almost from their birth, people
start making judgments as to cause and effects. It is
necessary in order to survive and prosper. When one sees a

change, then one prejudges what the effect will be. Over the years a bias builds as to what types of changes have brought about desirable or neutral effects, and the types of changes which bring about undesirable effects. So people are predetermined to judge certain classes of change when they have experienced similar events before.

Much has been stated in the popular press lately about CEOs being needed who can be "Changemasters" (Kanter 1983) and about the need for change in order for the American business world to continue with a competitive edge (McLaughlin 1989). Before the current rash of publications and articles, there was a popular movement which was concerned about individuals undergoing "future shock" which was brought about by too much change (Toffler 1970).

Regardless of whether one feels there has been too much change, or too little of the right kind of change, the human race has had to adapt to continual change in the way it reacts with its environment. One primary reason for this is because the human race has the ability and the propensity to continually change its environment. Unlike other animals inhabiting the planet, mankind has the tool making ability to improve (or damage) their surroundings. The human species is unique in rapidly causing change, and hence in causing the rapid need to adjust to change.

A means of measuring "Social Desirability" (SD) has been proposed as a means to gain the approval of others

when implementing change (Crowne and Marlowe 1964).
Golembiewski (1983) suggest that SD be built into a program
of organizational change to modify expectations about
results and to guide their interpretation.

The human species continually feels a need to try to
improve its environment, and to make for a more bountiful
and pleasurable life. It cuts down the forest to build
homes, and to make room for fields to plant its own choice
of domesticated crops. It supplants the native animals and
replaces them with its own choice of domesticated animals.
In so doing, it frequently must make further adjustments in
order for these crops and animals to flourish. Mankind is
the cause of the need to change, and also the one with the
most need to be able to adapt to the change. The ability
to create change, and to adapt to the change, has allowed
mankind to span the globe and to live from the arctic to
the equator.

Yet in spite of all the ability at creating change,
there still is the problem of individuals being able to
accept change, and being able to work well together in
times of change.

There have been studies as to the impact of change on
workers brought about by the introduction of new
technology. For example, Majchrazak and Cotton (1988) made
a longitudinal study of adjustment to technological change
which involved a manufacturing company that switched from

mass production to computer-automated batch production. They point out that longitudinal studies of workers changing technologies have been few and have yielded equivocal results. They believe that individual adjustment is a function of individual's perceived fit between their own abilities and values, and the abilities and values demanded by the work environment. Gutek (1982) studied the adjustment of a secretary and manager to a computerized managerial work-station and found that the implementation of the work-station positively changed the secretary's evaluation of her work but not that of the manager. Argote, Goodman and Schkade (1983) studied workers involved in the implementation of a batch production robot and found that the implementation of the computer driven robot increased the stress experienced on the job. Doan and Tziner (1988) studied computer-based automation in the office. They observed that to date little attempt has been made to empirically ascertain just how technological changes relate to experienced stress associated with different occupational and organizational aspects. They also discovered that even those workers who had prior experience using the technology still experienced considerable stress when a different form of the technology was introduced. Martin and Wall (1989) state that research has implicated attentional demand and responsibility as two sources of stress among blue collar workers, and that

attentional demand and responsibility will become
increasingly significant in shopfloor work with the
increasing use of computer-based technology. These studies
are informative but lack a good model for how people react
to change. If a good model as to how people react to
change in the workplace existed and could be substantiated,
then it would demonstrate that the way people react to
change is a system with interrelations between the
different elements of the model. As a system it would be
possible to examine the interrelations and interpret,
predict, measure, and evaluate the effects of change in the
workplace. These previous studies also did not involve
studying the agents of change (the computer professionals)
who brought about the change in people's worklife. Thus,
there are some studies which have looked at the change
brought about by computerization on workers, but nothing
that has looked at the adjustment to change which computer
professionals have had to make as the PC has changed their
rank, status, power, and coworker relationships.

A SPECTRUM OF CHANGE IMPLEMENTATIONS

A spectrum of general strategies for deliberately
effecting changes in human systems has been developed by
Chin and Benne (1969), utilizing some of the earlier work
of Etzioni (1961). These strategies are schemes or plans
for achieving the purpose of successfully implementing

change. The spectrum is depicted in Figure 1 and can be grouped into three general categories: A. Rational-Empirical, B. Normative-Reeducative, and C. Power-Coercive.

The Rational-Empirical group of strategies are what is normally used by educated people of European backgrounds. A fundamental assumption underlying these strategies is that people are rational. Also, that people will follow their rational self-interest, once they have an understanding of what it is. Basically it consists of having the proposed change presented to a group of people, along with an explanation or demonstration as to the desirability of that change, how it is in the group's best interest to change, and explaining or demonstrating how the change can be carried out to gain the benefit. Because the group is assumed to be rational and moved by self-interest, it is assumed that they will adopt the proposed change if the effort is worth the reward. This is the whole basis for the free enterprise system and is at the heart of Adam Smith's "invisible hand" which guides society in securing the best possible mix of goods and services which maximizes the benefit to society. Many of the believers in this type of approach advocate the universal education of people and a totally free exchange of ideas, so that people will have the best opportunity to judge what is in their best
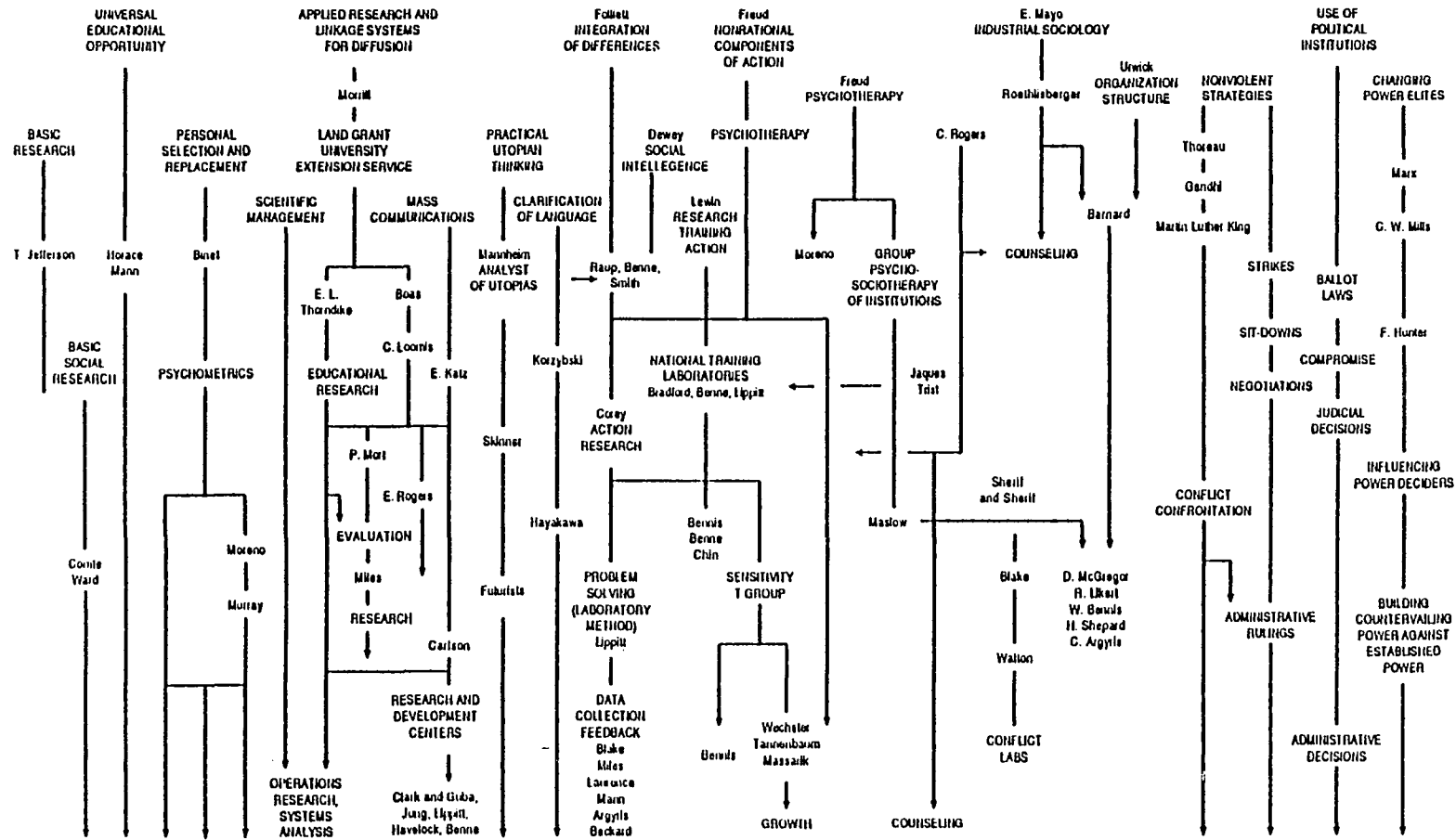
Figure 1. Spectrum of strategies for deliberate changing. (Chin and Benne 1969)

rational self-interest and which changes are able to fulfill those self interests.

The Normative-Reeducative group of strategies believe in the rationality and intelligence of people also, but that patterns of action and practice are supported by sociocultural norms and by commitments on the part of individuals to these norms. Sociocultural norms are supported by the attitude and value systems of individuals' normative outlooks which underlay their commitments. Change in a pattern of action will occur only as the persons involved are brought to change their normative orientations to old patterns and develop commitments to new ones. Hence, changes in normative orientations involve changes in attitudes, values, skills, and significant relationships, not just changes in knowledge, information or intellectual rationales. Freud and his development of psychotherapy followed this group of strategies. The modern organizational behaviorist such as McGregor (1968), Likert (1967), and Argyris (1962) are disciples of this group of strategies.

The Power-Coercive is what one thinks of as the traditional way in which change has historically been brought about. It is based on the use of power in some form to force those with lesser power to accept the will, plans, direction, philosophy, or leadership of the stronger. Often the power to be applied is the legitimate

power or authority of law. People such as Lenin used the power to make their own laws, and had no hesitation to use physical force to gain acceptance of change. Such quotes as "power comes from the barrel of a gun," or "if you want to make an omelet, you have to break some eggs" are typical of this type of use of power to effect change. Gandhi put a new twist on this category of power by not using physical force, but instead the power of a stronger will applied against those who had a weaker resolve (or a weaker commitment for not changing).

All of the methods shown in the spectrum in Figure 1 have been used at one time or another, and to varying degrees of success. All of them have their place (somewhere and sometimes) in the practice of bringing about change, and all of them have places where they would not be effective in bringing about proposed change. Based on the available evidence there does not appear to be one right way to always bring about change.

WHERE THE CHANGE ON COMPUTER PROFESSIONALS BROUGHT ABOUT BY THE INTRODUCTION OF PCS FITS IN THE SPECTRUM

In the several Investor Owned Utilities (IOUs) in the U.S. and Canada which the author is aware of, there has not been a single effort to consciously try to develop a plan or scheme for gaining the acceptance of the computer professionals to changes which affect their jobs and

positions. An unconscious belief that computer professionals are very rational beings, and that it is in their self-interest to utilized the best automation tools available in order to make their job easier, has lead to an unconscious use of the Rational-Empirical approach to change. However, it can hardly be called a plan. The MIS Directors put forth deliberate plans along the lines of the Normative-Reeducative group in order to bring end-users to accept the use of computers, be they micros, minis, or maxis, but they left their own staffs without any deliberate plans for acceptance of change because of their belief in the rationality of their staff and the supposed obvious benefits from PCs.

Part of this lack of attention can also be attributed to the lack of a good model for understanding the change process which a computer professional goes through when their status, power, importance, and value to the organization are challenged. Furthermore, the MIS Directors are conditioned to seeing their staffs readily accept and adopt technological changes, and hence they tend to believe that the Rational-Empirical strategy is sufficient. However, it is one thing to adopt a new technology which does not threaten your power base and change your status, and quite another to accept a new technology which changes the way you do your job and the way your job is perceived. While the computer

professionals have been masters at changing other's jobs,
they may not be as ready to accept change in their own
position. It is always easier to accept the need for
change in someone else's job and power base than in your
own.

THE CHANGE MODEL

Lazarus and Folkman (1985) discuss a triad of
responses which people make to events which occur. First,
there is the Irrelevant Appraisal, which is that they
perceive the event has no impact on them, and hence they
have indifferent feelings and emotions about the event.
Second, is the Stressful Appraisal in which they perceive
that the event has the potential to cause them mental,
emotional, physical, or some other type of harm. Third, is
the Benign-Positive Appraisal in which they perceive that
the event will be beneficial to them.

Ivancevich, Schweiger, and Power (1987) have
identified a triad of response appraisals when an
individual is faced with the changes associated with a
merger of two companies. First, there is a Harm/Loss
Appraisal which indicates that there has been some damage
to a person such as financial loss, loss of self-esteem or
a sense of powerlessness. Second, is a Threat Appraisal
when the individual perceives of a harm or loss that has
not yet occurred but is anticipated. There are three

factors that influence the intensity of a Threat Appraisal and its ensuing effect on an individual's response. 1. The Uncertainty of the event, both the not knowing whether the event will occur or what its consequences will be. 2. The Duration of the event, which is how long the stress event will last if it does occur. 3. The Imminence of the event, which is the amount of time before the actual event occurs. Third and lastly, is a Challenge Appraisal when the individual feels a need to arise to the challenge and sees it as an opportunity with the potential for gain or growth.

Synthesizing these two concepts of triads of responses, and adding further ideas, a model was developed which is represented in Figure 2. This model starts with an impending change being identified by an individual. That individual appraises the change based upon all the special characteristics which make up the individual. The result of the appraisal leads to one of three appraisals being made by the individual. Either the change is appraised as being irrelevant, a threat, or benign-positive. If it is irrelevant, then the individual has indifferent feelings and emotions about the impending change. If it is benign-positive, then the individual has pleasurable and comfortable feelings and emotions. If it is appraised as being a threat, the individual brings his or her own perceptions of the nature of the threat into play, as well as the three factors of uncertainty, duration and
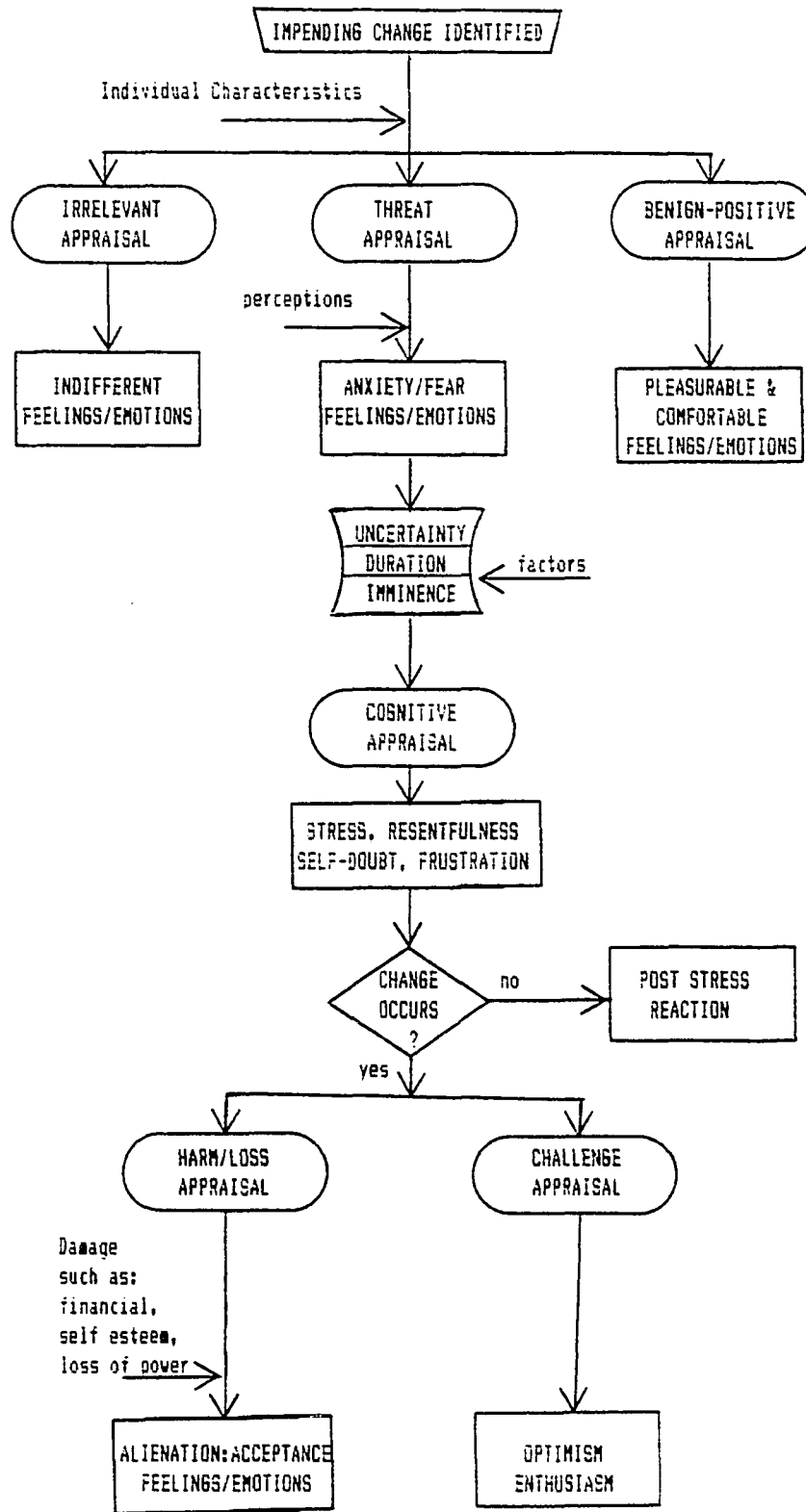
Figure 2. Proposed change model.

imminence. At this point the individual does a cognitive

appraisal of the change based upon the perceptions and

factors, and during the time of imminence of the change has

emotional reactions of anxiety, self-doubt, fear,

frustration, resentfulness, etc. There is a debate in the

academic community if the cognitive appraisal takes place

before the emotions and hence leads to the emotions, or if

the emotions take place first and then lead to a cognitive

appraisal which supports the emotions, or if the two are

part of an iterative process which cycles until a

convergence of emotions and cognition occur. This model

does not try to resolve the order of the process, merely

that the two go together, and that as a result there are

emotions which the individual develops, and that these

types of emotions will stay with the individual all through

the imminence period of the change. These emotions, or

psychological responses, are what are commonly associated

with workplace stress. The longer the imminence period,

the longer the individual will undergo the stress

associated with the threat appraisal. This part of the

model differs from the Ivancevich, Schweiger, and Power

(1987) triad of responses in that rather than having a

triad of responses (harm/loss, threat, or challenge), they

proposed first a threat appraisal with the imminence factor

playing the key role as to whether there is an immediate

harm/loss or challenge appraisal, or if the threat hangs on

for a longer time period. In the proposed model if the
imminence is immediate, then the threat appraisal passes
quite quickly, and the individual goes immediately into the
other two appraisals, but still the individual does a
threat appraisal even though it may be momentary.

The end result of the threat appraisal is that either
the change occurs, or it does not occur. If it does not
occur, then the individual is relieved of the emotions
associated with the threat, and goes into a post stress
reaction and a return to normalcy.

If the change does occur, then the individual either
does a harm/loss appraisal, or a challenge appraisal. If a
challenge appraisal is the result, then the individual
feels optimism or enthusiasm as a result of the change. If
a harm/loss appraisal results, then the individual makes an
assessment of the damage, and eventually either feels
alienation or acceptance.

THE CHANGE MODEL IS A SYSTEM

Frequently, the notion of a system is loosely used,
and often in its use there is not even reference to a
definition of what constitutes a system. This has led
to misunderstandings, and what appears to be conflicts
in various researchers' results. For the purpose of
this research the author feels a definition is needed

and uses the following from an article by George Lendaris (1986):

> there are two distinct notions needing attention: A) there is a whole involved and B) there are parts that operate together to manifest that whole. For the present purposes, there is utility in a definition which separately addresses these two key features of the notion we call 'system': A system is A) a unit with certain attributes perceived relative its (external) environment, and B) that unit has the quality that it internally contains subunits and those subunits operate together to manifest the perceived attributes of the unit.

Imbedded in this definition is the role of an observer who does the perceiving, as well as that of an environment in which the system exists. For our purposes the observer will be the author, but could just as easily be the MIS manager who is overseeing the implementation of change in the MIS department. The environment is that of an MIS department in an IOU. This environment includes the discussion of IOUs and their environment contained in Chapter I, but goes further since the MIS department is a service organization in the IOU, and is a department which deals with implementing and operating the technology associated with information systems.

The model represented by Figure 2 fits the above definition of a system. The model is a unit within an environment which has certain perceived attributes consisting of relationships, and it internally contains subunits which operate together manifesting the attributes

of the unit, such as the three appraisals:
Benign-Positive, Threat, and Irrelevant which each have
their own components yet still relate to one another.

With the change model functioning as a system it will
enable observers to measure, analyze, predict, interpret,
and evaluate the relationships between the system and its
environment as well as the relationships between the units
within the system.

STATEMENT OF ANALYSIS POSTULATES

When programmers and systems analysts are faced with
the job changes associated with the use of PCs in their
organizations, they follow the processes represented by the
model in Figure 2 in developing psychological responses.

Specifically this means, they first go through a triad
of either an Irrelevant Appraisal, Threat Appraisal, or a
Benign-Positive Appraisal. With the Irrelevant Appraisal
they have indifferent feelings/emotions. With the
Benign-Positive Appraisal they have pleasurable and
comfortable feelings/emotions. With the Threat Appraisal
they go through a cognitive process involving individual
characteristics, perceptions, and factors associated with
the change, which result in emotions causing stress during
the duration of the threat. If the change does not occur
then they return to normal situations. If the change does

occur, then either they will have a Harm/Loss Appraisal or
a Challenge Appraisal.

This is represented by the following statements of
analysis postulates which will be demonstrated:

P1: When faced with a change event the subject
computer professionals go through a triad of appraisals and
make either an Irrelevant Appraisal, Threat Appraisal, or a
Benign-Positive Appraisal.

P2: With the Irrelevant Appraisal the subject computer
professionals have indifferent feelings/emotions.

P3: With the Benign-Positive Appraisal the subject
computer professionals have pleasurable and comfortable
feelings/emotions.

P4: With the Threat Appraisal the subject computer
professionals go through a cognitive process which produces
psychological responses resulting from stress, such as loss
of self esteem, anxiety, fear, and performance difficulty.

P5: With the Threat Appraisal, after the change event
has transpired, the subject computer professionals will
have a Harm/Loss Appraisal or a Challenge Appraisal.

Data from the instrument will be used to determine if
the various respondents to the survey can be categorized
into groups which correspond to the Level A appraisals, and
thus help collaborate P1.

The instrument has scales which will be used to
register the various emotions and feelings which the

respondents experienced while going through the change

event associated with the introduction of the PC into

the organizations for which they worked. These scales will

be checked for correlations to determine if relationships

exist between the various emotions and feelings which the

model forecasts and are indicated by the analysis

postulates. The correlations of the scales will be used

as an analysis tool for the analysis postulates.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

INTRODUCTION

In order to verify or reject the model, the research
design and methodology must define the environment and
research subjects, the nature of the instrument for
measuring results, the data collection method, the data
organization, the data analysis methodology, and how the
instrument is developed and tested.

THE ENVIRONMENT AND RESEARCH SUBJECTS

The organizational environment is that of IOUs in the
Northwestern United States. The Information Systems
departments of six IOUs have agreed to allow their systems
analysts and programmers to participate in the research as
the subject computer professionals (there are a total of
seven such IOUs). The systems analysts and programmers who
are the subjects of the research are those people who
support the end users with application programs, such as:
accounts payable, general ledger, material and inventory
management, engineering calculations, and human resource
systems. These are the computer professionals who have had

the most impact on the quality of their work life due to
the PC.   It does not include the systems programmers, who
maintain the operating systems and telecommunication
software packages, and have minimal contact with the end
users and thus their work has not been impacted as much.

This yields a total population of around 300 people.
If even a 50% response rate is achieved, this will yield a
sample of around 150 people.

It needs to be recognized that different organizations
will be at different stages of introduction of the PCs into
the organization, so the computer professionals from
company to company will be experiencing different aspects
of the model at any one time.   For the purpose of being
able to identify the levels of PC penetration into
organizations, the model is divided into three levels of PC
penetration (see Figure 3).   At Level A the organization is
considering implementation of PCs, but has not yet done so.
At Level B the organization has starting using PCs, but has
not matured in the use PCs.   At Level C the PC is pervasive
throughout the company and is an accepted part of the way
of doing business.
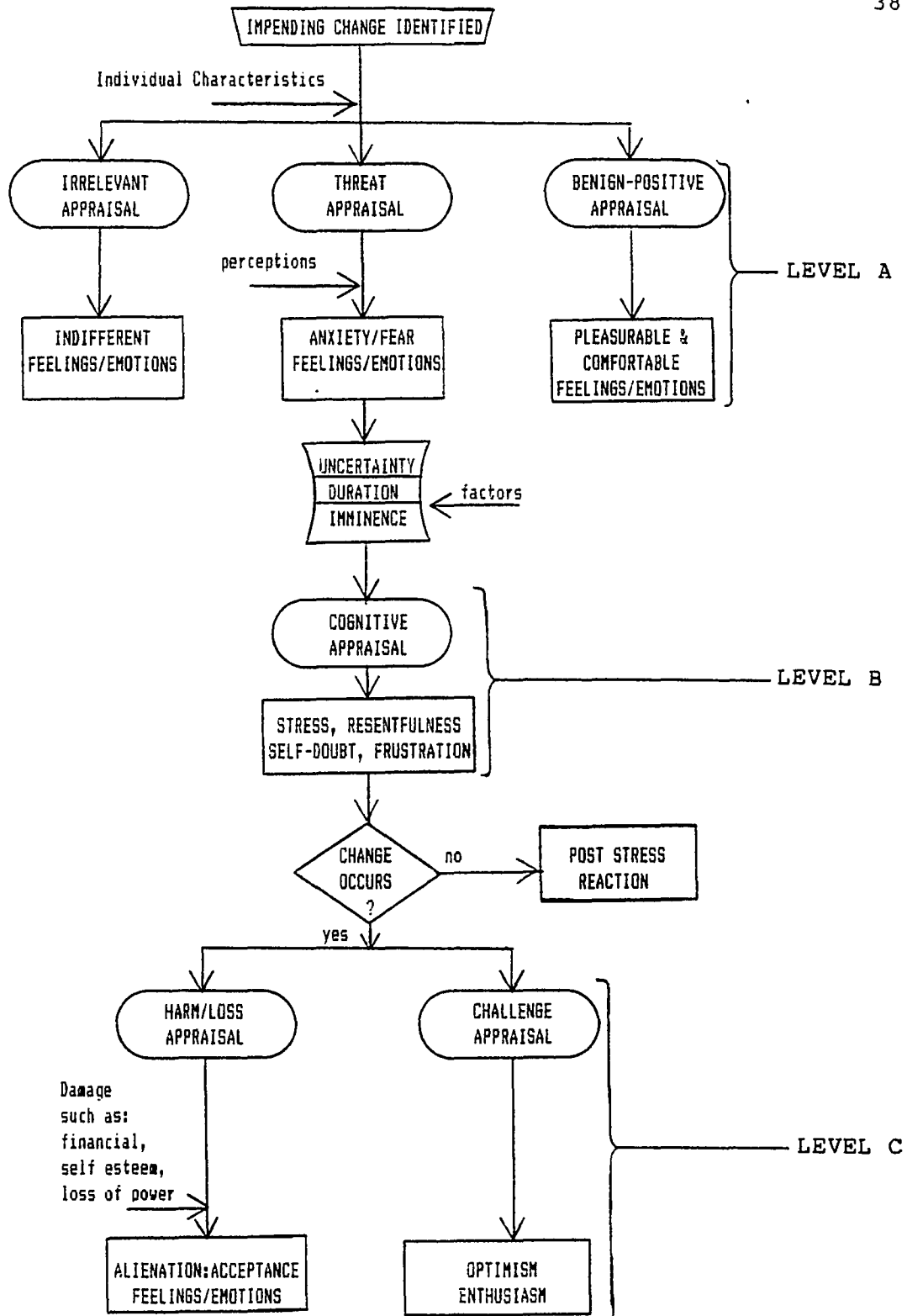
Figure 3. Proposed change model with levels indicated.

RESEARCH DESIGN

The research is a cross sectional evaluation of psychological responses of the computer professionals as they now feel about the changes brought about by the PC. For those organizations which have progressed further in the introduction of the PC into the organization, and maybe have even matured in the use of PCs, the computer professionals will be asked to recall their psychological responses at the time that they went through the various appraisals of the model.

The instrument is in the form of a survey. Surveys are an accepted method of measuring psychological responses. For example, in measuring stress there is a differentiation between objective and subjective forms. Objective stress is measured independently of a person's environmental perceptions, whereas subjective stress relies on self-reports (i.e. surveys). From previous research we know that subjectively measured stress caused by role conflict, compared to objectively measured conflict, was a better predictor of job-related tension (Kraut 1965). Also, in a study of the relationship between quantitative work load and cardiovascular response, it was shown that subjective ratings of work load, compared to objective tallies by observers of each person's phone calls, office

visits, and meetings, were better predictors of heart rate (French and Caplan 1972).

The instrument is a self-administered questionnaire which will contain demographic questions as well as questions relating to the model.

The author borrows heavily from existing instruments and the questions and measures which they contain. There are many instruments used by previous researchers which could apply in the measurement of various psychological responses to stress in the workplace. For example, in the area of job satisfaction there is an instrument developed by Brayfield and Rothe (1951) to measure overall job satisfaction, and satisfaction with the work itself can be measured by Johnson & Graen (1973) in the Role Orientation Index.

Measures of stress caused by role conflict and role ambiguity can be measured using a 30 item instrument developed by Rizzo, House, and Lirtzman (1970). Also, along the lines of stress caused by role conflict and organizational stress there is an instrument developed by Caplan (1971).

Relating to stress in general there are the General Health Questionnaire by Goldberg (1972 and 1978), the Symptom Distress Checklist by Parloff, Kelman, and Frank (1954), and the Subjective Stress Scale, used by the American Heart Association (1968) in the Los Angeles Heart

Study. Warr's model of mental health (1979 and 1987)
measured: enthusiasm, contentment, satisfaction, and
anxiety.

DATA COLLECTION METHOD

The questionnaires are self-administered to the
computer professionals. The setting and method of
administration varies from company to company since it is
at the discretion of the MIS manager as to the actual
giving of the instrument. The author is available to
conduct a meeting in which the computer professionals are
assembled. In such a meeting, the author provides
instructions as to the instrument, and informs the subjects
that the study does not identify individuals, nor does the
study make evaluations about the wisdom or judgment of the
computer professionals as they make the various appraisals.
However, in most cases these instructions are written on
the first page of the instrument because the author was not
allowed to personally oversee the administration of the
instrument. Almost all MIS managers expressed a desire to
merely have the instrument mailed to their site, and they
distributed them to their staff.

The resulting data from the instrument is entered into
an IBM PC and is thus available for analysis.

ORGANIZATION OF DATA

The data is organized by company, and within a company by salary level of the respondent. It is assumed that organizations are somewhat logical, and that salary correlates with value to the organization of the individual, and that in turn also correlates to the expertise and experience of the individual. There are also data fields for such items as: education, age, sex, and years in the computer field.

DATA ANALYSIS METHODOLOGY

The data analysis methodology relies heavily on statistical analyses of the data received from the surveys. First, the items in the survey are clustered into common traits which are used as scales. For example, there are scales for anxiety, job satisfaction, somatic symptoms, performance difficulty, resentment, depression, or instability of occupational self-esteem. These scales are developed and tested with the aid of statistical analysis to select those items which demonstrate the highest contribution to scale reliability, and Cronbach's alpha will be used as a measure of reliability. Other analyses are performed as appropriate.

Correlations between scales are computed, using Pearson's coefficient correlation to determine the relation

between each pair of variables. This is displayed, using a correlation matrix which shows correlations which can vary from 1.0 (perfect correlation), to 0.0 (no correlation), to -1.0 (perfect negative correlation).

The distribution is noted as to how many of the computer professionals fall into the various categories of the different psychological responses. For example, it would not surprise the author if few of the computer technicians feel an Irrelevant Appraisal to the PC. Also, the author does not believe that those IOUs which have fully implemented PCs into the organization, have computer professionals who experienced the Threat Appraisal and yet fall into the category of not believing the change occurred (and thus fall into the post stress reaction category).

The scales' correlations will demonstrate if there is a correspondence to the relations which would be expected if the computer professionals make the same appraisals as forecast by the model. For example, those computer professionals who make a threat appraisal should show high correlation with the traits of anxiety, fear, frustration, and resentfulness. Those with a benign-positive appraisal should show high correlation with the traits of comfort, ease, and satisfaction.

Additional analysis will be performed to determine if there are some additional factors which might be moderators

such as age, sex, expertise, or years in the computer field.

THE INSTRUMENT

An instrument is needed to be able to measure the psychological responses of the computer professionals to the change in their workplace brought about by the use of PCs. For this purpose a pilot instrument was developed for administration to a test population of computer professionals, which are different from the target population of computer professionals. Two organizations different from the six target IOUs were used, one an IOU and the other a quasi-government organization. With the seventh IOU being used as a pilot location, the author has used all of the IOUs in the Nothwestern United States in the research. The purpose of the pilot instrument is to develop, verify, and refine a questionnaire which may be given as the final instrument to the target population.

Nature of the Instrument

The pilot instrument needs to have the capability of verifying or negating the proposed model, using the ability to measure the psychological responses of the computer professionals to the change in their workplace brought about by the use of PCs. For this purpose, a self-report instrument was developed which consists of a series of

multiple choice questions asking computer professionals to rank their responses on a scale of from one to five. The numerical responses indicated: 1. Always True, 2. Often True, 3. Sometimes true, 4. Seldom True, 5. Never True.

It was felt that the pilot questionnaire should be tested for scale reliability, and to determine what number of items are sufficient to gain acceptable levels of reliability, yet avoid having too many items which makes the questionnaire too lengthy. Two companies were used for the pilot application of the instrument. The first was an IOU with a 100 computer professionals, and the second was a quasi-government agency with 24 computer professionals. Both companies had installed PCs some time ago and were considered to be at the C Level of the model in their computer usage, that is, at the level when PCs have become an established tool at the organization.

First Level of Appraisals (A)

Accordingly, for the A Level of appraisals (namely: Benign-Positive, Irrelevant, and Threat) appropriate measures of typical psychological responses were developed.

Benign-Positive Appraisal. For Benign-Positive four typical psychological responses were measured: 1. Enthusiasm, 2. Pleasure, 3. Job Satisfaction, and 4. Technology Specific Self Gratification. (In Appendix A all categories and items for the instrument are shown.)

Table I presents the sources and nature of the items
in the scales which measure Enthusiasm, Pleasure, Job
Satisfaction and Technology Specific Self Gratification.

There are several cases in the use of scales, which
were borrowed from other researchers, that the author did
not feel there were sufficient enough items in the scale to
be assured that a high alpha would result from the
administration of the instrument. The author generated
additional items frequently using the form and format of
the previous researchers' items. For example, Martin and
Wall (1989) used a three item Enthusiasm Scale which
consisted of:

1. This week my job made me feel keen.

2. This week my job made me feel lively.

3. This week my job made me feel enthusiastic.

In order to get more items in the Enthusiasm Scale the
author used Roget's Thesaurus to find synonyms for
enthusiasm, and generated additional items using the
synonyms: stimulated, excited, invigorated, energetic.
Specifically, four additional items were added to this
scale:

4. This week my job made me feel stimulated.

5. This week my job made me feel excited.

6. This week my job made me feel invigorated.

7. This week my job made me feel energetic.

TABLE I

SOURCES OF PILOT INSTRUMENT SCALES AND ITEMS - LEVEL A

Variable	# of Items	Source	Cross Reference Scale Item Number With Pilot Instrument Number	Comments
Benign-Positive Appraisal				
Enthusiasm	7	1,2,3 Martin & Wall 1989 4,5,6,7 Author	1-A1; 2-A8; 3-A21; 4-A28; 5-A35; 6-A36; 7-A43.	Items 4 through 7 were created using a thesaurus to match synonyms for enthusiasm.
Contentment	9	1,2,3 Martin & Wall 1989 4,5,6,7,8,9 Author	1-A5; 2-A14; 3-A15; 4-A27; 5-A29; 6-A39; 7-A45; 8-A46; 9-A47	Items 4 through 9 were created using a thesaurus to match synonyms for contentment.
Job Satisfaction	7	1,2,3,4 Martin & Wall 1989 5,6,7 Author	1-A7; 2-A10; 3-A20; 4-A23; 5-A33; 6-A37; 7-A41.	Items 5 through 7 were created using a thesaurus to match synonyms for satisfaction.
Technology Self Gratification	6	1,2,3,4,5,6 Author	1-A3; 2-A13; 3-A17; 4-A24; 5-A32; 6-A40.	Measures self gratification which subjects receive from working with PCs.
Irrelevant Appraisal				
Indifference	7	1,2,3,4,5,6,7 Author	1-A6; 2-A12; 3-A19; 4-A22; 5-A31; 6-A48; 7-A44.	Measures indifference with which subjects view the impact of PCs upon their jobs.
Threat Appraisal				
Fear	7	1,2,3,4,5,6,7 Author	1-A2; 2-A9; 3-A18; 4-A25; 5-A30; 6-A38; 7-A42.	Measures how threatened, fearful or uncertain subjects feel PCs were to them or their profession.
Anxiety	5	1,2,3 Martin & Wall 1989 4,5 Author	1-A4; 2-A11; 3-A16; 4-A26; 5-A34.	Items 4 & 5 were created using a thesaurus to match synonyms for anxious.

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The author would rather have too many items and have the luxury of reducing excessive items from the pilot instrument, rather than find out that an insufficient number of items were used and that the resulting Cronbach's alpha was below the acceptable level.

Irrelevant Appraisal. The Irrelevant Appraisal consisted of a single, seven item scale (labeled Indifference) which measures a computer professional's belief that the PC will not have much of an effect on their job. Table I presents the sources and nature of the items in this scale which measures indifference.

Threat Appraisal. For the Threat Appraisal two typical psychological responses were measured: Fear and Anxiety. Table I presents the sources and nature of the items in this scale which measures the fear, uncertainty, anxiety, or threat which computer professionals may feel toward PCs.

Second Level of Appraisals (B)

For those subjects exhibiting the Threat Appraisal, there is a second level (labeled the B Level) of appraisal which they undergo due to the uncertainty, duration, and imminence of the threat. This B Level is called the Threat/Cognitive Appraisal.

Threat/Cognitive Appraisal. They undergo this Threat/Cognitive appraisal until the change either occurs

or else is determined not to occur. To determine if the those computer professionals who perceive the Threat Appraisal also experience the Threat/Cognitive Appraisal, six categories of typical psychological responses to threat will be measured: 1. Self Esteem, 2. Subjective Stress, 3. Mastery, 4. Interpersonal Trust, 5. Somatic Symptoms, and 6. Performance Difficulty.

Table II presents the sources and nature of the items in the scales which measure Self Esteem, Subjective Stress, Mastery, Interpersonal Trust, Somatic Symptoms, and Performance Difficulty.

Third Level of Appraisals (C)

For those computer professionals who experience the Threat Appraisal, and going through the Cognitive Appraisal, finally either the change does or does not occur, which leads to the C Level of the model. For our case the PC does exist and all the target IOUs have moved, or plan on moving, ahead with the implementation of PCs in the organization. Hence, there is not a measure to determine if post stress reaction occurred in the case when no change occurs (i.e. PCs are not implemented in the company). Our model indicates that when the change does occur, those who felt threatened by the prospect of PC usage within their companies will either have a Harm/Loss Appraisal or a Challenge Appraisal.

TABLE II

SOURCES OF PILOT INSTRUMENT SCALES AND ITEMS - LEVEL B

Variable	# of Items	Source	Cross Reference Scale Item Number With Pilot Instrument Number	Comments
Self Esteem	10	1-10 Rosenburg 1965	1-B1; 2-B9; 3-B14; 4-B21; 5-B25; 6-B30; 7-B35; 8-B38; 9-B39; 10-B40.	Referred to as Rosenburg's Self Esteem Scale.
Subjective Stress	4	1-4 Shar, Reeder, & Dirken 1973	1-B3; 2-B10; 3-B15; 4-B19.	Originally developed by the American Heart Association 1968.
Mastery	7	1-7 Folkman, Lazarus, Gruen, & DeLongis 1986	1-B2; 2-B7; 3-B16; 4-B23; 5-B26; 6-B32; 7-B36.	Originally developed by Pearlin & Schooler, 1978. Assesses the extent to which one regards one's life as being under one's control, in contrast to being fatalistically determined.
Interpersonal Trust	7	1-7 Folkman, Lazarus, Gruen, & DeLongis 1986	1-B4; 2-B11; 3-B17; 4-B20; 5-B29; 6-B33; 7-B37.	Derived from a substantially shortened version of Rotter's Scales 1980.
Somatic Symptoms	6	1-6 Symptom Distress Checklist by Parloff, Kelman & Frank 1954	1-B6; 2-B8; 3-B18; 4-B22; 5-B27; 6-B34.	Also used by Lipman, Rickles, Covi, Derogatis, and Uhlenhuth 1969.
Performance Difficulty	6	1-6 Symptom Distress Checklist by Parloff, Kelman & Frank 1954	1-B5; 2-B12; 3-B13; 4-B24; 5-B28; 6-B31.	Both Somatic Symptoms & Performance Difficulty are subsets of the Symptom Distress Checklist.

Harm/Loss Appraisal. The Harm/Loss Appraisal is measured by four typical psychological responses, namely: 1. Depression and 2. Resentment for the alienation outcome; and 3. Satisfaction with Company and 4. Acceptance for the acceptance outcome. Table III presents the sources and nature of the items in the scales which measure Depression, Resentment, Satisfaction with Company, and Acceptance of the new technology.

Challenge Appraisal. The Challenge Appraisal is measured by three typical psychological responses to personal challenge, namely: 1. Challenge, 2. Enthusiasm, and 3. Pleasure.

Table III presents the sources and nature of the items in the scales which measure Challenge, Enthusiasm, and Pleasure.

Appendix A contains the original set of scales and items which are used in the pilot questionnaire. Appendix B contains a copy of the pilot questionnaire which was administered to those companies which are presently at Level C in their use of PCs.

The scales represent the means for being able to measure the emotions and feelings that the computer professionals experience as they go through the change event associated with the introduction of PCs into their workplace.

TABLE III

SOURCES OF PILOT INSTRUMENT SCALES AND ITEMS - LEVEL C

Variable	# of Items	Source	Cross Reference Scale Item Number With Pilot Instrument	Comments
			Harm/Loss Appraisal	
Depression	10	1,2,3 Martin & Wall 1989 4,5,6, Author 7,8,9,10 Symptom Distress Checklist, Parloff et al.1954	1-C1; 2-C8; 3-C17; 4-C23; 5-C32; 6-C36; 7-C42; 8-C47; 9-C51; 10-C53.	The author combined two well known scales for pupposes of the pilot instrument to measure depression. Items 4,5,6 were created using the form of the Martin & Wall items and a thesaurus to match synonyms for depresion.
Resentment	5	1,2,3 Sympton Distress Checklist, Parloff et al. 1954; 4,5 Author	1-C3; 2-C12; 3-C18; 4-C25; 5-C33;	The author added two additional items in order to have more than just three items. The author's items dealt with feeling bitter or aggrevated about what has happened.
Satisfaction with Company	6	1,2,3,4,5,6 Author	1-C4; 2-C14; 3-C15; 4-C22; 5-C34; 6-C38.	The author created six items to measure the level of satisfaction the computer professionals felt with the organization as another measure of resentment.
Acceptance	8	1,2,3,4,5,6,7,8 Author	1-C5; 2-C11; 3-C20; 4-C27; 5-C29; 6-C37; 7-C44; 8-C48.	These questions are oriented toward the computer professional's acceptance of PCs.
			Challenge Appraisal	
Challenge	8	1,2,3,4,5,6,7,8 Author	1-C7; 2-C9; 3-C19; 4-C24; 5-C35; 6-C39; 7-C43; 8-C49.	The author created eight items to measure the extent of challenge presented by the new technologies.
Enthusiasm	7	1,2,3 Martin & Wall 1989 4,5,6,7 Author	1-C2; 2-C13; 3-C21; 4-C26; 5-C31; 6-C40; 7-C46.	Items 4 through 7 were created using a thesaurus to match synonyms for enthusiasm.
Contentment	9	1,2,3 Martin & Wall 1989 4,5,6,7,8,9 Author	1-C6; 2-C10; 3-C16; 4-C28; 5-C30; 6-C41; 7-C45; 8-C50; 9-C52.	Items 4 through 9 were created using a thesaurus to match synonyms for contentment.

Demographic Data

Demographic data is also included to determine the
computer professionals: sex, age, salary level, years of
experience, education level, and current access to PCs.

The Completed Pilot Instrument

The pilot instrument then consists of five parts (see
Appendix B for sample). The first part is a general
section with demographic information about the individual
computer professional who is answering the questionnaire.
The second part is a series of 48 multiple choice questions
which are designed to measure responses to Level A of the
model. The third part is a series of 38 multiple choice
questions which are designed to measure responses to Level
B of the model. The fourth part is a series of 53 multiple
choice questions which are designed to measure responses to
Level C of the model. The fifth part is a comments page in
which the respondents are free to make any comments which
they believe might help the author improve the instrument.
The total number of multiple choice questions totalled 146,
which makes for a fairly long questionnaire.

The above instrument was tested on the previously
mentioned two companies and for the various categories of
psychological responses. The answers to the associated
items were tested using Cronbach's alpha which is a
generally accepted measure of scale reliability. Alpha

can range from a value of one on down to minus infinity,
with a value of one indicating that the items in a scale
have perfect reliability, and negative values are treated
as "zero" with zero as an indication of no reliability.
Most researchers are very pleased if their various measures
have alphas greater than .70, with even an occasional .60
being acceptable. The author has set a standard that any
alpha less than .70 will be unacceptable for this research.

Results of the Pilot Instrument

A total of 124 questionnaires were submitted to the two
pilot companies. A total of 51 questionnaires were
received back by the author for a response rate of 41
percent.

The IOU which has a hundred computer professionals has
their staff physically located at two geographically
separate locations. One of the locations is close by the
author's location, and the other is several hundred miles
away. From the nearby location the response rate was over
60 percent, but from the remote location the response rate
was very poor. One of the managers from the nearby
location indicated that this was to be expected as the
remote people seldom received much communication from the
local people, and as a result gave very little back.

Mechanics of analysis. The responses from the 51
questionnaires were entered into a hard drive on an IBM PC.

The PC software packages called SYSTAT, SYGRAPH, and TESTAT
were used to perform the data collection and analysis.
SYSTAT and SYGRAPH were purchased through Portland State
University's Computer Services Department, and a copy of
TESTAT was purchased directly from SYSTAT, Inc. in
Evanston, Illinois.

SYSTAT contains commands which will enter data,
manipulate data, and perform various statistical analysis.
SYGRAPH has various plotting and graphic capabilities.
TESTAT has routines for the testing the validity and
reliability of questionnaire data which includes the
computation of Cronbach's alpha based upon the raw data
entered from the questionnaires.

One of the author's goals is to make a more compact
questionnaire. This desire was borne out by several of the
comments received from respondents to the pilot
questionnaire. There were several comments both written
and oral given to the author that the questionnaire was too
lengthy, and advise was given that if the author really
wanted to get people to fill it out and have an acceptable
response rate, then it needed to be reduced in length.

There were two criteria used for the evaluation of
deleting, modifying, or adding items to a particular scale.
The first deals with Cronbach's alpha. The alpha must be
above .70, and if alpha is below that level then the items
on the scale must be examined and a determination made as

to which items are causing a low alpha. Then, the items must be modified, deleted, or new items added, in an attempt to increase alpha above the .70 level.

The second deals with the desire to shorten the questionnaire. The author decided that no less than four items would be acceptable for any scale, even though some other researchers from whom the author had borrowed scales had scales with as little as three items, the author felt that since he only had one chance to administer the final questionnaire he would rather go forward with a slight cushion. Additionally, there was a practical matter that the SYSTAT and TESTAT software packages would not accept any less than four items per scale. However, even though there was a desire to limit the number of items per scale, if in the process of computing Cronbach's alpha it was determined that by eliminating an item from the scale, it would adversely lower alpha by more than .010, then that item would be retained.

For each of the various scales associated with each of the psychological responses, Cronbach's alpha was computed for the items associated with that particular scale. The TESTAT package not only computes Cronbach's alpha, but also displays for each item what the Cronbach alpha would have been for that scale if that particular item was not included.

For example, the Challenge scale has eight items:

1. I feel that the new technology will provide exciting challenges.

2. I am really challenged by the new technology we have.

3. I feel the challenge of the new technology will provide opportunities.

4. The new technologies we have are making this a more interesting place to work.

5. The new technologies are like a breath of fresh air and invigorate me.

6. With the new technology my job is every bit as important as it has ever been.

7. With the new technology I will be able to show how important I am to this organization.

8. With the new technology this company will not be able to get along without me, or people like me.

Computing Cronbach's alpha on the pilot data for the C Level for Challenge an alpha = .809 was computed. This is an acceptable alpha, and since one of the goals is to reduce the length of the questionnaire, and to avoid unnecessary redundancy, then it is possible to eliminate one or more of the items. As was mentioned, TESTAT also gives the information as to what the alpha would have been if each one of the items had been omitted. The print out from TESTAT gave the following information:

"Value for Alpha excluding this item:

Item #	1	2	3	4	5	6	7	8
Alpha	.771	.765	.760	.753	.750	.791	.835	.855"

As can be seen from the above numbers, since the alpha for all eight items is .809, then by omitting item eight the total alpha is not adversely effected, and in this case it is even slightly improved by .046 to .855.

The data was rerun with item 8 being omitted and an alpha = .855 was computed as predicted, along with the following:

"Value for Alpha excluding this item:

Item #	1	2	3	4	5	6	7
Alpha	.831	.824	.819	.803	.810	.852	.889

Once again, it is observed that an item can be dropped without hurting (and in fact helping) the alpha, namely item seven can be dropped.

The data was rerun with item seven omitted and an alpha = .889 was computed, along with the following:

"Value for Alpha excluding this item.

Item #	1	2	3	4	5	6
Alpha	.871	.873	.859	.854	.857	.903"

Once again, it is observed that an item can be dropped without hurting (and in fact increasing) the alpha, namely item six can be dropped.

The data was rerun with item six being omitted and an alpha = .903 was computed along with the following:

"Value for Alpha excluding this item.

Item #	1	2	3	4	5
Alpha	.884	.889	.869	.885	.878"

At this point any further reduction of items, namely item 2, would cause a decrease in the value of Alpha, although admittedly a small reduction of .014. Thus, the Challenge Scale used in the final instrument consisted of the above five items.

Some scales were used in both the A Level of the model and in the C Level of the model. It is interesting to note what happened when Cronbach's alpha was computed and the above criteria for analyzing the items in the scale was applied. In all the cases, the same items were eliminated, and the final alpha for the reduced set of items was similar. For example, the Enthusiasm scale was used in both the A Level and the C Level. For Level A the Enthusiasm scale resulted in items 1, 2, and 3 being omitted because they had the least effect on alpha, with a final alpha of .936 being computed.. For Level C of the model, the same first three items were omitted, and the resulting items 4,5,6, and 7 yielded an alpha of .959.

Final outcome of pilot questionnaire. Values of Cronbach's alpha for the various scales run from .70 to .96, with the exception of one particular scale which only had an alpha of .58 (which will be discussed later). This

is a good set of alphas, with the one noted exception, and
gives an indication of good scale reliability.

Table IV gives the results of Cronbach's alpha for the
various scales at the A Level of appraisals, namely:
Benign-Positive, Irrelevant, and Threat.

Within the Threat Appraisal, a problem of scale
reliability occurred for the Anxiety scale which required
some corrective action. Originally, there were seven items
in the scale, some of which had very poor reliability
indexes. After eliminating 3 of the 7 items the alpha was
only .58 which is considerably below the minimum target of
.70 which the author had set. If four out of seven items
were dropped, leaving only three items, then the alpha was
raised above the .70 level, but the author had set another
target of having at least four items for each scale, so
this was unacceptable. After detailed investigation of the
51 individual responses to the seven items in the scale,
the author determined a pattern as to what caused the
inconsistent responses to the anxiety scale. Accordingly,
the author decided to drop two of the items, reword another
two items, and to add an additional item. Thus, Anxiety
ended up as a six item scale. It did not seem to be
practical to retest this one item on the pilot companies,
so the modified scale was used in the final questionnaire
and its Cronbach alpha was recomputed after the six target

TABLE IV

RESULTS OF PILOT INSTRUMENT - LEVEL A

Variable	# of Initial Items	# of Final Items	Alpha For Final Items	Cross Reference Scale Item Number With Pilot Instrument Number
			Benign-Positive Appraisal	
Enthusiasm	7	4	.94	1-A1; 2-A8; 3-A21; 4-A28; 5-A35; 6-A36; 7-A43.
Contentment	9	5	.95	1-A5; 2-A14; 3-A15; 4-A27; 5-A29; 6-A39; 7-A45; 8-A46; 9-A47.
Job Satisfaction	7	5	.89	1-A7; 2-A10; 3-A20; 4-A23; 5-A33; 6-A37; 7-A41.
Technology Self Gratification	6	4	.86	1-A3; 2-A13; 3-A17; 4-A24; 5-A32; 6-A40.
			Irrelevant Appraisal	
Indifference	7	4	.86	1-A6; 2-A12; 3-A19; 4-A22; 5-A31; 6-A48; 7-A44.
			Threat Appraisal	
Fear *	7	6	.58	1-A2; 2-A9; 3-A18; 4-A25; 5-A30; 6-A38, 7-A42.
Anxiety	5	5	.85	1-A4; 2-A11; 3-A16; 4-A26; 5-A34.

* Some items in this scale were modified because of the low alpha. Items five and six were dropped, and a new item added. Item four was modified to more clearly indicate fear of PCs.

companies had completed the questionnaire. The author
believes the resulting alpha will be acceptable.

Table V gives the pilot instrument results of scale
reliability for the B Level of appraisal. Specifically,
the Cognitive Appraisal which follows the Threat Appraisal.
There are six categories of typical psychological responses
to threat for which measurement scales were developed: 1.
Self Esteem, 2. Subjective Stress, 3. Mastery, 4.
Interpersonal Trust, 5. Somatic Symptoms, and 6.
Performance Difficulty.

One of the scales experienced scale reliability
difficulties. For Subjective Stress, an alpha of .71 was
achieved when dropping one item of a four item scale and
only using the three remaining items. When all four items
were used the alpha was only .66 for the scale. This left
a conflict with two of the original targets which the
author set, namely that no alpha would be below .70 and
that no less than four items per scale would be used. The
first item in the scale was the cause of the alpha being
below .70, and when it was omitted the alpha rose to an
acceptable range. The author examined the detailed
responses of the 51 individuals to the questionnaire and
determined a pattern of inconsistent responses which had to
do with interpretation of the meaning of the first item.

TABLE V

RESULTS OF PILOT INSTRUMENT - LEVEL B

Variable	# of Initial Items	# of Final Items	Alpha for Final Items	Cross Reference Scale Item Number With Pilot Instrument Number
Self Esteem	10	5	.85	1-B1; 2-B9; 3-B14; 4-B21; 5-B25; 6-B30; 7-B35; 8-B38; 9-B39; 10-B40.
Subjective Stress *	4	5	.66	1-B3; 2-B10; 3-B15; 4-B19.
Mastery	7	5	.75	1-B2; 2-B7; 3-B16; 4-B23; 5-B26; 6-B32; 7-B36.
Interpersonal Trust	7	5	.70	1-B4; 2-B11; 3-B17; 4-B20; 5-B29; 6-B33; 7-B37.
Somatic Symptoms	6	5	.81	1-B6; 2-B8; 3-B18; 4-B22; 5-B27; 6-B34.
Performance	6	5	.75	1-B5; 2-B12; 3-B13; 4-B24; 5-B28; 6-B31.

* Without item # 1 the alpha for Subjective Stress would be .71, but this would only leave three questions which is below the acceptable level of at least four items. A determination was made by the author to rewrite question # 1 and to add a fifth question for the final questionaire in an effort to increase the alpha when the final questionaire is administered to the computer professionals in the six IOUs.

Consequently, the first item was reworded, and the author added a fifth item, the net effect of which should be to raise the alpha to be within an acceptable range.

For Performance Difficulty all six items yielded an alpha of .75. An alpha of .75 was retained when dropping one item of the six item scale. While an alpha of .75 is within the authors acceptable range, it is a lower alpha than the other scales, and the author opted to modify the scale in order to achieve a higher alpha for the final instrument. One of the retained items was slightly reworded to be more consistent with the other items, which should raise the final alpha higher.

Table VI gives the pilot instrument results of scale reliability for the C Level of appraisal. Which consists of either a Harm/Loss Appraisal or a Challenge Appraisal. Specifically, there are a total of seven categories of typical psychological responses which had scales developed for them.

For the Harm/Loss Appraisal there are two prevalent outcomes: alienation or acceptance. Accordingly, the typical psychological responses represent those two types of outcomes. For the alienation outcome the two categories of typical psychological responses are: 1. Depression and 2. Resentment. For the acceptance outcome the two categories of typical psychological responses are: 1. Satisfaction with Company, and 2. Acceptance.

TABLE VI

RESULTS OF PILOT INSTRUMENT - LEVEL C

Variable	# of Initial Items	# of Final Items	Alpha For Final Items	Cross Reference Scale Item Number With Pilot Instrument Number
			Harm/Loss Appraisal	
Depression	10	5	.85	1-C1; 2-C8; 3-C17; 4-C23; 5-C32; 6-C36; 7-C42; 8-C47; 9-C51; 10-C53.
Resentment	5	4	.87	1-C3; 2-C12; 3-C18; 4-C25; 5-C33.
Satisfaction With Company	6	4	.80	1-C4; 2-C14; 3-C15; 4-C22; 5-C34; 6-C38.
Acceptance	8	4	.89	1-C5; 2-C11; 3-C20; 4-C27; 5-C29; 6-C37; 7-C44; 8-C48.
			Challenge Appraisal	
Challenge	8	5	.90	1-C7; 2-C9; 3-C19; 4-C24; 5-C35; 6-C39; 7-C43; 8-C49.
Enthusiasm	7	4	.96	1-C2; 2-C13; 3-C21; 4-C26; 5-C31; 6-C40; 7-C46.
Contentment	9	5	.89	1-C6; 2-C10; 3-C16; 4-C28; 5-C30; 6-C41; 7-C45; 8-C50; 9-C52.

For the Challenge Appraisal the three categories of typical psychological responses were: 1. Challenge, 2. Enthusiasm, and 3. Pleasure.

For the C Level of appraisal there were no problems of scale reliability encountered with the pilot instrument. The values for Cronbach's alpha ranged from a low of .80 for Satisfaction With Company, to a high of .96 for Enthusiasm. Also, the number of items per scale are reduced to either four or five.

As can be judged from the Tables IV, V, and VI, a significant number of unnecessary items (40) have been eliminated without sacrificing the scale reliability. Thus, one of the goals of reducing the number of questions in the questionnaire has been accomplished by reducing from 142 to 102 (-28%) the total number of responses required. Based on the written comments in the pilot questionnaire (as well as oral comments from several of the participants), it is believed that the response rate will increase because of the shortening of the number of the questions. This has been achieved while still maintaining the goal set for values of Cronbach's alpha.

Further Field Testing

It is always desirable to perform further field testing after a questionnaire is modified, however there is also the practical limit as to how many MIS managers from

companies will continue to participate in what they view as merely an academic exercise. The author felt that the effort and courtesy extended to him by the participants was sufficient and that to ask them to do more would be excessive. For the other remaining IOUs in the Northwestern United States, they were the target companies and the author desired to leave them undisturbed until the final questionnaire was administered.

Rather than try to extend the territory for testing to IOUs outside of the Northwest, or to try and get participation from similar organizations, such as public utility departments, where the author had no contacts, another approach was used. The author utilized personal interviews with twelve computer professionals who had taken the original pilot questionnaire. First, they were interviewed after they had completed the questionnaire and their impressions were noted. Mostly they complained about the length of the questionnaire, with the second most common complaint being of the redundancy of many of the questions. These were also the most frequent of the written complaints turned in with the questionnaire.

Their third most common complaint was that they did not see the relevancy of the questionnaire as to how it is going to help computer professionals adjust to change. This type of comment was also noted in some of the written comments on the questionnaire. The author did not indicate

to anyone what the real purpose of the questionnaire was
other than to make a vague reference to it being "an
attempt to measure the responses of computer professionals
to the introduction and use of personal computers (PCs) in
the workplace." The author did not want to bias the
respondents by giving them too much information about it
being an instrument to analyze a model, and of course they
were never shown the model. It is interesting to note that
many people still arrived at their own conclusions as to
what the real purpose was, and did an evaluation as to
whether or not the instrument would be effective for the
purpose which they had imagined for it.

After the questionnaire had been redesigned, the same
twelve computer professionals were shown the revised
instrument and then interviewed for their comments again.
Their comments were duly noted, and then they were shown
the model which was to be analyzed, were told the purpose
of the questionnaire and how it was to help in the
analysis of the model. Further comments were solicited at
this point and then noted. These comments were utilized in
making further revisions to the questionnaire. Appendix C
contains the revised items for the final questionnaire.
Appendix D contains the revised items for the final
questionnaire cross referenced with the numbers for the
items as shown on the pilot instrument.

Thus, further field testing of the revised questionnaire was made in person using a one-on-one situation with computer professionals who had already taken the questionnaire, and who eventually were given full knowledge of the purpose of the questionnaire.

Having completed all this testing, the author decided it was appropriate to risk the issuance of the questionnaire to the six target companies. There is always an element of risk that something has been overlooked, and when the completed questionnaires are received and Cronbach's alpha recomputed that the questionnaire may be found lacking.

Appendix E contains a copy of the final questionnaire which was issued to the target IOUs.

CHAPTER IV

ANALYSIS AND CONCLUSIONS

INTRODUCTION

The response rates of the companies are over fifty
percent for all companies. The scale reliability and
Cronbach's alpha are presented and discussed. The various
distribution of responses and the correlations of responses
are presented and discussed. Based on the findings of the
quasi-experiment the analysis postulates are confirmed.
The demographic results are presented and tested for
statistical independence.

RESPONSE RATE

A total of 294 questionnaires were submitted to the six
target companies. In Table VII a summary of basic data,
about the target companies and the associated responses, is
given. A total of 201 questionnaires were received back by
the author for a response rate of 68 percent. Of those
questionnaires received back, there were a total of five
which were not usable by the author for purposes of this
research because they were not completely filled out.

TABLE VII

RESPONSE RATE DATA

Company Number	Sent	Returned	(%)	Usable	(%)	Level PC Penetration
1.	27	21	78%	21	78%	A
2.	56	38	68%	37	66%	B
3.	30	22	73%	21	70%	B
4.	66	49	74%	49	74%	C
5.	45	33	73%	31	69%	C
6.	70	38	54%	37	53%	C
TOTAL	294	201	68%	196	67%	

In one case the respondent filled out about a third of
the questionnaire and wrote that he felt the questionnaire
was redundant and too lengthy to deserve his further
attention. In the other four cases the respondents filled
out the initial personal information and the portions
relating to Levels B or C, but did not fill out the
portions relating to Level A. In one case a respondent
indicated that she did not join the company until after the
company had already progressed past Level A. The author
believes the same situation probably accounted for the
other three similar responses.

SCALE RELIABILITY AND CRONBACH'S ALPHA

The analysis of scale reliability which was conducted
upon the responses from the pilot companies led the author
to modify some of the items associated with certain scales,
and to reduce the number of items for most of the scales.
Hence, it is appropriate to recompute Cronbach's alpha for
the responses received from the target companies. Table
VIII gives the summary of the alpha computations, with all
of the values being greater than or equal to .80 which are
good results and exceeds the author's goal of not having an
alpha below the value of .70.

Those scales which had marginal alphas on the pilot
instrument, and required modification to the items, all
have considerably higher alphas well within the acceptable

range which was established as a criteria as can be seen in
Table VIII.

LEVEL A ANALYSIS

For Level A of the model, there are two key aspects in
being able to determine if the proposed model is supported
by the data. The first is if the respondents can be
categorized into the three appraisals which the model
states should occur in Level A, namely: 1. Benign-Positive
Appraisal, 2. Irrelevant Appraisal, or 3. Threat
Appraisal. The second aspect deals with the correlation of
the scales which are indicative of the responses of people
while at Level A.

Distribution of Responses

While the three appraisals of Level A (Benign-Positive
Appraisal, Irrelevant Appraisal, and Threat Appraisal) seem
to be intuitively obvious, seemingly exhaustive of the
possibilities, and generally accepted by psychologists,
human behavioralist, educators, and other practitioners of
human responses, the author was not able to find where
other researchers have validated this construct. In order
to analyze that these three responses are representative of
the possibilities, and if the respondents can be
categorized into these three appraisals, the author first
read each appraisal to determine if it was obvious if a

TABLE VIII

SCALES AND ASSOCIATED CRONBACH'S ALPHA

Scale	Alpha
Benign-Positive Appraisal	
Enthusiasm	.95
Pleasure	.95
Job Satisfaction	.94
Technology Self Gratification	.87
Irrelevant Appraisal	
Indifference	.84
Threat Appraisal	
Fear	.96
Anxiety	.97
Cognitive Appraisal	
Self Esteem	.93
Subjective Stress	.94
Mastery	.91
Interpersonal Trust	.90
Somatic Symptoms	.80
Performance Difficulty	.87

TABLE VIII

SCALES AND ASSOCIATED CRONBACH'S ALPHA
(continued)

Harm/Loss Appraisal	
Depression	.95
Resentment	.91
Company Satisfaction	.91
Acceptance	.95
Challenge	
Challenge	.95
Enthusiasm	.95
Pleasure	.97

respondent had a proponderence of responses falling into one of the three appraisals. Approximately 80 percent of the respondents fit nicely into one of the three appraisals. For the remaining 20 percent two methods were used to determine if the respondent "fit." First a numeric average score was determined for each of the respondents being investigated, and if an obviously high average occurred for one of the appraisals coupled with correspondingly low means for the other two appraisals, then the respondent was assigned to that category. For those respondents for which it was still not obvious if they fit into an appraisal category, a final test was used involving Student's t distribution. A 90 percent confidence interval was computed for each of the three appraisals based upon those responses which previously had been determined to fit into one of the three categories. The remaining responses were then compared to the confidence intervals to see if they fit into only one category. There were only two responses which did not fall into one of the three categories. The results of this analysis is given in Table IX, and demonstrates that which previously has been intuitively assumed has been numerically demonstrated for the subject computer professionals.

This distribution indicates that a large majority of the responding computer professionals regarded the advent

TABLE IX

LEVEL A DISTRIBUTION OF APPRAISALS

Company		Benign-Positive Appraisal		Irrelevant Appraisal		Threat Appraisal		No Fit	
No.	Level	No.	%	No.	%	No.	%	No.	%
1	A	15	71%	2	10%	4	19%	0	0%
2	B	19	51%	6	16%	11	30%	1	3%
3	B	11	52%	3	14%	6	29%	1	5%
4	C	32	65%	7	14%	10	21%	0	0%
5	C	18	58%	5	16%	8	26%	0	0%
6	C	26	70%	1	3%	10	27%	0	0%
TOTAL		121	62%	24	12%	49	25%	2	1%

Total Number of Usable Responses = 121 + 24 + 49 + 2 = 196

of the PC with a Benign-Positive Appraisal, and that almost
two-thirds of them looked forward to the introduction of
the PC into their workplace. It is noteworthy that the
range of responses to the Benign-Positive Appraisal ranged
from 51 percent to 71 percent, which always yields a
majority of the computer professionals in each of the six
companies viewing the PC as desirable regardless of which
level of penetration the PC has made at their particular
companies. There does not seem to be any discernible
pattern as to whether the level of PC penetration has
tainted people's perceptions and rememberances of their
feelings at the time when PCs were first being contemplated
for introduction into their organization.

It is further noteworthy that a relatively small
percentage (about 1 out of 8) of computer professionals
felt that the impact of the PC would be irrelevant to their
situation. Obviously, few of the computer professionals
viewed the advent of the PC as having little impact on
them. They are one class of worker for whom change has
been a way of life, and they have introduced many changes
for other workers, and have seen the pace at which change
has occurred in the computer field. Thus, this relatively
low number having irrelevant appraisals of the coming of
the PC to their workplace is indicative of their previous
experiences and knowledge.

Finally, there is a sizable minority of one-fourth of
the computer professionals who appraise the coming of the
PC into their workplace as possibly having a negative
impact on them. This does not mean that they are
necessarily afraid of the PC itself, but are uncertain as
to whether the impact of the PC on the organization may
result in loss or harm to them in the way of prestige,
position, status, rank, salary, job security, or other
factors. While 25 percent is a decent sized minority, it
is not as large a portion as some may have felt based upon
hearing computer professionals discuss, while in informal
group settings, the potential for misuse and abuse of
computer resources and misuse of PC output from poorly
constructed end user developed reports. The author heard
many such discussions and a great deal of concern expressed
by computer professionals in several companies when the
advent and introduction of the PC was eminent in their
workplace. Perhaps this was legitimate concern as to how
to best manage a resource which was viewed as having benign
or positive impact, and was not a reflection of their own
fears and phobias as the author suspected in many cases.

It is worth mentioning again that there is a lack of a
definite pattern for the six participating companies as to
the current level of PC penetration having a noteworthy
influence on the proportions of the computer professionals

experiencing the three appraisals. As Table IX shows, the
only company which was still at Level A had 71 percent of
the computer professionals with a Benign-Positive
Appraisal, and company 6 which is at Level C has 70 percent
of the computer professionals with the same appraisal.
Similarly, the company at Level A has 19 percent with the
Threat Appraisal, while company 4 which is at Level C has
21 percent of the computer professionals with the same
appraisal. The various percentages fit within that which
would be expected from random samples being taken from
various groups of similarly backgrounded people.

This is consistent with the findings of Lazarus and
Folkman (1985) who studied not only reactions to change,
but also the coping mechanisms which are employed by people
to react and deal with the change. In their studies they
surveyed two groups of people who were undergoing similar
threat situations. One group they surveyed at three
different time points: 1. before the threat situation
occurred but was pending (our Level A), 2. while the people
were undergoing the stress associated with the change
occurring (our Level B), and 3. after the threat event had
passed (our Level C). The other group of people were
surveyed only after the change had occurred. Both groups
were asked in the survey to identify their emotions at all
three time periods, as well as the type of coping mechanism
used during that time period. Lazarus and Folkman could

find no statistical difference in the appraisals made by similar groups of people, facing similar threat events, which would indicate that those surveyed after a threat event had passed, had any different recollection of what their emotions or coping mechanisms were, from that of those who were surveyed while the threat event was unfolding.

Correlations of Responses

At the beginning of this section it was stated that there are two keys aspects of being able to determine if the proposed model is supported by the data. The second aspect deals with the correlations of the scales which are indicative of the responses one can expect from computer professionals who are having either a Benign-Positive, Irrelevant, or Threat Appraisal to the pending introduction of PCs into their workplace. In order to support the model, one would expect in the A Level to see high, positive correlations between the scales of Enthusiasm, Pleasure, Job Satisfaction and Technical Gratification, which correspond to a Benign-Positive Appraisal. Also, for the Threat Appraisal, one would expect to see high, positive correlations between the scales of Anxiety and Fear. One would expect, for the Irrelevant Appraisal, to see little correlation between the Indifference Scale and the other scales associated with either the Benign-Positive

Appraisal or the Threat Appraisal, since it is difficult to perceive something as being either threatening or beneficial while at the same time feeling it is irrelevant. Finally, one would expect to see high negative correlations between the Benign-Positive Appraisal scales and the Threat Appraisal scales, since it is difficult to perceive something as being threatening to one's well being at the same time as perceiving it as being beneficial to one's well being.

A statistical analysis was performed and the correlations between scales computed. The computations were done using an IBM PC and the software package ITAN (Gerbing and Hunter, 1988).

As can be seen in Table X, the lowest correlation among the Benign-Positive Appraisal Scales was +.68, and the correlation between the Threat Appraisal Scales was +.98. In general, the Indifference Appraisal scale exhibited significant, but modest, negative correlations with all the other scales. Therefore, the correlation matrix in Table X supports the proposed model.

Thus, analysis postulate one is accepted. P1: When faced with a change event the subject computer professionals go through a triad of appraisals and make either an Irrelevant Appraisal, Threat Appraisal, or a Benign-Positive Appraisal.

TABLE X

SCALE CORRELATES FOR LEVEL A

Scales	1	2	3	4	5	6	7
1 Enthusiasm	1.00						
2 Pleasure	.80*	1.00					
3 Job Satisfaction	.98*	.74*	1.00				
4 Tech Gratification	.81*	.60*	.83*	1.00			
5 Indifference	-.08	-.09	.01	-.16*	1.00		
6 Anxiety	-.67*	-.57*	-.72*	-.79*	-.36*	1.00	
7 Fear	-.62*	-.62*	-.70*	-.77*	-.33*	.98	1.00

*Significant at the .05 level, $r = \pm.12$, n = 194

The results of Table X, combined with the results of Table IX, lead us to substantiate analysis postulates two and three. P2: With the Irrelevant Appraisal the subject computer professionals have indifferent feelings/emotions. P3: With the Benign-Positive Appraisal the subject computer professionals have pleasurable and comfortable feelings/emotions.

When the correlations are reviewed with respect to groupings by level of penetration of PCs in the organization we get similar relationships between the various scales, thus once again demonstrating that the passage of time does not materially effect the validity of the survey. Tables XI, XII, and XIII show the resulting correlates for companies at Level A, B, or C. One needs to be cautious when interpreting the results of this type of subset analysis because some of the subsets can have significantly smaller samples involved. Nevertheless, the correlations still have the same grouping of relationships as is indicated by the proposed model. Specifically, scales for Benign-Positive and Threat Appraisals still have high positive correlations within themselves.

In particular, high positive correlations (statistically significant) were found among the Benign-Positive Appraisal scales, and between the Threat Appraisal scales. The correlations between these two sets were moderately negative and statistically significant.

TABLE XI

SCALE CORRELATES FOR LEVEL A, FOR
COMPANIES STILL AT LEVEL A
(COMPANY ONE)

Scales	1	2	3	4	5	6	7
1 Enthusiasm	1.00						
2 Pleasure	.91*	1.00					
3 Job Satisfaction	.98*	.85*	1.00				
4 Tech Gratification	.78*	.76*	.81*	1.00			
5 Indifference	-.05	.06	.05	-.05	1.00		
6 Anxiety	-.45*	-.49*	-.60*	-.68*	-.53*	1.00	
7 Fear	-.40	-.47*	-.57*	-.63*	-.55*	.99*	1.00

*Significant at the .05 level, $r = \pm.43$, $n = 21$

TABLE XII

SCALE CORRELATES FOR LEVEL A, FOR
COMPANIES STILL AT LEVEL B
(COMPANIES TWO & THREE)

Scales	1	2	3	4	5	6	7
1 Enthusiasm	1.00						
2 Pleasure	.77*	1.00					
3 Job Satisfaction	.97*	.75*	1.00				
4 Tech Gratification	.80*	.69*	.83*	1.00			
5 Indifference	.19	.26*	.27*	-.09	1.00		
6 Anxiety	-.73*	-.68*	-.78*	-.82*	-.44*	1.00	
7 Fear	-.73*	-.68*	-.79*	-.77*	-.49*	.97*	1.00

*Significant at the .05 level, r = ±.26, n = 56

TABLE XIII

SCALE CORRELATES FOR LEVEL A, FOR
COMPANIES AT LEVEL C (COMPANIES
FOUR, FIVE & SIX)

Scales	1	2	3	4	5	6	7
1 Enthusiasm	1.00						
2 Pleasure	.80*	1.00					
3 Job Satisfaction	.99*	.73*	1.00				
4 Tech Gratification	.82*	.67*	.84*	1.00			
5 Indifference	-.14	-.15	-.07	-.16	1.00		
6 Anxiety	-.67*	-.53*	-.70*	-.78*	-.38*	1.00	
7 Fear	-.68*	-.61*	-.68*	-.77*	-.33*	.98*	1.00

*Significant at the .05 level, $r = \pm.18$, n = 117

The Indifference Appraisal scale exhibited slight,
negative, statistically significant correlation with the
Threat Appraisal scales. The correlations of the
Benign-Positive Appraisal Scales and the Indifference
Appraisal scale varied across company levels; near zero for
Level A, somewhat positive for Level B, and negative for
Level C.

LEVEL B ANALYSIS

Level B of the model represents those individuals who
have experienced a Threat Appraisal, and are undergoing a
Cognitive Appraisal as to the potential impact of the
change. The psychological responses which they are
undergoing have to do with such variables as the eminence,
duration, and uncertainty of the change. For those people
experiencing a Threat Appraisal typical responses include
such scales as a lessing of Self Esteem, increased
Subjective Stress, a lowering of a belief in their own
Mastery, a lessing of Interpersonal Trust, increased
Somatic Symptoms, and Performance Difficulty. As has been
mentioned earlier, these scales have all been selected from
previous work performed by other researchers on people
undergoing threats to their well being. Thus, one would
expect, if the proposed model is supported by the data,
that those computer professionals who indicated on the
questionnaire that they experienced a Threat Appraisal

during Level A, then while in Level B and undergoing the Cognitive Appraisal they would have high levels of correlation between those scales indicating a threat.

Table XIV shows the correlations for Level B.

All correlations among these scales are positive and statistically significant. Except for Somatic Symptoms, all of the correlations were high, with the correlations being moderate for Somatic Symptoms. Omitting for the moment Somatic Symptoms, it can be easily stated that the other five scales show substantial intercorrelations, and thus substantiate the model at the B Level. One can only conjecture as to why the correlation of Somatic Symptoms with the other scales is more modest, but perhaps it is because the threat of PCs is not of sufficient intensity to the computer professional to cause overt health problems. Nevertheless, Somatic Symptoms still exhibited moderate correlation ranging from +.46 to +.55, indicating that there still is a relationship between this scale and the other scales associated with the Threat Appraisal.

Thus, the fourth analysis postulate is supported. P4: With the Threat Appraisal the subject computer professionals go through a cognitive process which produces psychological responses resulting from stress, such as loss of self esteem, anxiety, fear, and performance difficulty.

TABLE XIV

SCALE CORRELATES FOR LEVEL B

Scales	1	2	3	4	5	6
1 Self Esteem	1.00					
2 Subjective Stress	.71*	1.00				
3 Mastery	.93*	.83*	1.00			
4 Interpersonal Trust	.87*	.82*	.82*	1.00		
5 Somatic Symptoms	.47*	.55*	.52*	.46*	1.00	
6 Performance Difficulty	.95*	.70*	.92*	.87*	.47*	1.00

*Significant at the .05 level, $r = \pm.14$, n = 173

LEVEL C ANALYSIS

It remains to be seen if for Level C high correlations
exist between the scales which the proposed model
indicates.

For the category of alienation there should be high
correlations between Depression and Resentment. For the
category of acceptance there should be high correlations
between Company Satisfaction and Acceptance of PCs. For
the category of challenge there should be high correlations
between the scales of Challenge, Enthusiasm, and Pleasure.
Table XV shows the correlates for Level C.

The correlates correspond to those predicted for the
proposed model. All correlations were statistically
significant. Depression and Resentment demonstrated high
correlation with each other and moderate to high negative
correlation with all other scales. The correlations among
the remaing five scales were positive. Company
Satisfaction and PC Acceptance, which are scales for
measuring Acceptance, have high, positive correlation with
each other, and moderate, positive correlation with the
scales which measure the Challenge Appraisal. Challenge
and Enthusiasm, which are scales for measuring the
Challenge Appraisal, have high, positive correlation with
each other; while the remaining scale in the Challenge
Appraisal, of Pleasure, has high, positive correlation with

TABLE XV

SCALE CORRELATES FOR LEVEL C

Scales	1	2	3	4	5	6	7
1 Depression	1.00						
2 Resentment	.83*	1.00					
3 Company Satisfaction	-.53*	-.69*	1.00				
4 PC Acceptance	-.81*	-.71*	.79*	1.00			
5 Challenge	-.67*	-.58*	.34*	.57*	1.00		
6 Enthusiasm	-.52*	-.55*	.42*	.45*	.78*	1.00	
7 Pleasure	-.43*	-.54*	.34*	.26*	.57*	.78	1.00

Alienation { 1, 2 }

Acceptance { 3, 4 }

Challenge { 5, 6, 7 }

*Significant at the .05 level, r = +.18, n = 117

Enthusiasm, and moderate, positive correlation with Challenge. Pleasure has lower (but still within the moderate to low range) positive correlations with PC Acceptance and Company Satisfaction.

Thus, the fifth analysis postulate is supported. P5: With the Threat Appraisal, after the change event has transpired, the subject computer professionals will have a Harm/Loss Appraisal or a Challenge Appraisal.

CORRELATIONS CONSISTENT WITH THE MODEL

Thus, it has been shown that high scale reliability exists, the cluster groupings of questions fall into categories indicated by the model, and for those categories high correlations exist among the scales. Thus, the various aspects of the model which were to be analyzed for computer professionals has been found to be consistent with the model, and the model appears to be an appropriate tool to use, in the target environment, for describing computer professionnals' appraisals and psychological responses as they faced the technological change associated with the introduction of PCs. The author believes the model would be valid for other types of changes in the workplace, and for other groups of people, but this needs to be substantiated by further research.

DEMOGRAPHIC DATA

The demographic data was collected according to seven
categories, namely by: gender, access to PC at home, access
to PC at work, level of education, age, work experience in
the computer field, and salary level. This demographic
data will be presented for the three appraisals which the
computer professionals made at the A Level when PCs are
first being considered for introduction into the
organization, namely: 1. Benign/Positive, 2. Irrelevant,
and 3. Threat. An analysis will be made on the data to
determine if there is statistical significance to the
differences which occur in the numbers of individuals
appearing in different categories. These will be done
using inferential statistics for categorical data. A very
general test for performing inferential statistics on
frequencies of data is the chi square test of independence
(Nunnally 1975). That is, it is used to test the null
hypothesis that the numbers of individuals appearing in
different categories are no different from what would be
expected by chance alone.

Appraisal Responses by Gender

Table XVI shows the results of the survey broken out
by gender, for each of the three appraisals: 1.
Benign-Positive, 2. Irrelevant, and 3. Threat.

TABLE XVI

APPRAISAL RESPONSES BY GENDER

Gender	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
Male	79	20	41	140	57%	14%	29%
Female	41	5	8	54	75%	9%	16%
Total	120	25	49	194	62%	12%	25%

degrees of freedom = 2

chi square = 6.39, chi square at .05 level = 5.99

Reject Ho: Appraisal responses and gender are independent.

The calculated value of chi square is 6.39. The null hypothesis that appraisal responses and gender are independent is rejected at the .05 level. The research hypothesis that gender and appraisal responses are related is accepted.

Looking at Table XVI it appears that females feel that the PC presents less of a threat to them than do males.

Appraisal Responses by Access to PC at Home

Table XVII shows the results of the survey broken out by those people who have access to a PC at their home vs. those who do not have access to a PC at their home, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

A calculated chi square of 14.12 was obtained. The null hypothesis that availability of PC at home and appraisal response are independent is rejected at the .05 level. The research hypothesis that availability of PC at home and appraisal responses are related is accepted.

It may be assumed that those people with a PC in their home feel that the PC is less of a threat to them. We can not determine from the available data whether familiarity with PCs in the home has lead to a lessing in the fear of impact of PCs on their job, or if those people who felt the least threatened on their jobs by the impending use of PCs were more inclined to acquire them for home use.

TABLE XVII

APPRAISAL RESPONSES BY ACCESS TO PC AT HOME

	Frequency				Percent		
Access to PC	1	2	3	1,2,3	1	2	3
PC at Home	77	13	15	105	74%	12%	14%
No PC at Home	43	12	34	89	48%	14%	38%
TOTAL	120	25	49	194	62%	12%	25%

degrees of freedom = 2

chi square = 14.12,   chi square at .05 level = 5.99

Reject Ho: Availability of a PC at home and appraisal responses are independent.

Appraisal Responses by Access to PC at Work

Table XVIII shows the results of the survey broken out by those people who have access to a PC at work vs. those who do not have access to a PC at work, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

The calculated value of chi square was 5.57. The null hypothesis that appraisal responses and gender are independent is accepted at the .05 level. The research hypothesis that gender and appraisal responses are related is rejected.

This would lead one to suspect that access to a PC in the workplace does not lead to either an increase or a decrease in the perception of the individual as to whether or not a PC constitutes a threat to them in the workplace. Nevertheless, this is interesting because we saw in Table XVII that access to a PC at home was associated with less of a threat perception by individuals. This leads one to speculate that those who felt the least threatened by PCs in the workplace were the ones who were more inclined to acquire PCs for their homes. It would thus appear that PCs are assigned randomly in the workplace without regard to whether one feels threatened or not by PCs, i.e., it is just as likely that someone who feels threatened in the workplace by PCs will be assigned access to a PC, as

TABLE XVIII

APPRAISAL RESPONSES BY ACCESS TO PC AT WORK

Access to PC	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
PC at Work	111	21	40	172	65%	12%	23%
No PC at Work	9	4	9	22	41%	18%	41%
TOTAL	120	25	49	194	62%	12%	25%

degrees of freedom = 2

chi square = 5.57, chi square at .05 level = 5.99

Accept Ho: Availability of a PC at work and appraisal responses
are independent.

someone who does not feel threatened by PCs. This also leads one to speculate that management does not know, when assigning access to PCs in the workplace, whether or not the individuals being so assigned feel threatened by PCs.

However, it should be noted that only eleven percent of the respondents did not have access to a PC at work. Perhaps these people are in positions in which the use of a PC is unimportant. Also, because only eleven percent did not have access to PCs in the workplace this gave a lopsided distribution with a relatively small number of people in this category. This coupled with the relative closeness of the chi square test with the calculated chi square of 5.57 versus the chi square at .05 level of 5.99, leads to the possibility of a Type II error in which Ho is accepted when in reality the alternative is true.

Appraisal Responses by Education Level

Table XIX shows the results of the survey broken out by education level, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

The calculated value of chi square is 13.51. The null hypothesis that appraisal responses and education level are independent is rejected at the .05 level. The research hypothesis that education level and appraisal responses are related is accepted.

TABLE XIX

APPRAISAL RESPONSES BY EDUCATION LEVEL

Education Level	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
Non Bachelors Degree	36	12	23	71	51%	17%	32%
Bachelors Degree	44	10	21	75	59%	13%	28%
Beyond Bachelors	40	3	5	48	83%	6%	11%
Total	120	25	49	194	62%	12%	25%

degrees of freedom = 4

chi square = 13.51, chi square at the .05 level = 9.49

Reject Ho: Education level and appraisal responses are independent.

This is an interesting result which seems to indicate that the more highly educated an individual is, the less likely they are to feel threatened by the introduction of PCs into the workplace. One can only speculate whether this is because they are more highly educated and hence have a greater sense of self confidence that they can handle the situation, or if they feel more secure in their jobs because they know with their higher education and college degree(s) they can more readily find other jobs than someone without their educational background, or if there are some other possible explanations for this finding.

Appraisal Responses by Age

Table XX shows the results of the survey broken out by age in years, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

The calculated value of chi square was 4.87. The null hypothesis that appraisal responses and age are independent is accepted at the .05 level. The research hypothesis that age and appraisal responses are related is rejected.

This is significant, with implications that for computer professionals in the subject companies age makes no difference in whether or not they feel threatened in their jobs by the introduction of the PC. This goes counter to many people's belief that older people feel more

TABLE XX

APPRAISAL RESPONSES BY AGE

Age (years)	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
35 or Less	54	11	30	95	57%	12%	31%
36 Thru 45	49	9	15	73	67%	12%	21%
46 & Over	17	5	4	26	65%	19%	15%
Total	120	25	49	194	62%	12%	25%

degrees of freedom = 4

chi square = 4.87,   chi square at .05 level = 9.49

Accept Ho: Age of person and appraisal responses are independent

threatened by computers. Perhaps popular belief is once again wrong, or perhaps because the subjects are computer professionals they are less likely to feel threatened by computers of any type, be they micro, mini, or maxi computers.

Appraisal Responses by Years of Experience

Table XXI shows the results of the survey broken out by years of work experience in the computer field, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

The calculated value of chi square was 10.71. The null hypothesis that appraisal responses and experience are independent is accepted at the .05 level. The research hypothesis that experience and appraisal responses are related is rejected.

This result indicates that years of familiarity with computers does not result in either a lessening or an increasing of the perception that PCs represent a threat to an individual computer professional in the workplace.

Appraisal Responses by Salary Level

Table XXII shows the results of the survey broken out by salary level, for each of the three appraisals: 1. Benign-Positive, 2. Irrelevant, and 3. Threat.

The calculated value of chi square is 11.53. The null hypothesis that appraisal responses and salary level are

TABLE XXI

APPRAISAL RESPONSES BY YEARS OF EXPERIENCE

Years of Experience	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
5 Years or Less	18	1	5	24	75%	4%	21%
6 Thru 10	37	11	22	70	53%	16%	31%
11 Thru 15	29	5	16	50	58%	10%	32%
16 or More	36	8	6	50	72%	16%	12%
Total	120	25	49	194	62%	12%	25%

degrees of freedom = 6

chi square = 10.71,   chi square at the .05 level = 12.59

Accept Ho: Years of experience and appraisal responses are independent.

TABLE XXII

APPRAISAL RESPONSES BY SALARY LEVEL

Salary Level	Frequency				Percent		
	1	2	3	1,2,3	1	2	3
$30,000/Year or Less	17	3	16	36	47%	8%	45%
$30,000 Thru $40,000	47	13	20	80	59%	16%	25%
$40,001/Year or More	56	9	13	78	72%	11%	17%
Total	120	25	49	194	62%	12%	25%

degrees of freedom = 4

chi square = 11.53, chi square at the .05 level = 9.49

Reject Ho: Salary level and appraisal responses are independent.

independent is rejected at the .05 level. The research hypothesis that salary level and appraisal responses are related is accepted.

This particular set of demographic data was included in the questionnaire not so much to determine if higher paid people were less or more threatened by the introduction of PCs, but because it was assumed that companies were logical in their salary administration, and that higher pay correlated to the value the organization felt that the employee represented to it. Thus, the intention was to see if more valuable employees would feel less or more threatened by the introduction of PCs into the workplace. The above table seems to indicate that there is a difference in the feelings of being threatened. This implies that the more valuable computer professionals feel less threatened by the introduction of the PC, and feel that it is a positive move.

Summary of Demographic Differences

Table XXIII shows the summary of demographic differences with respect to which demographic categories are independent (or dependent) with respect to the appraisal responses. It is noteworthy that four out of seven demographic categories appear to be related to their appraisal responses, namely: gender, access to PC at home, education level, and salary level.

TABLE XXIII

DEMOGRAPHIC SUMMARY

	Chi Square	.05 Level	d.f.	Accept Ho:Independent
Gender	6.39	5.99	2	No
PC Home	14.12	5.99	2	No
PC Work	5.57	5.99	2	Yes
Education	13.51	9.49	4	No
Age	4.87	9.49	4	Yes
Experience	10.71	12.59	6	Yes
Salary	11.53	9.29	4	No

One needs to keep in mind while reviewing the
demographic data, that a very specific set of people were
used in the quasi-experiment. Specifically, computer
professionals, working in gas and electric utilities,
who live and work in the Northwestern United States. While
it is possible the demographic findings may be true for
people in general, it is more likely that the results are
peculiar to the specific environment and circumstances
involved in the study. Generalities based upon this one
set of data could be misleading and could lead to harmful
results if used without forethought and discretion.

CHAPTER V

IMPLICATIONS

INTRODUCTION

The verified model is reviewed and the conditions
of its validity are explained. There are implications as
to how the model can be expanded into other environments,
and implications for researchers and business practitioners
alike.

REVIEW OF THE MODEL

The Model

A model was presented in Chapter II, which described
the process of stages and psychological responses involved
in individuals reacting to change in the workplace. The
model was to be analyzed for computer professionals working
in Northwestern Investor Owned Utilities (IOUs), who were
experiencing the change associated with the introduction of
PCs into the IOUs for whom they worked. The model is
presented in Figure 4.

IMPENDING CHANGE IDENTIFIED

Individual Characteristics

IRRELEVANT
APPRAISAL

THREAT
APPRAISAL

BENIGN-POSITIVE
APPRAISAL

perceptions

INDIFFERENT
FEELINGS/EMOTIONS

ANXIETY/FEAR
FEELINGS/EMOTIONS

PLEASURABLE &
COMFORTABLE
FEELINGS/EMOTIONS

UNCERTAINTY
DURATION
IMMINENCE

factors

COGNITIVE
APPRAISAL

STRESS, RESENTFULNESS
SELF-DOUBT, FRUSTRATION

CHANGE
OCCURS
?

no

POST STRESS
REACTION

yes

HARM/LOSS
APPRAISAL

CHALLENGE
APPRAISAL

Damage
such as:
financial,
self esteem,
loss of power

ALIENATION:ACCEPTANCE
FEELINGS/EMOTIONS

OPTIMISM
ENTHUSIASM

Figure 4. The model.

The process depicted by the model starts with the identification of a change event. The individuals facing the change event make one of a triad of appraisals of the situation, namely: 1. Irrelevant Appraisal, 2. Benign-Positive Appraisal, or 3. Threat Appraisal.

With the Irrelevant Appraisal they have indifferent feelings/emotions associated with the change event. With the Benign-Positive Appraisal they have pleasurable and comfortable feelings/emotions.

With the Threat Appraisal they go through a cognitive process involving individual characteristics, perceptions, and factors associated with the change, which result in emotions causing stress during the duration of the perceived threat. If the change event does not occur, then they return to their normal situations. If the change event does occur, then either they will have a Harm/Loss Appraisal or a Challenge Appraisal. Certain feelings/emotions are associated with the Harm/Loss Appraisal and Challenge Appraisal.

The model was analyzed for the above mentioned computer professionals as PCs were being introduced into six IOUs. These companies were at various stages of introduction of PCs into the organization, ranging from just starting plans on how to introduce PCs into the organization, to maturity in use of PCs in the organization.

The analysis was performed using a quasi-experiment, with self-report surveys being completed by the subject computer professionals who were asked to rank their psychological responses at various times in the process of introduction of PCs into their companies. Scales were developed, and pilot tested on two other organizations, which would indicate if the computer professionals were experiencing the feelings/emotions indicated by the model. Modifications were made to the questionnaire based upon the pilot testing. The scales developed give a degree of measure and quantification toward being able to analyze relationships and explain behavior. The final instrument was administered to the six IOUs. Around 200 completed questionnaires were analyzed. Correlations were examined for scales which were duplicate predictors of certain appraisals, such as the Threat Appraisal had scales for Anxiety and Fear. Those scales which were duplicate predictors of specific appraisals had high, positive correlations, and certain appraisals which would evoke opposite scales (such as high Job Satisfaction vs. high Anxiety) had high, negative correlations. The correlations observed were in the range of those which the model indicated would occur.

Further research is needed to validate the model by using such methods as Factor Analysis/Path Analysis. The behavior observed in this research can be explained and

reviewed using the model. The research demonstrates correlations between the observed behavior and the model, but does not prove causality which is an extensive area for future research.

The correlation matrix for Level A (Table X) indicate that there are three high level factors, namely Irrelevant, Threat, and Benign-Positive, even though there are seven scales. The seven scales relate to the high level factors with Enthusiasm, Pleasure, Job Satisfaction, and Technical Gratification being related to Benign-Positive; with Anxiety and Fear being related to Threat, and with Indifference being related to Irrelevant. Even though the Threat factor has subsequent appraisals and various outcomes of psychological responses, the overall factor is still the single element of Threat.

For those computer professionals making the Threat Appraisal, the subsequent correlation matrix shown in Table XII has correlates which correspond to those psychological responses associated with stress. This is the response indicated by the model for those who feel threatened by the eminent introduction of the PC. Table XIII has correlates which relate to the outcomes of alienation, acceptance, or challenge which are the final outcomes indicated by the model.

Demographic Data Review

Additionally, demographic data was analyzed to determine if certain categories of individuals were more likely to experience certain appraisals. It was identified, for the subject computer professionals, that access to a PC in the workplace, age of the individual, and years of experience in the computer field were independent of the appraisals made by the individuals and hence independent of the feelings/emotions evoked.

In the case of gender it was indicated that female computer professionals felt less threatened by the introduction of PCs and were more likely to see them as being a positive change event.

Those computer professionals with access to a PC at home seem to be more likely to see the introduction of PCs into their workplace as a positive change event, and felt less threatened.

Those computer professionals with higher educations seem to be more likely to see the introduction of PCs into their workplace as a positive change event, and felt less threatened.

Those computer professionals with higher salary levels (and hence supposedly more valuable to their organizations) seem to be more likely to see the introduction of PCs as a positive change event, and felt less threatened.

EXTENSION OF THE MODEL TO OTHER ENVIRONMENTS

The proposed model has been analyzed for computer
professionals working in gas and electric, investor owned
utilities (IOUs) in the Northwestern United States. Based
on the author's experience in, and exposure to, the utility
business across the United States and Canada, there is
reason to believe the model would apply to computer
professionals in all other IOUs in the United States and
Canada.

The author has 29 years of experience in the computer
field, having worked in the aerospace, electronics,
manufacturing, insurance, engineering/construction, and
real estate industries. Additionally, he has hired several
hundred computer professionals from across the nation and
from all types of organizations and has had the opportunity
to observe that previous industry experience or geographic
residence are not predictors as to whether someone will be
a good performer as a computer professional in another
industry or in another location. The conclusion of all
this experience is that a good computer professional in one
type of industry will be a good computer professional in
another type of industry (the same applies to mediocre and
poor performers as well), and that there are no discernible
psychological patterns based on industry or geography.

Based on this experience, the author believes there is not
much difference in the psychological makeup of computer
professionals in various industries or areas, and hence the
model applies to computer professionals in all types of
industries.

The author has seen many computer end users shift
their career toward that of a systems analyst or
programmer. Indeed, with the advent of the PC many
computer end users are performing the duties of computer
professionals. It has long been a common practice for many
engineers to do their own systems analysis and programming
on mainframe computers. Likewise, many a computer
professional has become so well versed in the operations of
their computer end user functions they support, that they
have transferred to the end user departments and have
essentially stopped performing the duties of a computer
professional. Furthermore, in the case of some other
computer professionals who transferred to end user
departments it is difficult to determine if they are end
users or computer professionals because they do both jobs
interchangeably. Computer professionals often are very
successful in end user positions. At one company for whom
the author worked, a former programmer with a mathematics
degree eventually became the controller, and another former
programmer became the vice president of marketing. At that
same company the vice president of finance told the author

that the person who best understood how accounting worked in that company was one of the author's computer professionals. Based on this interchangeablility of computer professionals and end users, the author believes the model applies to all computer end users as well. Since almost everyone in today's organization uses computers, then this model applies to people involved in all aspects of organizations when adapting to computer induced change.

The author will speculate a step further and state that he believes that the model not only applies to computer induced change, but to all types of changes in the workplace. There is little reason to believe that computer induced change might trigger a different type of psychological response, than other types of changes in the workplace which might be perceived as being either benign-positive, irrelevant, or threatening. Indeed, the author's model was developed from combining the work and research of other investigators in the field of human research, which was not directed at only computer professionals' response to change, but was general in nature and involved many different types of people in many different types of situations.

It is recognized that further research needs to be done in order to confirm that the model does apply to many classes of workers in many different types of environments and industries. However, it is believed that the model is

general in nature and can be used by managers and
researchers alike for their various purposes.

IMPLICATIONS FOR RESEARCHERS

Researchers can use the model to determine that it
does have general application for more situations than the
one presented in this work. Upon further analysis,
researchers can start the process of further evaluation and
research to try and determine what causes various people to
feel threatened while others feel an impending change will
have positive or irrelevant effects. Researchers can also
analyze that when people do feel threatened by an event,
the model can be used to analyze what can be done to
minimize the extent of the threat which is perceived.
Furthermore, researchers can use the model to analyze what
it takes to get those people who feel threatened by a
change, to more readily move to the either the optimism or
enthusiasm of a Challenge Appraisal, rather than the
possible alienation emotions of a Harm/Loss Appraisal.
There is further room for research to determine if all
threatened employees who make a Harm/Loss Appraisal have a
dichotomy of events of either alienation or acceptance, or
actually experience the alienation emotions until they
finally adjust to acceptance. Maybe those employees who
are assessed as being alienated, are just those who take

longer to pass out of the alienation mode and into acceptance.

There are many implications for researchers once a new model as to how people move through the various psychological responses associated with change has been presented.

IMPLICATIONS FOR BUSINESS PRACTITIONERS

The author believes the most interesting area for implications is for the managers of people. Even though this model is of a general and theoretical nature, knowledgable managers can utilize it to help move their staff into the more desirable appraisals, or can identify which types of changes will cause the most dysfunctional behavior.

For example, the author is an experienced manager in the computer field, having managed computer departments in three different large companies over the past fifteen years. He felt he knew fairly well the psychic, hopes, fears, aspirations, and phobias of computer professionals as a whole, and at IOUs in particular. Being an experienced manager he naturally had made a mental estimate as to what he thought the percentages would be for the triad of responses for Benign-Positive, Irrelevant, and Threat, as 65%, 5%, and 30% respectively. The author was a little smug when the percentages from the research turned

out to be 62%, 12%, and 25% respectively (with 1% not

fitting into any category). Even though the author was a

little surprised by the higher percentage of people

favoring the irrelevant appraisal, the research percentages

were not very far from what had been mentally estimated

before the research. The point is, many managers have a

good feel for how their staffs will respond to different

types of changes. If they recognize that a triad of

initial responses exists to any type of change which is

being proposed, then they can focus in on those changes

which they feel will have a high percentage of their staff

feeling a Threat Appraisal, and try and mitigate their

appraisals before they are made. Thus, if a manager feels

a high percentage of the staff will experience a Threat

Appraisal by an impending change, then he or she can

initiate a campaign, using one of the strategies shown in

the spectrum in Figure 1, to move more of the staff to have

a more desirable appraisal when the change is introduced.

For example, in the author's own case when PCs were

being contemplated for introduction into the largest IOU in

the Northwestern United States, for which he managed the

Information Systems Department, and recognizing he

estimated that 30% of his computer professionals (about 40

valuable employees) would have a Threat Appraisal when PCs

were first being introduced, he would have utilized a

strategy along the lines of the Normative-Reeducative

school of thought (presented in Figure 1). Thus, there would have been sessions presented to the staff with the purpose of providing education about the benefits to be derived by computer professionals and the company from the PCs, and to try and modify and reeducate them in their norms and attitudes. Instead, the response was to provide technical training on the use of PCs (the typical response for Information Systems Managers), and nothing was really done to help the 25% to 30% of the staff who were soon to undergo a Threat Appraisal. (In defense of the author this was eight years ago when he had more of a tendency to believe that most problems were of a technical nature, that logic and reason prevailed (typical Rational-Empirical school of thought shown in Figure 1), and there was little need for concern over the emotions of computer professionals.

Threat Appraisal - Uncertainty, Duration, Imminence

In addition to trying to head off problems by attempting to steer more people toward avoiding a Threat Appraisal, the model indicates that even if a Threat Appraisal occurs, then the factors leading to anxiety, self-doubt, fear, frustration, and resentfulness are the uncertainty, duration, and imminence of the threat. Recognizing these factors a manager can attempt to minimize the forces associated with these factors.

As was stated in Chapter II, the uncertainty of the event involves both not knowing whether the event will occur and what the consequences might be. A manager could take steps to determine as soon as possible whether the event will take place or not, analyze what possible consequences might arise, and inform people immediately. Also, some thought should be given to trying to minimize what might be perceived as the unfavorable consequences of the event. For example, in the case of the introduction of PCs at the author's company, the Human Resources Department was discussing among themselves if the widespread use of PCs would create a situation in which every employee would do programming, and hence do away with the high paid technical classification of programmer. This premature speculate by a bunch of people who held power over careers, but knew very little at that point about PCs, leaked out to the rest of the organization in the form of rumors which increased part of the uncertainty about what the consequences of PCs would be. Using the model, a manager would recognize that such types of uncertainties need to be addressed, and informed decisions be made early which are as favorable to the employees as is practical.

The duration of the event involves how long the stress event will last if it does occur. The manager should take great efforts to see to it that the actual stress is short lived. In the case of the introduction of PCs into an

organization, the introduction, training, procedures,

practices, equipment, and any thing else needed for the

successful use of PCs should occur as quickly as possible

so that the actual time lapse, of the stressful event,

occurs as quickly as possible, and the people effected do

not undergo a long drawn out time period during which they

feel the stress of the event. The same thing can be said

for corporate mergers, reorganizations, introduction of new

procedures, or any other type of change event.

The imminence of the event is the amount of time which

elapses between when the possible change is identified and

when the actual event occurs. That is, this is the time

during which the employee waits for "the other shoe to

drop." In the case of the introduction of PCs into an

organization, the longer the "hows and whys" of the issue

are debated by management, the longer the computer

professionals feel the threat of living under the Sword of

Damocles and hence the greater the stress. Once a stress

event has been identified, management should try to

minimize the amount of time between the identification of

the possible change and when the change actually takes

place.

Challenge or Harm/Loss Appraisals

Even after all this effort, there will still be those

employees who made the Threat Appraisal and the change

event occurs, and will eventually make either a Challenge
or Harm/Loss Appraisal. An effort needs to be made by the
manager to minimize the possibility of perception of harm
or loss occurring. Great effort should be made to avoid
the possibility of employees making a Harm/Loss Appraisal.
Managers need to be creative in presenting threatening
changes as really being opportunities to overcome
challenges. In the case of corporate mergers, desirable
employees should be given the chance to show that the
company can't get along without them, and should be shown
that the merger is an opportunity to demonstrate how needed
they really are.

If there is no way to avoid a Harm/Loss Appraisal,
with the result that an employee will experience alienation
or acceptance, then the manager needs to steer the employee
into an acceptance mode rather than let him or her stew in
an alienation mode. In the case of corporate merger, where
it is unavoidable that an employee be demoted, rather than
let the employee just simmer in alienation, the manager
needs to work with the individual to assure him or her that
it was no reflection upon the employee's personal ability,
a stronger company resulted from the merger, and that with
this strength there is a good possibility that the employee
will regain the lost position and even be able to climb
higher in a faster manner than before. This or some
similar approach, depending upon the individual, needs to

be made in order to help the employee quickly move to an acceptance mode of emotions and feelings so that the employee can again be a productive and contributing member of the staff.

LINKAGES TO OTHER CHANGE MODELS

Schweiger, Ivancevich, and Power (1987) have linked Elisabeth Kubler-Ross's (1969) model of the harm/loss associated with the death of a loved one in a lineal five stage model of denial, anger, bargaining, depression, and acceptance, to their own model as to effective actions to take to mitigate the harm/loss to an individual's job associated with a corporate merger. Both of these models deal with change, although only one deals with change in the workplace. Both of the above models may be linked to the model presented in this research. For the five stage model, it may be possible that alienated employees go through the five stages described by Kubler-Ross (1969) before they reach acceptance. Perhaps a stressful event in which they have a Harm/Loss Appraisal has a similar psychological response as the loss of a loved one. Also, Schweiger et al. (1987) details effective and ineffective actions which managers can take when employees feel that major losses in their work life are beyond their control. These same management responses fit nicely into the model this research has developed.

The model on coping with change, developed and
researched extensively by Lazarus and Folkman (1985), can
be linked quite nicely to the model verified by this
research. In fact, part of this researcher's model was
based upon the extensive work performed by Lazarus and
Folkman. They have worked in concert with other
researchers' and have published at least a half a dozen
articles on research with different groups of individuals,
in different environments, which the author has reviewed.
All of their findings on individual's coping mechanisms,
when dealing with change, would link nicely with this
research model.

Likewise, the model verified by this research may be
linked to other change models, proposed responses to
change, proposals on how to manage change, or various other
research aspects of change. This model can lead to rich
opportunities to link change to many other researchers'
efforts on analyzing change.

THE MODEL DEPICTS A SYSTEM

The model analyzed by this research constitutes a
system. As a system it is possible to perform further
research to understand the functioning of the system both
from holistic and wholistic viewpoints. That is, it is
possible to analyze the internal relationships of the
system and understand how the system functions internally,

and also to analyze the system within the context of its environment and how the system interacts with its environment. Thus, further research into the internal and external relationships and workings of the model can help develop methodologies for being able to interpret, measure, predict, analyze, and evaluate organizational change. The capabilities of systems science can be applied to the model to make it a powerful tool for the researcher and business practitioner. For example, among systems scientists there is a methodology called interpretive structural modeling (ISM) which can be applied to this model, which will allow analysis to be made of the relationships and effects of the model. The principles and applications of ISM have been amply described by such researchers as Warfield (1976), Malone (1975), and Lendaris (1978). Warfield and his associates have even developed a computerized tool to facilitate the ISM methodology.

IMPLICATIONS OF DEMOGRAPHIC DATA

A review of Table XXIV in Chapter IV reveals that there were statistically significant differences in the responses to the reactions to the impending change brought about by the prospect of the introduction of PCs into the organization. In particular the significant differences occurred by gender, by those computer professionals who had a PC at home, by education level, and by salary level.

There was not a significant difference for those who had access to a PC at work or not, by age, or by years of work experience.

The data given in Chapter IV indicates women felt less threatened by the introduction of PCs than men. Also, those who have computers at home appear to be less threatened by the introduction of PCs. Furthermore, those of a higher education level appear to be less threatened by PCs. Finally, those who have higher salary levels appear to be less threatened by PCs. An Information Systems Manager who is about to introduce PCs into an organization could have given classes to comfort those with the highest tendency toward the Threat Appraisal, and could have invited only males, without a computer at home, with lower education levels, and lower pay levels, and would have had a high concentration of those computer professionals who needed such a class.

An interesting implication of the data also indicates that age was not a factor in someone having or not having a threat appraisal. It has been generally assumed by the popular press that older people have a harder time adjusting to changes in the computer field. Yet this study shows that there is independence between the appraisals made by computer professionals in these organizations and the age factor. Perhaps the popular press has overplayed the age factor. Maybe a more important factor in

acceptance of the computer is really whether someone is familiar with a touch keyboard or not. The author's own experience is that those people who are familiar with touch typing are less resistant to accepting computer terminals and PCs than those who are not touch typists. The author has seen very few secretaries who have been afraid of learning the wordprocessing capability of PCs, regardless of their age. On the other hand, the author has seen several managers and vice presidents (who are generally older) who were unfamiliar with keyboards, and who were very apprehensive about having PCs put in their office for fear their secretaries would show them up in the ability to learn to use PCs. However, managers and vice presidents who were touch typists seemed to be more eager to get their own PC and their only apprehension was how to get the budget to pay for it.

The finding that women computer professionals appear to be less threatened by the introduction of PCs into the organization than men is an interesting area for speculation and possible future research. Could it be that women in general are less threatened by new technology than men? Could it be that as long as the new technology has a keyboard, that women find it less threatening? As noted above the author has found secretaries more ready to accept PCs than vice presidents (who are almost always male). Or, could it be that the women computer professionals are of

such a nature that they do not feel as threatened by new technology?

The author has observed for some time the industrious capabilities exhibited in the workplace by female computer professionals, and has formed his own opinion on the matter. Table XVI yields part of the first clue. It is observed that in the survey there were 140 male respondents and 54 female respondents. That yields a preponderance of over two and a half times as many men as women who are computer professionals. In our culture the areas of science and technology have long been dominated by males, with females only recently starting to enter into fields such as computers and medicine in significant numbers. The female computer professionals who the author has come in contact with have generally exhibited two traits which set them apart in his opinion. First, they seem to be more adventurous, less intimidated by conventional thinking, and willing to take on new challenges than the general population. These are probably traits which enabled them to be able to cope with male dominated classes in school, and male domination in their chosen occupation. Second, they are generally very good team players in the workforce, and while they have personal ambition and desire for advancement, they outwardly exhibit less fear about their career and seem to be willing to "keep their nose to the

grindstone" and are less upset with organizational disturbances which are going on around them. If these observed traits are generally correct, then it is understandable that female computer professionals would feel less threatened than their male counterparts by the introduction of PCs. The author bases his observations on his years of experience which included eleven years in an IOU managing a department of around three hundred people, which had over a hundred computer professionals, in which there were about thirty-five female computer professionals. There were around a hundred other females in the department who were not computer professionals.

<div align="center">SUMMARY OF IMPLICATIONS</div>

This model has provided a tool with which the steps and stages of psychological reactions can be graphically represented, and a good beginning can be made to understand the relationships which occur during the change process. Much more work needs to be made to further analyze and validate the model for other groups of individuals in other environments, but there is nothing to indicate that the model is limited to the situation examined in the quasi-experiment provided in this research. It is believed that the model is general in nature and has wide application. Also, that the model can be linked to many other change models, tools, and apparatuses, which would

make it an even more useful tool and broadens its
application. Furthermore, the model depicts a system which
can be analyzed usinq the methodologies of the systems
scientist, and thus can be used to analyze, predict,
measure, interpret, and evaluate organizational change.

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APPENDIX A

ORIGINAL SET OF SCALES AND ITEMS FROM WHICH

QUESTIONNAIRE WAS MADE

APPENDIX A

ORIGINAL SET OF SCALES & ITEMS FROM WHICH

QUESTIONNAIRE WAS MADE

Please answer these questions on a scale of from 1 to 5

with the following ranking: 1. Always true. 2. Often

true. 3. Sometimes true. 4. Seldom True. 5. Never True.

BENIGN-POSITIVE APPRAISAL (Level A)

Enthusiasm Scale

> 1. This week my job made me feel keen.

> 2. This week my job made me feel lively.

> 3. This week my job made me feel enthusiastic.

4. This week my job made me feel stimulated.

5. This week my job made me feel excited.

6. This week my job made me feel invigorated.

7. This week my job made me feel energetic.

Questions 1 to 3 from Martin & Wall. (36)

> This question was eliminated after analysis because of

lack of contribution to the value of Cronbach's alpha.

Contentment Scale

    1. This week my job made me feel calm.

> 2. This week my job made me feel contented.

> 3. This week my job made me feel relaxed.

> 4. This week my job made me feel comfortable.

> 5. This week my job made me feel pleasurable.

    6. This week my job made me feel peaceful.

    7. This week my job made me feel restful.

    8. This week my job made me feel tranquil.

    9. This week my job made me feel serene.

        Questions 1 to 3 from by Martin & Wall. (36)

Job Satisfaction Scale

> 1. This past week I felt frustrated with my job.*

> 2. This past week I felt satisfied with my job.

    3. This past week I felt interested with my job.

    4. This past week I felt challenged with my job.

    5, This past week I felt industrious with my job.

    6. This past week I felt motivated with my job.

    7. This past week I felt inspired with my job.

        Questions 1 to 4 from Martin & Wall. (36)

* Signifies this question is to be reversed scored.

<u>Technology Specific Self Gratification</u>

1. I think a lot of good things will come to me because of the PCs.

2. I believe the PC will be good for the company and me.

> 3. I believe I will be able to readily learn to use PCs.

> 4. This company needs to get moving soon on PCs.

5. I can hardly wait for my users to get PCs.

6. I can hardly wait for my own PC.

IRRELEVANT APPRAISAL (Level A)

<u>Indifference Scale</u>

1. The PC will not change my job significantly.

2. My job goes on the same, even though technology changes.

3. I do not get very excited about the prospect of PCs.

> 4. PCs are just another form of computers.

5. I am indifferent when I think about PCs.

6. Five years from now computer professionals will still be doing the same basic things.

> 7. I believe the PC will have an irrelevant effect on me.

THREAT APPRAISAL (Level A)

Fear Scale

1. I feel threatened by PCs.

2. I feel my job will be threatened by PCs.

3. I fear a loss of status, position, or salary from use of PCs.

4. PCs are the single biggest threat my occupation faces.

> 5. PCs have the potential to dramatically change my job.

> 6. The job I will be doing five years from now will be significantly different because of PCs.

7. I feel a great deal of uncertainty because of PCs.

Anxiety Scale

1. A great deal of the time I have felt tense because of PCs.

2. A great deal of the time I have felt frustrated because of PCs.

3. A great deal of the time I have felt anxious because of Pcs.

4. A great deal of the time I have felt concern because of PCs.

5. A great deal of the time I have felt fearful because of PCs.

Questions 1-3 from Martin & Wall 1989.

THREAT/COGNITIVE APPRAISAL (Level B)

Self Esteem

> 1. I feel that I have a number of good qualities.*

   2. I wish I had more respect for myself.

   3. I feel I'm a person of worth, at least on an equal

      plane with others.*

   4. I feel I do not have much to be proud of.

   5. I take a positive attitude towards myself.*

   6. I certainly feel useless at times.

> 7. All in all, I am inclined to feel that I am a

      failure.

> 8. I am able to do things as well as most other

      people.*

> 9. At times I think I am no good at all.

  10. On the whole, I am satisfied with myself.*

      From Rosenburg 1965.

Subjective Stress Scale - L. A. Heart Study

   1. In general, I am unusually tense or nervous.

   2. There is a great amount of nervous strain connected

      with my daily activities, I am always under

      pressure.

   3. At the end of day I am completely exhausted,

      mentally and physically.

4. My daily activities are extremely trying and
   stressful.

   From American Heart Association (1968).

Mastery

1. I have little control over the things that happen to
   me.

2. There is really no way I can solve some of the
   problems I have.

3. There is little I can do to change many of the
   important things in my life.

4. I often feel helpless in dealing with the problems
   of life.

5. Sometimes I feel that I'm being pushed around in
   life.

> 6. What happens to me in the future mostly depends on
   me.*

> 7. I can do just about anything I really set my mind to
   do.*

   From Folkman, Lazarus, Gruen, & DeLongis 1986.

Interpersonal Trust

    1. In dealing with strangers one is better off to be cautious until they provide evidence that they are trustworthy.

    2. Most people can be counted on to do what they say they will do.*

> 3. The Human Resources Department is a place where we all get unbiased treatment.*

    4. It is safe to believe that in spite of what people say, most people are primarily interested in their own welfare.

> 5. Most people would be horrified if they knew how much news that the public hears is distorted.

    6. In these competitive times, one has to be alert or someone is likely to take advantage of you.

    7. Most salespeople in this company are honest in describing their products.*

       From Folkman, Lazarus, Gruen, & DeLongis 1986.

Somatic Symptoms

    1. I get a soreness in my muscles.

> 2. I feel my heart pounding or racing.

    3. I get a weakness in parts of my body.

    4. I get pains in my heart or chest.

    5. I get pains in the lower part of my back.

6. I have trouble getting to sleep or staying asleep.

   From Parloff et al. 1954.

Performance Difficulty

1. I am able to work under a great deal of pressure.*

2. I feel inferior to others.

> 3. I have to do things very slowly in order to be sure

   I am doing them well.

4. I have trouble concentrating.

5. I have difficulty remembering things.

6. I have difficulty in making decisions.

   From Parloff et al. 1954.

HARM/LOSS APPRAISAL (Level C)

Depression

> 1. A great deal of the time I have felt miserable
     because of PCs.

  2. A great deal of the time I have felt depressed
     because of PCs.

  3. A great deal of the time I have felt gloomy because
     of PCs.

  4. A great deal of the time I have felt grim because of
     PCs.

> 5. A great deal of the time I have felt grumpy because
     of PCs.

  6. A great deal of the time I have felt discontented
     because of PCs.

> 7. A great deal of the time people ask too much of me.
     (since we started using PCs)

> 8. A great deal of the time I feel blocked or stymied.
     (since we started using PCs)

  9. A great deal of the time I feel others do not
     understand me. (since we started using PCs)

 10. A great deal of the time I feel hopeless about the
     future. (since we started using PCs)

         Questions 1-3 from Martin & Wall 1989.

         Questions 7-10 from Parloff, et al. 1954.

5. I have reached the point of accepting PCs in the workplace.

> 6. I feel comfortable with PCs.

> 7. I am satisfied with the way PCs are being used in the company.

> 8. Now that my users are using PCs, they are more satisfied with the computer department.

CHALLENGE APPRAISAL (Level C)

Challenge

1. I feel that the new technology will provide exciting challenges.

2. I am really challenged by the new technology we have.

3. I feel the challenge of the new technology will provide opportunities.

4. The new technologies we have are making this a more interesting place to work.

5. The new technologies are like a breath of fresh air and invigorate me.

> 6. With the new technology my job is every bit as important as it has ever been.

<u>Resentment</u>

      1. I feel I get a raw deal out of life.

> 2. Other people always seem to get the breaks.

      3. When I look back on what's happened to me, I feel resentful.

      4. I guess you could say I feel bitter about things.

      5. I feel aggravated about what's happened to me.

         Questions 1-3 from Parloff et al. 1954.

<u>Satisfaction with Company</u>

> 1. Everything usually works out for the best.

      2. All things considered, this company runs pretty well.

      3. At this company, loyal employees are taken care of.

      4. I like the organization I am in.

> 5. I get along pretty well with the supervision and management of this company.

      6. I am satisfied with this company.

<u>Acceptance</u>

      1. Now that they are installed I believe that PCs have been good for the company.

      2. PCs are not so bad.

      3. I have come to like using PCs.

> 4. My users are more satisfied now that they have PCs.

> 7. With the new technology I will be able to show how important I am to this organization.

> 8. With the new technology this company will not be able to get along without me, or people like me.

Enthusiasm

> 1. This week my job made me feel keen.

> 2. This week my job made me feel lively.

> 3. This week my job made me feel enthusiastic.

4. This week my job made me feel stimulated.

5. This week my job made me feel excited.

6. This week my job made me feel invigorated.

7. This week my job made me feel energetic.

Questions 1 to 3 from Martin & Wall 1989.

Contentment

1. This week my job made me feel calm.

> 2. This week my job made me feel contented.

> 3. This week my job made me feel relaxed.

> 4. This week my job made me feel comfortable.

> 5. This week my job made me feel pleasurable.

6. This week my job made me feel peaceful.

7. This week my job made me feel restful.

8. This week my job made me feel tranquil.

9. This week my job made me feel serene.

Questions 1 to 3 from Martin & Wall 1989.

APPENDIX B

PILOT QUESTIONNAIRE

The purpose of this questionaire is to attempt to measure the responses of computer professionals to the introduction and use of personal computers (PCs) in the workplace. There will not be any attempt on the part of anyone to identify individuals or to analyze individual responses. This research is oriented toward identifying responses of groups of people and to see if various classes of responses exist among groups of computer professionals. Also, to see how computer professionals may have responded over time to PCs when : 1. PCs were just being considered at an organization. 2. When PCs were just starting to be used at an organization. 3. When PCs have become an established tool at an organization.

The research is not oriented toward making any type of judgment as to how well or how poorly PCs were introduced into the organization, but is interested in validating a model of the stages of psychological responses which people go through in the process of PCs being integrated into the workplace.

The data will be collected by company since some companies are at different stages of adaptation of PCs into the workplace. Some demographic information is desired to see if there are any significant groupings of answers among different sets of people.

There are no wrong answers, only inconsistent answers which can cause "noise" in the research. Please answer the questions honestly and to the best of your ability and recollection (when recollection is required).

Once again it should be pointed out that individuals will not be identified, and no effort will be made to identify individual responses or to analyze individual responses.

Background information: Please mark the spot indicated with the correct answer.

I am : male___   female___

I have a PC at my home : yes___   no___

I have ready access to a PC at the workplace : yes___   no___

My highest level of education is :

    High School   .   ___
    Two years of less of college   ___
    Between two to four years of college   ___
    Completed Bachelors degree   ___
    Bachelors degree plus some graduate studies   ___
    Completed Masters degree   ___
    Completed Ph.D. degree   ___

My age in years is :

    25 or less   ___
    between 26 and 35   ___
    between 36 and 45   ___
    between 46 and 55   ___
    56 or over   ___

My years of experience in the computer field is :

    5 or less   ___
    between 6 and 10   ___
    between 11 and 15   ___
    between 16 and 20   ___
    over 21 years   ___

My salary level is :

    $20,000/year ($1666/month) or less   ___
    between $20,001 and $30,000/year ($1667 & $2500/mo.)   ___
    between $30,001 and $40,000/year ($2501 & $3333/mo.)   ___
    between $40,001 and $50,000/year ($3334 & $4166/mo.)   ___
    between $50,001 and $60,000/year ($4167 & $5000/mo.)   ___
    $60,001/year ($5001/mo.) or more   ___

Please answer these questions on a scale of from 1 to 5 which is explained below. The questions are asked within the context of your workplace and the introduction of the new technology associated with personal computers (PCs). In particular, the questionaire is aimed at determining your personal perspective of the potential, or actual impact, of PCs and the change associated with this new technology.

Indicate answers with a scale of from 1 to 5. With the following:
1. Almost Always True. 2. Often True. 3. Sometimes True.
4. Seldom True. 5. Never True.

Part A: These questions are aimed at the time period when your company first started thinking about the use of PCs. Recall your feelings and thoughts which you had when your company first planned on using PCs. Circle the number which best represents your mental attitude during a typical week at that time.

1. This week my job made me feel keen.   1 2 3 4 5
2. I feel threatened by PCs.   1 2 3 4 5
3. I think a lot of good things will come to me because of
    the PCs.   1 2 3 4 5
4. A great deal of the time I have felt tense because of PCs.   1 2 3 4 5
5. This week my job made me feel calm.   1 2 3 4 5
6. The PC will not change my job significantly.   1 2 3 4 5
7. This past week I felt frustrated by my job.   1 2 3 4 5
8. This week my job made me feel lively.   1 2 3 4 5
9. I feel my job will be threatened by PCs.   1 2 3 4 5
10. This past week I felt satisfied with my job   1 2 3 4 5
11. A great deal of the time I have felt frustrated because
    of PCs.   1 2 3 4 5
12. My job goes on the same, even though technology changes.   1 2 3 4 5
13. I believe the PC will be good for the company and me.   1 2 3 4 5
14. This week my job made me feel contented.   1 2 3 4 5

15. This week my job made me feel relaxed.   1 2 3 4 5

16. A great deal of the time I have felt anxious because of PCs.   1 2 3 4 5

17. I believe I will be able to readily learn to use PCs.   1 2 3 4 5

18. I fear a loss of status, position, or salary from company

    use of PCs.   1 2 3 4 5

19. I do not get very excited about the prospect of PCs.   1 2 3 4 5

20. This past week I felt interested in my job.   1 2 3 4 5

21. This week my job made me feel enthusiastic.   1 2 3 4 5

22. PCs are just another form of computers.   1 2 3 4 5

23. This past week I felt challenged by my job.   1 2 3 4 5

24. This company needs to get moving soon on PCs.   1 2 3 4 5

25. PCs are the single biggest threat my occupation faces.   1 2 3 4 5

26. A great deal of the time I have felt concern because of PCs.   1 2 3 4 5

27. This week my job made me feel comfortable.   1 2 3 4 5

28. This week my job made me feel stimulated.   1 2 3 4 5

29. This week my job made me feel pleasurable.   1 2 3 4 5

30. PCs have the potential to dramatically change my job.   1 2 3 4 5

31. I am indifferent when I think about PCs.   1 2 3 4 5

32. I can hardly wait for my users to get PCs.   1 2 3 4 5

33. This past week I felt industrious because of my job.   1 2 3 4 5

34. A great deal of the time I have felt fearful because of PCs.   1 2 3 4 5

35. This week my job made me feel excited.   1 2 3 4 5

36. This week my job made me feel invigorated.   1 2 3 4 5

37. This past week I felt motivated in my job.   1 2 3 4 5

38. The job I will be doing five years from now will be

    significantly different because of PCs.   1 2 3 4 5

39. This week my job made me feel peaceful.   1 2 3 4 5

40. I can hardly wait for my own PC.   1 2 3 4 5

41. This past week I felt inspired by my job.   1 2 3 4 5

42. I feel a great deal of uncertainty because of PCs.   1 2 3 4 5

43. This week my job made me feel energetic.   1 2 3 4 5

44. I believe the PC will have an irrelevant effect on me.   1 2 3 4 5

45. This week my job made me feel restful.   1 2 3 4 5

46. This week my job made me feel tranquil.   1 2 3 4 5

47. This week my job made me feel serene.   1 2 3 4 5

48. Five years from now computer professionals will still be

    doing the same basic things.   1 2 3 4 5

END OF PART A.

Part B: These questions are aimed at the time period when the company was initially using PCs, both by your department and by various user departments. Recall your feelings and thoughts which you had during a typical week when the company was initially using PCs. Circle the number which best represents your mental attitude at that time.

	Always True	Often True	Sometimes True	Seldom True	Never True
1. I feel that I have a number of good qualities.	1	2	3	4	5
2. I have little control over the things that happen to me.	1	2	3	4	5
3. In general, I am unusually tense or nervous.	1	2	3	4	5
4. In dealing with strangers one is better off to be cautious until they provide evidence that they are trustworthy.	1	2	3	4	5
5. I am able to work under a great deal of pressure.	1	2	3	4	5
6. I get a soreness in my muscles.	1	2	3	4	5
7. There is really no way I can solve some of the problems I have.	1	2	3	4	5
8. I feel my heart pounding or racing.	1	2	3	4	5
9. I wish I had more respect for myself.	1	2	3	4	5
10. There is a great amount of nervous strain connected with my daily activities, I am always under pressure.	1	2	3	4	5
11. Most people can be counted on to do what they say they will do.	1	2	3	4	5
12. I feel inferior to others.	1	2	3	4	5
13. I have to do things very slowly in order to be sure I am doing them well.	1	2	3	4	5
14. I feel I'm a person of worth, at least on an equal plane with others.	1	2	3	4	5
15. At the end of day I am completely exhausted, mentally and physically.	1	2	3	4	5
16. There is little I can do to change many of the important things in my life.	1	2	3	4	5
17. The Human Resources Department is a place where we all get unbiased treatment.	1	2	3	4	5
18. I get a weakness in parts of my body.	1	2	3	4	5
19. My daily activities are extremely trying and stressful.	1	2	3	4	5

PART C: These questions are aimed at the current time period when PCs are commonly being used in the company. Express the thoughts and feelings which you now have by circling the appropriate number by each question.

Always True / _Often True_ / _Sometimes True_ / _Seldom True_ / _Never True_

1. A great deal of the time I have felt miserable because of PCs.   1 2 3 4 5
2. This week my job made me feel keen.   1 2 3 4 5
3. I feel I get a raw deal out of life.   1 2 3 4 5
4. Everything usually works out for the best.   1 2 3 4 5
5. Now that they are installed I believe that PCs have been good for the company.   1 2 3 4 5
6. This week my job made me feel calm.   1 2 3 4 5
7. I feel that the new technology will provide exciting challenges.   1 2 3 4 5
8. A great deal of the time I have felt depressed because of PCs.   1 2 3 4 5
9. I am really challenged by the new technology we have.   1 2 3 4 5
10. This week my job made me feel contented.   1 2 3 4 5
11. PCs are not so bad.   1 2 3 4 5
12. Other people always seem to get the breaks.   1 2 3 4 5
13. This week my job made me feel lively.   1 2 3 4 5
14. All things considered, this company runs pretty well.   1 2 3 4 5
15. At this company, loyal employees are taken care of.   1 2 3 4 5
16. This week my job made me feel relaxed.   1 2 3 4 5
17. A great deal of the time I have felt gloomy because of PCs.   1 2 3 4 5
18. When I look back on what's happened to me, I feel resentful.   1 2 3 4 5
19. I feel the challenge of the new technology will provide opportunities for me.   1 2 3 4 5
20. I have come to like using PCs.   1 2 3 4 5
21. This week my job made me feel enthusiastic.   1 2 3 4 5
22. I like the organization I am in.   1 2 3 4 5
23. A great deal of the time I have felt grim because of PCs.   1 2 3 4 5
24. The new technology we have is making this a more interesting place to work.   1 2 3 4 5
25. I guess you could say I feel bitter about things.   1 2 3 4 5
26. This week my job made me feel stimulated.   1 2 3 4 5

27. My users are more satisfied now that they have PCs. 1 2 3 4 5
28. This week my job made me feel comfortable. 1 2 3 4 5
29. I have reached the point of accepting PCs in the workplace. 1 2 3 4 5
30. This week my job made me feel pleasurable. 1 2 3 4 5
31. This week my job made me feel excited. 1 2 3 4 5
32. A great deal of the time I have felt grumpy because of PCs. 1 2 3 4 5
33. I feel aggravated about what's happened to me. 1 2 3 4 5
34. I get along pretty well with the supervision and management of this company. 1 2 3 4 5
35. The new technologies are like a breath of fresh air and invigorate me. 1 2 3 4 5
36. A great deal of the time I have felt discontented because of PCs. 1 2 3 4 5
37. I feel comfortable with PCs. 1 2 3 4 5
38. I am satisfied with this company. 1 2 3 4 5
39. With the new technology my job is every bit as important as it has ever been. 1 2 3 4 5
40. This week my job made me feel invigorated. 1 2 3 4 5
41. This week my job made me feel peaceful. 1 2 3 4 5
42. A great deal of the time people ask too much of me since we started using PCs. 1 2 3 4 5
43. With the new technology I will be able to show how important I am to this organization. 1 2 3 4 5
44. I am satisfied with the way PCs are being used in the company. 1 2 3 4 5
45. This week my job made me feel restful. 1 2 3 4 5
46. This week my job made me feel energetic. 1 2 3 4 5
47. A great deal of the time I feel blocked or stymied since we started using PCs. 1 2 3 4 5
48. Now that my users are using PCs, they are more satisfied with our department. 1 2 3 4 5
49. With the new technology this company will not be able to get along without me, or people like me. 1 2 3 4 5
50. This week my job made me feel tranquil. 1 2 3 4 5
51. A great deal of the time I feel others do not understand me since we started using PCs. 1 2 3 4 5
52. This week my job made me feel serene. 1 2 3 4 5
53. A great deal of the time I feel hopeless about the future since we started using PCs. 1 2 3 4 5

COMMENTS PAGE (OPTIONAL)

If you have any comments about the questionaire, or the questions themselves, which you believe might help the researcher put together a better (or more clearly stated) instrument for measuring attitudes/perceptions about PCs, please use this page to make your comments.

Note: For the company which was only at Level A, parts B and C of the questionnaire were omitted since those parts would have not applied to that company. Also, minor wording changes were made in the questionnaire to reflect the fact that parts B and C were omitted.

Likewise for the two companies which were only at Level B, part C of the questionnaire was omitted since it did not apply to those companies. Once again, it was necessary to make minor wording changes to reflect the fact that part C was omitted.

APPENDIX   C

REVISED ITEMS FOR FINAL QUESTIONNAIRE

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APPENDIX C

REVISED ITEMS FOR FINAL QUESTIONNAIRE

Indicate answers with a scale of from 1 to 5. With the following: 1. Always True. 2. Often True.
3. Sometimes True. 4. Seldom True. 5. Never True.

BENIGN-POSITIVE APPRAISAL (Level A)

Enthusiasm

    1. This week my job made me feel stimulated.

    2. This week my job made me feel excited.

    3. This week my job made me feel invigorated.

    4. This week my job made me feel energetic.

Contentment

    1. This week my job made me feel calm.

    2. This week my job made me feel peaceful.

    3. This week my job made me feel restful.

    4. This week my job made me feel tranquil.

    5. This week my job made me feel serene.

Job Satisfaction

1. This past week I felt interested in my job.

2. This past week I felt challenged by my job.

3. This past week I felt industrious because of my job.

4. This past week I felt motivated in my job.

5. This past week I felt inspired by my job.

Technology Specific Self Gratification

1. I think a lot of good things will come to me because of the PCs.

2. I believe the PC will be good for the company and me.

3. I can hardly wait for my users to get PCs.

4. I can hardly wait for my own PC.

IRRELEVANT APPRAISAL (Level A)

1. The PC will not change my job significantly.

2. My job goes on the same, even though technology changes.

3. I do not get very excited about the prospect of PCs.

4. I am indifferent when I think about PCs.

5. Five years from now computer professionals will still be doing the same basic things.

THREAT APPRAISAL (Level A)

Fear Scale

1. I feel threatened by PCs.

2. I feel my job will be threatened by PCs.

3. I fear a loss of status, position, or salary from company use of PCs.

4. PCs are the single biggest threat my occupation faces.

5. I feel a great deal of uncertainty because of PCs.

6. I feel my job will be endangered by PCs.

Anxiety Scale

1. A great deal of the time I have felt tense because of PCs.

2. A great deal of the time I have felt frustrated because of PCs.

3. A great deal of the time I have felt anxious because of Pcs.

4. A great deal of the time I have felt concern because of PCs.

5. A great deal of the time I have felt fearful because of PCs.

THREAT/COGNITIVE APPRAISAL (Level B)

Self Esteem

    1. I wish I had more respect for myself.

    2. I feel I'm a person of worth, at least on an equal
       plane with others.*

    3. I feel I do not have much to be proud of.

    4. I certainly feel useless at times.

    5. On the whole, I am satisfied with myself.*

Subjective Stress Scale - L. A. Heart Association

    1. My daily activities cause an unusual amount of
       tenseness or nervousness.

    2. There is a great amount of nervous strain connected
       with my daily activities, I am always under
       pressure.

    3. At the end of day I am completely exhausted,
       mentally and physically.

    4. My daily activities are extremely trying and
       stressful.

    5. A great deal of pressure and stress are part of my
       daily activities.

* Means this item is reverse scored

Mastery

1. I have little control over the things that happen to me.

2. There is really no way I can solve some of the problems I have.

3. There is little I can do to change many of the important things in my life.

4. I often feel helpless in dealing with the problems of life.

5. Sometimes I feel that I'm being pushed around in life.

Interpersonal Trust

1. In dealing with strangers one is better off to be cautious until they provide evidence that they are trustworthy.

2. Most people can be counted on to do what they say they will do.*

3. It is safe to believe that in spite of what people say, most people are primarily interested in their own welfare.

4. In these competitive times, one has to be alert or someone is likely to take advantage of you.

5. Most salespeople at this company are honest in describing their products.*

Somatic Symptoms

    1. I get a soreness in my muscles.

    2. I get a weakness in parts of my body.

    3. I get pains in my heart or chest.

    4. I get pains in the lower part of my back.

    5. I have trouble getting to sleep or staying asleep.

Performance Difficulty

    1 I am able to work under a great deal of pressure.*

    2. I feel inferior to others.

    3. I have trouble concentrating.

    4. I have difficulty remembering things.

    5. I have difficulty in making decisions.

HARM/LOSS APPRAISAL (Level C)

Depression

    1. A great deal of the time I have felt gloomy because of PCs.

    2. A great deal of the time I have felt grim because of PCs.

    3. A great deal of the time I have felt discontented because of PCs.

4. A great deal of the time I feel hopeless about the future since we started using PCs.

Resentment

1. I feel I get a raw deal out of life.

2. When I look back on what's happened to me, I feel resentful.

3. I guess you could say I feel bitter about things.

4. I feel aggravated about what's happened to me.

Satisfaction with Company

1. All things considered, this company runs pretty well.

2. At this company, loyal employees are taken care of.

3. I like the organization I am in.

4. I am satisfied with this company.

Acceptance

1. Now that they are installed I believe that PCs have been good for the company.

2. PCs are not so bad.

3. I have come to like using PCs.

4. I have reached the point of accepting PCs in the workplace.

CHALLENGE APPRAISAL (Level C)

Challenge

 1. I feel that the new technology will provide exciting challenges.

 2. I am really challenged by the new technology we have.

 3. I feel the challenge of the new technology will provide opportunities for me.

 4. The new technology we have is making this a more interesting place to work.

 5. The new technologies are like a breath of fresh air and invigorate me.

Enthusiasm

 1. This week my job made me feel stimulated.

 2. This week my job made me feel excited.

 3. This week my job made me feel invigorated.

 4. This week my job made me feel energetic.

Contentment

 1. This week my job made me feel calm.

 2. This week my job made me feel peaceful.

 3. This week my job made me feel restful.

4. This week my job made me feel tranquil.

5. This week my job made me feel serene.

APPENDIX D

REVISED ITEMS FOR FINAL QUESTIONNAIRE

CROSS REFERENCED WITH THE NUMBERS

FOR THE ITEMS ON THE

PILOT INSTRUMENT

Numbering of question is the same number as it was on the pilot
instrument with new, additional questions being without numbers.
Changes to questions and new questions are underlined for emphasis.

LEVEL A

BENIGN-POSITIVE APPRAISAL

	CROSS REFERENCE #
Enthusiasm Scale	FINAL INSTRUMENT

4. This week my job made me feel stimulated.	18
5. This week my job made me feel excited.	23
6. This week my job made me feel invigorated.	24
7. This week my job made me feel energetic.	30

Contentment Scale

1. This week my job made me feel calm.	4
6. This week my job made me feel peaceful.	26
7. This week my job made me feel restful.	31
8. This week my job made me feel tranquil.	35
9. This week my job made me feel serene.	33

Job Satisfaction Scale

3. This past week I felt interested in my job.	14
4. This past week I felt challenged by my job.	15
5. This past week I felt industrious because of my job.	21
6. This past week I felt motivated in my job.	25
7. This past week I felt inspired by my job.	28

Technology Specific Self Gratification Scale

1. I think a lot of good things will come to me because of the PCs.	2
2. I believe the PC will be good for the company and me.	10
5. I can hardly wait for my users to get PCs.	20
6. I can hardly wait for my own PC.	27

<u>LEVEL B</u>

THREAT/COGNITIVE APPRAISAL

<u>Self Esteem Scale</u>

2. I wish I had more respect for myself.	7
3. I feel I'm a person of worth, at least on an equal plane with others.*	11
4. I feel I do not have much to be proud of.	17
6. I certainly feel useless at times.	24
10. On the whole, I am satisfied with myself.*	29

<u>Subjective Stress Scale - L. A. Heart Association</u>

1. My daily activities cause an unusual amount of tenseness or nervousness.	2
2. There is a great amount of nervous strain connected with my daily activities, I am always under pressure.	8
3. At the end of day I am completely exhausted, mentally and physically.	12
4. My daily activities are extremely trying and stressful.	15
A great deal of pressure and stress are part of my daily activities.	30

<u>Mastery Scale</u>

1. I have little control over the things that happen to me.	1
2. There is really no way I can solve some of the problems I have.	6
3. There is little I can do to change many of the important things in my life.	13
4. I often feel helpless in dealing with the problems of life.	19
5. Sometimes I feel that I'm being pushed around in life.	21

<u>Interpersonal Trust Scale</u>

1. In dealing with strangers one is better off to be cautious until they provide evidence that they are trustworthy.	3
2. Most people can be counted on to do what they say they will do.*	9
4. It is safe to believe that in spite of what people say, most people are primarily interested in their own welfare.	16
6. In these competitive times, one has to be alert or someone is likely to take advantage of you.	26
7. Most salespeople at this company are honest in describing their products.*	28

* This item to be reversed scored

IRRELEVANT APPRAISAL

Indifference Scale

1. The PC will not change my job significantly.   5
2. My job goes on the same, even though technology changes.   9
3. I do not get very excited about the prospect of PCs.   13
5. I am indifferent when I think about PCs.   19
6. Five years from now computer professionals will still be doing the   34
   same basic things.

THREAT APPRAISAL

Fear Scale

1. I feel threatened by PCs.   1
2. I feel my job will be threatened by PCs.   6
3. I fear a loss of status, position, or salary from use of PCs.   12
4. PCs are a big threat to my occupation.   16
7. I feel a great deal of uncertainty because of PCs.   29
   I feel my job will be endangered by PCs.   32

Anxiety Scale

1. A great deal of the time I have felt tense because of PCs.   3
2. A great deal of the time I have felt frustrated because of PCs.   7
3. A great deal of the time I have felt anxious because of Pcs.   11
4. A great deal of the time I have felt concern because of PCs.   17
5. A great deal of the time I have felt fearful because of PCs.   22

Somatic Symptoms Scale

1.	I get a soreness in my muscles.	5
3.	I get a weakness in parts of my body.	14
4.	I get pains in my heart or chest.	18
5.	I get pains in the lower part of my back.	22
6.	I have trouble getting to sleep or staying asleep.	27

Performance Difficulty Scale

1.	I am able to work under a great deal of pressure.*	4
2.	I feel inferior to others at my workplace.	10
4.	I have trouble concentrating.	20
5.	I have difficulty remembering things.	23
6.	I have difficulty in making decisions.	25

LEVEL C

HARM/LOSS APPRAISAL

Depression Scale

3. A great deal of the time I have felt gloomy because of PCs.   9
4. A great deal of the time I have felt grim because of PCs.   14
6. A great deal of the time I have felt discontented because of PCs.   22
9. A great deal of the time I feel hopeless about the future since we   31
   started using PCs.

Resentment Scale

1. I feel I get a raw deal out of life.   1
3. When I look back on what's happened to me, I feel resentful.   10
4. I guess you could say I feel bitter about things.   16
5. I feel aggravated about what's happened to me.   20

Satisfaction with Company Scale

2. All things considered, this company runs pretty well.   7
3. At this company, loyal employees are taken care of.   8
4. I like the organization I am in.   13
6. I am satisfied with this company.   24

Acceptance Scale

1. Now that they are installed I believe that PCs have been good   2
   for the company.
2. PCs are not so bad.   6
3. I have come to like using PCs.   12
5. I have reached the point of accepting PCs in the workplace.   18

CHALLENGE APPRAISAL

Challenge Scale

1. I feel that the new technology will provide exciting challenges.   4
2. I am really challenged by the new technology we have.   5
3. I feel the challenge of the new technology will provide   11
   opportunities.
4. The new technologies we have are making this a more interesting   15
   place to work.
5. The new technologies are like a breath of fresh air and invigorate   21
   me.

Enthusiasm Scale

    4. This week my job made me feel stimulated.   17
    5. This week my job made me feel excited.   19
    6. This week my job made me feel invigorated.   24
    7. This week my job made me feel energetic.   27

Contentment Scale

    1. This week my job made me feel calm.   3
    6. This week my job made me feel peaceful.   25
    7. This week my job made me feel restful.   26
    8. This week my job made me feel tranquil.   28
    9. This week my job made me feel serene.   30

APPENDIX   E

FINAL QUESTIONNAIRE

The purpose of this questionaire is to attempt to measure the responses of computer professionals to the introduction and use of personal computers (PCs) in the workplace. There will not be any attempt on the part of anyone to identify individuals or to analyze individual responses. This research is oriented toward identifying responses of groups of people and to see if various classes of responses exist among groups of computer professionals. Also, to see how computer professionals may have responded over time to PCs when : 1. PCs were just being considered at an organization. 2. When PCs were just starting to be used at an organization. 3. When PCs have become an established tool at an organization.

The research is not oriented toward making any type of judgment as to how well or how poorly PCs were introduced into the organization, but is interested in validating a model of the stages of psychological responses which people go through in the process of PCs being integrated into the workplace.

The data will be collected by company since some companies are at different stages of adaptation of PCs into the workplace. Some demographic information is desired to see if there are any significant groupings of answers among different sets of people.

There are no wrong answers, only inconsistent answers which can cause "noise" in the research. Please answer the questions honestly and to the best of your ability and recollection (when recollection is required).

Once again it should be pointed out that individuals will not be identified, and no effort will be made to identify individual responses or to analyze individual responses.

Background information: Please mark the spot indicated with the correct answer.

I am :   male___   female___

I have a PC at my home :   yes___   no___

I have ready access to a PC at the workplace :   yes___   no___

My highest level of education is :

    High School   ___

    Two years or less of college   ___

    Between two to four years of college   ___

    Completed Bachelors degree   ___

    Bachelors degree plus some graduate studies   ___

    Completed Masters degree   ___

    Completed Ph.D. degree   ___

My age in years is :

    25 or less   ___

    between 26 and 35   ___

    between 36 and 45   ___

    between 46 and 55   ___

    56 or over   ___

My years of experience in the computer field is :

    5 or less   ___

    between 6 and 10   ___

    between 11 and 15   ___

    between 16 and 20   ___

    over 21 years   ___

My salary level is :

    $20,000/year ($1666/month) or less   ___

    between $20,001 and $30,000/year ($1667 & $2500/mo.)   ___

    between $30,001 and $40,000/year ($2501 & $3333/mo.)   ___

    between $40,001 and $50,000/year ($3334 & $4166/mo.)   ___

    between $50,001 and $60,000/year ($4167 & $5000/mo.)   ___

    $60,001/year ($5001/mo.) or more   ___

Please answer these questions on a scale of from 1 to 5 which is explained below. The questions are asked within the context of your workplace and the introduction of the new technology associated with personal computers (PCs). In particular, the questionaire is aimed at determining your personal perspective of the potential, or actual impact, of PCs and the change associated with this new technology.

Indicate answers with a scale of from 1 to 5. W .h the following:
1. Almost Always True. 2. Often True. 3. Sometimes True.
4. Seldom True. 5. Never True.

Part A: These questions are aimed at the time period when your company first started thinking about the use of PCs. Recall your feelings and thoughts which you had when your company first planned on using PCs. Circle the number which best represents your mental attitude during a typical week at that time.

	Always True	Often True	Sometimes True	Seldom True	Never True
1. I feel threatened by PCs.	1	2	3	4	5
2. I think a lot of good things will come to me because of the PCs.	1	2	3	4	5
3. A great deal of the time I have felt tense because of PCs.	1	2	3	4	5
4. This week my job made me feel calm.	1	2	3	4	5
5. The PC will not change my job significantly.	1	2	3	4	5
6. I feel my job will be threatened by PCs.	1	2	3	4	5
7. A great deal of the time I have felt frustrated because					
8 of PCs.	1	2	3	4	5
9. My job goes on the same, even though technology changes.	1	2	3	4	5
10. I believe the PC will be good for the company and me.	1	2	3	4	5
11. A great deal of the time I have felt anxious because of PCs.	1	2	3	4	5
12. I fear a loss of status, position, or salary from company use of PCs.	1	2	3	4	5
13. I do not get very excited about the prospect of PCs.	1	2	3	4	5
14. This past week I felt interested in my job.	1	2	3	4	5

	Always True	Often True	Sometimes True	Seldom True	Never True
15. This past week I felt challenged by my job.	1	2	3	4	5
16. PCs are the single biggest threat my occupation faces.	1	2	3	4	5
17. A great deal of the time I have felt concern because of PCs.	1	2	3	4	5
18. This week my job made me feel stimulated.	1	2	3	4	5
19. I am indifferent when I think about PCs.	1	2	3	4	5
20. I can hardly wait for my users to get PCs.	1	2	3	4	5
21. This past week I felt industrious because of my job.	1	2	3	4	5
22. A great deal of the time I have felt fearful because of PCs.	1	2	3	4	5
23. This week my job made me feel excited.	1	2	3	4	5
24. This week my job made me feel invigorated.	1	2	3	4	5
25. This past week I felt motivated in my job.	1	2	3	4	5
26. This week my job made me feel peaceful.	1	2	3	4	5
27. I can hardly wait for my own PC.	1	2	3	4	5
28. This past week I felt inspired by my job.	1	2	3	4	5
29. I feel a great deal of uncertainty because of PCs.	1	2	3	4	5
30. This week my job made me feel energetic.	1	2	3	4	5
31. This week my job made me feel restful.	1	2	3	4	5
32. I feel my job will be endangered by PCs.	1	2	3	4	5
33. This week my job made me feel serene.	1	2	3	4	5
34. Five years from now computer professionals will still be doing the same basic things.	1	2	3	4	5
35. This week my job made me feel tranquil.	1	2	3	4	5

END OF PART A.

Part B: These questions are aimed at the time period when the company
was initially using PCs, both by your department and by various user
departments. Recall your feelings and thoughts which you had during a
typical week when the company was initially using PCs. Circle the number
which best represents your mental attitude at that time.

Always True / Often True / Sometimes True / Seldom True / Never True

1. I have little control over the things that happen to me. 1 2 3 4 5
2. My daily activities cause an unusual amount of tenseness
    and nervousness 1 2 3 4 5
3. In dealing with strangers one is better off to be cautious
    until they provide evidence that they are trustworthy. 1 2 3 4 5
4. I am able to work under a great deal of pressure. 1 2 3 4 5
5. I get a soreness in my muscles. 1 2 3 4 5
6. There is really no way I can solve some of the problems
    I have. 1 2 3 4 5
7. I wish I had more respect for myself. 1 2 3 4 5
8. There is a great amount of nervous strain connected with my
    daily activities, I am always under pressure. 1 2 3 4 5
9. Most people can be counted on to do what they say they
    will do. 1 2 3 4 5
10. I feel inferior to others at my workplace. 1 2 3 4 5
11. I feel I'm a person of worth, at least on an equal plane
    with others. 1 2 3 4 5
12. At the end of day I am completely exhausted, mentally and
    physically. 1 2 3 4 5
13. There is little I can do to change many of the important
    things in my life. 1 2 3 4 5
14. I get a weakness in parts of my body. 1 2 3 4 5
15. My daily activities are extremely trying and stressful. 1 2 3 4 5
16. It is safe to believe that in spite of what people say, most
    people are primarily interested in their own welfare. 1 2 3 4 5
17. I feel I do not have much to be proud of. 1 2 3 4 5
18. I get pains in my heart or chest. 1 2 3 4 5
19. I often feel helpless in dealing with the problems of life. 1 2 3 4 5
20. I have trouble concentrating. 1 2 3 4 5
21. Sometimes I feel that I'm being pushed around in life. 1 2 3 4 5

	Always True	Often True	Sometimes True	Seldom True	Never True
22. I get pains in the lower part of my back.	1	2	3	4	5
23. I have difficulty remembering things.	1	2	3	4	5
24. I certainly feel useless at times.	1	2	3	4	5
25. I have difficulty in making decisions.	1	2	3	4	5
26. In these competitive times, one has to be alert or someone is likely to take advantage of you.	1	2	3	4	5
27. I have trouble getting to sleep or staying asleep.	1	2	3	4	5
28. Most salespeople at this company are honest in describing their products.	1	2	3	4	5
29. On the whole, I am satisfied with myself.	1	2	3	4	5
30. A great deal of pressure and stress are part of my daily activities.	1	2	3	4	5

END OF PART B.

PART C: These questions are aimed at the present time when PCs are commonly being used in the company. Express the thoughts and feelings which you now have this week by circling the appropriate number by each question.

Always True | Often True | Sometimes True | Seldom True | Never True

1. I feel I get a raw deal out of life. — 1 2 3 4 5
2. Now that they are installed I believe that PCs have been good for the company. — 1 2 3 4 5
3. This week my job made me feel calm. — 1 2 3 4 5
4. I feel that the new technology will provide exciting challenges. — 1 2 3 4 5
5. I am really challenged by the new technology we have. — 1 2 3 4 5
6. PCs are not so bad. — 1 2 3 4 5
7. All things considered, this company runs pretty well. — 1 2 3 4 5
8. At this company, loyal employees are taken care of. — 1 2 3 4 5
9. A great deal of the time I have felt gloomy because of PCs. — 1 2 3 4 5
10. When I look back on what's happened to me, I feel resentful. — 1 2 3 4 5
11. I feel the challenge of the new technology will provide opportunities for me. — 1 2 3 4 5
12. I have come to like using PCs. — 1 2 3 4 5
13. I like the organization I am in. — 1 2 3 4 5
14. A great deal of the time I have felt grim because of PCs. — 1 2 3 4 5
15. The new technology we have is making this a more interesting place to work. — 1 2 3 4 5
16. I guess you could say I feel bitter about things. — 1 2 3 4 5
17. This week my job made me feel stimulated. — 1 2 3 4 5
18. I have reached the point of accepting PCs in the workplace. — 1 2 3 4 5
19. This week my job made me feel excited. — 1 2 3 4 5
20. I feel aggravated about what's happened to me. — 1 2 3 4 5
21. The new technologies are like a breath of fresh air and invigorate me. — 1 2 3 4 5
22. A great deal of the time I have felt discontented because of PCs. — 1 2 3 4 5
23. I am satisfied with this company. — 1 2 3 4 5
24. This week my job made me feel invigorated. — 1 2 3 4 5

	Always True	Often True	Sometimes True	Seldom True	Never True

25. This week my job made me feel peaceful.   1   2   3   4   5

26. This week my job made me feel restful.   1   2   3   4   5

27. This week my job made me feel energetic.   1   2   3   4   5

28. This week my job made me feel tranquil.   1   2   3   4   5

29. A great deal of the time I feel others do not understand
me since we started using PCs.   1   2   3   4   5

30. This week my job made me feel serene.   1   2   3   4   5

31. A great deal of the time I feel hopeless about the future
since we started using PCs.   1   2   3   4   5

END OF PART C:

COMMENTS PAGE (OPTIONAL)

If you have any comments which you believe might help the researcher better understand the psychological responses (i.e. emotions, feelings, etc.) which the advent of personal computers has brought about, please use this page to make your comments. You can comment about your own personal feelings or make generalizations about computer professionals as a class, or any other thing you feel might be useful. Once again, neither companies or individuals will be identified.