Order Number 9303280

Computer technology: Neutral tools or value-laden symbols?

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The University of Arizona, 1992

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Ann Arbor, MI 48106

COMPUTER TECHNOLOGY:

NEUTRAL TOOLS OR VALUE-LADEN SYMBOLS?

by

Susan Joyce Winter

A Dissertation Submitted to the Faculty of the

COMMITTEE ON BUSINESS ADMINISTRATION

In Partial Fulfillment of the Requirements
For the Degree of

DOCTOR OF PHILOSOPHY
WITH A MAJOR IN MANAGEMENT

In the Graduate College

THE UNIVERSITY OF ARIZONA

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THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Susan Joyce Winter

entitled Computer Technology: Neutral Tools or Value-Laden Symbols?

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

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SIGNED: Susan Joyce Winter

ACKNOWLEDGMENTS

Completing this dissertation and my doctoral studies would have been impossible without the help and support of many people. Although they know who they are, and I have thanked each of them along the way, I would like to use this limited space to formally acknowledge the valuable support of several who have proved most instrumental.

I would like to thank my committee members--Barbara Gutek, Lee Beach, Christina Shalley, Doug Vogel, and Joey George--for their academic support and encouragement during my work at Arizona. Special thanks must go to Barbara who has supported me as an advisor, mentor, and coach over the many years during which we have worked together. My enormous debt to her can never be completely described; much less paid back. I also thank Dale Berger at The Claremont Graduate School for (in no particular order) his patience, kindness, and lucid explanations of statistical concepts. I will always be grateful to Susan Kegeles for taking a chance on me during my undergraduate studies at a time when nobody else would. I also thank Hilda Kessler who has always believed in me.

Many times during my graduate school career, the pursuit of science carried on in the context of a large bureaucracy has led me to frustration and doubt. Many faculty members and students have listened, sympathized, laughed, strategized, helped me to fulfill my obligations, and forgiven me when they went unfulfilled. Their generosity has not gone unnoticed. As this acknowledgement is limited to only one page, I can only name a few. Among those not already mentioned are Suzi Iacono, Kristopher Weatherly, Dinah Bird Westerfield, Bob Lunn, Sandra Richmond, Susan DeRyke, Deborah Adair, Katherine Chudoba, Chris Earley, Wayne Cascio, John Huonker, Terri Lituchy, Carlos Cabana, Bonnie Dlott, and Nancy Ashley.

In collecting the data presented in this dissertation, I am indebted to the managers and workers who volunteered their time to answer my many questions solely for "the good of science." I also thank the National Science Foundation (Grant IRI-8714768) for supporting this research.

I am grateful to the many secretaries, administrative assistants, and office managers who have guided me through the intricacies of University life. Particular thanks are due to Jane Gray, Gayle Randle, and B.J. Reich. Their patience, generosity, knowledge, humor, attention to detail, and remarkable filing systems have eased my journey to the Ph.D.

DEDICATION

This dissertation is dedicated to the memory of my mother. She taught me to love knowledge, to enjoy language, and to follow my convictions wherever they may lead. It was her suggestion that influenced me to pursue a Ph.D.

Those who work with their hands and those who work with their minds have taken different paths. Through their actions, my parents taught me that neither path is inherently more difficult, more valuable, or more reliant upon knowledge; they are just different. The trash collector, the doctor, the receptionist, and the university chancellor are all equally deserving of respect. This belief has profoundly influenced my life and my work.

Paul and Virginia Smith and Eustoquio and Consuela Cortez have taken up where my own parents left off. Their constant, unselfish love and support over the last 32 years is all the more precious because it has been so often and so freely volunteered. Over the years, my sister Linda and I have found that, in spite of our differences, it is possible to love, honor, and cherish for richer, for poorer, in sickness as in health, as long as we both shall live.

My husband has probably been most directly affected by my doctoral studies. He has cheerfully and patiently made repeated sacrifices, each of which has quietly reminded me of my good fortune in having such an exceptional partner in life.

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ABSTRACT

Technology is often presented as a neutral tool to be used when and where appropriate to perform work more efficiently and improve the quality of life. This dissertation explores the possibility that computers are distributed as though they were value-laden objects rather than neutral tools. This is done by focusing on the similarity between computers and income, because income is also distributed by organizations and is generally valued positively.

The literature on organizational symbols is reviewed and evidence of the value attached to computers is presented. Previous research on income inequality is discussed focusing on factors empirically associated with income and on factors influencing the allocation of valued goods within a group. Earlier work on individual wage allocation and on the determinants of wage inequality within work groups is partially replicated and extended to the area of computer resources.

Hypotheses regarding the distribution of income and computers are developed at both the individual and group level and the possibility that computer terminals act as value-laden objects is explored by comparing their distribution to that of income in white-collar work groups when computer use is statistically controlled.

At the individual level, computer terminals and income shared many of the same correlates and predictors. For the sample as a whole, computers and income were slightly positively correlated and previous findings that characteristics of work and of individuals are related to income were replicated. The same set of predictors was also related to having one's own computer terminal, providing evidence that computer resources could act as symbols of status. Exploratory analyses indicated that the pattern of results differed by the organizational function of the work group and by job classification. Though use was consistently related to having one's own terminal, it was never the only factor involved. Group-level evidence of symbolic value was equivocal; previous findings regarding the distribution of income were not replicated and the pattern of relationships for computers was different from that for income. Implications of the symbolic value of computers for managers and directions for future research were described.

1. INTRODUCTION

During the last decade, microcomputers have become increasingly common in organizations. Almost 40% of capital spending in the U.S. is being used to acquire information technology to improve productivity. Much of this spending is going toward automating white collar office work (Davis, 1991). However, hopes of productivity gains among white collar workers are not being realized and many managers are disenchanted with their computer systems' ability to improve worker productivity (Bowen, 1986; Harris, Levine, Treece, Seghers, Brott, & Mitchell, 1987; Izzo, 1987; Kletke, Trumbly & Nelson, 1990).

The predominant metaphor used by professionals in the management of information systems (MIS) to describe the relationship between information systems and their users (people) is that of a tool (Gutek, 1989; Hirschheim, 1986; Hirschheim & Newman, 1991). Technology is seen as a tool in the hands of the workers to be used when and where appropriate to make their work more efficient and to raise the quality of life in general (Capron, 1990; Deans & Kane, 1992; Kroenke & Dolan, 1990; Liker, Roitman, & Roskies, 1986). The tool itself is seen as neutral and can be used in many ways (Boynton & Zmud, 1990; Hirschheim, 1986; Hirschheim & Newman, 1991). One of the missions of MIS

professionals is to describe tasks or problems in detail and identify or develop computerized "tools" to aid in performing those tasks or solving those problems (Alavi & Weiss, 1986; Brancheau & Wetherbe, 1987; Jenkins, 1988; McClure, 1989).

Perhaps one of the reasons computers have not alleviated the productivity problem in white collar work is because they have not been distributed to workers solely on the basis of their appropriateness to the tasks performed (efficiency potential). Rather, distribution may have been based on the value attached to them by their users. Research in the area of organizational culture has suggested that the distribution of physical artifacts (the built environment) such as computers can indicate the value of those objects to those who interact with them (Schein, 1985; Sundstrom, 1986). This dissertation explores the possibility that computers are allocated as though they were value-laden objects rather than neutral tools, by focusing on the similarity between computers and income which is another extensively studied, generally desired, organizationally distributed outcome. If income itself is not related to the need for a computer (and I know of no evidence that it is), then to the extent that computers resemble income in their distribution, it is possible that they are not being deployed solely as neutral tools. The

questions to be answered by this research are: Are computer equipment and income correlated? Do they share the same predictors? and When being allocated to group members, are they subject to the same influences?

If computers are positively valued, they could be more consistently integrated into organizations' compensation packages and strategic plans for managing employee performance. This would improve the ability to attract, retain, and motivate employees. If computers are negatively valued, this information could help organizations manage their use and interpret employees' reactions to them. In addition, any negative effects of computer use could be avoided or ameliorated whenever possible and employees' increased computer skills could be recognized and rewarded by the organization. If computers are neutral tools they could be allocated to those employees who can make best use of them (those with the necessary skills and those who perform tasks which are most appropriate for computers) and organizations could aggressively support computers by supplying training and time for learning and practice, to those workers who need them.

The next section contains a review of the literature from the area of environmental psychology, on organizational symbols, focusing primarily on those indicating status. The value of computers is posited to differ depending on the

type of job performed by the worker and the function of the group within which the work is being done. Evidence of the value attached to computers is presented from three diverse areas: organizational sociology, the research on individual-level impacts of use, and the literature on information technology development. Then, the sociology and social psychology literatures on income inequality will be reviewed, focusing on those factors that are empirically associated with income as well as factors influencing the allocation of valued goods within a group. Hypotheses regarding the distribution of income and computers will be developed at both the individual and group level. The research methods will be described including the procedures followed, the sample of respondents, specific measures, and analysis performed at both the individual and group level. Results of the analysis will be presented and their implications for managers and researchers will be discussed.

2. BACKGROUND

Symbols

Recently, attention has been focused on the topic of organizational symbols and their role in corporate climate (James & Jones, 1974) and culture (Martin, Feldman, Hatch, & Sitkin, 1983; Schein, 1984; 1985). Most theorists suggest that a symbol is any object or event that conveys or transmits meanings, images, feelings, and values to those who encounter it (Dandridge, Mitroff, & Joyce, 1980; Morgan, Frost, & Pondy, 1983). Symbols have received much attention because they are believed to be used in forming impressions and in rapid communication of information to those inside and outside of an organization (Dandridge, 1983; Dandridge et al., 1980; Morgan et al., 1983; Sundstrom, 1986).

Schein (1985) suggests that culture is composed of three levels: artifacts (the built environment) which are visible, values (the sense of what "ought" to be), and basic assumptions that are invisible and preconscious. Symbols would be visible artifacts that embody the underlying values of the group. Norms, values, beliefs, and cognitions established by previous interaction with the object all play a role in the interpretation of symbols.

Organizational symbols' connotations depend upon their social meaning within the context of specific work

situations, as distinct from the social meaning connoted when found in other contexts (Ornstein, 1986). The concept of social meaning refers to the way in which others interpret and understand a situation within a certain context or frame (Goffman, 1974). It is similar to the concepts of attitude and organizational climate and culture, but differs in that it is sensitive to specific situations rather than stable across many situations.

Organizational symbols can rapidly convey many types of information about an employee. For example, in one case, the occupants of semi-enclosed work-spaces in a large open office attached drawings of small doors across the entries of their work-stations. These served no practical value, but were "closed" to let others know that the occupant wanted to be left alone ("The trouble with open offices," 1978). This is an example of a symbol used to communicate the workers' current desires for privacy.

One commonly researched class of symbols is those associated with status, or the relative standing of an individual in the organization's hierarchy of authority and influence. For the individual, the symbols of status represent concrete and visible evidence of rank in the organization and the power that accompanies it. Status markers (characteristics of workspaces that signify the occupant's status) can perform several functions. They can

efficiently communicate the hierarchy of influence in the organization, serve as incentives for performance, or serve as props for use in carrying out the duties associated with specific jobs (Konar & Sundstrom, 1985; Sundstrom, 1986).

Several features of workspaces in offices have apparently become more or less traditional signs of status. These include location near a window, accessibility by others (a private office), amount of floorspace, furnishings, and degree of personalization permitted (Konar & Sundstrom, 1985; Konar, Sundstrom, Brady, Mandel, & Rice, 1982; Steele 1973a,b). There is little systematic empirical research on this subject, but anecdotes abound and aspects of the workspace apparently symbolize status in the hierarchy in many offices (Sundstrom, 1986). For example, many organizations (including CBS in New York City and the Civil Service) have developed formal policies detailing the appropriate size and furnishings of offices for each level in their hierarchy (Harris, 1977; Wotton, 1976). Upon entering an office, any individual familiar with the organization's policy can easily assess the occupant's level in the hierarchy.

A status marker can also act as an incentive to the extent that it is itself valued or it indicates the relative standing or allocation of promotions valued by the employee. Lavish workspaces for high-ranking members of an

organization may also be justified as props required for performing their jobs. The executive may need a large, well-furnished office because he or she needs to hold meetings with many important people who would expect a lavish office. However, low-ranking employees may have difficulty in obtaining the necessary props for their own jobs (Sundstrom, 1986).

Within an organization, symbols of status will be allocated differentially to workers based on their rank in the hierarchy. When information about individuals' standings in the organization is scarce, any aspect of the work place that is closely tied to rank (even if it is also necessary for performing the job) can be given significance and operate as a symbol of status (Steele, 1973b). Income is also allocated to workers based on their rank in the organization and, when publicly available, can be used as an indicator of status, power, and influence.

The allocation of income and of status symbols simultaneously reflects the value of the individual to the organization, the props required to perform the job, as well as indicants of success. Top executives may receive the largest incomes, the largest private offices, and the nicest furnishings because they are the most valued employees, or because of the perception that they need these props, but this does not diminish the significance of the symbols in

transmitting information about the employee to others.

Contingency Factors

An organizational symbol is context specific so there may be widespread disagreement on its meaning. However, some symbols may show consistent patterns of meaning for similar workers in different organizations if those workers form similar cognitions based on their previous interactions with that object (Sundstrom, 1986). Outlined below are two factors that are posited to affect users' interpretations of their computers -- job classification and functional structure.

Job Classification

Computers may differ markedly from each other in their physical characteristics, implementation, purpose, history, and social meaning (Kling & Scachi, 1982). Computers designed to support executives do differ markedly from those designed to support clerical workers (Rockart & DeLong, 1988). Though no research has yet focused on differences in social meaning, the effects of computer use on the quality of work life have been found to differ based on participants' occupations. Often, researchers have found positive effects (i.e. decreased tedium, increased speed of work, more fun) for managerial, executive, and professional

workers and have found negative effects (i.e. decreased control, increased stress) for clerical workers (Alcalay & Pasick, 1983; Grandjean, 1987). Therefore, the value attached to computers by their users may depend partly on the nature of the individual's job.

Functional Structure

Because norms, values, beliefs, and established cognitions play a role in the interpretation of symbols, the effects of working with computers may also differ based on the dominant interpretations of the group in which one works rather than on the nature of the individual's work. Berger and Luckmann's (1967) seminal work on creation of the meaning of symbols emphasized the social construction of reality. Research on social information processing has emphasized that both task and social cues affect attitudes and behavior in organizations (O'Reilly & Caldwell, 1979; Weiss & Shaw, 1979; White & Mitchell, 1979). Acceptance and learning of computers has been found to be affected by the user's work group (Helmreich, 1987).

Computers and their impacts could vary systematically according to the nature of the group in which an individual is working because of stable patterns in the nature of the computers and because of social cues provided by the work group. Structural contingency theory (relating technology

and structure in order to maximize effectiveness) would predict that computers and work situations should covary (Lawrence & Lorsch, 1967; Perrow, 1970; Woodward, 1965). Thus, the computers, and therefore, the positive and negative effects of their use, may differ by work situation or structure.

One facet of organizational structure particularly relevant to the study of computers is functional structure. Functional structure refers to units (such as departments, divisions, task teams, etc.) that differ because of the functions they serve within the organization (Daft & Steers, 1986). Units serving different functions require different input materials, processing mechanisms, and products, and therefore may require different technologies (Rousseau, 1979). Previous work has related structural function to information technology (Danziger & Dutton, 1977; Kling, 1980; Bikson & Gutek, 1983; Gutek, Bikson, & Mankin, 1984). Therefore, the value attached to computers by their users may depend partly on the organizational function of the group to which they belong.

Evidence of Value

Evidence of the value attached to computers by those who use or possess them can be found in three separate areas of research. The literature on organizational sociology

includes work on the impact of computerization on power and status, the assessment of characteristics of those who have computers, and the institutionalization of computers in organizations. A separate literature in sociology, MIS, ergonomics, and public health focuses on the individual-level impacts of computers on their users and includes both positive and negative effects. The third relevant literature focuses on the development of information technology and the status-related associations of its users. Each of these three literatures is reviewed below in light of the contingency factors outlined in the previous section.

Organizational Sociology

Though much of the literature on the computerization of work usually presents computers as neutral tools to help workers accomplish tasks (Boynton & Zmud, 1990; Capron, 1990; Deans & Kane, 1991; Jenkins, 1988; Kroenke & Dolan, 1990; McClure, 1989), some authors have focused on their use by management as a form of control (Clement, 1988; Edwards, 1979; Zuboff, 1988). Other researchers have shown that control over computer resources is related to power and status within an organization (Kling & Iacono, 1984; Kraemer & Dutton, 1979: Markus, 1981). Specifically, computers have been noted to appeal to people as entertaining or status-improving technology (Beatty & Gordon, 1988; Katz, 1987;

King, 1983; Malone, 1980; Ord, 1989) and have been mentioned as one of the items respondents would want in their workspace to indicate their new status if they were promoted (Sundstrom, 1986).

Additionally, using a situational approach, managers and professionals have reported positive interpretations of those whose offices contained a computer terminal (Safayeni, Purdy, & Higgins, 1989). The institutionalization of computer use in classroom instruction and in organizational settings has also been described (Davis, 1983; Dickson, 1981), and some employees expect and demand access to computers at work (Kling & Iacono, 1989).

Individual-Level Impacts of Use

Literature on the impact of computers provides more direct evidence of the value attached to computers by their users. The positive and negative effects of computers on their users can be seen to contrast markedly with the mainstream MIS presentation of computers as neutral tools. The direct effects of computers are mixed and seem to depend partly on the nature of the work performed by the individuals.

On the positive side, computer users can learn or improve marketable skills (Clement & Parsons, 1990; Clement, Parsons, & Zelechow, 1990) and can ease time zone

constraints by providing rapid asynchronous communication (Turner, 1980). Research on managers and professionals using computers indicate that they can also facilitate output, increase speed, decrease tedium and improve working conditions (Alcalay & Pasick, 1983). Many computer users enjoy "playing" while doing work (Snizek, 1987; Starbuck, 1990).

On the negative side, computer-based systems can make the task environment more demanding and anxiety provoking as workers experience unexpected blocks in their ability to perform their work (Clement & Parsons, 1990; Clement, Parsons, & Zelechow, 1990; Johannson & Aronsson, 1984). Research on clerical workers using computers indicate that they experience more uncertainty, stress, delays and health problems than do clerical workers who do not use computers (Grandjean, 1987; Turner, 1980; Smith, Cohen, Stammerjohn, & Happ, 1981; Wineman, 1982). In addition, computers may be used as a mechanism of managerial control affecting the pacing of work and surveillance of workers (Alcalay & Pasick, 1983; Braverman, 1974; Clement, 1988; Edwards, 1979; Lawler, 1983; McClure, 1989).

Information Technology Development

There has been no formal study of the status conferred by computer use; however, one could speculate that the

symbolic value of computers depends on characteristics of the people who use them or of the context within which they are used. They may be symbols of negative status when they are associated with clerical and secretarial tasks or workers but may be symbols of positive status when they are associated with highly skilled, technical tasks or workers (Safayeni et al., 1989; Sundstrom, 1986). Indeed, designers of executive support systems have recognized that acceptance of their systems depends partly on overcoming users' associations of typing with secretarial work either by changing users' attitudes or by replacing the keyboard with a mouse or light pen (Dreyfuss, 1988). In contrast, vendors of engineering support systems emphasize the status inherent in owning the latest state-of-the-art equipment.

Conclusion

From the research reviewed, we can see some evidence that the effects of using computers at work may not be neutral and may covary with the nature of the work performed by the individual or by the work group. Indirect or symbolic effects may be closely related to direct effects because interaction with the object and the resulting cognitions play a role in the creation of its social meaning. Though the social meaning of computers has yet to be fully investigated empirically, there is some evidence

that the assumption of neutrality may not be warranted and that status information (either positive or negative) is communicated by them. Computers do seem to be value-laden objects and their social meaning may differ according to the nature of the job being performed and, perhaps, by the functional structure of the group.

Exposing the social meaning of any artifact (such as computers) is not a simple task since the insiders of a culture are not necessarily aware of their own artifacts and their social meaning (Schein, 1985). When questioned, respondents may even deny the symbolic value of an artifact and attribute the differences in its distribution to its utility in the performance of various jobs (Lipman, Cooper, Harris, & Tranter, 1978). Even social meanings and values that are consciously articulated may indicate only what people will say rather than what they actually think or do (Argyris & Schon, 1978). Therefore, one cannot ask about the value attached to computers directly. However, an outsider can observe the distribution of an artifact, in light of its instrumental nature, and infer from that distribution the underlying value of the artifact to the group (Schein, 1985; Sundstrom, 1986).

Though little empirical work has focused on the distribution of computers, two diverse programs of research have focused on inequality in an organizationally

distributed outcome whose value is generally considered positive, namely income. The distribution of income has been studied extensively by both sociologists and social psychologists. Relevant concepts from these two literatures are described below with particular reference to factors associated with income inequality.

Inequality

Issues of distributive justice arise any time something of value is scarce or something of negative value (a harm or risk) cannot be avoided by all. These issues have been researched not only at the societal level (illuminating which groups within a society receive the largest share of a good), but also at the organizational, group, and dyadic levels (Blalock, 1956; 1957; Blau, 1977; Blau, Blum, & Schwartz, 1982). Recently, researchers have expressed a renewed interest in the theoretical and empirical study of inequality, its determinants, and its effects (Hill & Killingsworth, 1989; Kalleberg, 1988; Windolf, 1986). One branch of research has focused more specifically on the role of organizations in creating and maintaining inequality (Baron & Bielby, 1980; Kanter, 1977; Pfeffer & Davis-Blake, 1990; Pfeffer & Langton, 1990).

Income Inequality Research in Sociology

Studies of income dispersion have identified individual, job, and organizational factors consistently associated with income inequality at the national level (Becker, 1962; 1964; Doeringer & Piore, 1971; Pfeffer & Davis-Blake, 1990; Strober, 1990; Thurow, 1972; Williamson, 1975). Surveys of large numbers of workers in the U.S. have found that some types of workers in some types of jobs receive higher incomes than others. Individual employee characteristics empirically associated with salary levels include education, age, gender, marital status, minority status, job tenure, and organizational tenure. For example, workers with more education are, on average, paid more than those with less education and older workers are, on average, paid more than younger workers.

Characteristics of the type of work performed which are associated with salary levels in empirical studies include job classification (clerical, managerial, professional, etc.), routineness of work, hours worked per week, and supervisory responsibility. For example, executives are paid more than secretaries and workers performing routine jobs are paid less. Organizational characteristics associated with salary levels in empirical studies include the degree of unionization, organizational size, region of the country, and type of industry. For example, unionized

organizations pay higher wages, on average, than nonunionized organizations and large organizations pay higher wages, on average, than small organizations.

Income Inequality Research in Social Psychology

This study explores income and computer inequality both at an individual level (as described in the previous section) and at a group level (among individuals working in the same group). An extensive program of mostly laboratory-based research on equity and distributive justice has focused on conditions relevant to the distribution of positively valued goods (rewards) within small ad hoc groups. Research suggests that characteristics of the structure of work and the methods by which rewards are administered may affect the degree of inequality in reward allocation among members of a group (Leventhal, 1976). However, little empirical work on the inequality of the distribution of rewards within a group has focused on intact, standing groups, embedded in organizational settings. One notable exception is the recent work by Pfeffer and Langton (1988) which has shown that concepts from distributive justice can help predict the degree of equality found in the distribution of income within academic departments. A brief description of relevant concepts and findings from equity and distributive justice research

follows.

Wage allocation theories predict that goods (such as income and computers) would be distributed in organizations according to workers' inputs or productivity (a norm of equity) with more productive workers receiving higher wages (Strober, 1990). However, actual pay does not vary as much as does productivity or workers' inputs. Research on distributive justice indicates that increased equality (each worker getting an equal share regardless of his or her inputs or productivity) would be expected under any of several conditions.

Goods should be distributed equally, rather than equitably (according to each member's contribution), when group members are dependent upon one another and the performance of any one member cannot be uniquely identified or when information about inputs is vague and contradictory (Deutsch, 1985). Leventhal (1976) suggested additional forces related to conflict which may lead to increased equality in the distribution of goods. Since inequality in the distribution of goods leads to conflict, Leventhal (1976) has outlined mechanisms by which this inherent conflict can be avoided and conditions under which goods will be distributed equally, rather than equitably, as a means of avoiding conflict. These conditions affect the ease with which recipients can compare the amount of their

rewards with others. In addition, characteristics of the allocator which can affect his or her sensitivity to conflict are considered.

The unequal distribution of goods has been found to engender dissatisfaction among those recipients who receive the least even when the inequality is based on performance (Leventhal, 1976). Evidence from laboratory studies suggests that the greater the difference in pay between the best and worst performer, the more likely there is to be conflict. Conflict and dissatisfaction among group members can have serious consequences for the allocator (Leventhal, 1976). He or she may be directly subjected to criticism, his superiors may be consulted, and group members may reduce their performance. Allocators who are most vulnerable to the effects of group conflict may inflate the rewards of the most poorly paid in order to placate them (Leventhal, Michaels, & Sanford, 1972) and, in so doing, move from equity toward equality.

An alternate method of reducing conflict is to impose secrecy about the distribution of the good (Leventhal, Michaels, & Sanford, 1972). This keeps recipients from comparing themselves to one another and reduces the likelihood of dissatisfaction. Evidence suggests that secrecy may strengthen an allocator's tendency to distribute rewards according to inputs (equitably) in order to maximize

productivity (by motivating poorer performers to improve in order to increase their rewards). However, as Lawler and Porter (Lawler, 1973; Porter & Lawler, 1968) have suggested, secrecy obscures the link between performance and pay and may reduce the incentive value and therefore the effectiveness of merit pay plans.

Conclusion

Previous findings from the sociology of inequality and the social psychology of equity and distributive justice are apparently relevant to understanding the distribution of income in organizations and may be relevant to understanding the distribution of computers in organizations. In order to infer the social meaning of computers this paper compares the distribution of income, whose positive value is generally accepted, to that of computers, whose value is unknown but expected to differ by the type of work performed and the type of group in which they are found. The next section develops specific hypotheses drawn from the relevant literatures and designed to test the questions: Are income and computers distributed similarly?, Do they share the same predictors?, and When being allocated to group members, are they subject to the same influences?

3. HYPOTHESES

Two types of hypotheses will be developed. Individual level hypotheses concern factors empirically related in the sociology literature to income, and group level hypotheses concern factors related in the social psychology literature to the equitable distribution of rewards among members of an interacting group. Figure 1 contains a list of factors included in the hypotheses at each of the two levels of analysis. At the individual level, the hypotheses focus on two sets of predictors (characteristics of the work performed and employee characteristics) which are commonly associated with income and the relationship of these predictors to income and computers. A third set of predictors will be used to control for the worker's ability to use the computer, and a fourth set will control for the extent to which a computer is used in performing one's job. A fifth set of predictors related to income and previously described as organizational characteristics will be statistically or methodologically controlled. There is insufficient information to allow development of specific hypotheses for the contingency variables. However, these variables are included in the analyses, and all hypothesized results are predicted to differ by job classification and functional structure.

Figure 1. Predictors of Individual-Level and Group-Level Inequality

Individual Level

Employee Characteristics
education
age
gender
marital status
job tenure
organizational tenure

Work Characteristics
job classification
routineness of work
hours worked per week
supervising others
functional structure

Computer Ability
computer related skills
years of computer experience

Computer Use
hours per week working on computer
percent of tasks performed with computer

Group Level

Work Characteristics
group heterogeneity in those shown above
percentage exempt*
uniformity of group tasks*

Employee Characteristics
group heterogeneity in those shown above (including computer ability)
percentage minority*
percentage women*

Computer Use
group heterogeneity in those shown above

Exchange of Information
work group size*
geographic dispersion of group*
average reported coordination required to perform work
average amount of interaction reported
public or private firm*

Supervisor Characteristics
job tenure*
organizational tenure*
job classification*
education*
sex*
power to hire*
power to fire*

* = group level information from supervisor interview

At the group level, the hypotheses focus on inequality in the distribution of the two outcomes (computers and income) among interacting group members. Five sets of predictors will be included. Three of these are the degree of heterogeneity of the group with respect to the need for a computer, employee, and work characteristics included in the individual level analysis. Group level hypotheses will also include factors associated with the exchange of information and characteristics of the group's supervisor.

Individual Compensation

The simplest model of similarity in the allocation of two commodities is their joint distribution, the extent to which they occur together. This hypothesis asks the question: Are level of income and distribution of computer terminals related?

Hypothesis 1: There will be a significant relation between the distribution of income and of computers.

A more complex model of similarity in the allocation of two commodities includes an expectation that they share the same predictors once other relevant factors are controlled (such as organizational characteristics and the extent to which a computer is used in performing the job). The following two hypotheses ask the question: Do income and computers share the same predictors?

Work Characteristics

Characteristics of the job performed, though often confounded with characteristics of the incumbent, have also been related to income.

Hypothesis 2: Work characteristics empirically associated with income (job classification, routineness of work, hours worked per week, supervising others, and functional structure) will predict income and computers equally well. Both income and computers will be positively related to being a manager, performing less routine work, working more hours per week, supervising others, and working in a group which performs managerial or data-oriented professional work.

Employee Characteristics

Individual characteristics of the employee have been empirically related to income.

Hypothesis 3: Individual characteristics empirically associated with income (education, age, gender, marital status, job tenure, organizational tenure) will predict income and computers equally well. Both income and computers will be positively associated with amount of education, age, being married, being a man, and having longer tenure on the job and in the organization.

Human capital theory (Strober, 1990) would predict that

the worker's ability to use the computer (computer related skills and experience) would be related to income. Distributive justice (Deutsch, 1985) would predict that equipment would be allocated to those with the skills and experience required to make best use of it.

Hypothesis 4a: Computer skills and experience will be related to income.

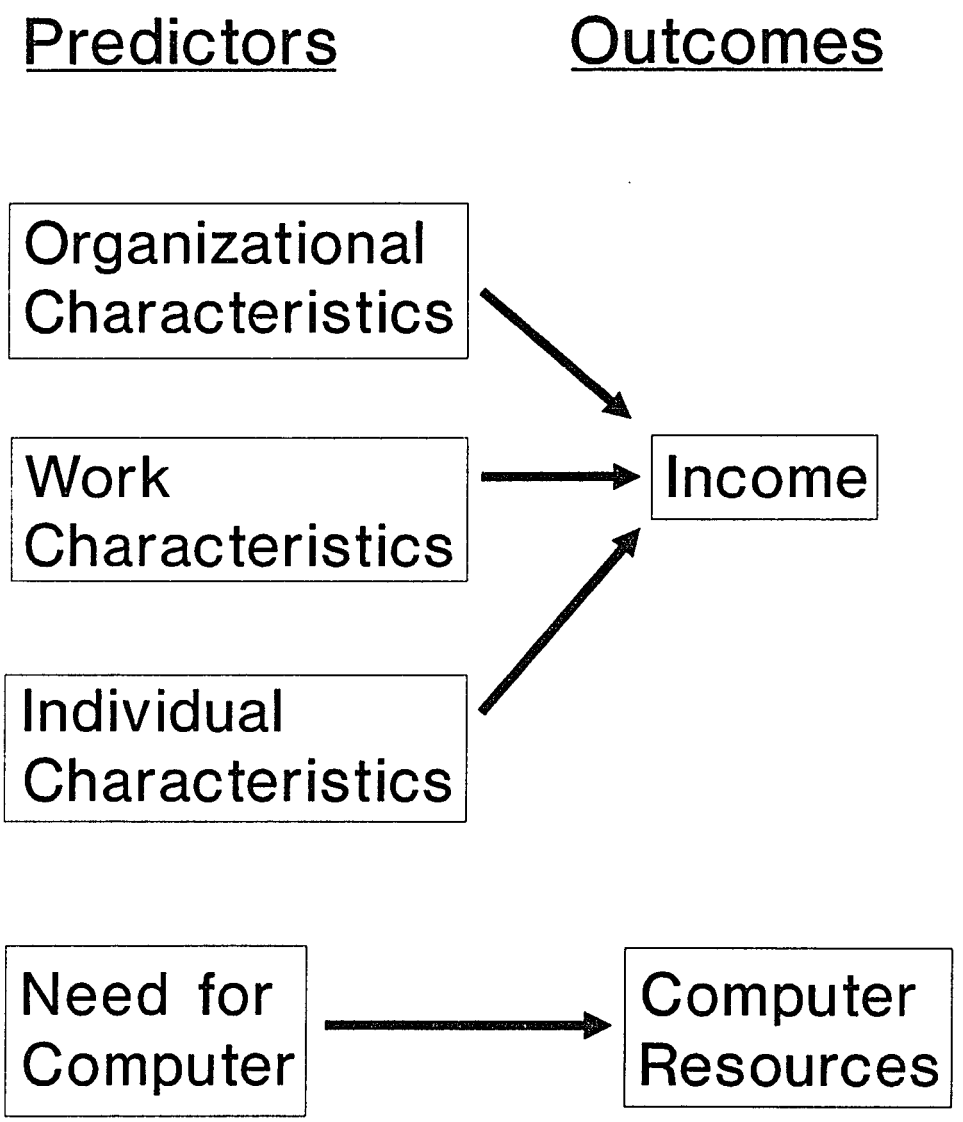
Hypothesis 4b: Computer skills and experience will be related to computer equipment.

A model depicting these relationships if computers are not acting as symbols of status (the null model) is shown in Figure 2.

Inequality Within Groups

At the group level, the analysis will focus on inequality in the distribution of the two outcomes among members of intact, natural, work groups. These hypotheses answer the question: When being allocated to group members, are income and computers subject to the same influences? Four sets of predictors identified in the distributive justice literature will be included: 1) inequality in work characteristics, 2) inequality in employee characteristics, 3) factors affecting the exchange of information among group members, and 4) characteristics of the group's supervisor. Inequality in the extent to which a computer is required to

Figure 2. The Null Model



perform one's work will be controlled for statistically.

Work Characteristics

Characteristics of the work performed also affect the amount of income received. Therefore, heterogeneity within a work group in the work characteristics outlined in the previous section would lead income and computers to be allocated unequally.

Hypothesis 5: Income and computers will be more heterogeneous in work groups whose employees differ in their job classification, number of hours worked per week, supervisory responsibility, and exempt status and where the jobs performed differ in their degree of routinization and task uniformity.

Employee Characteristics

Empirical results indicate that income is allocated according to characteristics of employees. Therefore, heterogeneity within a work group in the employee characteristics outlined in the previous section would lead income and computers to be allocated unequally.

Hypothesis 6: Income and computers will be more heterogeneous in work groups whose employees differ in individual characteristics previously associated with income (education, age, gender, marital status, job tenure,

organizational tenure, minority status).

Hypothesis 7: Income and computer equipment will be more heterogeneous in work groups whose employees differ in computer-related skills and experience.

Exchange of Information

Unequal reward distributions engender conflict and hostility among those who receive the least only if they are aware of the inequality. Factors that affect the exchange of information should affect inequality in the allocation of compensation. The amount of interaction among workers, which is affected by the size of the work group and the interdependence of the tasks being performed, is important in determining the exchange of information.

In addition, the exchange of information is affected by the public nature of that information. The two outcomes being considered differ in their publicness: income is less visible than computer equipment. However, since the salaries of employees who work for the government are public information, the nature of the work group's parent firm (public or private sector) should also affect the exchange of information about income. Thus, hypothesis eight should be more strongly supported for income than for computers.

Hypothesis 8: Income and computers will be more heterogeneous in work groups with a greater exchange of

information (those in larger work groups, in public organizations, with less contact among members, whose members do not all work in the same location, and require less coordination in performing the tasks of the group).

Supervisor Characteristics

Even when based on merit, inequality leads to conflict with those receiving the least feeling aggrieved. This conflict may have negative effects for allocators. For example, students who receive low scores on exams will be unhappy, may be hostile during class and may complain to the professor, the head of the department, and even to the dean. Those allocators who are most vulnerable to these negative effects should alter their distribution of goods (such as exam scores) toward equality. Those least vulnerable should show the most inequality in the allocation of compensation. Supervisors with long tenure, complete power to hire and fire employees, and higher status are less vulnerable to the negative effects of conflict and their groups should have the most inequality in income and computers.

Hypothesis 9: Work groups in which supervisors are more powerful (have longer job and organizational tenure, sole power to hire and fire employees, more education, and a higher job classification) will be more heterogeneous in income and computers.

4. METHODS

The data used to test these hypotheses come from a large field study of computer-using white collar work groups. Consistent with previous research (Bikson & Gutek, 1983; Bikson, Gutek, & Mankin, 1987; Gutek, Bikson, & Mankin, 1984), a work group was defined as four or more persons, including at least one level of supervision, engaged in some common information-related process or product. Groups were sought that were diverse in computer implementation and use as well as in computer equipment configuration.

Eighty-nine work groups in 49 different organizations in the Southern California area, recruited through personal contact, agreed to participate. The 89 work groups that volunteered constituted a convenience sample of groups of at least four people using computer systems in their work for at least one year. Computers did not have to be used by all members of the group for the group to be included in the study, but computers had to be necessary for the work of the group as a whole, rather than for the work of one or two individual employees. The average work group size was ten.

Procedures

Questionnaires were handed out to all members of the

work groups and interviews with the supervisor or manager of each work group were conducted in summer, 1988. The semi-structured interviews took about 1 1/2 to 2 hours each and questionnaires were usually collected from group members at the end of each interview. A second interview with each supervisor lasting 30 to 40 minutes was performed by telephone 9 to 10 months later. Because one work group no longer existed, only 88 supervisors were reinterviewed. This paper presents analyses based on the responses of the 89 supervisors to the first interviews and on the 623 questionnaire respondents in the 89 work groups.

The Sample

Table 1 provides basic information about the sample. As Table 1 suggests, the data collected can be analyzed at several different levels depending on the research questions of interest. One can think of the data as a sample of 89 computer-using work groups, a sample of 623 employees in computer-using groups, or a sample of 89 managers. Eighty-nine work groups in 49 organizations agreed to participate, for an average of 1.82 groups per organization. Almost 70% of the organizations had employees at more than one site. Seventy-four percent were primarily engaged in providing services while 26% were engaged in manufacturing. Finally, in 80% of the work groups, none of the workers were

Table 1. Sample of Work Groups (N=89).

Number of work groups	89
Number of organizations	49
Number of employees	623
Mean number of employees per work group	10
Mean number of work groups per organization	1.82
Percentage of organizations with multiple sites	69.7
Median number of workers in company	2,000
Median number of workers at site	200

Number of workers at site	
4-100	38.4%
100-500	30.2%
500-1000	8.1%
1000-9000	23.3%

Functional Structure	
Managerial or Admin.	22%
Text-Professional	25%
Tech-Professional	26%
Clerical	27%

Unionization	
none of the workers	80%
some of the workers	9%
all of the workers	11%

Sector	
Service	74%
Manufacturing	26%

unionized, in 9% some workers were unionized, and in 11% of the groups (10 groups), everyone was unionized.

Considering that all the work groups were from greater Los Angeles, a racially heterogeneous area, the work groups are overwhelmingly Caucasian: 24% of the groups were "all white" and in the average (median) work group, only 18% of the workers were non-white. (We did not ask ethnicity in

the questionnaire but did acquire information on ethnicity in the interviews in which we asked managers the number of people in the work group who were non-white.)

Groups were classified into four types according to the nature of the work they performed. Work groups were divided into four categories by function: technically-oriented professional groups (performing scientific and engineering work including research and development), text-oriented professional groups (representing a variety of trained specialized tasks involving writing such as editorial work, legal departments, organizational effectiveness, and marketing), management and administrative groups (including generic management functions like personnel, finance, and the office of the mayor), and clerical support groups (e.g. order entry, reservations, computerized appointment scheduling, billing and bookkeeping).

Measures

Individual Level Hypotheses

Outcomes

Income was assessed in the questionnaire. In this sample income was slightly higher than the national average, though the difference may reflect the higher cost of living in the Southern California area. As shown in Table 2, the largest group of respondents (44%) reported income between

$25,001 and $50,000. The second largest group (40%) reported income between $10,000 and $25,000. Only 5% reported income below $10,000 and 11% reported income over $50,000. Respondents were asked to indicate their income within broad categories (rather than providing a specific number) because of the sensitivity of this information. Categories were coded so that larger numbers indicated larger incomes.

Table 2. Outcome Measures (N=623).

Income	
under $10,000	4.8%
10,000 to 25,000	40.1%
25,001 to 50,000	44.4%
over 50,001	10.7%
Computer Terminals	
Share terminals	48.6%
Have one of my own	51.4%

Our ability to measure computer equipment was severely limited by the nature of the study. In general, workers did not know the technical or brand names of their equipment or its configuration (nor is there any particular reason why they should). One of the few questions workers could accurately answer on a survey is whether they shared a computer with others or had their own terminal. Slightly more than half of the workers (51.4%) had their own terminal (with 5.7% saying they had more than one terminal of their

own) and slightly less than half of the workers (48.6%) shared their terminals. This information was coded so that higher numbers indicated more individual computer resources (having your own terminal).

Most of the people who shared a terminal shared with more than one other person (44% of the total group). In most cases of sharing, computer terminals were available in a particular location that was accessed by all or most members of the work group - and occasionally by members of other work groups as well. In some cases, the computer area contained several of the same pieces of equipment; in other cases, it contained a mix of systems.

In addition to practicality, this measure of computer resources is particularly appropriate for assessing the status associated with computers for several reasons. First, computer use does seem to be limited by convenient access (Gogan, 1991). With individual terminals, workers spend more time using their computers and can more easily integrate them into their personal work habits and schedules. There is also evidence that sharing terminals decreases feelings of ownership and decreases experimentation, learning, and personalization (Katz, 1987). Additionally, sharing terminals prohibits the ergonomic design of the work station, which would permit the mitigation or elimination of many of the physical problems

associated with computer use (Grandjean, 1987). Finally, this particular measure of computer resources would be most likely to capture any status effect of computers because control and privacy at work are associated with high status workers (Sundstrom, 1986) and should be more strongly associated with having one's own terminal.

Predictors

Organizational variables. As previously discussed, four characteristics of the employing organization have been empirically related to income. Region of the country was controlled by the research design which sampled only workers in the Southern California area. Unionization was not a significant factor since so little of the white collar workforce was unionized and the unions that were represented were not very strong. Variability in the industrial sectors represented was not broad enough to be of concern.

However, the organizations did vary in size. As shown in Table 1, size of organization was assessed in the interview and the average number of workers in the parent company was 2,000. The number of employees in the parent company varied with 25% of groups reporting seven to 200 workers in their organization, 15% reporting 200 to 1,000 workers, 25% reporting 1,000 to 10,000 workers, 12% reporting 10,000 to 50,000 workers, and 23% reporting 50,000

to 200,000 workers (see Table 3).

Table 3. Predictors statistically controlled.

ORGANIZATIONAL VARIABLES (N=89)

Number of workers in company	
7 to 200	25.0%
200 to 1,000	15.5%
1,000 to 10,000	25.0%
10,000 to 50,000	11.9%
50,000 to 200,000	22.6%

COMPUTER USE (N=623)

Hours/week at the Computer	
Less than 5	14.5%
5 to 10 hours	17.8%
10 to 20 hours	19.7%
20 to 30 hours	22.2%
30 to 40 hours	19.7%
More than 40	6.0%

Work characteristics. As shown in Table 4, the largest proportion of our sample of white collar workers (34%) were performing secretarial or clerical functions (such as typing or taking orders). Workers were considered to be professionals if they had specialized training of a scientific or intellectual nature and did not generally supervise others; technical work involved one of the applied sciences. The second largest occupational group was composed of non-technical professionals (21%) such as social

Table 4. Individual-level Predictors of Income (N=623).

WORK CHARACTERISTICS

Occupation		Hours worked per week	
executive/managerial	12.0%	less than 40	15.0%
technical professional	17.7%	40	46.5%
other professional	20.9%	more than 40	37.2%
technical-clerical	13.5%		
secretarial/clerical	34.4%		
other	1.6%		

Functional Structure		Supervise Others	
Managerial/Administrative	21.3%	yes	71%
Text-Professional	21.2%	no	29%
Technical Professional	30.0%		
Clerical	27.5%		

EMPLOYEE CHARACTERISTICS

Education		Organizational Tenure	
less than college	18.8%	less than 6 months	8.9%
some college	38.0%	6 months to 1 year	7.7%
bachelor's degree	17.4%	1 to 2 years	12.2%
masters degree	22.2%	2 to 5 years	23.7%
doctoral degree	3.6%	5 to 10 years	24.5%
		more than 10 years	23.0%
Job Tenure			
less than 6 months	15.4%	Age	
6 months to 1 year	13.5%	under 25	12.4%
1 to 2 years	17.8%	26 to 35	38.4%
2 to 5 years	26.8%	36 to 45	27.5%
5 to 10 years	17.3%	46 to 55	16.1%
more than 10 years	9.2%	over 55	5.6%

Sex		Marital Status	
male	35.9%	married	55.8%
female	64.1%	unmarried	44.2%

COMPUTER ABILITY

Years of Computer Experience		Computer Skills	
none	4.0%	data entry	73.6%
less than 1 year	10.2%	application package	59.4%
1 to 5 years	45.6%	programming language	25.1%
5 to 10 years	28.7%	machine language	8.6%
more than 10 years	11.4%	hardware/systems	1.0%

workers or lawyers, followed in size by technicians and technical professional workers (18%) such as engineers, accountants, and computer programmers. A relatively small subset of our sample performed work that was both technical and clerical (13%) such as bookkeeping, and the smallest group were executives or managers (12%).

In addition to job classification, routineness of work was measured by the Withey, Daft, and Cooper (1983) 5-item indicator of routinization. The first question was preceded by the statement "The following questions pertain to the normal, usual, day-to-day pattern of work carried out by yourself and the people in your work unit. Please circle the appropriate answers." The questions were: How many of these tasks are the same from day-to-day?, To what extent would you say your work is routine?, People in this unit do about the same job in the same way most of the time., Basically, unit members perform repetitive activities in doing their jobs., and How repetitious are your duties?. The five items were scored on a scale from one to seven with larger numbers indicating more routine work. The items had a high internal consistency (N = 611, alpha = .88) and were combined into a scale that was approximately normally distributed (Mean = 2.45, SD = .72).

The function of the group to which the worker belonged was classified into one of four categories as described

earlier. Most respondents (30.0%) belonged to groups performing technical professional functions. Managerial or administrative groups employed 21.3%, text-oriented professional groups employed 21.2%, and clerical groups employed 27.5%.

Employee characteristics. The measures of employee characteristics were taken directly from questions asked on the survey. Sex, marital status, education, age, supervising others, job tenure, organizational tenure, functional structure, and the number of hours worked per week are also shown in Table 4. An overwhelming majority of our sample was employed fulltime; 47% reported working 40 hours per week and 37% reported working more than 40 hours per week. Only 16% worked less than 40 hours per week.

In this study, only 36% of the respondents were men and 64% were women. Almost 56% were currently married and 44% were currently unmarried. The largest percentage of workers (38%) were between the ages of 26 and 35, 28% were between 36 and 45, 16% were between 46 and 55, 12% were under 25 and 6% were over 55 years old. In addition, 71% of respondents supervised others and 29% did not.

The sample is much better educated than the national average. The mean educational attainment of the U.S. workforce is 12.6 years (U.S. Department of Labor, 1980),

much lower than that of our sample. Thirty-eight percent of our sample had attended some college, 17% had completed bachelors degrees, 22% had completed masters degrees, and 4% had completed doctoral degrees. Only 19% had terminal high school diplomas, had not completed high school, or had vocational school training.

The largest category of job tenure (27%) was two to five years, followed by the 18% who had one to two years and the 17% that had five to ten years of job tenure. Only 9% had been working at their job for more than ten years, 15% had less than six months of job tenure, and 13% had between six months and one year of tenure.

In contrast, organizational tenure was skewed to the left with almost equal proportions of the respondents working more than ten years (23%), five to ten years (24%), and two to five years (24%) for their company. Only 9% had been with the company less than six months, 8% had six months to one year and 12% had one to two years of tenure.

Minority status was deemed too sensitive an issue to include in the questionnaire. At the time the data were collected, heated public debate in the Southern California area focused on preferred terms for each minority group (for instance, hispanic vs. latino and Black vs. African-American). It was decided not to risk the ill will of our respondents, therefore minority status was not assessed in

the questionnaire and was not included in the individual level analyses. However, this information was obtained at the group level from the interviews and will be discussed in the section on measures used to test the group level hypotheses.

Computer ability. Computer skills and experience could also affect the distribution of both income and computers. Human capital theory would predict that workers with computer skills or experience would have higher incomes while research in distributive justice would predict that computers should be allocated to those who can make best use of them (those with more skills and experience). Five items on the questionnaire assessed the types of computer skills workers had, and one asked about the number of years of computer experience.

As shown in Table 4, the computer skills and experience of workers in the study were measured in two ways. First was a self-report of the number of years of computer experience with response options of: none, less than one year, one to five years, five to ten years, and more than ten years. The smallest category of workers (4%) responded "none" and approximately equal numbers of workers said they had less than one year (10.2%) or more than ten years (11.4%) of experience with computers. The modal category of

experience (45.6%) reported was between one and five years. The second largest category was five to ten years (28.7%). This distribution reflects the relatively recent sharp increase in computer use in white-collar work. It is also consistent with our finding that the work groups' average first year of computer use was 1984, four years prior to the beginning of our research.

In addition to computer experience, respondents were also asked which of five computer skills they possessed. The skills reported by our sample were data entry (73.6%), running an application package (59.4%), programming languages (25.1%), machine languages (8.6%), and hardware or systems work (1.0%). In general, the lower the level of skill, the larger percentage of our respondents reported possessing it. When the total number of computer skills was calculated, the modal category was one, and 77 workers (12%) said they had none of the skills listed. This is possible because the use of some systems does not require any of the skills mentioned or because workers may not recognize that they are using an application package. For instance, a worker may only access screens of information by computer. Only 5% of the sample had four of the five skills and nobody had all five.

Computer use. The distribution of computers, but not

of income, is likely to be a function of the extent to which a computer is used in performing one's work. Two measures of computer use were included in the questionnaire: the number of hours spent per week at the computer and the percent of tasks performed in one's job that required the use of a computer.

The extent to which tasks performed required the use of a computer was measured in two ways. Respondents were asked to indicate how often they performed 21 common office tasks (shown in Appendix A) and whether or not they used a computer in doing them. Each task could be performed rarely or never, sometimes, or frequently, and could be done without a computer, sometimes with a computer, or mostly with a computer. The number of tasks performed frequently was calculated. The number of tasks performed mostly with a computer was also calculated. The percentage of tasks performed frequently which were done mostly by computer was used as a measure of the extent to which job tasks demanded the use of a computer.

The distribution of this measure departed somewhat from normality with 9% (56) of the respondents reporting that none of their frequently performed tasks were done mostly by computer and 9% (54) of the respondents reporting that all of their frequently performed tasks were done mostly by computer. The distribution of scores between these extremes

was reasonably normal. Overall, the mean was 54.3%, the median was 57.1%, and the standard deviation was 29.6.

A second measure of the need for a computer was the average number of hours a week the respondent reported working on a computer. The distribution of this variable approximated normality (see Table 3). The largest group of respondents (22%) averaged between 20 and 30 hours of computer use per week. Two slightly smaller groups (each comprising 22% of the sample) averaged 10 to 20 hours and averaged 30 to 40 hours of use. Fewer (18%) averaged 5 to 10 hours, about 14% averaged less than 5 hours, and only 6% spent more than 40 hours per week using a computer.

Results were hypothesized to differ by organizational function of the work group and job classification. Appendix B shows means and standard deviations for the predictors and outcomes for the entire sample, for workers in groups performing each different organizational function, and for workers in each of the different types of jobs. Also included in Appendix B are tables of simple correlations between the predictors and outcomes for the entire sample and for the hypothesized moderators described above.

Group Level Hypotheses

Measurement of Heterogeneity

Work group heterogeneity was primarily calculated from

survey and interview responses. The measurement of inequality (especially of income) has received considerable attention (Allison, 1978; Blau, 1977; Schwartz & Winship, 1979) and recommendations depend on the nature of the data. The coefficient of variation is recommended for assessing heterogeneity of continuous variables when they do not have diminishing marginal utility or when value is irrelevant to the analysis. The coefficient of variation is the standard deviation divided by the mean (Allison, 1978).

However, the index of heterogeneity is suggested for assessing diversity of categorical or ordinal data. Work group heterogeneity on the categorical and ordinal variables was measured using Blau's (1977) index of heterogeneity

$$\sum_{k=0}^{i} 1-p_i^2$$

(where p_i is the fraction of the group in each category).

Outcomes. Survey responses were used to calculate each group's score on the index of heterogeneity for income (mean=3.41; s.d.=.20) and computers (mean=1.21; s.d.=.21).

Predictors. Work characteristics: Survey responses were used to calculate each group's score on the index of heterogeneity for members' job classification (mean=4.40;

s.d.=.24) supervising others (mean=1.31; s.d.=.19), and number of hours worked (mean=2.37; s.d.=.20). The coefficient of variation was used to measure heterogeneity on the individual level, continuously distributed variable routinization (mean=.22; s.d.=.09). In addition to diversity in the work characteristics described above, information was available from the interviews about the percentage of exempt workers in each work group. The distribution of responses on this measure departed somewhat from normality. Nine groups had no exempt members and eleven had only exempt members, but the mean and median were both .50 (s.d.=.33).

Interviews also provided information about the uniformity of tasks done by the different workers. About 12.4% of respondents' supervisors reported that all members of the group performed the same tasks, about 11.2% reported that all members of the group performed different tasks, 28.1% reported that almost all did different tasks, and slightly less than half (48.3%) reported that not all members did the same task (mean=2.38; s.d.=.85).

Employee characteristics. Survey responses were used to calculate each group's score on the index of heterogeneity for the individual level variables: level of education (mean=4.50; s.d.=.19), age (mean=4.58; s.d.=.15),

number of hours worked per week (mean=2.37; s.d.=.20), marital status (mean=1.40; s.d.=.14), job tenure (mean=5.63; s.d.=.12), and organizational tenure (mean=5.60; s.d.=.13) as described above.

In addition to diversity in the individual characteristics, information was available from the interviews about the percentage of women and the percentage of minority members in each work group. Though seven groups included no women and eight had no men, the percentage of women was fairly normally distributed with a mean of .61 and a median of .64 (s.d.=.29). The distribution of the proportion of minorities was strongly skewed to the positive. Though the mean minority percentage was 0.23, the median was 0.20 (s.d.=.22) and 21 groups had no minority members.

Computer ability. Survey responses were used to calculate each group's score on the index of heterogeneity for the individual level measure of years of computer experience (mean=4.5; s.d.=.17) and for the possession of individual computer-related skills: data-entry (mean=1.26; s.d.=.19), applications packages (mean=1.29; s.d.=.18), programming (mean=1.28; s.d.=.19), machine language (mean=1.11; s.d.=.16), and hardware or systems work (mean=1.02; s.d.=.06).

Computer use. Survey responses were used to calculate each group's score on the index of heterogeneity for the individual level measure of hours per week of computer use (mean=5.57; s.d.=.18). The coefficient of variation was calculated for the percent of tasks performed by computer (mean=0.54; s.d.=.37).

Exchange of information. The opportunity for the exchange of information was measured in several ways. In the interview, each manager was asked the number of workers in his or her group (mean=10.08; s.d.=6.26), and whether all workers were in the same physical location or if they were geographically dispersed (mean=1.21; s.d.=.41). As shown in Table 5, most of the work groups were fairly small with 49% reporting four to eight members. Twenty-nine percent of the groups had nine to twelve members, 16% had 13 to 20 members and almost 6% had 21 to 39 members. The median group had nine members. The majority of managers (78.7%) reported that all of their workers were in the same physical location, but a sizable minority (21.3%) reported that they were geographically dispersed.

Since salaries paid to workers in the public sector are publicly available, interviewers also determined whether the organization was in the public or private sector (mean=1.55; s.d.=.50). Fifty-five percent of the organizations were

Table 5. Group-level Predictors of Income (N=89).

EXCHANGE OF INFORMATION

Number of workers in group		Sector	
4-8	49.4%	Private	55.1%
9-12	29.3%	Public	44.9%
13-20	15.7%		
21-39	5.6%		

Geographic dispersion of group	
members are contiguous	78.7%
members are dispersed	21.3%

HETEROGENEITY IN WORK CHARACTERISTICS

Uniformity of group tasks	
all perform the same tasks	12.4%
not all perform the same tasks	48.3%
almost all do different tasks	28.1%
all perform different tasks	11.2%

operating within the private sector and 45% were in the public sector.

In addition, workers responded to two questions on the amount of coordination required to complete their work. They were asked to rate on a five point scale their agreement with the following two questions: "To get the job done, it is important for each person to coordinate his/her work with others" and "People have to work together to get the job done." These two questions were combined into a reliable scale measuring coordination (alpha=.63) and individual scores were aggregated to the group level to

yield an index of the average amount of coordination for each group (mean=2.44; s.d.=.32).

Workers were also asked to rate the frequency with which they interacted with other people in their group when they were dealing with people at work. Responses to this question were aggregated to the work group level to yield an index of the average frequency of interaction within each group (mean=2.74; s.d.=.27).

Supervisor characteristics. In addition to the supervisor's job tenure (mean=2.66; s.d.=1.02), organizational tenure (mean=3.89; s.d.=1.13), education (mean=3.37; s.d.=1.05), and sex (1.33; s.d.=.47), information was collected on his or her power to hire and fire employees. Interviewees were asked if they had complete control over hiring, shared control over hiring, or no control over hiring (mean=2.60; s.d.=.64). They were similarly asked about their control over firing (mean=2.58; s.d.=.64). Responses are listed in Table 6. Almost 80% of the respondents were managers and 24% had held their current jobs for longer than five years; 36% had between two and five years of job tenure, 23% had one to two years, and 17% had less than one year. Most of the supervisors interviewed had been with their current organizations over five years with 37% reporting over ten years of

Table 6. Characteristics of Person Interviewed (N=89).

Job tenure		Organizational tenure	
less than 1 year	16.9%	less than 1 year	4.5%
1 to 2 years	23.6%	1 to 2 years	12.4%
2 to 5 years	36.0%	2 to 5 years	19.1%
over 5 years	23.6%	5 to 10 years	31.5%
		over 10 years	37.1%
Education			
Completed high school	2.2%		
Vocational, certificate	4.5%		
Some college, AA	21.3%		
BA or BS	14.6%		
Some graduate work, MA	51.7%		
PhD, MD, etc.	7.9%		
Sex		Job classification	
Male	67.0%	manager/exec	76%
Female	33.0%	other	24%
Power to hire			
no say in decision	7.9%		
shared with others	24.7%		
total control	67.4%		
Power to fire			
no say in decision	7.9%		
shared with others	25.8%		
total control	66.3%		

organizational tenure, 32% reporting five to ten years, 19% reporting two to five years, 12% reporting one to two years, and 5% reporting less than one year of organizational tenure.

As a group the supervisors were extremely well educated, with 8% holding doctoral degrees, 52% reporting some graduate work, 14% holding bachelors degrees, 21% having some college education, and only 6% reporting a

terminal high school or vocational school diploma. About two thirds of the supervisors (67%) were men and about one third (33%) were women.

The amount of power held by the manager was assessed in the interview by asking about the degree of control exercised over hiring and firing employees. Most supervisors in our sample reported total control over hiring (67.4%) and total control over firing (66.3%). A sizable minority reported that they shared control over hiring (24.7%) and firing (25.8%) with one or more other people in the organization. A few managers reported no control over hiring (7.9% of the sample) and firing (7.9% of the sample) of workers in their groups.

Analysis Performed

Individual-Level Hypotheses

Hypothesis one was tested with simple correlations. Multiple regression was used to test hypotheses two, three, and four by estimating the effects of the individual demographic and work variables on the two outcome measures. Predictors included the demographic attributes (including computer ability) and the job attributes. The outcomes were income and computers. Separate regression models were developed for each of the two outcome variables. The models

also included, as control variables, the size of the organization and the extent to which a computer was used for performing the job. All analyses outlined were performed for the total sample. The sample was then divided into five groups based on the worker's job classifications and the two regression models described above were repeated for each of the groups. Finally, the sample was divided into four groups based on the respondent's work group type (functional structure) and the two regression models were again repeated for each of the groups.

Unique variance contributed to the outcome measures by each of the two sets of predictor variables and by the control variables was estimated by blocked regressions. This procedure estimates the unique contribution in variance by a block of variables, controlling for the effects of all other predictor or control variables. Whenever job classification was included as a predictor in a regression model, it was dummy coded with "clerical" as the omitted category. Whenever work group type was included as a predictor in a regression model, it was also dummy coded with "clerical" as the omitted category.

Group-Level Hypotheses

Multiple regression was used to estimate the effects of dissimilarity in job variables and in demographic

characteristics (including computer-related skills and experience), and the effects of communication and supervisor characteristics on the equality of distribution of income and computer terminals. Independent measures included inequality in the demographic attributes and in the job attributes, aspects of the organization of work related to communication opportunities, and the power of the group's supervisor. Separate regression models were developed for each of the two outcome variables (income and computer inequality). All analyses outlined were performed for the total sample only (no moderators) because of the large number of predictors (31) relative to the sample size (89). Since a specific direction was predicted for the effects, one-tailed tests of significance were used in evaluating the results of directional statistical tests.

5. FINDINGS

Results

Individual-Level Hypotheses

Simple correlations

Hypothesis one was supported for the entire sample of respondents. The simple correlations between income and having one's own computer terminal are presented in Table 7. For the entire sample, income was significantly related to having one's own computer terminal, however the magnitude of the correlation was small ($r=.148$; $p<.001$), accounting for only 2.2% of the variance.

Exploratory analyses of the hypothesized moderators of this relationship (group function and job classification) were also performed. As can be seen in Table 7, correlations for workers in groups performing different organizational functions and for workers in different types of jobs did differ from one another and from the results for the sample as a whole. No significant relationship was found between income and computers for workers in groups performing text-oriented professional functions ($r=.077$; n.s.) or clerical functions ($r=.084$; n.s.). In contrast, income and having one's own computer terminal were correlated for workers in groups performing managerial or administrative functions ($r=.192$; $p<.05$) and data-oriented

Table 7. Simple correlations between income and computers.

	SIMPLE r	SIMPLE r^2
TOTAL SAMPLE	.148 ***	.022 ***
WORKERS IN GROUPS PERFORMING DIFFERENT FUNCTIONS		
Man./Admin. Function	.192 *	.037 *
Text Prof. Function	.077	.006
Data Prof. Function	.152 *	.023 *
Clerical Function	.084	.007
WORKERS IN DIFFERENT JOB CLASSIFICATIONS		
Managers/Executives	.100	.010
Data Professionals	.290 **	.084 **
Other Professionals	.161 *	.026 *
Secretary/Tech.-Clerical	.161 *	.026 *
Clerical Workers	.200 **	.040 **

*p<.05; **p<.01; ***p<.001; ****p<.0001

or technical professional functions (r=.152; p<.05). Please note, though the correlation coefficients for the total sample and for those workers in data-oriented professional groups were almost identical, the levels of statistical significance differed because of the different sample sizes.

Also shown in Table 7 are the simple correlations between income and having one's own computer terminal for workers in different job classifications. The correlation was strongest for data-oriented or technical professional

workers (r=.290; p<.01), and still quite strong for clerical workers (r=.200; p<.01). The correlation was similar to that for the overall sample for professional workers who were not technically trained or data-oriented (r=.161; p<.05) and for workers who performed jobs that were secretarial or clerical and technical in nature (r=.161; p<.05). No statistically significant correlation was found between income and computers for managers and executives (r=.100; n.s.).

Thus, Hypothesis 1 was supported for the entire sample, for workers in groups performing managerial, administrative, or data-oriented professional functions, and for workers in jobs that were professional, secretarial, or clerical in nature. Hypothesis 1 was not supported for workers in groups performing text-oriented professional or clerical functions, nor for workers in managerial or executive positions.

Blocked multiple regressions

Entire sample. Table 8 shows the results of blocked multiple regression for the entire sample of respondents. Supporting hypotheses two and three, both job characteristics and individual characteristics (exclusive of computer ability) were predictive of income and computers when organization size, computer ability, and computer use

Table 8. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for the total sample and adjusted for the number of predictors.

TOTAL SAMPLE	INCOME MULT. R^2	COMPUTERS MULT. R^2
Job Characteristics	.157 ****	.023 **
Indiv. Characteristics	.078 ****	.011 *
Computer Ability	.000	.004
Computer Use	.000	.097 ****
Model R^2	.521 ****	.187 ****

*p<.05; **p<.01; ***p<.001; ****p<.0001

were statistically controlled. Job characteristics were more strongly related to each of the outcomes (income Adj. R^2=.157; p<.0001, computers Adj. R^2=.023; p<.01) than were individual characteristics (income Adj. R^2=.078; p<.0001, computers Adj. R^2=.011; p<.05). The predictors accounted for a larger percentage of the variance in income than in computers. Contrary to hypothesis four, computer ability predicted neither income (Adj. R^2=.000; n.s.), nor computers (Adj. R^2=.004; n.s.).

Table 9 shows the final standardized regression coefficients of each of the predictors (with all others included in the equation) for income and computers for the entire sample of respondents. These final beta weights represent the unique effect of each predictor on the outcome

Table 9. Standardized regression coefficients for the determinants of income and computers for the entire sample (N=623).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.073 *	-.098 *
INDIVIDUAL CHARACTERISTICS		
Education	.174 ****	-.019
Age	.080 *	.115 **
Sex (Female)	-.130 ****	-.044
Unmarried	-.106 ***	.062
Job Tenure	.085 *	-.127 **
Org. Tenure	.102 **	.033
WORK CHARACTERISTICS		
Managerial Job	.262 ****	.124 *
Technical Prof.	.222 ****	-.034
Other Profession	.183 ****	-.078
Sec-Tech Cler.	.024	.006
Managerial Group	.033	.092
Data Prof. Group	.053	.073
Text Prof. Group	-.010	.087
Routineness	-.039	-.008
Hours Worked	.224 ****	.061
Supervise Others	.061	-.141 ***
COMPUTER ABILITY		
Data Entry	-.016	.087 *
Application Pkg.	-.054	.028
Programming Lang	.040	.009
Machine Language	-.027	-.040
Systems/Hardware	-.004	-.017
Yrs. Experience	.058	.100 *
COMPUTER USE		
Hours of Use	.031	.354 ****
% of Activities	-.026	.002

*p<.05; **p<.01; ***p<.001; ****p<.0001

of interest. Workers in larger organizations had higher incomes (consistent with previous findings), but were less likely to have their own terminals.

Hypothesis 2 received partial support with some characteristics of the work performed affecting income and computers. When job classification was dummy coded, workers in three of the five groups (managers, technical professionals, and other professionals) reported higher incomes than did clerical workers. Workers in managerial jobs were significantly more likely to have their own terminals than those in clerical jobs. Working more hours was also positively associated with income but not related to computer equipment. Contrary to Hypothesis 2, routineness of the work performed and organizational function of the work group were not uniquely associated with income or computers. Respondents who supervised others were less likely to have their own computer terminals.

As predicted in Hypothesis 3, income was positively associated with all six of the individual characteristics: amount of education, age, being married, being a man, and having longer tenure on the job and in the organization. Two of the six individual characteristics included in Hypothesis 3 were related to computer resources, but only one was in the hypothesized direction. Having one's own computer terminal was positively associated with age, but

negatively associated with job tenure.

Hypothesis 4a was not supported; none of the computer ability or use variables was uniquely related to income. Hypothesis 4b received mixed support. Computer experience was positively associated with having one's own terminal but reporting data entry skills (reverse coded) was negatively related. Finally, the number of hours of computer use was uniquely positively associated with having one's own terminal.

Moderators. Though there was insufficient information to allow development of specific hypotheses for the contingency variables, they were included as moderators. The results of these exploratory analyses are shown in Tables 10 through 20 and discussed below. The blocked multiple regressions will be described in detail, but the final standardized regression coefficients will be summarized in the text. Full results appear in the relevant tables.

Workers in groups performing different organizational functions: Table 10 shows the results of blocked multiple regression for workers in groups performing managerial or administrative functions. Supporting hypothesis two, job characteristics were predictive of income and computers

Table 10. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for members of groups performing different functions and adjusted for the number of predictors.

PREDICTORS	INCOME MULT. R^2	COMPUTERS MULT. R^2
WORKERS IN MANAGERIAL/ADMINISTRATIVE GROUPS		
Job Characteristics	.047 ***	.039 *
Indiv. Characteristics	.079 ****	.011
Computer Ability	.000	.000
Computer Use	.000	.094 ***
Model R^2	.570 ****	.288 ****
WORKERS IN TEXT-ORIENTED PROFESSIONAL GROUPS		
Job Characteristics	.159 ****	.008
Indiv. Characteristics	.021 *	.020
Computer Ability	.000	.000
Computer Use	.000	.039 **
Model R^2	.579 ****	.266 ****
WORKERS IN DATA-ORIENTED PROFESSIONAL GROUPS		
Job Characteristics	.077 ****	.029 **
Indiv. Characteristics	.066 ****	.028 *
Computer Ability	.000	.006 *
Computer Use	.000	.099 ****
Model R^2	.500 ****	.316 ****
WORKERS IN CLERICAL GROUPS		
Job Characteristics	.103 ****	.010
Indiv. Characteristics	.052 **	.013
Computer Ability	.000	.014 *
Computer Use	.000	.106 ****
Model R^2	.277 ****	.231 ****

*p<.05; **p<.01; ***p<.001; ****p<.0001

(income Adj. R^2=.047; p<.001, computers Adj. R^2=.039; p<.05). when organization size, computer ability, and computer use were statistically controlled. Individual characteristics (exclusive of computer ability) were predictive of income (Adj. R^2=.079; p<.0001) but not of computers (Adj. R^2=.011; n.s.). The predictors accounted for a larger percentage of the variance in income than in computers. Contrary to hypothesis four, computer ability predicted neither income (Adj. R^2=.000; n.s.), nor computers (Adj. R^2=.000; n.s.).

Table 11 shows the final standardized regression coefficients of each of the predictors (with all others included in the equation). These final beta weights represent the unique effect of each predictor on the outcome of interest. For groups performing managerial functions, workers in larger organizations had higher incomes (consistent with previous findings), but were less likely to have their own terminals. Hypothesis 2 received partial support with some characteristics of the work performed affecting income and computers. When job classification was dummy coded, managers reported higher incomes and were more likely to have their own terminals than clerical workers. Working more hours was also positively associated with income but not related to computer equipment. Contrary to Hypothesis 2, routineness of the work performed and

Table 11. Standardized regression coefficients for the determinants of income and computers for workers in groups performing managerial or administrative functions (N=132).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.166 *	-.276 **
INDIVIDUAL CHARACTERISTICS		
Education	.130	-.171
Age	.240 **	.151
Sex (Female)	-.053	.040
Unmarried	-.142 *	.065
Job Tenure	-.007	-.030
Org. Tenure	.177 *	.138
WORK CHARACTERISTICS		
Managerial Job	.237 *	.354 **
Technical Prof.	.114	.158
Other Profession	.157	.020
Sec-Tech Cler.	-.013	.123
Routineness	.050	.113
Hours Worked	.246 ***	.088
Supervise Others	.122	-.026
COMPUTER ABILITY		
Data Entry	-.052	.062
Application Pkg.	-.091	.031
Programming Lang	.047	.058
Machine Language	.004	-.025
Systems/Hardware	-.027	.054
Yrs. Experience	.004	-.037
COMPUTER USE		
Hours of Use	.045	.380 ****
% of Activities	-.076	.025

*p<.05; **p<.01; ***p<.001; ****p<.0001

supervising others were not uniquely associated with income or computers.

As predicted in Hypothesis 3, income was positively associated with three of the six individual characteristics: age, being married, and having longer tenure in the organization. None of the six individual characteristics included in Hypothesis 3 were related to computer resources. Neither Hypothesis 4a nor 4b was supported; none of the computer ability variables was uniquely related to income or computers.

Table 10 shows the results of blocked multiple regression for workers in groups performing text-oriented professional functions. Supporting hypothesis two, both individual and job characteristics were predictive of income (job characteristics Adj. R^2=.159; p<.0001, individual characteristics Adj. R^2=.021; p<.05). Contrary to hypothesis two, neither was predictive of computers (job characteristics Adj. R^2=.008; n.s., individual characteristics Adj. R^2=.020; n.s.). Contrary to hypothesis four, computer ability predicted neither income (Adj. R^2=.000; n.s.), nor computers (Adj. R^2=.000; n.s.).

Table 12 shows the final standardized regression coefficients of each of the predictors for income and computers. For workers in groups performing text-oriented

Table 12. Standardized regression coefficients for the determinants of income and computers for workers in groups performing text-oriented professional functions (N=128).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	-.041	-.205 *
INDIVIDUAL CHARACTERISTICS		
Education	.142	-.257 *
Age	.027	.023
Sex (Female)	-.139 *	-.069
Unmarried	-.107	.192 *
Job Tenure	.029	-.132
Org. Tenure	.123	.038
WORK CHARACTERISTICS		
Managerial Job	.347 ****	.233 *
Technical Prof.	.405 ****	.050
Other Profession	.478 ****	.242
Sec-Tech Cler.	.259 **	.242 *
Routineness	-.024	.139
Hours Worked	.290 ****	.103
Supervise Others	-.043	-.094
COMPUTER ABILITY		
Data Entry	.077	.157
Application Pkg.	-.014	-.081
Programming Lang	.076	.011
Machine Language	-.076	-.087
Systems/Hardware	-.008	.060
Yrs. Experience	.083	-.069
COMPUTER USE		
Hours of Use	-.041	.242 *
% of Activities	.054	.086

*p<.05; **p<.01; ***p<.001; ****p<.0001

professional functions, organization size was unrelated to income, but negatively related to computers. Hypothesis 2 received partial support with some characteristics of the work performed affecting income and computers. When job classification was dummy coded, managers, professionals, and secretarial or technical/clerical workers reported higher incomes than clerical workers. Managers and secretarial or technical/clerical workers were more likely to have their own terminals than clerical workers. Working more hours was also positively associated with income but not related to computer equipment. Contrary to Hypothesis 2, routineness of the work performed and supervising others were not uniquely associated with income or computers.

As predicted in Hypothesis 3, income was positively associated with one of the six individual characteristics: being male. Two of the six individual characteristics included in Hypothesis 3 were related to computer resources, but in the opposite direction of that predicted. Workers who were married and had less education were more likely to have their own terminals. Neither Hypothesis 4a nor 4b was supported; none of the computer ability variables was uniquely related to income or computers.

Table 10 shows the results of blocked multiple regression for workers in groups performing data-oriented professional functions. Supporting hypothesis two,

individual and job characteristics were predictive of income and computers. Job characteristics were more strongly related to each of the outcomes (income Adj. R^2=.077; p<.0001, computers Adj. R^2=.029; p<.01) than were individual characteristics (income Adj. R^2=.066; p<.0001, computers Adj. R^2=.028; p<.05). The predictors accounted for a larger percentage of the variance in income than in computers. Contrary to hypothesis 4a, computer ability did not predict income (Adj. R^2=.000; n.s.). However, computer ability was associated with computers (Adj. R^2=.006; p<.05), supporting hypothesis 4b.

Table 13 shows the final standardized regression coefficients of each of the predictors for income and computers for workers in groups performing data-oriented professional work. Organization size was unrelated to income or computers. Hypothesis 2 received partial support with some characteristics of the work performed affecting income and computers. When job classification was dummy coded it was unrelated to computers, but managers and technical professionals reported higher incomes than clerical workers. Working more hours was also positively associated with income but not related to computer equipment. Routineness of the work performed was related to both income and computers. Supervising others was not

Table 13. Standardized regression coefficients for the determinants of income and computers for workers in groups performing data-oriented professional functions (N=187).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.023	.004
INDIVIDUAL CHARACTERISTICS		
Education	.182 **	.059
Age	.132 *	.068
Sex (Female)	-.201 **	-.092
Unmarried	-.100	.023
Job Tenure	.128	-.202 *
Org. Tenure	-.050	-.134
WORK CHARACTERISTICS		
Managerial Job	.209 **	.089
Technical Prof.	.188 *	-.027
Other Profession	.050	.142
Sec-Tech Cler.	-.089	-.015
Routineness	-.122 *	-.173 *
Hours Worked	.141 *	.088
Supervise Others	.108	-.114
COMPUTER ABILITY		
Data Entry	-.028	.031
Application Pkg.	-.118	-.042
Programming Lang	.038	-.004
Machine Language	-.043	.025
Systems/Hardware	-.007	-.019
Yrs. Experience	.100	.217 **
COMPUTER USE		
Hours of Use	.011	.382 ****
% of Activities	-.075	-.030

*p<.05; **p<.01; ***p<.001; ****p<.0001

uniquely associated with income or computers.

Consistent with Hypothesis 3, income was positively associated with three of the six individual characteristics: age, education, and being male. One of the six individual characteristics included in Hypothesis 3 was related to computer resources, but in the opposite direction of that predicted. Workers with less job tenure were likely to have their own terminals. Hypothesis 4a was not supported; none of the computer ability variables was uniquely related to income. Hypothesis 4B received partial support; workers with more years of experience were more likely to have their own terminals.

Table 10 shows the results of blocked multiple in groups performing clerical functions. Supporting hypothesis two, individual and job characteristics were predictive of income (job characteristics Adj. R^2=.103; p<.0001, individual characteristics Adj. R^2=.052; p<.01). Contrary to hypotheses two, neither was predictive of computers (job characteristics Adj. R^2=.010; n.s., individual characteristics Adj. R^2=.013; n.s.). Contrary to hypothesis 4a, computer ability did not predict income (Adj. R^2=.000; n.s.). However, computer ability was associated with computers (Adj. R^2=.014; p<.05), supporting hypothesis 4b.

Table 14 shows the final standardized regression

Table 14. Standardized regression coefficients for the determinants of income and computers for workers in groups performing clerical functions (N=176).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.175 *	.060
INDIVIDUAL CHARACTERISTICS		
Education	.095	.179
Age	.058	.147 *
Sex (Female)	-.111	.007
Unmarried	-.142 *	.056
Job Tenure	.135	-.084
Org. Tenure	.095	.101
WORK CHARACTERISTICS		
Managerial Job	.305 ***	.048
Technical Prof.	.077	-.043
Other Profession	.177 *	-.095
Sec-Tech Cler.	.044	-.062
Routineness	.069	-.085
Hours Worked	.139	-.011
Supervise Others	.072	-.269 **
COMPUTER ABILITY		
Data Entry	-.081	.116
Application Pkg.	-.114	.077
Programming Lang	-.016	-.037
Machine Language	.088	.053
Systems/Hardware	N/A	N/A
Yrs. Experience	.048	.250 **
COMPUTER USE		
Hours of Use	.117	.400 ****
% of Activities	-.059	-.127

*p<.05; **p<.01; ***p<.001; ****p<.0001

coefficients of each of the predictors for income and computers for workers in groups performing clerical functions. Organization size was positively related to income, but unrelated to computers. Hypothesis 2 received partial support with some characteristics of the work performed affecting income and computers. When job classification was dummy coded it was unrelated to computers, but managers and non-technical professionals reported higher incomes than did clerical workers. Routineness of the work performed and working more hours were unrelated to either income or computers. Supervising others was not uniquely associated with income, but was negatively associated with computers.

Consistent with Hypothesis 3, income was positively associated with one of the six individual characteristics: being married and one of the six individual characteristics was related to computer resources; older workers were more likely to have their own terminals. Hypothesis 4a was not supported; none of the computer ability variables was uniquely related to income. Hypothesis 4B received partial support; workers with longer computer experience were more likely to have their own terminals.

Workers in different job classifications: Table 15 shows the results of blocked multiple regression for workers

Table 15. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for workers in different job classifications and adjusted for the number of predictors.

PREDICTORS	INCOME MULT. R^2	COMPUTERS MULT. R^2
WORKERS IN MANAGERIAL OR EXECUTIVE JOBS		
Job Characteristics	.000	.000
Indiv. Characteristics	.089 *	.000
Computer Ability	.000	.000
Computer Use	.011	.000
Model R^2	.342 ***	.000
WORKERS IN DATA-ORIENTED PROFESSIONS		
Job Characteristics	.007	.067 ***
Indiv. Characteristics	.149 ***	.000
Computer Ability	.000	.104 ***
Computer Use	.000	.036 **
Model R^2	.268 ***	.452 ****
WORKERS IN NON-DATA ORIENTED PROFESSIONS		
Job Characteristics	.143 ****	.072 ***
Indiv. Characteristics	.038 *	.041 **
Computer Ability	.011	.000
Computer Use	.021 *	.065 ***
Model R^2	.341 ****	.432 ****
WORKERS IN SECRETARIAL OR TECHNICAL-CLERICAL JOBS		
Job Characteristics	.001	.036 *
Indiv. Characteristics	.053 *	.000
Computer Ability	.000	.000
Computer Use	.032 *	.195 ****
Model R^2	.137 *	.258 ***
WORKERS IN CLERICAL JOBS		
Job Characteristics	.097 ****	.023
Indiv. Characteristics	.070 ***	.000
Computer Ability	.025 *	.000
Computer Use	.000	.073 ***
Model R^2	.301 ****	.142 **

*p<.05; **p<.01; ***p<.001; ****p<.0001

performing managerial or executive jobs. Contrary to hypothesis two, job characteristics were not predictive of income (Adj. R^2=.000; n.s.) or of computers (Adj. R^2=.000; n.s.). Hypothesis 3 received mixed support. Individual characteristics were predictive of income (Adj. R^2=.089; $p<.05$,), but not of computers (Adj. R^2=.000; n.s.). Contrary to hypothesis 4, computer ability did not predict income (Adj. R^2=.000; n.s.) or computers (Adj. R^2=.000; n.s.).

Table 16 shows the final standardized regression coefficients of each of the predictors for income and computers for managers and executives. Organization size was unrelated to income or computers. Hypothesis 2 was not supported; non of the characteristics of the work performed affected income or computers. Consistent with Hypothesis 3, income was positively associated with one of the six individual characteristics: being male. None of the six individual characteristics included in Hypothesis 3 was related to computer resources. Hypothesis 4 was not supported; none of the computer ability variables was uniquely related to income or computers.

Table 15 shows the results of blocked multiple regression for workers performing data-oriented (technically

Table 16. Standardized regression coefficients for the determinants of income and computers for managers and executives (N=75).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.014	-.149
INDIVIDUAL CHARACTERISTICS		
Education	.161	.085
Age	.028	.078
Sex (Female)	-.354 *	.151
Unmarried	-.001	.101
Job Tenure	.124	-.252
Org. Tenure	.107	.028
WORK CHARACTERISTICS		
Managerial Group	.211	.370
Data Prof. Group	.216	.225
Text Prof. Group	.092	.104
Routineness	-.094	.010
Hours Worked	.180	-.032
Supervise Others	.092	.103
COMPUTER ABILITY		
Data Entry	.000	.136
Application Pkg.	-.161	-.132
Programming Lang	-.087	-.089
Machine Language	-.011	-.048
Systems/Hardware	N/A	N/A
Yrs. Experience	-.070	.107
COMPUTER USE		
Hours of Use	.048	.075
% of Activities	-.258 *	-.128

*p<.05; **p<.01; ***p<.001; ****p<.0001

trained) professional jobs. Hypothesis two received mixed support. Job characteristics were not predictive of income (Adj. R^2=.007; n.s.) but were predictive of computers (Adj. R^2=.067; p<.001). Hypothesis 3 received mixed support. Individual characteristics were predictive of income (Adj. R^2=.149; p<.001,), but not of computers (Adj. R^2=.000; n.s.). Contrary to hypothesis 4a, computer ability did not predict income (Adj. R^2=.000; n.s.). However, computer ability did predict computers (Adj. R^2=.104; p<.001), supporting hypothesis 4b.

Table 17 shows the final standardized regression coefficients of each of the predictors for income and computers for technically-oriented professionals. Organization size was unrelated to income or computers. Hypothesis 2 was partially supported; those who worked more hours reported higher incomes. Respondents with less routine jobs were more likely to have their own terminals. Consistent with Hypothesis 3, income was positively associated with three of the six individual characteristics: education, being male, and having longer job tenure. None of the six individual characteristics included in Hypothesis 3 was related to computer resources. Hypothesis 4a was not supported; none of the computer ability variables was uniquely related to income. However, years of computer

Table 17. Standardized regression coefficients for the determinants of income and computers for technically-oriented professionals N=110).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	-.127	-.047
INDIVIDUAL CHARACTERISTICS		
Education	.219 *	-.071
Age	.200	.100
Sex (Female)	-.267 **	-.126
Unmarried	-.175	-.023
Job Tenure	.176 *	-.088
Org. Tenure	-.099	-.129
WORK CHARACTERISTICS		
Managerial Group	.075	-.002
Data Prof. Group	.371	-.003
Text Prof. Group	.391	-.217
Routineness	.027	-.266 **
Hours Worked	.238 *	.135
Supervise Others	-.066	-.095
COMPUTER ABILITY		
Data Entry	-.011	.147
Application Pkg.	.024	.073
Programming Lang	-.138	.095
Machine Language	.059	.088
Systems/Hardware	.000	.007
Yrs. Experience	.164	.492 ****
COMPUTER USE		
Hours of Use	-.021	.289 **
% of Activities	-.012	-.052

*p<.05; **p<.01; ***p<.001 ****p<.0001

experience was positively associated with having one's own terminal (supporting hypothesis 4b).

Table 15 shows the results of blocked multiple regression for workers performing non-technical (text-oriented) professional jobs. Supporting hypotheses two and three, both job characteristics and individual characteristics were predictive of income and computers. Job characteristics were more strongly predictive of both income (Adj. R^2=.143; p<.0001) and computers (Adj. R^2=.072; p<.001) than were individual characteristics (income Adj. R^2=.038; p<.05, computers Adj. R^2=.041; p<.01). Contrary to hypothesis 4, computer ability did not predict income (Adj. R^2=.011; n.s.) or computers (Adj. R^2=.000; n.s.).

Table 18 shows the final standardized regression coefficients of each of the predictors for income and computers for text-oriented professionals. Organization size was unrelated to income, but negatively related to computers. Hypothesis 2 was partially supported; those who worked more hours reported higher incomes and their own terminals. Respondents with more routine jobs who did not supervise others were more likely to have their own terminals. Workers in groups performing text-oriented professional functions were more likely to have their own

Table 18. Standardized regression coefficients for the determinants of income and computers for text-oriented professionals (N=130).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.077	-.326 ***
INDIVIDUAL CHARACTERISTICS		
Education	.196	-.265 **
Age	.037	.127
Sex (Female)	-.034	-.014
Unmarried	-.045	.128
Job Tenure	.048	-.170
Org. Tenure	.247 *	.033
WORK CHARACTERISTICS		
Managerial Group	-.048	.064
Data Prof. Group	.055	.149
Text Prof. Group	-.024	.399 *
Routineness	.108	.205 *
Hours Worked	.471 ****	.252 **
Supervise Others	.011	-.144 *
COMPUTER ABILITY		
Data Entry	.089	.152
Application Pkg.	-.187	-.076
Programming Lang	.169	.006
Machine Language	-.111	-.044
Systems/Hardware	-.058	.106
Yrs. Experience	.193 *	.016
COMPUTER USE		
Hours of Use	-.204 *	.304 ***
% of Activities	-.057	.084

*p<.05; **p<.01; ***p<.001; ****p<.0001

terminals than were workers in clerical groups.

Income was positively associated with only one of the six individual characteristics: having longer organizational tenure. One of the six individual characteristics included in Hypothesis 3 was related to computer resources, but in the opposite direction of that predicted. Workers with less education were more likely to have their own terminals. Hypothesis 4a received partial support; workers with more years of computer experience reported higher incomes. Hypothesis 4b was not supported.

Table 15 shows the results of blocked multiple regression for workers performing either secretarial jobs or jobs that are both technical and clerical in nature. Both hypotheses two and three received partial support. Job characteristics predicted computers (Adj. R^2=.036; $p<.05$), but not income (Adj. R^2=.001; n.s.). Individual characteristics predicted income (Adj. R^2=.053; $p<.05$), but not computers (Adj. R^2=.000; n.s.). Contrary to hypothesis 4, computer ability did not predict income (Adj. R^2=.000; n.s.) or computers (Adj. R^2=.000; n.s.).

Table 19 shows the final standardized regression coefficients of each of the predictors for income and computers for secretarial and technical-clerical workers.

Table 19. Standardized regression coefficients for the determinants of income and computers for secretaries and technical clerical workers (N=121).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.167	-.108
INDIVIDUAL CHARACTERISTICS		
Education	.163	.070
Age	.066	.127
Sex (Female)	-.162	.034
Unmarried	-.113	.008
Job Tenure	.069	-.100
Org. Tenure	.221	.046
WORK CHARACTERISTICS		
Managerial Group	.102	.277 **
Data Prof. Group	.072	.112
Text Prof. Group	.037	.217 *
Routineness	-.052	-.169 *
Hours Worked	.193	-.038
Supervise Others	.130	-.088
COMPUTER ABILITY		
Data Entry	-.043	.040
Application Pkg.	.041	.044
Programming Lang	.098	-.069
Machine Language	.003	.015
Systems/Hardware	N/A	N/A
Yrs. Experience	.061	-.032
COMPUTER USE		
Hours of Use	.271 *	.551 ****
% of Activities	-.017	-.004

*p<.05; **p<.01; ***p<.001; ****p<.0001

Organization size was unrelated to income or computers. Hypothesis 2 was partially supported; none of the work characteristics were uniquely associated with income. However, respondents who worked in groups performing managerial or text professional functions were more likely to have their own terminals than those in groups performing clerical functions. Those with more routine job were less likely to have their own terminals. None of the individual characteristics included in Hypothesis 3 was related to income or to computer resources. Hypothesis 4 also was not supported.

Table 15 shows the results of blocked multiple regression for workers in clerical jobs. Both job and individual characteristics predicted income (job characteristics Adj. R^2=.097; p<.0001, individual Adj. R^2=.070; p<.001), but not computers (job characteristics Adj. R^2=.023; n.s., individual Adj. R^2=.000; n.s.). Supporting hypothesis 4a, computer ability did predict income (Adj. R^2=.025; p<.05). Hypothesis 4b was not supported; computer ability did not predict computer resources (Adj. R^2=.000; n.s.).

Table 20 shows the final standardized regression coefficients of each of the predictors for income and

Table 20. Standardized regression coefficients for the determinants of income and computers for clerical workers (N=177).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.125	.187
INDIVIDUAL CHARACTERISTICS		
Education	.087	.014
Age	.210 **	.074
Sex (Female)	.003	-.005
Unmarried	-.115	.134
Job Tenure	.144	-.118
Org. Tenure	.058	.100
WORK CHARACTERISTICS		
Managerial Group	.039	.211 *
Data Prof. Group	.110	.021
Text Prof. Group	-.221 **	-.080
Routineness	.003	.066
Hours Worked	.224 **	-.007
Supervise Others	.116	-.146
COMPUTER ABILITY		
Data Entry	-.141	-.021
Application Pkg.	-.213 **	.026
Programming Lang	.019	.000
Machine Language	.079	.019
Systems/Hardware	N/A	N/A
Yrs. Experience	.062	.103
COMPUTER USE		
Hours of Use	-.030	.326 ***
% of Activities	.026	.056

*p<.05; **p<.01; ***p<.001; ****p<.0001

computers for clerical workers. Organization size was unrelated to income or computers. Hypothesis 2 was partially supported; some of the work characteristics were uniquely associated with income or computers. Respondents who worked in groups performing text-oriented professional functions reported lower incomes than those in groups performing clerical functions. Respondents who worked in groups performing managerial functions were more likely to have their own computer terminals than those in groups performing clerical functions. Working more hours was positively associated with income. None of the individual characteristics included in Hypothesis 3 was related to computer resources, but age was positively associated with income. Hypothesis 4a received support with workers who knew an application program reporting higher incomes. Hypothesis 4b was not supported.

Summary of Individual-level results

In summary, at the individual level, the distribution of computer resources does resemble that of income for the sample as a whole, but job classification and the organizational function of the work group affect their similarity. As can be seen in Table 21, computers were, in part, allocated "rationally" (according to the amount of use) for all types of workers except managers and

Table 21. Summary of results of statistical tests performed on individual-level data for the total sample and for each sub-sample. Cell entries show preliminary indication of results consistent with (yes) or contrary to (no) various theories. Column headings indicate theories with outcomes in parentheses and the block of predictors used in each analysis below.

	THEORY (OUTCOME)						
	REPLICATE PREVIOUS FINDINGS (INCOME)		**COMPUTER AS A SYMBOL (COMP.)**		**HUMAN CAPITAL (INCOME)**	**DISTRIB-UTIVE JUSTICE (COMP.)**	**RATIONAL ALLOCA-TION (COMP.)**
PREDICTORS	**Ind. Char**	**Job Char**	**Ind. Char**	**Job Char**	**Comp. Skill**	**Comp. Skill**	**Comp. use/need**
OVERALL	YES	YES	YES	YES	NO	NO	YES
WORKERS IN GROUPS PERFORMING DIFFERENT FUNCTIONS							
Man./Admin. Function	YES	YES	NO	YES	NO	NO	YES
Text Prof. Function	YES	YES	NO	NO	NO	NO	YES
Data Prof. Function	YES	YES	YES	YES	NO	YES	YES
Clerical Function	YES	YES	NO	NO	NO	YES	YES
WORKERS IN DIFFERENT JOB CLASSIFICATIONS							
Managers/ Executives	YES	NO	NO	NO	NO	NO	NO
Data Prof.	YES	NO	NO	YES	NO	YES	YES
Other Prof.	YES	YES	YES	YES	NO	NO	YES
Secretary/ Tech-Cler.	YES	NO	NO	YES	NO	NO	YES
Clerical Workers	YES	YES	NO	NO	YES	NO	YES

Note: A "yes" in a cell indicates that the statistical test relating its predictors to its outcome for its sample was significant. A "no" indicates the test was not significant.

executives, but for none of the sub-samples was use the only factor predicting whether or not workers had their own terminals. For workers in professional, secretarial or technical-clerical jobs, and in groups performing managerial, administrative, or data-oriented professional functions within their organizations, income and computers were correlated and characteristics of the individual or of the job were associated with both income and computers. Thus the distribution of computer resources resembled that of income for these workers. For workers in groups performing clerical or text-oriented professional functions, and for managers or executives income and computers were not correlated and neither individual nor job characteristics were associated with computers. Thus, the distribution of computer resources did not resemble that of income for these workers. For workers in clerical jobs, computer resources and income were related when tested with a simple correlation, but not when tested with the more complete model. Overall, characteristics of the job were more consistently related to the distribution of computers than were characteristics of the workers. Characteristics of the workers were more consistently related to the distribution of income than were characteristics of the job.

Human Capital Theory was supported only for clerical workers; they were the only ones for whom computer-related

skills and experience were related to income. Predictions from Distributive Justice were supported only for data-professionals and those in groups performing data-professional or clerical functions; for them, computer-related skills and experience were related to having their own terminals.

Group-Level Hypotheses

Simple correlations between the predictors and outcomes are shown in Appendix B. Table 22 shows the results of a multiple regression predicting inequality in income for the entire sample. Inequality in work characteristics was associated with inequality in both income (Adj. R^2=.079; $p<.05$) and computers (Adj. R^2=.053; $p<.10$). Inequality in individual characteristics was associated with income (Adj. R^2=.187; $p<.001$), but not computers (Adj. R^2=.000; n.s.). In contrast, inequality in computer-related skills and experience were not associated with inequality in income (Adj. R^2=.000; n.s.) but were marginally associated with inequality in computer terminals (Adj. R^2=.047; $p<.10$). Thus, hypothesis 5 was supported for both income and computers. Hypothesis 6 was supported for income, but not for computers; hypothesis 7 was supported for computers, but not for income.

Table 22. Multiple regressions predicting heterogeneity in income and computers from each of six sets of predictors and adjusted for the number of predictors.

PREDICTORS	INCOME MULT. R^2	COMPUTERS MULT. R^2
Job Characteristics	.079 **	.053 *
Indiv. Characteristics	.187 ****	.000
Computer Ability	.000	.067 *
Exchange of Information	.044	.067 *
Supervisor Power	.000	.027
Computer Use	.000	.000

*p<.10; **p<.05; ***p<.01; ****p<.001;

Contrary to previous findings on work group income inequality (Pfeffer & Langton, 1988), when considered as a block neither the exchange of information nor supervisor's power was related to income (exchange of information Adj. R^2=.044; n.s; supervisor's power Adj. R^2=.000; n.s.). In contrast, the exchange of information was marginally related to inequality in computer equipment (Adj. R^2=.047; p<.10), but unrelated to supervisor's power (Adj. R^2=.027; n.s.). Thus, hypothesis 8 received partial support, but in the opposite direction than that predicted. Hypothesis 9 was not supported.

Table 23 shows beta weights for multiple regressions performed using the predictors described above. When each set of variables was used to predict each outcome, only the

Table 23. Standardized regression coefficients for the determinants of heterogeneity in income and computers.

PREDICTORS	INCOME	COMPUTERS
WORK CHARACTERISTICS		
Job Category	.205 *	.088
Hours Worked	.169	.155
Supervising	.096	-.184
Routineness	-.052	-.227 **
Exempt	.048	-.088
Task Uniformity	.101	.111
INDIVIDUAL CHARACTERISTICS		
Age	.027	.050
Education	.494 *****	.073
% Women	-.027	.006
Unmarried	-.010	-.204 *
Job Tenure	.007	.084
Org. Tenure	.060	.120
% Minority	.075	.085
COMPUTER ABILITY		
Data Entry	.014	.136
Application Pkg.	-.066	.142
Programming Lang	-.144	-.022
Machine Language	-.010	.223 **
Systems/Hardware	.034	.141
Yrs. Experience	.009	.114
COMPUTER USE		
Hours of Use	-.015	.047
% of Activities	-.124	-.006

*p<.10; **p<.05; ***p<.01; ****p<.001; *****p<.0001

Table 23 continued. Standardized regression coefficients for the determinants of heterogeneity in income and computers.

PREDICTORS	INCOME	COMPUTERS
INFORMATION EXCHANGE		
Avg. Interaction	.165	-.166
Public Firm	.081	.006
Geog. Dispersion	-.109	.025
Group Size	.220 **	.089
Coordination	-.128	.258 **
SUPERVISOR CHARACTERISTICS		
Female	-.089	.042
Hiring Power	-.220	-.161
Firing Power	.227	.079
Job Tenure	-.015	.175
Org. Tenure	-.070	-.232 *
Education	.113	.023
Job Category	.032	-.203 *

*p<.10; **p<.05; ***p<.01; ****p<.001; *****p<.0001

number of employees in the group, inequality in job classification, and employee education were related to income. Similarly, only the amount of coordination, supervisors' tenure in the organization and job classification, and inequality in the routineness of work, marital status, and knowing machine language were related to computers.

When all predictors were included in the equation,

final beta weights indicated unique contributions to inequality in income were made by the number of employees in the group, and inequality in employees' education, and knowledge of a programming language (see Table 24). Unique contributions to inequality in computers were made by the supervisor's power to hire and fire, and inequality in supervising others, marital status, data entry skills, and the routineness of the work performed.

Summary of Group-level results

Previous findings relating three concepts from the literature on distributive justice to income heterogeneity were not replicated. However, one of these three concepts (exchange of information) was related to heterogeneity in computer resources, though in a direction opposite to that predicted. Thus, group level evidence of the symbolic value attached to computer resources was ambiguous for this sample.

Table 24. Final Standardized regression coefficients for the determinants of heterogeneity in income and computers with all predictors included in the equation.

PREDICTORS	INCOME	COMPUTERS
WORK CHARACTERISTICS		
Job Category	.087	-.034
Hours Worked	.164	.076
Supervising	.195	-.268 *
Routineness	-.147	-.243 **
Exempt	.095	-.109
Task Uniformity	-.024	-.010
INDIVIDUAL CHARACTERISTICS		
Age	.143	-.102
Education	.425 ****	.150
% Women	-.127	.000
Unmarried	-.044	-.273 **
Job Tenure	-.055	.141
Org. Tenure	-.059	.099
% Minority	.017	.071
COMPUTER ABILITY		
Data Entry	-.148	.322 **
Application Pkg.	-.175	.067
Programming Lang	-.348 ***	.068
Machine Language	-.004	.178
Systems/Hardware	.042	-.033
Yrs. Experience	-.025	.063
COMPUTER USE		
Hours of Use	-.122	.068
% of Activities	-.088	-.074

*p<.10; **p<.05; ***p<.01; ****p<.001

Table 24 continued. Final Standardized regression coefficients for the determinants of heterogeneity in income and computers with all predictors included in the equation.

PREDICTORS	INCOME	COMPUTERS
INFORMATION EXCHANGE		
Avg. Interaction	.140	-.101
Public Firm	.023	-.139
Geog. Dispersion	-.079	.121
Group Size	.225 **	-.082
Coordination	-.180	.169
SUPERVISOR CHARACTERISTICS		
Female	.087	.141
Hiring Power	-.097	-.507 *
Firing Power	-.030	.629 **
Job Tenure	.018	-.028
Org. Tenure	-.073	-.102
Education	.166	.072
Job Category	.006	-.148

*p<.10; **p<.05; ***p<.01; ****p<.001

6. DISCUSSION

These analyses indicate preliminary evidence of similarity between the distribution of income and that of computers. There seems to be individual-level evidence that computer resources are not allocated solely according to workers' level of use (an allocation norm that many would consider "rational" or "objective"). It is possible that having one's own computer may act as a symbol of status. For the sample as a whole, having one's own computer and income were slightly positively correlated. Additionally, previous findings that characteristics of work and of individuals are related to income were replicated lending support for the assumption that our sample was representative and our measures were valid. The same set of predictors were also related to having one's own computer terminal, providing evidence consistent with the theory that computer resources may be acting as symbols of status. Contrary to both Human Capital Theory (Strober, 1990) and Distributive Justice (Deutsch, 1985), computer-related skills and experience were not related to either income or computers. Computer use also affected allocation providing support for a "rational" model.

There is some evidence that the basis of allocation may depend upon the nature of the work performed and the

organizational purpose of one's work group. The simple correlation between income and computers was stronger for workers in groups performing data-oriented professional or managerial and administrative functions than for those in groups performing text-oriented professional or clerical functions. These simple correlations were highest for data-oriented professional workers, but still significant for clerical, secretarial, technical-clerical, and non data-oriented professionals.

The moderated multiple regression analyses were primarily exploratory because previous work on income allocation has not focused on moderators such as job classification or organizational function and no relevant theories were adequate for deriving predictions. Though use was consistently related to having one's own terminal (except for managers), it was never the only factor involved. Previous findings that characteristics of work and of individuals were related to income were replicated for workers in groups performing four different organizational functions, and for workers in clerical or text-oriented professional jobs. For managers, data-oriented professionals, and secretarial or technical and clerical workers, individual characteristics were associated with income (replicating previous work), but job characteristics were not.

Providing evidence of possible symbolic value, these same factors were related to having one's own terminal for data-oriented professional workers and for those in groups performing text-oriented professional functions in the organization. Job characteristics (not including computer use) were related to computer resources for data-professional workers, secretarial or technical and clerical workers, and those in groups performing administrative or managerial functions. There was no evidence of similarity in the distribution of income and computers for managers or for workers in groups performing text-oriented professional or clerical functions. Evidence for clerical workers was mixed with a positive simple correlation but dissimilarity in the predictors of computers and income.

The group-level evidence of symbolic value is equivocal. Previous findings that characteristics of the way work is organized are related to inequality in the distribution of income were not consistently replicated. Group heterogeneity in the nature of the work performed was related to inequality in income and in computers. However, group heterogeneity in characteristics of the workers was related to income, but not to computers. Previous results concerning other factors affecting the degree of income dispersion within groups were not replicated. Neither the amount of interaction among group members nor supervisor's

power was associated with income heterogeneity. However, the degree of interaction was associated with heterogeneity of computer resources. These contradictory results may be due to a lack of statistical power attributable to the small sample size.

Implications

Previous research indicates that any object or event that conveys meanings, images, feelings, and values to those who encounter it (Dandridge et al., 1980; Morgan et al., 1983) and is allocated differentially to workers based on their rank in the hierarchy can act as a symbol of status (Steele, 1973b). This dissertation has presented evidence that the individual allocation of computers may be distributed according to rank in the hierarchy (as indicated by income). Thus, computer resources may be able to act as symbols of status particularly among data-oriented professionals, secretaries, and technical-clerical workers, and in work groups performing managerial or data-professional functions.

Though some organizations may negate the symbolic value of computer resources by allocating identical equipment to each worker, in many situations the allocation of computers may engender the same degree of conflict as the allocation of office space. Managers who recognize the non-rational,

power-related implications of computer resource allocation decisions should be better able to understand "irrational" responses to computers and, therefore, should be able to manage more effectively.

For example, a manager supervising an engineer may consider his or her strong requests for a modem with direct-dialing capability frivolous and irrational since it would only be used a few times each day. However, management may want to purchase the modem (investing a relatively small amount of money) in order to retain and motivate a valued employee (especially if engineers at other companies are receiving these modems). Either decision (purchasing or not purchasing) may also provide a signal to the employee regarding his or her value to the organization.

The amount and distribution of computer resources may also provide a signal about the organization to prospective employees, clients, competitors, and regulators. Many firms choose office furnishings to portray a particular image to their clients (e.g. waiting areas in law offices, banks, and hospitals look very different from each other). If a manager recognizes the symbolic value of computer resources, he or she can take the same care in choosing and displaying computers in order to enhance the firm's preferred image.

As computer equipment becomes less expensive, it represents a relatively small fraction of managerial and

professional compensation packages and may play a pivotal role in signaling both the modernity of the organization and the value of an employee to the company. Organizations recognizing the symbolic value of computer resources can choose to integrate them into their compensation system and use them to attract, retain, and motivate the best employees. Some organizations (such as Universities) have already moved in this direction because of market pressures (competition for scarce professors of business and engineering); many more may be able to do so profitably.

Because respondents are generally unable to describe (or are unaware of) many of the symbols they encounter (Argyris & Schon, 1978), the study of organizational symbols has remained primarily an ideographic, qualitative endeavor drawing heavily from anthropological research methods and anecdotal evidence. Few studies have taken a normative approach by attempting to identify consistent patterns, classify common symbols, or test causal theories or models by collecting, comparing, and testing quantitative data from respondents in multiple organizations (though see Ornstein, 1986 and Safayeni et al., 1989 for notable exceptions). In contrast to previous work, this dissertation took a normative approach and used quantitative data in an attempt to classify one possible object (the computer terminal) as a symbol of status by identifying patterns in its distribution

and comparing those patterns to those of a more commonly accepted symbol of status (income).

Unfortunately, because the information collected about the symbolic nature of computers (their distribution) and about status (income) is indirect, there may be many possible alternate explanations for the reported results that remain unrefutable. However, researchers have not yet developed quantitative composite measures of organizational status that are widely accepted, reliable and valid for cross-organizational or international samples.

It may also be extremely difficult to collect accurate information more directly relevant to the symbolic value of computers from average workers responding to written questionnaires. Symbols embody the values of the group (the sense of what "ought" to be), but members do not usually (and may be unable to) examine the underlying assumptions that explain why things "ought" to be this way rather than another; these underlying assumptions are generally invisible and preconscious (Schein, 1985). Additionally, respondents in the U.S. may be heavily influenced by social desirability bias and may be unwilling to discuss the importance of status and its symbols in a society which is not supposed to have rigid social classes and which was founded on the assumption that all its members were created equal. Thus, direct questions about organizational symbols,

even if embedded in a carefully crafted questionnaire and skillfully worded, may yield inaccurate or questionable information.

The research method used for this dissertation, though inferential, may prove fruitful as a first step in identifying objects whose distributions indicate they may be able to act as symbols of status. Additional work would be required to determine the nature of the images, feelings, and values transmitted by the objects. If these meanings are relevant to status and the objects are distributed according to status, one can conclude that these are acting as status symbols. Thus, this research method may further efforts to identify and classify organizational symbols whose meanings remains fairly consistent across organizations or jobs.

Limitations

The results are only suggestive of the true symbolic value of computer resources because this study has several strong limitations. However, most of the limitations led to an attenuation of the results, making them more difficult to detect statistically and yielding empirical evidence that should represent the lower bound of the true effect. First, as with most large scale survey-based field studies, there were many sources of uncontrolled variance. Though many of

the statistical tests performed were statistically significant, the percent of variance accounted for was generally quite small. A study designed to control extraneous sources of variance may find that the true symbolic value of computers is much larger.

The second serious limitation was the small sample size. Though a sample of 623 is larger than that gathered for much behavioral research, it is much smaller than that used in similar work on income inequality and moderated regressions further shrank sample sizes. Studies of individual-level income inequality performed by sociologists often use data collected by the U.S. census and generally include thousands of people. The small sample sizes severely curtailed statistical power and, again, made it more difficult to detect the true symbolic value of computers. Further, dividing the sample according to the hypothesized moderators may have restricted the range of some of the variables, again attenuating the results.

Third, multiple statistical tests of significance were performed, inflating the Type I error rate. Though each test was unlikely to reject the null hypothesis when it was false, the probability that one or more of the large number of tests did so was much higher.

A fourth limitation stems from the inferential nature of the study. Because value is inferred solely from the

distribution of the artifact (a condition that is necessary, but not sufficient, for objects to act as symbols of status), no information is provided about the mechanism by which computers are allocated. It is unclear whether the unequal distribution reflects allocators' preferences, biases, and assumptions or workers's demands for equipment. This study does not illuminate the direction of causality.

Finally, the sample used was one of convenience on which secondary analyses were performed. The small number of categories included in each of the outcomes (computers and income) may have attenuated the results. A continuous measure of income would have replicated previous work more closely and may have yielded more similar results. A more fine-grained descriptive measure of computer resources (speed, size of hard disk drive, number of floppy disk drives, software available etc.) would have provided more complete information about these cultural artifacts. Similarly, organizational policies regarding the allocation of computers and income could have been elicited and could be compared to actual distributions of these outcomes or controlled for statistically.

Additionally, the data were collected four years ago in one geographic region. It was not possible to draw a stratified random sample of computer-using white collar work groups because we do not know the characteristics of the

parent population. Although the sample was selected to achieve variation in many areas (type of equipment, function, occupational mix), there is no reason to assume that our sample was representative (though replication of previous findings indicates it may not be too unusual). Future work should include groups from outside the Southern California area.

7. CONCLUSION

The "tool" metaphor used by professionals in MIS does not adequately describe the relationship between information systems and their users. This dissertation reports empirical field research suggesting that, for many workers, having one's own computer was related to status in the workplace. As cultural artifacts, computer resources were distributed in a manner that may indicate they are transmitting status information and may have significant symbolic value that managers should not ignore. Due to the many and serious limitations of this study, it illuminated, but did not provide a definitive answer, to the research questions addressed. Computer equipment and income were correlated and shared some of the same predictors, but these relationships were moderated by the nature of the work performed and of the work group. When being allocated to group members, computers were subject to one of the influences predicted from the distributive justice literature; income was subject to none of these influences.

It is not clear that having one's own computer was acting as a status marker, but it probably could do so. This empirical evidence of extra-rational computer resource distribution in diverse field settings provides a first step in assessing the symbolic value of computer artifacts and

suggests that subsequent steps may prove fruitful. Future work should focus on bracketing more closely the true effect sizes for various organizations and occupations and the mechanism by which symbolic value may affect allocation decisions and the resulting distribution of computer resources.

A policy capturing study using scenarios describing employees and the nature of the work they do and asking whether they should (or would be expected to) have their own terminals can be used to abstract the decision rules used by allocators. Comparing results with different wordings of the decision would indicate the amount of slippage between allocators' ideal policy and organizational reality. Another possibility which should be explored further is the use of photographic stimuli representing offices with different types computer resources and asking respondents what they symbolize about the incumbents of those offices and about the organizations in which they work. A third possibility would be to ask respondents to describe or draw the work space they would want or expect to use for various types of jobs. Any of these methods could allow the true size of the symbolic effect of computer resources to be more closely estimated by providing tighter experimental control in order to limit error variance.

Appendix A. Common office tasks.

1. Write original material
2. Type or keyboard text or data supplied by someone else
3. Edit or rewrite
4. Proofread and correct
5. Develop forms
6. Fill in forms
7. Create or maintain databases
8. Process or maintain records
9. Keep activity logs
10. Administrative support
11. Data analysis
12. Statistical computation
13. Programming
14. Distribute information
15. Handle messages
16. Locate or retrieve information
17. Create graphs, charts, diagrams
18. Prepare documents, reports
19. Bookkeeping
20. Billing
21. Gather information from sources outside the company

Appendix B. Detailed Results of Statistical Analyses

Table A. Means and standard deviations for the predictors and outcomes for total sample and workers in groups performing different functions.

PREDICTORS	TOTAL	MANAGER	TEXT	DATA	CLERICL
# Employed in Co. (1,8)	4.59 (2.13)	4.27 (1.87)	5.65 (2.08)	4.27 (2.45)	4.35 (1.67)
INDIVIDUAL CHARACTERISTICS					
Education (1-5)	2.54 (1.13)	2.71 (1.09)	3.10 (1.19)	2.47 (1.10)	2.05 (1.92)
Age (1-5)	2.64 (1.07)	2.65 (1.00)	2.63 (1.09)	2.53 (1.00)	2.78 (1.16)
Sex (Female) (1,2)	1.64 (0.48)	1.66 (0.48)	1.71 (0.46)	1.41 (0.49)	1.83 (0.38)
Unmarried (1,2)	1.44 (0.50)	1.42 (0.50)	1.46 (0.50)	1.41 (0.49)	1.49 (0.50)
Job Tenure (1-6)	3.45 (1.53)	3.12 (1.47)	3.38 (1.36)	3.68 (1.63)	3.51 (1.55)
Org. Tenure (1-6)	4.16 (1.54)	4.05 (1.50)	4.07 (1.49)	4.22 (1.63)	4.25 (1.53)
WORK CHARACTERISTICS					
Managerial Job (0,1)	0.12 (0.33)	0.21 (0.41)	0.06 (0.23)	0.12 (0.32)	0.10 (0.30)
Technical Prof. (0,1)	0.18 (0.38)	0.05 (0.21)	0.12 (0.32)	0.47 (0.50)	0.01 (0.11)
Other Prof. (0,1)	0.21 (0.41)	0.33 (0.47)	0.43 (0.50)	0.10 (0.30)	0.07 (0.26)
Sectry/Tech. Cler. (0,1)	0.19 (0.40)	0.24 (0.43)	0.21 (0.41)	0.13 (0.34)	0.22 (0.41)
Clerical Job (0,1)	0.28 (0.45)	0.17 (0.37)	0.17 (0.38)	0.16 (0.37)	0.59 (0.50)
Routineness (1-4)	2.46 (0.72)	2.20 (0.62)	2.20 (0.71)	2.42 (0.71)	2.88 (0.61)
Weekly Hours Worked (1-3)	2.23 (0.69)	2.42 (0.57)	1.92 (0.75)	2.48 (0.60)	2.03 (0.68)
Supervise Others (1,2)	1.29 (0.45)	1.31 (0.47)	1.26 (0.44)	1.39 (0.49)	1.20 (0.40)

Table A continued. Means and standard deviations for the predictors and outcomes for total sample and workers in groups performing different organizational functions.

PREDICTORS	TOTAL	MANAGER	TEXT	DATA	CLERICL
COMPUTER ABILITY					
Data Entry (1,2)	1.26 (0.44)	1.19 (0.39)	1.25 (0.44)	1.37 (0.48)	1.22 (0.41)
Application Pkg. (1,2)	1.41 (0.49)	1.33 (0.47)	1.33 (0.47)	1.38 (0.49)	1.56 (0.50)
Programming Lang. (1,2)	1.75 (0.43)	1.79 (0.41)	1.76 (0.43)	1.65 (0.48)	1.81 (0.39)
Machine Lang. (1,2)	1.91 (0.28)	1.99 (0.12)	1.94 (0.24)	1.82 (0.39)	1.95 (0.23)
Systems/Hard ware (1,2)	1.99 (0.10)	1.99 (0.12)	1.99 (0.09)	1.98 (0.13)	2.00 (0.00)
Experience Yrs. (1-5)	3.33 (0.95)	3.40 (0.91)	3.18 (0.99)	3.36 (1.00)	3.37 (0.88)
COMPUTER USE					
Hours of Use (1-6)	3.33 (1.49)	2.98 (1.26)	2.90 (1.38)	3.71 (1.61)	3.52 (1.45)
% Activities Computerized	0.54 (0.30)	0.54 (0.26)	0.50 (0.29)	0.58 (0.30)	0.54 (0.31)
OUTCOMES					
Income (1-4)	2.61 (0.74)	2.73 (0.75)	2.56 (0.73)	2.86 (0.72)	2.27 (0.63)
Computers (1,2)	1.51 (0.50)	1.54 (0.50)	1.42 (0.50)	1.58 (0.50)	1.50 (0.50)

Table B. Means and standard deviations for the predictors and outcomes for workers in different job classifications.

PREDICTOR	MANAGER	DATAPRO	OTHERPRO	SECTRY	CLERICL
# Emp. at Co. (1,8)	4.13 (2.15)	5.06 (2.27)	5.19 (2.10)	3.93 (2.20	4.40 (1.78)
INDIVIDUAL CHARACTERISTICS					
Education (1-5)	2.99 (1.16)	3.00 (1.16)	3.30 (1.00)	1.93 (0.87)	1.91 (0.76)
Age (1-5)	2.99 (0.99)	2.50 (0.93)	2.63 (0.90)	2.69 (1.23)	2.56 (1.14)
Female (1,2)	1.43 (0.50)	1.36 (0.48)	1.59 (0.49)	1.82 (0.38)	1.85 (0.36)
Unmarried (1,2)	1.37 (0.49)	1.44 (0.50)	1.38 (0.49)	1.45 (0.50)	1.52 (0.50)
Tenure, Job (1-6)	3.51 (1.67)	3.65 (1.54)	3.32 (1.39)	3.51 (1.60)	3.38 (1.51)
Tenure, Org (1-6)	4.60 (1.38)	4.21 (1.60)	4.18 (1.43)	4.07 (1.62)	4.01 (1.54)
WORK CHARACTERISTICS					
Manager Grp (0,1)	0.37 (0.49)	0.06 (0.23)	0.33 (0.47)	0.26 (0.44)	0.12 (0.33)
Text Prof Grp (0,1)	0.09 (0.29)	0.14 (0.35)	0.42 (0.50)	0.22 (0.42)	0.12 (0.33)
Data Prof Grp (0,1)	0.29 (0.46)	0.79 (0.41)	0.15 (0.36)	0.21 (0.41)	0.17 (0.38)
Clerical Grp (0,1)	0.24 (0.43)	0.02 (0.13)	0.10 (0.30)	0.31 (0.47)	0.58 (0.50)
Routine (1-4)	2.24 (0.55)	2.22 (0.75)	2.08 (0.65)	2.61 (0.64)	2.87 (0.60)
Hrs Wrkd. (1-3)	2.73 (0.50)	2.38 (0.64)	2.29 (0.70)	2.11 (0.68)	1.95 (0.66)
Supervise (1,2)	1.85 (1.36)	1.29 (0.46)	1.23 (0.42)	1.26 (0.44)	1.13 (0.34)

Table B continued. Means and standard deviations for the predictors and outcomes for workers in different job classifications.

PREDICTOR	MANAGER	DATAPRO	OTHERPRO	SECTRY	CLERICL
COMPUTER ABILITY					
Entry (1,2)	1.21 (0.41)	1.35 (0.48)	1.32 (0.47)	1.12 (0.33)	1.28 (0.45)
App. Pkg. (1,2)	1.31 (0.47)	1.19 (0.40)	1.33 (0.47)	1.46 (0.50)	1.58 (0.50)
Program (1,2)	1.74 (0.44)	1.51 (0.50)	1.74 (0.44)	1.76 (0.43)	1.89 (0.31)
Mach Lang (1,2)	1.95 (0.23)	1.74 (0.44)	1.95 (0.21)	1.97 (0.18)	1.95 (0.22)
Systems (1,2)	2.00 (0.00)	1.96 (0.19)	1.98 (0.12)	2.00 (0.00)	2.00 (0.00)
Yrs Exp. (1-5)	3.36 (1.01)	3.62 (0.95)	3.20 (1.06)	3.33 (0.76)	3.30 (0.88)
COMPUTER USE					
Hours (1-6)	2.71 (1.38)	2.73 (1.53)	2.88 (1.35)	3.36 (1.34)	3.63 (1.53)
Task % Computer	0.50 (0.28)	0.62 (0.27)	0.51 (0.29)	0.57 (0.28)	0.54 (0.33)
OUTCOMES					
Income (1-4)	3.31 (0.57)	3.04 (0.63)	2.84 (0.56)	2.25 (0.59)	2.09 (0.59)
Computers (1,2)	1.61 (0.49)	1.55 (0.50)	1.38 (0.49)	1.52 (0.50)	1.54 (0.50)

Table C. Simple correlations between the predictors and outcomes for the entire sample (N=623).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.105 **	-.087 *
INDIVIDUAL CHARACTERISTICS		
Education	.403 ****	-.083*
Age	.176 ****	.064
Sex (Female)	-.378 ****	-.007
Unmarried	-.216 ****	.079
Job Tenure	.185 ****	-.088 *
Org. Tenure	.280 ****	-.007
WORK CHARACTERISTICS		
Managerial Job	.356 ****	.071
Technical Prof.	.273 ****	.033
Other Profession	.160 ****	-.135 **
Sec-Tech Cler.	-.237 ****	.008
Clerical Job	-.434 ****	.029
Managerial Group	.086 *	.028
Data Prof. Group	.226 ****	.087*
Text Prof. Group	-.029	-.102 *
Clerical Group	-.290 ****	-.022
Routineness	-.297 ****	.040
Hours Worked	.445 ****	.118 **
Supervise Others	.311 ****	-.087 *
COMPUTER ABILITY		
Data Entry	.044	.045
Application Pkg.	-.197 ****	-.025
Programming Lang	-.082 *	-.033
Machine Language	-.128 **	-.117 **
Systems/Hardware	-.077	-.032
Yrs. Experience	.130 ***	.190 ****
COMPUTER USE		
Hours of Use	-.050	.371 ****
% of Activities	-.002	.165 ****

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table D. Simple correlations between the predictors and outcomes for workers in groups performing managerial work (N=132).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.398 ****	-.280 **
INDIVIDUAL CHARACTERISTICS		
Education	.437 ****	-.216 *
Age	.438 ****	.203 *
Sex (Female)	-.322 ****	.133
Unmarried	-.167	.116
Job Tenure	.267 ***	.040
Org. Tenure	.512 ****	.074
WORK CHARACTERISTICS		
Managerial Job	.470 ****	.182 *
Technical Prof.	-.020	.133
Other Profession	.118	-.353 ****
Sec-Tech Cler.	-.282 ***	.151
Clerical Job	-.337 ****	.059
Routineness	-.208 *	.155
Hours Worked	.525 ****	-.015
Supervise Others	.312 **	.102
COMPUTER ABILITY		
Data Entry	.013	-.039
Application Pkg.	-.050	.067
Programming Lang	.078	.184 *
Machine Language	.039	.011
Systems/Hardware	-.046	.011
Yrs. Experience	.051	.072
COMPUTER USE		
Hours of Use	-.187 *	.361 ***
% of Activities	-.066	.047

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table E. Simple correlations between the predictors and outcomes for workers in groups performing text oriented professional work (N=128).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.016	-.230 **
INDIVIDUAL CHARACTERISTICS		
Education	.423 ****	-.320 ****
Age	.139	.015
Sex (Female)	-.281 ***	-.093
Unmarried	-.204 *	.144
Job Tenure	.171 *	-.018
Org. Tenure	.329 ****	.041
WORK CHARACTERISTICS		
Managerial Job	.283 ***	.118
Technical Prof.	.215 *	-.167
Other Profession	.315 ****	-.131
Sec-Tech Cler.	-.153	.258 ***
Clerical Job	-.579 ****	-.077
Routineness	-.343 ****	.336 ****
Hours Worked	.485 ****	.127
Supervise Others	.152	-.078
COMPUTER ABILITY		
Data Entry	.204 *	.150
Application Pkg.	-.198 *	.066
Programming Lang	-.072	-.005
Machine Language	-.110	-.080
Systems/Hardware	-.053	.078
Yrs. Experience	.142	-.111
COMPUTER USE		
Hours of Use	-.159	.313 ***
% of Activities	.027	.173

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table F. Simple correlations between the predictors and outcomes for workers in groups performing data oriented professional work (N=187).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.096	-.001
INDIVIDUAL CHARACTERISTICS		
Education	.431 ****	.114
Age	.231 ***	-.061
Sex (Female)	-.436 ****	-.066
Unmarried	-.300 ****	.052
Job Tenure	.207 ***	-.325 ****
Org. Tenure	.224 ***	-.188 *
WORK CHARACTERISTICS		
Managerial Job	.306 ****	.014
Technical Prof.	.292 ****	.023
Other Profession	.017	.126
Sec-Tech Cler.	-.387 ****	-.080
Clerical	-.339 ****	-.045
Routineness	-.283 ****	-.267 ***
Hours Worked	.302 ****	.198 **
Supervise Others	.325 ****	-.162 *
COMPUTER ABILITY		
Data Entry	.002	.042
Application Pkg.	-.214 ***	-.244 ***
Programming Lang	-.094	-.252 ***
Machine Language	-.183 *	-.200 **
Systems/Hardware	-.089	-.116
Yrs. Experience	.172 *	.345 ****
COMPUTER USE		
Hours of Use	-.062	.383 ****
% of Activities	-.071	.249 ***

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table G. Simple correlations between the predictors and outcomes for workers in groups performing clerical work (N=176).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.022	.189 *
INDIVIDUAL CHARACTERISTICS		
Education	.249 ****	.082
Age	.098	.143
Sex (Female)	-.134	.147
Unmarried	-.116	.049
Job Tenure	.154	.019
Org. Tenure	.193 *	.086
WORK CHARACTERISTICS		
Managerial Job	.401 ****	-.038
Technical Prof.	.046	
Other Profession	.161 *	-.081
Sec-Tech Cler.	-.071	-.178 *
Clerical Job	-.266 ***	.181 *
Routineness	-.056	.082
Hours Worked	.352 ****	.001
Supervise Others	.308 ****	-.233 **
COMPUTER ABILITY		
Data Entry	-.176 *	-.014
Application Pkg.	-.166 *	.060
Programming Lang	-.085	.080
Machine Language	.010	-.033
Systems/Hardware	N/A	N/A
Yrs. Experience	.149	.337 ****
COMPUTER USE		
Hours of Use	.119	.392 ****
% of Activities	.031	.130

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table H. Simple correlations between predictors and outcomes for managers and executives (N=75).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.036	-.152
INDIVIDUAL CHARACTERISTICS		
Education	.356 **	.201
Age	.127	-.011
Sex (Female)	-.526 ****	.127
Unmarried	-.324 **	.110
Job Tenure	.198	-.227
Org. Tenure	.231 *	-.133
WORK CHARACTERISTICS		
Managerial Group	.129	.172
Data Prof. Group	.165	-.011
Text Prof. Group	.067	.037
Clerical Group	-.366 ***	-.120
Routineness	-.335 **	-.174
Hours Worked	.153	-.084
Supervise Others	.224	.046
COMPUTER ABILITY		
Data Entry	.186	.135
Application Pkg.	-.139	-.208
Programming Lang	-.015	-.138
Machine Language	-.085	-.072
Systems/Hardware	N/A	N/A
Yrs. Experience	-.144	.101
COMPUTER USE		
Hours of Use	-.312 **	.090
% of Activities	-.226	.033 **

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table I. Simple correlations between predictors and outcomes for technical professionals N=110).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	-.027	-.100
INDIVIDUAL CHARACTERISTICS		
Education	.312 ***	-.045
Age	.250 **	.067
Sex (Female)	-.343 ****	-.157
Unmarried	-.225 *	-.050
Job Tenure	.202 *	-.151
Org. Tenure	.142	-.048
WORK CHARACTERISTICS		
Managerial Group	-.141	.143
Data Prof. Group	.136	.172
Text Prof. Group	-.023	-.291 **
Clerical Group	-.116	
Routineness	-.024	-.184
Hours Worked	.321 ***	.321 ***
Supervise Others	.167	-.241 *
COMPUTER ABILITY		
Data Entry	-.032	.273 **
Application Pkg.	.053	-.094
Programming Lang	-.104	-.172
Machine Language	-.075	-.202 *
Systems/Hardware	-.069	-.186
Yrs. Experience	.188 *	.458 ****
COMPUTER USE		
Hours of Use	.080	.467 ****
% of Activities	.066	.231 *

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table J. Simple correlations between predictors and outcomes for other professionals (N=130).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.079	-.370 ****
INDIVIDUAL CHARACTERISTICS		
Education	.046	-.449
Age	.128	.175
Sex (Female)	-.194 *	-.110
Unmarried	-.172 *	.070
Job Tenure	.177 *	-.109
Org. Tenure	.338 ****	-.004
WORK CHARACTERISTICS		
Managerial Group	.027	-.125
Data Prof. Group	.044	.319 ***
Text Prof. Group	-.033	-.072
Clerical Group	.053	-.051
Routineness	-.101	.364 ****
Hours Worked	.464 ****	.159
Supervise Others	.088	-.114
COMPUTER ABILITY		
Data Entry	.079	.077
Application Pkg.	-.032	.077
Programming Lang	.146	.128
Machine Language	-.133	-.148
Systems/Hardware	-.038	.106
Yrs. Experience	.058	-.029
COMPUTER USE		
Hours of Use	-.209 *	.365 ****
% of Activities	-.139	.037

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table K. Simple correlations between predictors and outcomes for secretaries and technical clerical workers (N=121).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	.168	.042
INDIVIDUAL CHARACTERISTICS		
Education	.085	-.033
Age	.117	-.024
Sex (Female)	-.039	.133
Unmarried	-.118	.086
Job Tenure	.206 *	-.109
Org. Tenure	.310 ***	-.050
WORK CHARACTERISTICS		
Managerial Group	.094	.182
Data Prof. Group	-.081	-.045
Text Prof. Group	.088	.152
Clerical Group	-.096	-.261 **
Routineness	-.059	-.171
Hours Worked	.186 *	.060
Supervise Others	.075	-.190 *
COMPUTER ABILITY		
Data Entry	-.121	-.045
Application Pkg.	-.037	-.080
Programming Lang	.172	.024
Machine Language	-.081	.063
Systems/Hardware	N/A	N/A
Yrs. Experience	.134	.112
COMPUTER USE		
Hours of Use	.198 *	.495 ****
% of Activities	.035	.221 *

*p<.05; **p<.01; ***p<.001 ****p<.0001

Table L. Simple correlations between predictors and outcomes for clerical workers (N=177).

PREDICTORS	INCOME	COMPUTERS
Org Size (# Emp)	-.041	.152
INDIVIDUAL CHARACTERISTICS		
Education	.098	.068
Age	.257 ***	.097
Sex (Female)	.033	.049
Unmarried	-.205 **	.118
Job Tenure	.260 ***	.022
Org. Tenure	.302 ****	.105
WORK CHARACTERISTICS		
Managerial Group	.065	.053
Data Prof. Group	.155 *	-.004
Text Prof. Group	-.300 ****	-.159 *
Clerical Group	.045	.078
Routineness	-.030	.096
Hours Worked	.379 ****	.071 **
Supervise Others	.216 **	-.116
COMPUTER ABILITY		
Data Entry	-.104	-.101
Application Pkg.	-.134	.016
Programming Lang	.048	-.031
Machine Language	-.013	-.098
Systems/Hardware	N/A	N/A
Yrs. Experience	.304 ****	.246 **
COMPUTER USE		
Hours of Use	.198 *	.333 ****
% of Activities	.156 *	.222 **

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table M. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for the total sample.

TOTAL SAMPLE	INCOME MULT. R^2	COMPUTERS MULT. R^2
Job Characteristics	.166 ****	.034 **
Indiv. Characteristics	.087 ****	.020 *
Computer Ability	.007	.014
Computer Use	.001	.100 ****
Adj. R^2	.521 ****	.187 ****

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table N. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for members of groups performing different functions.

PREDICTORS	INCOME MULT. R^2	COMPUTERS MULT. R^2
WORKERS IN MANAGERIAL/ADMINISTRATIVE GROUPS		
Job Characteristics	.105 ***	.098 *
Indiv. Characteristics	.121 ****	.056
Computer Ability	.009	.014
Computer Use	.004	.108 ***
Adj. R^2	.570 ****	.288 ****
WORKERS IN TEXT-ORIENTED PROFESSIONAL GROUPS		
Job Characteristics	.212 ****	.070
Indiv. Characteristics	.045 *	.066
Computer Ability	.013	.036
Computer Use	.002	.054 **
Adj. R^2	.579 ****	.266 ****
WORKERS IN DATA-ORIENTED PROFESSIONAL GROUPS		
Job Characteristics	.117 ****	.071 **
Indiv. Characteristics	.096 ****	.059 *
Computer Ability	.023	.038 *
Computer Use	.002	.109 ****
Adj. R^2	.500 ****	.316 ****
WORKERS IN CLERICAL GROUPS		
Job Characteristics	.149 ****	.061
Indiv. Characteristics	.089 **	.052
Computer Ability	.026	.053 *
Computer Use	.011	.121 ****
Adj. R^2	.277 ****	.231 ****

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table O. Multiple regressions predicting income and computers from each of four sets of predictors holding constant all other predictors for workers in different job classifications.

PREDICTORS	INCOME MULT. R^2	COMPUTERS MULT. R^2
WORKERS IN MANAGERIAL OR EXECUTIVE JOBS		
Job Characteristics	.077	.072
Indiv. Characteristics	.163 *	.077
Computer Ability	.026	.044
Computer Use	.038	.010
Adj. R^2	.342 ***	.000
WORKERS IN DATA-ORIENTED PROFESSIONS		
Job Characteristics	.071	.127 ***
Indiv. Characteristics	.196 ***	.033
Computer Ability	.037	.153 ***
Computer Use	.001	.054 **
Adj. R^2	.268 ***	.452 ****
WORKERS IN NON-DATA ORIENTED PROFESSIONS		
Job Characteristics	.189 ****	.122 ***
Indiv. Characteristics	.083 *	.086 **
Computer Ability	.057	.034
Computer Use	.036 *	.079 ***
Adj. R^2	.341 ****	.432 ****
WORKERS IN SECRETARIAL OR TECHNICAL-CLERICAL JOBS		
Job Characteristics	.059	.100 *
Indiv. Characteristics	.100 *	.022
Computer Ability	.013	.007
Computer Use	.048 *	.208 ****
Adj. R^2	.137 *	.258 ***
WORKERS IN CLERICAL JOBS		
Job Characteristics	.133 ****	.062
Indiv. Characteristics	.102 ***	.022
Computer Ability	.058 *	.009
Computer Use	.001	.083 ***
Adj. R^2	.301 ****	.142 **

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table P. Simple correlations between predictors and outcomes for the group level heterogeneity hypotheses.

PREDICTORS	INCOME	COMPUTERS
INDIVIDUAL CHARACTERISTICS		
Age	.054	.070
Education	.491 ****	.074
% Women	-.004	.007
Unmarried	.019	-.174
Job Tenure	.030	.096
Org. Tenure	.097	.132
% Minority	.021	.048
WORK CHARACTERISTICS		
Job Category	.307 **	.027
Hours Worked	.225 *	.142
Supervising	.199	-.136
Routineness	.011	-.231 *
Exempt	.088	-.080
Task Uniformity	.174	.099
COMPUTER ABILITY		
Data Entry	.041	.182
Application Pkg.	-.061	.131
Programming Lang	-.138	-.024
Machine Language	-.022	.242 *
Systems/Hardware	.031	.102
Yrs. Experience	.002	.167
COMPUTER USE		
Hours of Use	.021	.049
% of Activities	-.120	-.022

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table P continued. Simple correlation between predictors and outcomes for the group level heterogeneity hypotheses.

PREDICTORS	INCOME	COMPUTERS
INFORMATION EXCHANGE		
Avg. Interaction	.144	-.149
Public Firm	.037	.056
Geog. Dispersion	-.114	.078
Group Size	.200	.098
Coordination	-.118	.269 **
SUPERVISOR CHARACTERISTICS		
Female	-.110	.024
Hiring Power	-.016	-.005
Firing Power	.030	.056
Job Tenure	-.053	.060
Org. Tenure	-.103	-.193
Education	.148	.094
Job Category	-.049	-.205

*p<.05; **p<.01; ***p<.001; ****p<.0001

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