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# Assessing employee response to changes in job design : a comparison of alternative job characteristics models.

Deborah M. Ramirez
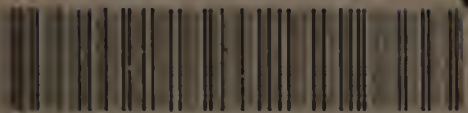*University of Massachusetts Amherst*

ASSESSING EMPLOYEE RESPONSE TO CHANGES IN
JOB DESIGN:  A COMPARISON OF ALTERNATIVE
JOB CHARACTERISTICS MODELS


A Dissertation Presented

by

Deborah M. Ramirez


Submitted to the Graduate School of the
University of Massachusetts in partial fulfillment
of the requirements for the degree of

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February, 1987

School of Management

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Approved as to style and content by:

_D. Anthony Butterfield_
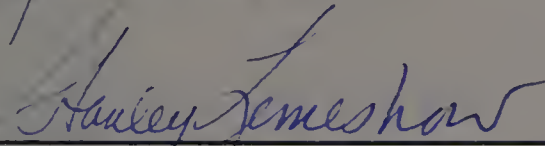
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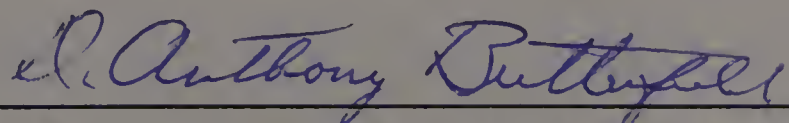
_Ronald Karren_

Ronald Karren, Member

_Jean McGuire_

Jean McGuire, Member

_Stanley Lemeshow_

Stanley Lemeshow, Member

_D. Anthony Butterfield_

D. Anthony Butterfield, Director of Doctoral
Program, School of Management

iii

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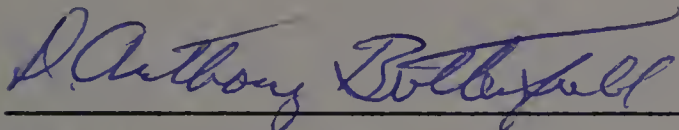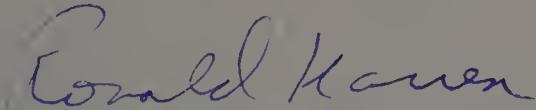
ABSTRACT

ASSESSING EMPLOYEE RESPONSE TO CHANGES IN
JOB DESIGN: A COMPARISON OF ALTERNATIVE
JOB CHARACTERISTICS MODELS

February, 1987

Deborah M. Ramirez, A. B., University of Chicago
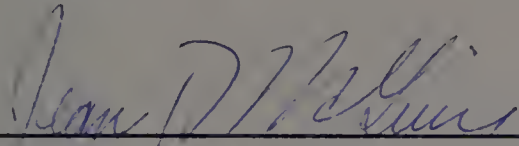
Ph. D., University of Massachusetts

Directed by: Professor D. Anthony Butterfield

This study is an exploratory investigation of the relationship between twenty-five job characteristics and employee job satisfaction, and changes in satisfaction due to changes in job design resulting from the implementation of a new computer system in five federal government offices. Regressions were fit for alternative models and compared to the Job Characteristics Model (JCM) to determine if a significantly greater amount of the variance in job satisfaction could be explained. Tests of both between-subjects hypotheses that job design affects satisfaction and within-subjects hypotheses that changes in job design affect changes in satisfaction were conducted. The dimensionality of work was also investigated by factor analysis.

The Job Factors Study Questionnaire was constructed to assess the amount present, amount desired and importance of twenty-five job

characteristics. Job satisfaction was assessed by the short-form of the Minnesota Satisfaction Questionnaire. The questionnaires were administered to 90 employees before implementation and to 75 of the same 90 employees six months after implementation. Multiple regression analyses were conducted on seven a priori models and two a posteriori models. Factor analysis was conducted on the twenty-five variables which measured the amount present of each job characteristic.

Seven job characteristics were identified as being very important to the respondents: Challenge, Feedback from agents, Learning opportunities, Pace control, Role ambiguity, Role conflict and Role overload. Measures of the amount present of each of these were used as independent variables in the Most Important Job Characteristics Model (MIJCM). In regressions of both between-subjects models and within-subjects models, the MIJCM provided a better regression fit and explained a significantly greater portion of the variance in satisfaction than the JCM. Factor analysis of the twenty-five amount present variables produced an interpretable 3-factor solution.

The results suggest that the job characteristics that are important to employees have the greatest impact on job satisfaction. Refinement of the job characteristics approach should proceed by incorporating Importance into model-building. The results of the factor analysis can provide some support for Griffin and Skivington's (1984) three component conceptualization of task: Individual, Physical and Social.

# TABLE OF CONTENTS

## LIST OF TABLES

# LIST OF FIGURES

# CHAPTER I

## INTRODUCTION

The study of changes that occur in organizations is a common topic of interest in the organizational sciences. Theoreticians and empirical researchers have developed ways to conceptualize, measure and evaluate change. A better understanding of the process of change will, hopefully, result in mitigating the human anguish and decreased work effectiveness which can be caused by change. It will help realize the potential of change to improve work life and organizational performance.

Organizations undergo change for a variety of reasons. The type of change investigated in this dissertation research was a change in job design which resulted from the introduction of a new computer system. The increasing availability of equipment to automate various work functions and the development of software to enhance the performance of currently installed systems has been a major impetus for change in the way that work is performed. The development of tools which can be used to more fully understand the impact that change may have on workers is one objective of research in the organizational sciences. This dissertation research is an attempt to address the need for development and refinement of such tools.

The use of computers in the work place has been changing the nature of work since the machines were first introduced three decades ago. At that time the jobs most profoundly affected were those held by the operators of the equipment and closely related personnel, but also affected were em-

ployees in those sections of the organization whose jobs were altered to incorporate one or more of the various computer applications. As computer usage became widespread, more applications were developed and thus more jobs were altered to take advantage of the time and cost savings that computers offered. The advent of distributed data processing, data base management systems and, most recently, inexpensive and powerful microcomputer hardware and software has been a major force behind the implementation of computerized systems in organizations of all sizes. Consequently, the potential impact on jobs in which such technology is used is enormous. As more applications are made available, jobs can be expected to change to some degree in order to make use of these applications in business today.

A vital issue which needs to be addressed is the way in which jobs in the organization change as work is redesigned around the new technology and the effect such changes may have on employee satisfaction and performance. Consultants and researchers have urged that organizations which acquire new information technology pay as much attention to the organizational issues in the implementation process as they do to the characteristics of the information technology itself (Gutek, Bikson, Eveland, Mankin & Mohrman, 1984). In and of itself, the technology does not impose its own structure on the organization, but choices must be made by the designers of the computer systems and by organizational members to direct the implementation of these systems in specified ways. Each choice that is made has implications for the design of the jobs in which the computer system will become a part. If management's objective is to maintain or increase the

levels of employee satisfaction and performance, the integration of a new system into the work of the organizational members must be done in such a way as to positively affect the components of work which are linked to satisfaction and performance.

The organizational sciences can assist the redesigner of jobs by providing theoretical models of the relationship between work components and organizational outcomes such as satisfaction and performance which can be used to guide the change process. The Job Characteristics Model of work motivation, developed by Hackman and Lawler (1971) and refined by Hackman and Oldham (1980, 1974), is one such model. The basic premise of this model is that work is composed of various attributes, or characteristics, which are highly motivating to the worker. Every job possesses different amounts of each characteristic. Varying the levels in which these character-istics are present will influence the levels of employee satisfaction and performance on the job. Jobs in which greater amounts of the character-istics are present will be jobs which also contain higher levels of satisfaction and performance; lesser amounts of the characteristics lead to lower amounts of these two outcomes. The amounts in which the characteristics are present in the job is referred to as the job scope. The process of increasing the amounts of the characteristics is called enlarging the job scope, commonly reffered to as job enlargement or job enrichment. Although many different frameworks can be adopted for studying changes in jobs, the job characteristics framework offers several advantages. First, the conceptualization of "work" is highly quantifiable. A scale is used to measure the amounts in which the characteristics are present. The

measurements are subjected to statistical analysis to test for the relation-
ships between the characteristics and various employee responses. Second,
this model has been used extensively in organizational research, and thus an
enormous amount of testing has provided a wealth of information on the
application of the model in research settings. Third, the conceptualization of
"work" as consisting of separate, identifiable components is intuitively
appealing. When faced with the task of describing how jobs are changed,
this model provides a manageable framework within which to investigate
such changes.

Working within the framework of the Job Characteristics Model, one
can view the implementation of a new computer system as an event which
has the potential to alter the amounts in which the characteristics of the job
are present. This would result in a change in the levels of employee satis-
faction and performance since these levels are affected by the amounts
present of the job characteristics. Therefore, an implementation affects
workers by changing the amounts in which their jobs possess motivating
characteristics. For example, suppose that an employee has been per-
forming the tasks in her job according to a format prescribed by her
supervisor. When software becomes available which allows her to access
information she needs in various ways, her supervisor may tell her to use
the computer to gather that information to complete her work in whichever
way would work best for her. According to the framework of the JCM, the
employee will experience an increase in the amount of autonomy present in
her job, which should result in an increased level of general satisfaction and
work effectiveness. Autonomy is one motivating characteristic of a job. The

job may be changed in other ways as well, which may result in increased or decreased levels of the amounts present of other job characteristics.

In many cases, the specific ways in which a job changes as a result of a computer system implementation may not be an intentional decision on the part of management. Very often an existing software package is installed and employees are trained in the use of the package as it has been designed with minor modifications to suit their needs. The criteria used for making decisions about software modifications is typically the short-term goal of getting the work done on the same or faster schedule than before the software was installed. Very little conscious effort is made to understand how the use of the new system may change the job characteristics configuration of each job affected by the installation. If the levels at which each job characteristic is present do indeed affect satisfaction and performance, then a decrease in these levels due to an unintentional job redesign may pose a long-term threat to the gains in performance anticipated by such a computer system implementation. On the other hand, a conscious effort to redesign jobs in a manner which maintains or enlarges the job scope should lead to maximum benefits from the implementation. The redesign of jobs which would result from the purchase and installation of a particular computer system should be taken into consideration before the final decision is made. During the construction or modification of a system the resulting job design must also be a factor in the system design. This implies that the computer system designer and the human resource specialist (or manager) must work together to achieve the optimal work system. Job redesign

becomes a key element of any work system redesign due to computerization or any change in work procedures.

The Job Characteristics Model was a framework developed to aid in the diagnosis of jobs which are low in motivating characteristics and thus lead to poor work performance and low employee satisfaction. An instrument based on this framework was developed to measure the amounts present of five characteristics and other aspects of the job, including employee satisfaction. This instrument is called the Job Diagnostic Survey (JDS). The results obtained from an administration of the JDS would be used to develop a job redesign program to increase the levels of the five job components. Use of the JDS as a job enrichment tool was preceded by research on the Job Characteristics Model conducted by its originators, Hackman and Lawler. Subsequent research (Hackman & Oldham, 1980) has established the validity of its use in many instances, although criticism of the model remains. Several concerns have been expressed about the inappropriateness of using the model in its present form. One concern is that the dimensionality of work is not the same as that assumed by the theory, i.e. five components that are universally salient to all individuals. Another concern is that the model is seldom used to explain the dynamic relationship between *changes* in the amounts of the job characteristics and *changes* in satisfaction or performance, but rather the static relationship between the amounts of the characteristics and satisfaction or performance at one point in time across groups of individuals is usually tested. The research reported in this dissertation is an exploratory study aimed at refining the job characteristics approach to job design by addressing these concerns.

The first objective of this study was to investigate *changes* in the amounts present of job characteristics and their effects on employee satisfaction. (The outcome variable of work performance was not examined in this study.) The relationship between increases or decreases in the amounts present of job characteristics (change in job scope) and increases or decreases in the levels of job satisfaction was examined using the Job Characteristics Model in a form which measured changes over a period of time within the same job. The second objective of the study was to generate and test alternative formulations of the job characteristics model. Additional job characteristics (twenty-five in all) which have been cited in the literature were used to assess the amount in which each job characteristic was *desired to be present* and the *degree of importance* which each subject attached to that job characteristic as well as the amount present of that job characteristic. Alternative models were generated and compared to Hackman and Oldham's formulation to determine if a significantly greater amount of the variance in job satisfaction could be explained by an alternative model. The results of this research significantly add to the literature by providing another much needed study of changes in job characteristics and their effects upon workers as well as refining the task attributes approach to job design.

All of the job characteristics in Hackman and Oldham's model may not be major determinants of job satisfaction for every individual. There may be different sets of factors which are important to different groups of workers. Rather than constructing a new model in which all twenty-five characteristics are measured, a search was conducted to isolate the char-

acteristics which were most important to the group of employees identified in this study. By determining which factors were most important, a different set of job characteristics emerged as a better predictor of job satisfaction than the Hackman and Oldham model. In the refinement of any theoretical model, an attempt is made to explain as much of the variation in the dependent variables as possible through the use of as few independent variables as possible. The selection of the "best" set of independent variables should include enough variables for adequate description, control or prediction, but not so many that analysis and interpretation is unduly complicated (Neter & Wasserman, 1974).

The search procedures for finding a "best" set rely heavily on subjective judgment. In this study two approaches were taken. First, job characteristics identified as most desired, most discrepant (between amount present and amount desired) and most important to the job incumbents were used to generate new models. The $R^2$ criterion was used to reach decisions on which sets of independent variables significantly added predictive power to the model. $R^2$, the coefficient of multiple determination, will always increase or remain the same as variables are added to a model, but the incremental increase can be tested using an F-ratio to determine its statistical level of significance. The goal of the process is to obtain a set of job characteristics which provide a parsimonious model of the job design—employee satisfaction relationship. Both the static relationship between levels of each characteristic and satisfaction as well as the dynamic relationship between changes in each variable were examined.

The second procedure that was used to find a "best" set of independent variables relies on a less statistical approach. In addition to obtaining measures of the amounts present of the twenty-five job characteristics included in this study, measures of the amounts desired and the importance of each individual job characteristic were also collected. Perhaps job satisfaction is not a function of *how much* of a motivating characteristic is present in a job, but rather a function of *how much of a discrepancy* exists between what is in the job and what is desired to be in the job. This information was collected to allow testing of the relationship between the discrepancy and job satisfaction. Particular job characteristics may be more important to some incumbents than to others. Perhaps it is these more important characteristics which affect job satisfaction, rather than the five included in Hackman and Oldham's model. These are issues which were examined in the study.

The dimensionality of "work" was also investigated. The Job Characteristics Model is based on the assumption that "work" is perceived by incumbents as consisting of five mutually exclusive components which define the entire job. Factor analysis of the variables which were measured by the amount present of the twenty-five job characteristics provided evidence of the number of dimensions of work perceived by this sample of job incumbents. The dimensionality issue has implications for the continued use of a task attributes approach to job design.

The background of the Job Characteristics Model and its use in the literature today will be presented in the following chapter. Then, a

presentation of the methodology used in the study, the results and a discussion will follow.

# CHAPTER II

## THEORETICAL AND EMPIRICAL BACKGROUND

In this chapter, the research literature which is based in the task attributes framework will be reviewed and the objectives of this research study as it relates to the literature will be presented. A review of the literature includes development of the framework, measurement issues, refinement through the use of moderator variables and extensions to the model, and a critical assessment of neglected areas in the job characteristics research. The theoretical background provides a base upon which the present study was conceived, designed and executed.

### Development of the Task Attributes Framework

The implementation of new technology and redesign of jobs are important determinants of workers' reactions to their jobs (Turner & Lawrence, 1965). As Turner and Lawrence state,

> The more rapidly technology advances, the more
> frequently jobs are going to be redesigned, and
> the greater the need for discovering how in fact
> workers do respond to variations in
> technologically determined task attributes (1965,
> p. 4).

Thus the foundation was laid for a task attributes approach to understanding the ways in which jobs are changed by computerization.

The task attributes approach, which subsequently evolved into what is now known as job characteristics theory, provided a conceptualization of

the job as consisting of separate, identifiable components which could be independently assessed and modified. These components were considered to be independent variables and the degree to which these were present in a job was thought to be related to three dependent variables: job satisfaction, attendance, and psychosomatic response (which was later dropped from the theory). Turner and Lawrence established criteria for selecting the descriptive framework: it should characterize jobs from across the entire range of industrial experience, it should be quantifiable, it should be able to describe jobs behaviorally in broadly defined terms, and it should be practical to use. They considered traditional ways of describing industrial work (such as technical, organizational, social and personal), but found these schemes to fall short of their criteria. None of these schemes could be used to describe the behavior that needed to be engaged in to perform the task, and most were limited in measurability. The behavioral conceptualization which they finally developed was based on Homans' (1950) categorization and included three elements of behavior— activities, interactions and mental states— crossed by two elements of task— prescribed and discretionary. The Requisite Task Attributes described were Variety, Autonomy, Required Interaction, Optional Interaction, Knowledge and Skill, and Responsibility (see Figure 1).

Turner and Lawrence were now able to investigate the task attributes—worker response relationship in terms of the operational measures which they developed. A score on a rating scale was obtained for each attribute of a particular job by field observation. Since the attributes were related, the researchers combined the scores into the RTA Index and

ELEMENTS OF BEHAVIOR

|  | | ACTIVI-TIES | INTER-ACTIONS | MENTAL STATES |
|---|---|---|---|---|
| ELEMENTS OF TASK | PRE-SCRIBED | Variety (Object and Motor) | Required Inter-action | Knowledge and Skill |
| | DISCRE-TIONARY | Autonomy | Optional Interaction (On or Off the Job) | Respon-sibility |

Figure 1. Requisite Task Attributes: Descriptive Scheme (Turner & Lawrence, 1965).

tested the relationship between the index and worker satisfaction and attendance. The model was supported, but indications of a moderating effect of subcultural variables were present.

## Development of the Job Characteristics Approach

Further refinement of the task attributes framework by Hackman and Lawler (1971) resulted in the development of three general properties possessed by jobs which are highly motivating to the incumbents: the job must allow the worker to feel personally responsible for a meaningful portion of the work, the job must provide outcomes which are intrinsically meaningful to the worker, and the job must provide feedback about what is accomplished. Four job characteristics were proposed to serve as measures of these three properties.

A measure of *autonomy,* as specified by Turner and Lawrence, taps the degree to which workers feel personal responsibility for their work, i.e., that the outcomes of the work are due to their own behavior. Jobs can be experienced as meaningful when they involve doing a whole piece of work of some significance, tapped by a measure of *task identity,* while at the same time giving employees a chance to use valued skills and abilities, tapped by a measure of *skill variety. Feedback,* either from the work itself or from supervisors or co-workers, is the final characteristic possessed by a motivating job. Hackman and Lawler emphasize that the critical issue is the way in which these characteristics are experienced by the jobholders.

> Regardless of the amount of feedback (or variety, or autonomy,
> or task identity) a worker really has in his work, it is how

much *he perceives that he has* [emphasis theirs] which will
affect his reactions to the job (1971, pp. 264-5).

Although objective job characteristics are important because they do affect

perceptions, care should be taken in assuming that a change in objective

characteristics necessarily leads to a corresponding change in the way the

job is experienced.

In the study undertaken by Hackman and Lawler, they were able to

confirm the findings of Turner and Lawrence. Workers whose jobs

possessed higher amounts of the four characteristics were found to be more

satisfied with their jobs. They also investigated the moderating effect of a

subcultural variable, "urban" vs. "rural" background, and confirmed pre-

vious findings that the job characteristics—employee satisfaction relation-

ship was stronger for workers of "rural" background. Similar results were

found for "higher order need strength" used as a moderator variable,

although not all job characteristics were moderated by this psychological

level variable. The emphasis in Hackman and Lawler's work was on the

need to redesign jobs that were found to be low in the amounts present of

the four job characteristics (referred to as the "core dimensions" or "core

characteristics") in order to increase their motivating potential. Thus, task

redesign by the job enrichment (or job enlargement) strategy was proposed.

Much of the subsequent work that was based on this job characteristics

model was undertaken with an eye toward diagnosis and redesign of jobs to

increase amounts of the core dimensions and to discover the limitations of

the strategy. Although this approach is still useful for assessing the impact

of computerization on employees, little work has been directly devoted to

measuring changes in job characteristics and the effects of such changes.

Areas of research that were stimulated after the refinement of the model by Hackman and Lawler concentrate on the measurement of job characteristics and basic testing of the job characteristics–worker response relationship across groups of individuals.

## Measurement of Job Characteristics and Job Satisfaction

Two instruments have been developed to obtain measures of the amounts in which the core characteristics are present in an individual's job. The Job Diagnostic Survey (JDS) was developed by Hackman and Oldham (1974,1975) to collect the following measures: five core characteristics ( *task significance* was added to the previous set of four core character-istics); two supplementary dimensions *feedback from agents* and *dealing with others*; the experienced psychological states of meaningfulness, responsibility and knowledge of results; various aspects of employee satis-faction; and individual growth need strength. The JDS can be administered directly to job incumbents to obtain self-report measures and/or observers or supervisors can rate the jobs. It was the researchers' intention for the instrument to be used both in the diagnosis of jobs prior to redesign and in research and evaluation activities aimed at assessing the effects of redesigned jobs. The Job Characteristics Inventory (JCI) was developed as a perceptual measurement tool by Sims, Szilagyi and Keller (1976). They kept the original four core characteristics and the two additional dimensions *dealing with others* and *friendship opportunities* which Hackman and Lawler explored in their work.

Standardized observations have also been used to assess job char-
acteristics (Jenkins, Nadler, Lawler & Cammann, 1975). In addition to the
five core characteristics and the dimensions *dealing with others* and
*feedback from others*, Jenkins et al. include twelve other job factors (see
Table 1). Tests for repeatability, homogeneity and convergent and discrim-
inant validity were, in general, acceptable but weak. Some factors fared
much better than others. Discrimination among job characteristics was
particularly poor.

When the JDS and JCI were introduced in the research literature, they
were accompanied by the results of tests for reliability and validity of the
instruments which their developers had undertaken. As the use of the
instruments spread, additional data became available for such assessments.
Tests for reliability of the JDS scales consist of Hackman and Oldham's
(1975) measures of internal consistency, which range from 0.59 (task
identity and dealing with others) to 0.78 (feedback from agents). These
measures are based on three items which compose each scale, obtained from
658 employees. Correlations among ratings by employees, supervisors and
observers were also reported. The median of the correlations between
employees and supervisors is 0.51; between employees and observers is
0.63; and between supervisors and observers is 0.46. Some inter-rater
correlations for specific job factors are quite low, however (e.g., feedback
from agents: 0.07 for employee/supervisor, -0.13 for employee/observer,
0.14 for supervisor/observer). A comparison of variance within jobs to
variance between jobs, in general, also supports scale reliability. Sims et al.
(1976) present corrected split-half reliabilities for factors measured by the

## TABLE 1

### JOB DIMENSIONS MEASURED BY INSTRUMENT

| Hackman and Oldham, 1975 (JDS) | Sims et al., 1976 (JCI) | Jenkins et al., 1975 (Observations) |
| --- | --- | --- |
| Skill variety | Variety | Variety |
| Task identity | Task identity | Task identity |
| Autonomy | Autonomy | Autonomy |
| Task significance | Feedback | Meaningfulness |
| Feedback from the job itself | Dealing with others | Task feedback |
| Feedback from agents | Friendship opportunities | External feedback |
| Dealing with others | | Rigidity |
| | | Certainty |
| | | Conflicting demands |
| | | Interruptions |
| | | Skills and abilities |
| | | Worker pace control |
| | | Dependence |
| | | Cooperation |
| | | Work pressures |
| | | Effort |
| | | Resources |
| | | Comfort |
| | | Locus of pace control |

JCI scales for each of two samples. For a sample of 1161 Medical Center employees, reliabilities range from 0.62 (friendship opportunities) to 0.80 (variety and feedback). Reliability measures in the same range were found for the sample of employees in a manufacturing firm. Pierce and Dunham (1978) found that the JCI demonstrated stronger internal consistency than the JDS. Cronbach coefficient alpha values for four JCI scales were above 0.85, whereas the values for the JDS ranged from 0.69 (feedback) to 0.79 (autonomy). This may be expected since more items are used by the JCI than the JDS to measure three of the factors. In subsequent research, reliability measures are often reported and have usually been found satisfactory.

Tests for validity have included tests of discrimination between job factors, convergence among the scales composing a single factor, and dimensionality of the instrument used to measure the factors. Intercorrelations among JDS scale scores (Hackman & Oldham, 1975) show job factors to be moderately positively intercorrelated. Sims et al. (1976) constructed a discriminant and convergent validity matrix and concluded that the four job characteristic variables presented evidence of discriminant and convergent validity of the JCI. In addition, multiple discriminant analysis was success-ful in showing that job characteristics can discriminate between occu-pational groups. Factor analysis of the JCI yielded an interpretable six-factor structure which lent evidence of construct validity. The dimension-ality of the JCI has also been investigated by Brief and Aldag (1978) and Griffin, Moorhead, Johnson and Chonko (1980). Pierce and Dunham's (1978) comparison of the JDS and JCI showed support for the four factor structure

of the JCI but failed to confirm the dimensionality of the JDS. Dunham (1976) and Dunham, Aldag and Brief (1977) were also unable to confirm the five-factor structure of the JDS as the best solution for most samples they tested. Using confirmatory factor analysis, Harvey, Billings and Nilan (1985) obtained maximum likelihood solutions from the LISREL V computer program to show support for the five-factor structure of the JDS. They obtained the best fit when they included two method factors to account for the method variance introduced by negatively worded items and three-anchor scaling. Either the underlying dimensionality of perceived task design is different for every sample, or the JDS is inadequate for assessing multidimensionality in certain circumstances.

Ferratt, Dunham and Pierce (1981) demonstrated a lack of discriminant validity of the satisfaction instruments often used in job characteristics research—portions of the JCI and JDS which measure satisfaction and the Minnesota Satisfaction Questionnaire—and questioned the ability of commonly used instruments to distinguish between the description of task characteristics and the evaluation of jobs as measured by job satisfaction. The issue of common method variance is also raised, since job characteristics and job satisfaction are both assessed by a single method, i.e., questionnaire. An unknown portion of the error must be attributable to a common causal variable (Thomas & Griffin, 1983; Griffin, 1982; Roberts & Glick, 1981). A subsequent article by Aldag, Barr & Brief (1981) provides a review of the psychometric properties of the JDS and the JCI.

The most radical reaction to the inability of the model's five dimensional structure to be confirmed is the proposal to develop an entirely new

framework based on three dimensions of work: Individual, Social and Physical (Griffin & Skivington, 1984). In their conceptualization of task, Griffin and Skivington suggest that tasks can be described and characterized along these three dimensions. The physical dimensions refers to the objective elements and interrelationships that comprise the task, regardless of the individual performing the task or the social context. The individual dimension refers to unique variations among individuals in terms of what they bring to the task and what they expect from their work. The social dimension refers to the direct and indirect interpersonal aspects of an individual's work setting—the work group context, the organizational context and the societal context. They stress the need for theoretical enhancement of this framework, but point out that its primary strength is that it provides a parsimonious framework while simultaneously allowing a detailed and substantive analysis and assessment of most task settings.

In the original task attributes framework developed by Turner and Lawrence (1965), three worker response measures were examined: job satisfaction, attendance and psychosomatic response. Hackman and Lawler (1971) examined job satisfaction, attendance and employee performance. Subsequent studies carried out under this framework have focused on two variables: job satisfaction and employee performance. Griffin (1982) reports that research has shown strong support for a positive task design—job satisfaction relationship, but less support for the relationship between task design and performance. Since job characteristics and job satisfaction are typically assessed by the same questionnaire, the relationship may be due to common method variance rather the existence of a

"true" relationship. Since few studies have obtained job characteristics measured by means other than self-report, this issue cannot yet be fully examined. Loeher, Noe, Moeller and Fitzgerald (1985) conducted a meta-analysis of the job characteristics—job satisfaction relationship and found moderate support in the 28 studies which were included. The overall sample-weighted correlation coefficient was .39 after correcting for unreliability in the measures. The instruments which were used to measure satisfaction in these studies were: Alderfer ERG, Brayfield and Rothe, Hackman and Lawler, Job Descriptive Index—Work, Job Diagnostic Survey—General Satisfaction, Kunin Faces Scale, Minnesota Satisfaction Questionnaire, Index of Organization Reactions, Yale Job Inventory, and Lawler and Hall.

## Moderator Variables

When Turner and Lawrence (1965) conducted their study, they made the unexpected finding that two different patterns of response to task attributes existed in their sample. The hypothesized positive relationship between task scope (as measured by the RTA Index) and the dependent variable of job satisfaction held only for those who worked in Town settings. In contrast, City workers found higher job satisfaction on jobs of low task scope (low RTA scores). This finding led to an investigation of subcultural factors to account for "moderators" of the task scope—satisfaction relationship. As reported by Pierce and Dunham (1976) in their literature review, other subcultural, or sociological level, factors were explored as potential moderators. Shepard (1970), Susman (1973), Schuler (1973) and Stone and

Porter (1973) investigated the urban—rural distinction and attempted to draw out the underlying differences. Stone (1974) used Protestant Work Ethic scores to obtain a measure of individual alienation. Aldag and Brief (1975) analyzed the moderating effect of demographic and psychological variables. Support for a moderating effect was mixed and not consistent.

Hackman and Lawler (1971) attempted to reconceptualize the socio-logical level factors into individual level factors. Based on the expectancy theory of motivation, individual differences in the strength of the desire to satisfy higher order needs through work on jobs which are meaningful, give a sense of responsibility and knowledge of results were found to serve as a moderator of the task scope—satisfaction relationship. They developed a measure of "higher order need strength" (HONS) and found a moderating effect for the relationships between satisfaction and three of the four job dimensions studied. Brief and Aldag (1975) replicated their findings. Sims and Szilagyi (1976) also found support for a HONS moderator. Oldham (1976) also found that "growth need strength" (GNS) moderated the relationship. In their reformulation of the job characteristics model, Hackman and Oldham (1976, 1980) and Hackman, Oldham, Janson, and Purdy (1975) included GNS. Subsequent research on the moderating effects of individual difference variables has not always confirmed such a relation-ship (Steers & Spencer, 1977; Stone, Mowday & Porter, 1977; White, 1978; Aldag & Brief, 1979b; Pokorney, Gilmore & Beehr, 1980; Ganster, 1980; Farh & Scott, 1983; Seers & Graen, 1984; Champoux, 1980; Evans, Kiggundu & House, 1979; Abdel-Halim, 1979). Different conclusions about the useful-ness of continuing the search for individual difference variables have been

reached. As Griffin (1982) reports, Aldag and Brief (1979a) are strong advocates while White (1978) laments the inability of research to generate generalizable moderators with "Why continue?" (1978, p. 278).

## Extensions to the Model

The social information processing approach to task design was an outgrowth of the job characteristics framework. A major criticism of the job characteristics approach was that almost an entire body of research focused on five core characteristics which were expected to be universally salient and complete. This prompted researchers to consider the relationship between objective and perceived task characteristics. As reported by Thomas and Griffin (1983), the social information processing model is based on the assumption that the salient content and dimensions of jobs may be partially the result of perceptions that are shaped through social influences. Cues may be provided by the social environment as to which dimensions are used to characterize a particular job and which dimensions are more important than others. Thus research under a social information processing framework is aimed at discovering how social cues shape job perceptions (Salancik & Pfeffer, 1978; Oldham & Miller, 1979; White & Mitchell, 1979; O'Reilly, Parlette & Bloom, 1980; O'Connor & Barrett, 1980; Shaw, 1980; Griffin, 1983). Although the initial development of this model promised an alternative view of task design, Thomas and Griffin (1983) in their literature review note that the majority of the research supported a viewpoint which overlaps job characteristics theory.

The relationship between job characteristics and structural elements of the organization has also been considered. In a study conducted by Dunham (1977), Perceived Environmental Characteristics (PEC) were measured in an attempt to discover a moderation of the task design—affective response relationship. The PEC's included such variables as organizational climate, company support, interpersonal and task-oriented leadership and work assignment. Rousseau (1977) found significant differences between job characteristics, employee satisfaction and motivation across technology [long-linked, mediating and intensive (Thompson, 1967)]. Other studies have built on the "macro" variable explanation (Rousseau, 1978; Pierce, Dunham & Blackburn, 1979; Abdel-Halim, 1981; Snizek & Bullard, 1983).

The job characteristics model, or portions of the model, has been used in related investigations. The relationship between task characteristics and leader behavior has been studied (Griffin, 1980; Ferris, 1983; Seers & Graen, 1984). Experimental manipulations of autonomy have been made (Farh & Scott, 1983). Task interdependence has been reintroduced as an important job component (Kiggundu, 1981, 1983).

## Neglected Areas in Job Characteristics Research

In their critical review of seven conceptual models available to study the motivational properties of tasks, Steers and Mowday (1977) have expressed the following concerns.

> Although such studies abound [examining the
> relationships between perceived job character-
> istics and employee reactions], the type of

> research methodology typically employed suggests
> caution in interpreting the results. Correlating
> perceived job characteristics with employee
> satisfaction at one point in time provides a static
> comparison, revealing little about how employees
> react to *changes* in their jobs (1977, p. 646,
> emphasis theirs).

The author is aware of only six studies in which changes in task character-istics were assessed. Four of these were field studies (Hackman, Pearce & Wolfe, 1978; Dunham, Newman & Blackburn, 1978; Oldham & Brass, 1979; Ramirez, 1985, one study was an experimental simulation to investigate response shifts (Terborg & Davis, 1982), and researchers experimentally manipulated autonomy in the final study (Farh & Scott, 1983).

Hackman et al. (1978) found that the effect which the changes had on satisfaction of employees was unfavorable. However, for those groups of employees whose jobs were increased in scope, general satisfaction in-creased as well. Decreases in job scope resulted in decreases in satisfaction. Dunham et al. (1978) found that no significant mean change in perceptions of task complexity could be detected 3 months after a task redesign, but did find a change 12 months afterwards. Oldham and Brass (1979) investigated the effect of changes in physical layout of an office upon employee satis-faction and work motivation. They found that the change in physical layout led to decreases in the extent to which many of the job characteristics were present and also to decreases in satisfaction and work motivation. Ramirez (1985) found no significant change in task scope, but a significant increase in satisfaction. Terborg and Davis (1982) found increases in the motivating potential scores (a measure of task scope) and satisfaction after an experi-mental manipulation of task characteristics, and found support for the use

of retrospective ratings as well. Farh and Scott (1983) found that experimental variations of autonomy produced a negative effect on performance. Griffin (1981) investigated the stability of the task characteristics—outcome variable relationship over a three month period, but this was for purposes of reliability assessment. No task change intervention took place. He found that individual perceptions of task characteristics are relatively stable over a three month time interval, but individual reactions to perceived task characteristics are less stable.

Another concern expressed by Steers and Mowday is directed at the Turner and Lawrence Requisite Task Attributes model.

> . . . the task characteristics they identified were based on an a priori classification scheme and little attention was given to establishing empirically their importance to the respondents. In the absence of such information, it is not possible to conclude that the six task attributes they identified are the most salient ones from a motivational standpoint (1977, p. 648).

Sims, Szilagyi and Keller (1976) have stated a similar concern regarding the JCI.

> While the JCI will be useful to various researchers, it should be pointed out that the six dimensions discussed in the paper are by no means an exhaustive list of aspects which are important or characteristic of all tasks. Certain job characteristics not studied in this paper—such as task complexity, task responsibility, task challenge—may be salient aspects of many jobs in other organizations. Such additional job characteristics deserve the attention of researchers in order that this field of study may continue to develop (1976, p. 210).

Turner and Lawrence (1965) state that the first step in the development of the task attribute measurements was a search of "the relevant

literature and their own experience" (1965, p. 148). Their research was prompted by the concern in the 1960's that automation was responsible for the de-skilling of industrial work, loss of autonomy and decrease in human interaction on the job. In response to those concerns, it is easy to see which job attributes were selected for inclusion in their model. Furthermore, one of the criteria used in selecting a framework was that it be able to characterize jobs from across the entire range of *industrial* experience. Thus the focus of the model was its use in work of an industrial nature, not in administrative, clerical, professional or service occupations. From a motivational standpoint, the job characteristics chosen for inclusion in the model may not be the most salient ones for workers in nonindustrial occupations. In reference to the quote from Sims et al., while some studies have included measures of additional job characteristics, no systematic attempt has been made to integrate these characteristics into the existing model.

Following up their comments on the lack of empirically establishing the importance of the task characteristics to respondents, Steers and Mowday (1977) conclude that

> . . . the derivation and importance of various task characteristics remain ambiguous. The task characteristics that are typically studied are based most often on conceptual (rather than empirical) classification schemes. Such nonempirical approaches raise questions concerning the relevance of the selected task characteristics for motivation and performance. Perhaps other more important characteristics have not been defined into the existing models. Few serious attempts have been made by investigators to examine the relative importance of each task characteristic in influencing behavior. While the determination of such weights is easily accomplished, it remains to be done (1977, p. 655).

Griffin (1977) presented evidence that workers may have prefer-
ences for different job characteristics. In his sample of 65 managers and
non-managers, he used trade-off analysis to show that workers preferred
feedback and autonomy more than variety and identity. The impact that
different preferences for job characteristics would have on the task
design—employee satisfaction relationship remains to be determined.

## Objectives of this Research Study

The study reported in this dissertation addresses the concerns
expressed above. First, an assessment of the changes in task design due to
the implementation of a new computer system was made and related to
changes in employee satisfaction. This provided a test of Hackman and
Oldham's Job Characteristics Model as a dynamic model of change.

Second, the concern expressed by Sims et al. that job characteristics in
addition to those included in the JCI deserve the attention of researchers in
order to continue the development of this field of study was directly
addressed. Researchers have investigated various job characteristics,
typically drawing on previous work which had yielded measures that fit
into the job characteristics framework. While providing answers to the
research questions posed by the study, their conclusions are of limited value
in refining a general model. No systematic attempt had been made to
incorporate a large number of job characteristics in a single study. Early
work that was based on the conceptual classification schemes of their
developers was an important and necessary first step, but further progress
may be achieved by taking an empirical approach which can establish the

saliency of selected job characteristics to the job incumbents. That is the approach that was taken in this study. Twenty-five job characteristics have been identified in the literature which can readily yield self-report measures similar to those gathered on the JDS. These characteristics (see Table 2) have been used in the literature to describe aspects of jobs that individuals find intrinsically or extrinsically motivating (or de-motivating). Third, in an attempt to investigate the relevance of the selected job characteristics to an employee, and thus establish saliency, two assessments were made in addition to obtaining a measure of the degree to which a particular job characteristic is perceived to be present. A measure of the amount in which a particular job characteristic is *desired* to be present as well as a measure of the degree of *importance* which a subject attaches to that characteristic was obtained for each job characteristic. A measure of the amount of the *discrepancy* between the amount present and the amount desired was calculated from the raw measures and served as a way to locate the job characteristics with which incumbents indicated the least degree of fit. In earlier studies it was assumed that the larger the amount in which the job characteristic was present (a large job scope), the greater the level of satisfaction or performance. This may or may not be so, but was never investigated directly. Even if the assumption does hold true for the characteristics which are included in the JDS and JCI, it might not be tenable for the twenty-five which are included in this study. The inclusion of these additional measures allowed alternative models to be constructed. These models were compared to each other and to Hackman and Oldham's formulation of the Job Characteristics Model to determine if a greater amount of

TABLE 2

JOB CHARACTERISTICS MEASURED IN THE STUDY
AND THEIR LITERATURE REFERENCES

| Job Characteristic | Literature Reference |
| --- | --- |
| 1. Autonomy | Hackman & Oldham, 1980 |
| 2. Certainty | Jenkins et al., 1975 |
| 3. Challenge | Cammann et al., 1983 |
| 4. Dealing with others | Hackman & Oldham, 1980 |
| 5. Effort | Jenkins et al., 1975 |
| 6. Feedback from agents | Hackman & Oldham, 1980 |
| 7. Feedback from the job | Hackman & Oldham, 1980 |
| 8. Friendship opportunities | Hackman & Lawler, 1971 and Sims et al., 1975 |
| 9. Interruptions on the job | Jenkins et al., 1975 |
| 10. Knowledge and skills required | Jenkins et al., 1975 and Cammann et al., 1983 |
| 11. Learning opportunities | Rousseau, 1978 |
| 12. Initiated task interdependence | Kiggundu, 1983 |
| 13. Optional interaction | Turner & Lawrence, 1965 |
| 14. Pace control | Jenkins et al., 1975 and Cammann et al., 1983 |
| 15. Required interaction | Turner & Lawrence, 1965 |
| 16. Responsibility | Hackman & Oldham, 1980 and Cammann et al, 1983 |
| 17. Received task interdependence | Kiggundu, 1983 |
| 18. Rigidity | Jenkins et al., 1975 |
| 19. Role ambiguity | Rousseau, 1978; Rizzo, House & Lirtzman, 1970 and Cammann et al., 1983 |
| 20. Role conflict | (same as Role ambiguity) |
| 21. Role overload | Cammann et al., 1983 |
| 22. Skill variety | Hackman & Oldham, 1980 |
| 23. Training adequacy | Cammann et al. 1983 |
| 24. Task identity | Hackman & Oldham, 1980 |
| 25. Task significance | Hackman & Oldham, 1980 |

the variance in employee response could be explained. Both the static relationship between job characteristics and employee satisfaction across individuals as well as the dynamic relationship between changes in job characteristics and changes in satisfaction were tested using the alternative models.

The dimensionality of "task" was also investigated in this study. Factor analysis of the amount present variables used in the analyses produced factor solutions reflecting the dimensions into which "task" could be broken, at least in this sample.

The employee response measure used in this study was general satisfaction with the job. Where appropriate, the relationship between job characteristics and intrinsic job satisfaction or between job characteristics and extrinsic job satisfaction was investigated.

The procedures used for construction of the instrument to measure the independent variables, selection of the instrument to measure the dependent variables, selection of sample, questionnaire administration and analysis of data are presented in the following chapter.

# CHAPTER III

## METHODOLOGY

In order to investigate the issues raised in the preceding chapter, the following procedures were followed. A list of job characteristics used by various researchers was compiled and a questionnaire was designed to obtain self-report measures of each characteristic. Additional related information, which is described below, was also obtained. The questionnaire was administered to employees of the federal government at their work sites at two points in time. Measures were taken *before* (at time$_1$) and *after* (at time$_2$) the installation of new computer software systems in their workplaces during October, 1985. Time$_1$ measures were taken before the installation in July (three offices) and September (two offices) and time$_2$ measures were taken six months after the installation in April, 1986. Identical forms of the questionnaire were used in each administration. Analyses included various descriptive analyses, tests of the fit of various regression models proposed and factor analysis of model dimensionality.

### Selection of the Variables

The literature generated from a task attributes framework between 1965 and 1985 was inspected to compile the list of job characteristics which would be used as independent variables in the study. Many studies utilized the five core characteristics proposed by Hackman and Oldham (1980) as well as the two additional characteristics *dealing with others* and *friendship*

33

*opportunities* which were used by Hackman and Lawler (1971) and Sims, Szilagyi and Keller (1976). Comparatively few studies utilized self-report assessments of the variables which had been measured by observation in the study by Jenkins, Nadler, Lawler and Cammann (1975). Occasionally, only one or two job characteristics were examined in isolation from others (e.g., Kiggundu, 1983, 1981) or in addition to Hackman and Oldham's core characteristics (e.g., Rousseau, 1978). Cammann, Fichman, Jenkins and Klesh (1983) included measures of job characteristics in their instrument which was designed to assess organizational change.

Several other job characteristics were under consideration for inclusion in the study, but were eliminated because of the difficulty they would have presented in the interpretation of their measures. In many cases, the questionnaire items which would be used to measure the construct had very similar wording to those already included. Although this would present a good opportunity to assess the construct validity, an effort was made to include only the items which, subjectively at least, appeared to measure different constructs. This, of course, underlines the subjective aspects of even an empirical approach to model refinement.

Table 2 in Chapter 2 supplies a complete list of references for the characteristics selected for inclusion in this study. When a job characteristic was used in several studies, reference was made to the study or studies which included the characteristic first or supplied the wording for use in the assessment instrument. These twenty-five characteristics are a good representation of what can be found in the literature and examination of

them can lead to significant refinements of the job characteristics model of task design.

The dependent variable used in the study is general satisfaction with the job, although subscales of intrinsic and extrinsic satisfaction will be used in some analyses.

## Construction of the Job Factors Study Questionnaire

The Job Factors Study Questionnaire (JFSQ) was constructed to obtain self-report measures of all of the independent variables. The complete JFSQ is in Appendix A. For each job characteristic, three types of assessments are made: *Amount Present*, *Amount Desired* and *Importance to the respondent*. The amount in which each characteristic is perceived to be *present* in the job is measured using three items in two separate sections of the questionnaire. In section one, the respondent is asked to assess the extent to which each characteristic is present on a Likert scale which ranges from 1 ("To a very little extent") to 7 ("To a very great extent"). Twenty-two of the items are worded such that a higher number indicates a greater amount present of the characteristic. Three items are reverse-worded since these three characteristics may be interpreted as less socially desirable than the other twenty-two. Two items are used in section three in which a description of the job including the presence of the characteristic is made and the respondent is asked to indicate the accuracy of the statement from 1 ("Very Inaccurate") to 7 ("Very Accurate"). One item of the pair is worded such that the description states an amount present which is the reverse of the other item. The fifty statements so generated are randomly scattered

throughout section three. The wording for the items which are included in the JDS is taken directly from that instrument. Items which are noted in Table 2 as coming from Cammann et al. (1983) are contained in the Michigan Organizational Assessment Questionnaire. The wording of other items comes from the source noted in the literature reference. The score for *Amount Present* is the average of the three items, corrected for reverse-wording. A higher number indicates a greater perceived amount present of the job characteristic in the job of the respondent.

The *Amount Desired* to be present of each characteristic is measured in section two in part (a) of a two part question. The respondent is presented with the same description of the job as that given in section one, but asked "To what extent would you like a job in which ... ?" The 1 to 7 scale uses behavioral anchors at the extremes and the midpoint anchor states "I would like a job somewhere in between." The order of presentation of the items in section two is different than that of section one; they are randomly scattered throughout the section.

A measure of the *Importance* which the subject attaches to each job characteristic is obtained in part (b) of the question in section two. After the respondent replies to the item which measures the amount desired, he or she is asked "How important is this factor to you?" Rather than circling or writing a number as was done in part (a) and in sections one and three, the respondent is presented with four categories and asked to place an "X" on the line which indicates his or her choice. The categories are "Not Important", "Slightly Important", "Moderately Important" and "Very Important".

In addition to these three measures which are directly obtained from the questionnaire, the *Discrepancy* between the amount present and the amount desired in the job is calculated as a difference score and used in some analyses.

Biographical information was collected in section four only on the questionnaire which was administered before the change in computer system (time$_1$); it is omitted in the time$_2$ administration. The respondent was asked to supply information regarding number of years with the present organization, number of years in the present position, educational level attained, job title, sex and age category. Location of the particular office in which the respondent worked was also recorded.

## Selection of the Minnesota Satisfaction Questionnaire

The dependent variable, general satisfaction with the job, is measured by the short-form of the Minnesota Satisfaction Questionnaire (Weiss, Dawis, England & Lofquist, 1967). The MSQ is in Appendix B. The MSQ provides subscales of Intrinsic Satisfaction and Extrinsic Satisfaction as well as an overall measure of general satisfaction. Aldag, Barr and Brief (1981) have criticized the use of the satisfaction measures included on the JDS or the Job Descriptive Index (Smith, Kendall & Hulin, 1969) to measure job satisfaction in task characteristics research. Scales from the JDI essentially equate satisfaction with perceptions of an enriched job, thus introducing the problem of domain overlap. Other concerns center around the issues of common method variance and the potential for producing spurious inflation of the job characteristics—job satisfaction relationship when a general

response measure is used. They advocate the use of measures that focus on eliciting evaluative rather than descriptive responses, such as the MSQ, to alleviate some of the problems.

The short-form MSQ consists of 20 items which describe various facets of the job (see Table 3). The respondent is instructed to ask himself how satisfied he is with each facet of his job and to indicate whether he is "Very Dissatisfied", "Dissatisfied", "Neither Satisfied nor Dissatisfied", "Satisfied", or "Very Satisfied". Responses are weighted from 1 to 5, respectively. Scale scores are determined by summing the weights for the responses chosen for the items in each scale. The range for the General Satisfaction scale is 20 (low) to 100 (high). Scores for Intrinsic Satisfaction can range from 12 to 60; the range for Extrinsic Satisfaction is 6 to 30. The short-form was developed by choosing 20 representative items from the long-form MSQ, which consists of 100 items. The items chosen were those which correlated the highest with their respective scales.

The reliability and validity of the short-form MSQ have been examined (Weiss et al., 1967). Internal consistency is high, as shown by Hoyt reliability coefficients calculated for seven occupational groups (N=1723). For the General Satisfaction scale, the coefficients ranged from .87 (for assemblers) to .92 (for engineers). The range on the Extrinsic Satisfaction scale was .77 (electronics assemblers) to .82 (engineers and machinists). On the Intrinsic scale the range was .84 (two assembler groups) to .91 (engineers). Median reliability coefficients were .90 for General Satisfaction, .80 for Extrinsic Satisfaction, and .86 for Intrinsic Satisfaction. Stability of the General Satisfaction scale may be inferred from

## TABLE 3

## TWENTY FACETS OF THE JOB INCLUDED
## ON THE MINNESOTA SATISFACTION QUESTIONNAIRE

1.  Ability utilization.
2.  Achievement.
3.  Activity.
4.  Advancement.
5.  Authority.
6.  Company policies and practices.
7.  Compensation.
8.  Co-workers.
9.  Creativity.
10. Independence.
11. Moral values.
12. Recognition.
13. Responsibility.
14. Security.
15. Social service.
16. Social status.
17. Supervision—human relations.
18. Supervision—technical.
19. Variety.
20. Working conditions.

data on the long-form MSQ since both scales use the same 20 items. Test-retest correlation of those scale scores yielded coefficients of .89 over a one-week period and .70 over a one-year interval. An investigation of the validity of the long-form MSQ shows good evidence of construct validity for the Ability Utilization, Advancement and Variety scales, some evidence of construct validity for the Authority, Achievement, Creativity and Responsibility scales, and little evidence of construct validity for the Activity, Compensation, Independence, Moral Values, Recognition, Security, Social Service, Social Status and Working Conditions scales of the Minnesota Importance Questionnaire (a companion measure of vocational needs). Evidence for concurrent validity of the MSQ consists of findings that there are group differences in satisfaction which parallel accumulated research findings.

## Selection of Sample

Since one objective of the study was to assess the changes in task design due to a change in computer systems, a field site was sought which could provide a natural setting for assessing the effects of such a change. The Division of Coal Mine Workers' Compensation of the the U.S. Department of Labor had plans to install a new computer software system on October 1, 1985. The offices of Coal Mine Workers' Compensation which are served by the Philadelphia Regional Administration were made available for the study by the Director of Workers' Compensation Programs. Claims examiners and associated clerical workers are employed by these offices, which are located in five cities in Pennsylvania and West Virginia, to process workers'

compensation claims in accordance with the Federal Mine Safety and Health Act.

Only permanent (full or part time) employees who had been working in their jobs for at least six months prior to the time$_1$ questionnaire administration were asked to participate, of which there were a total of 128 eligible. Ninety respondents were obtained. Participation rates at each site ranged from 62 percent to 85 percent (See Table 4). A profile of the participants in terms of biographical data obtained from them can be found in Table 5. Most respondents had worked in their present position from 4 to 10 years and nearly all had worked for the federal government for 4 or more years. All respondents had at least a high school degree and most had completed some work beyond the high school level. About a third were clerical workers, almost half were claims examiners or supervisors (who are also claims examiners) and the remaining employees worked in capacities such as Workers' Compensation Assistant or Medical Scheduler. Three-fourths of the respondents were female. While a wide age range was represented, slightly more than half the respondents were between 30 and 39 years of age.

## Changes in Jobs due to Computerization

A new computer system to keep track of workers' compensation claims was implemented on October 1, 1985. This system replaced a pre-existing system that was generally recognized as outdated and inadequate to meet the needs of the users. Some additional hardware was purchased and installed at each office.

## TABLE 4

### PARTICIPATION RATES

| Site | No. Employees Eligible to Participate | | | No. Employees Participating | | | Percentage of Employees Participating |
|------|---------|------|-------|---------|------|-------|---------|
|      | On-Site | Ab-sent | Total | On-Site | By Mail | Total |         |

| Part One: Summer, 1985 (Time$_1$) | | | | | | | |
|------|------|------|------|------|------|------|------|
| 1 | 51 | 9 | 60 | 34 | 3 | 37 | 62 |
| 2 | 15 | 3 | 18 | 11 | 1 | 12 | 67 |
| 3 | 15 | 0 | 15 | 12 | 0 | 12 | 80 |
| 4 | 21 | 1 | 22 | 18 | 0 | 18 | 82 |
| 5 | 12 | 1 | 13 | 10 | 1 | 11 | 85 |
| Total | | | 128 | | | 90 | 70 |

| Part Two: Spring, 1986 (Time$_2$)[a] | | | | | | | |
|------|------|------|------|------|------|------|------|
| 1 | 30 | 3 | 33 | 30 | 3 | 33 | 100 |
| 2 | 9 | 1 | 10 | 9 | 0 | 9 | 90 |
| 3 | 9 | 2 | 11 | 9 | 0 | 9 | 82 |
| 4 | 16 | 0 | 16 | 15 | 0 | 15 | 94 |
| 5 | 8 | 1 | 9 | 8 | 1 | 9 | 100 |
| Total | | | 79 | | | 75 | 95 |

[a]Only those employes who participated in part one of the study were eligible to participate in part two.

## TABLE 5

### BIOGRAPHICAL PROFILE OF RESPONDENTS

| Variable | Category | Percentage in Category[a] |
|---|---|---|
| Number of Years with the Organization | Less than 1 Year | 8.9 |
| | 1 to 3 Years | 13.3 |
| | 4 to 10 Years | 82.5 |
| | 11 to 20 Years | 3.3 |
| | Over 20 Years | 0.0 |
| Number of Years in the Present Position | Less than 1 Year | 14.4 |
| | 1 to 3 Years | 21.1 |
| | 4 to 10 Years | 61.1 |
| | 11 to 20 Years | 1.1 |
| | Over 20 Years | 1.1 |
| Educational Level | Grade School | 0.0 |
| | Some High School | 0.0 |
| | High School Degree | 30.0 |
| | Some Business or Technical School | 8.9 |
| | Some College | 17.8 |
| | Business or Technical School Degree | 7.8 |
| | College Degree | 31.1 |
| | Master's or Higher Degree | 3.3 |
| Job Category | Clerk-Typist | 17.8 |
| | Secretary | 4.4 |
| | Data Transcriber | 3.3 |
| | Mail/File Clerk | 11.1 |
| | Clerical Supervisor | 2.2 |
| | Claims Examiner | 42.2 |
| | Supervisor (also a Claims Examiner) | 6.7 |
| | Paraprofessional | 11.1 |
| Sex | Male | 24.4 |
| | Female | 74.4 |
| Age Category | Under 20 Years | 1.1 |
| | 20 to 29 Years | 14.4 |
| | 30 to 39 Years | 51.1 |
| | 40 to 49 Years | 17.8 |
| | 50 to 59 Years | 12.2 |
| | 60 Years or Over | 2.2 |
| Research Site | Site No. 1 | 41.1 |
| | Site No. 2 | 13.3 |
| | Site No. 3 | 13.3 |
| | Site No. 4 | 20.0 |
| | Site No. 5 | 12.2 |

[a]Percentages do not add up to 100 due to missing information.

Measurements of the perceived job characteristics were made both before and after the implementation.[1] No job redesign program was undertaken in conjunction with the planned system change, so no a priori assumptions were made about which job characteristics would be likely to change or that any would change at all. The focus of the study was on the ability of the alternative models to provide improved descriptions of the task design—job satisfaction relationship. Increases in the amounts present of the job characteristics should result in increases in satisfaction; decreases should lead to decreases and no changes in job characteristics should lead to no changes in job satisfaction.

During the collection of data after the system change, the supervisors were asked whether or not they saw evidence that jobs had been changed by the implementation. Although they expressed general satisfaction with the features that the new system offerred, none of them saw any substantial changes in their jobs or in the jobs of their subordinates due to the computer system. In fact, they expressed concern that a much greater change had taken place in jobs as a result of passage of the Gramm-Rudman bill, which limited spending in all federal offices during the early part of 1986. The implication this had for interpretation of the results is discussed in Chapter 5.

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[1]This procedure is similar to the one used by Hackman, Pearce and Wolfe (1978) in their study of the effects of changes in job characteristics due to a technological innovation in a bank.

## Administration of the Questionnaires

The researcher conducted all of the questionnaire administrations during Summer, 1985 and Spring, 1986. Prior to the researcher's arrival at the 1985 administration, the head supervisor of each office announced to the employees that a doctoral student would be coming to the work place to request voluntary participation in a research study which would be conducted on work time. Upon the researcher's arrival, a meeting was held at which all employees were given some information regarding the background of the study and why they were being asked to participate. Employees were aware that management was encouraging participation, but the researcher emphasized that the study had been initiated by the researcher and that the data collected was going to be used to complete a doctoral dissertation. They were informed that their names would be known to the researcher since there would be a second part of the study the following Spring, but they were given assurances that this information was only going to be kept by the researcher and would not be made available to management. Confidentiality of their responses was assured. They were also told that officials of their union had reviewed the questionnaires that they would complete and were satisfied that the employees would in no way be harmed by participating in the study. After questions were answered, employees who elected to participate were given instructions on the procedure that would be followed.

In the largest office, employees were instructed to go to a conference room at a particular time, depending on which module they worked in. At a second office, employees were called together in their lunch room and those

who agreed to participate remained. In the remaining offices, employees were asked to complete the questionnaires at their desks. Specific instructions for completing the questionnaires were printed on the instruments, but general instructions were given at the meeting. They were asked to go through the questionnaires quickly and not to discuss their responses with co-workers. A code number had been placed on each of the questionnaires and on an index card clipped to the top of the questionnaire packet. Participants were requested to print their names only on the cards, which were picked up by the researcher soon after the administration had begun, and not to place their names on either of the questionnaires. The code numbers would be used in part two of the study to identify respondents. Times to complete questionnaires ranged from 20 minutes to 40 minutes. Respondents were requested by their managers to put aside their work while completing the questionnaires. Provisions had been made to back up the telephones with employees who were not eligible to participate (temporary workers), however there was some interference with work in a few instances. As the employees completed the questionnaires, they handed them directly to the researcher and returned to work. There appeared to be few problems with understanding the instructions and many participants expressed their interest in the study. Questionnaires were left for employees who were absent or indicated an interest in participating, but faced a time constraint. A cover letter explaining the study and giving instructions for completing and mailing the questionnaires and a stamped envelope addressed to the researcher was left with the union steward or another non-management employee. As can be seen from Table 4, fourteen

questionnaires were left behind, of which 5 were returned. Mail-back questionnaires were 6% of the time$_1$ responses and 5% of the time$_2$ responses.

During the follow-up administration in Spring, 1986, a similar procedure was followed. Since the completion of the questionnaires at the employee's desk had worked so well in the last three offices during the 1985 administration, this was the procedure followed in four of the offices in 1986. In the office which had enough space to accommodate all participants in one area, the same procedure was followed as that during the time$_1$ administration. For each office, a list of names of those who participated in part one was compiled and arranged alphabetically with the identifying code number beside the name. The employees were assembled and given instructions. They were told to find the code number which matched their name on the Code Matching List and to place that code number on each of the two questionnaires (JFSQ and MSQ). After the questionnaires were completed , they were returned to the researcher, who inspected the code numbers to ensure that each questionnaire could be identified. All of the Code Matching Lists were also returned to the researcher. Seven questionnaires were left behind for absent employees, of which four were returned by mail (see Table 4). The appropriate code number was placed on the questionnaires and the participant's name was placed on the cover letter.

## Analysis of the Data

The following raw data was collected via questionnaires: Amount Present (AP) of each job characteristic at time$_1$ and time$_2$, Amount Desired

(AD) of each job characteristic at $time_1$ and $time_2$, Importance (IMP) of each job characteristic at $time_1$ and $time_2$, General Satisfaction (GENSAT) with the job at $time_1$ and $time_2$, and biographical data (number of years with the organization, number of years in the present position, educational level, job title, sex, and age category) at $time_1$. Calculations were made on the data to obtain the following: Discrepancy (DIS) between amount present and amount desired of each job characteristic at $time_1$ and $time_2$, Motivating Potential Score[2] (MPS) at $time_1$ and $time_2$, Change in Amount Present (CAP) of each job characteristic, Change in Amount Desired (CAD) of each job characteristic, Change in Importance (CIMP) of each job characteristic, Change in Discrepancy (CDIS) between amount present and amount desired of each job characteristic, Change in Motivating Potential (CMPS) and Change in General Satisfaction (CGENSAT) with the job.

Means and standard deviations were computed for all raw and calculated data. Mean Amount Present, Amount Desired, and Importance of each characteristic were compared by groups (job category, sex, age category, tenure in job, educational level and location) using the appropriate tests of significance to discover if there were any differences which could be explained by membership in a group. To determine which job characteristics were most important to the respondents, a table was constructed which showed the percentage of respondents who chose each category of importance. The stability of the Importance scores between the first and

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[2]This index was developed by Hackman and Lawler (1971) and used extensively in subsequent job characteristics research. It will be described fully in Chapter 4.

second administration was examined by calculating Cohen's kappa, a coefficient of response agreement.

The reliability of the *Amount Present* scales and the *General Satisfaction*, *Extrinsic Satisfaction* and *Intrinsic Satisfaction* scales was investigated. Cronbach alpha's and median correlations were inspected to ensure adequate homogeneity of scale items.

At each point in time (time$_1$ and time$_2$) tests of the following between-subjects hypotheses were performed by regression analysis.

(1)  Hackman and Oldham's Job Characteristics Model—the core characteristics as independent variables.

$$GENSAT = f \left( AP_{Autonomy}, AP_{Feedback \; from \; job}, AP_{Skill \; variety}, AP_{Task \; identity}, AP_{Task \; significance} \right)$$

(2)  Hackman and Oldham's Job Characteristics Model—formulation using Motivating Potential Score.

$$GENSAT = f \left( MPS \right)$$

(3)  Amount Present of Each Job Characteristic in Study—Entire set of 25 job characteristics measured in study.

$$GENSAT = f \left( AP_1, \ldots AP_{25} \right)$$

(4)  Model Weighted by Importance—Hackman and Oldham's core characteristics.

$$GENSAT = f \left( \left( AP_{Autonomy} * IMP_{Autonomy} \right), \ldots \ldots \left( AP_{Task \; significance} * IMP_{Task \; significance} \right) \right)$$

(5)  Model Weighted by Importance—Entire set of 25 job characteristics measured in study.

$$GENSAT = f \left( \left( AP_1 * IMP_1 \right), \ldots \left( AP_{25} * IMP_{25} \right) \right)$$

(6) Discrepancy Model—Hackman and Oldham's core characteristics.

$$GENSAT = f \{ DIS_{Autonomy}, DIS_{Feedback\ from\ job}, \\ DIS_{Skill\ variety}, DIS_{Task\ identity}, \\ DIS_{Task\ significance} \}$$

(7) Discrepancy Model—Entire set of 25 job characteristics measured in study.

$$GENSAT = f \{ DIS_1, \ldots DIS_{25} \}$$

Where,

$GENSAT$ = General Satisfaction with Job

$AP_{Autonomy}$ through $AP_{Task\ significance}$ = Amount Present of Hackman and Oldham's five "core" job characteristics

$AP_1$ through $AP_{25}$ = Amount Present of the 25 job characteristics included in the study

$IMP_{Autonomy}$ through $IMP_{Task\ significance}$ = Importance of the five core characteristics

$IMP_1$ through $IMP_{25}$ = Importance of the 25 job characteristics included in the study

$DIS_{Autonomy}$ through $DIS_{Task\ significance}$ = Discrepancy between Amount Present and Amount Desired of Hackman and Oldham's five core characteristics

$DIS_1$ through $DIS_{25}$ = Discrepancy between Amount Present and Amount Desired of the 25 job characteristics included in the study

$$MPS = [ (AP_{Skill\ var} + AP_{Task\ iden} + AP_{Task\ signif}) / 3 ] \\ * AP_{Autonomy} * AP_{Feedback\ from\ job}$$

The coefficients of multiple determination, $R^2$, of the models were compared to determine if a significantly greater amount of the variance in job satisfaction could be explained by one of the proposed models. Additional models were generated upon inspection of the data in an attempt to discover which factors in addition to Hackman and Oldham's five "core" characteristics contribute significantly to the task design—satisfaction relationship and which combinations of characteristics yield a significant improvement over the Job Characteristics Model with respect to the outcome measure of employee satisfaction. Regressions were fit and model comparisons made. Stepwise regressions were generated and examined as part of the empirical approach to model refinement. The appropriateness of using parametric tests was also examined.

After the data had been collected at $time_2$, tests of within-subjects hypotheses were performed. The models used were the same as those listed above, but the *changes* in General Satisfaction (CGENSAT), Amount Present (CAP), Discrepancy (CDIS) and Motivating Potential Score (CMPS) were used as variables in the regressions. This provided a test of the hypothesis that *changes* in job characteristics are related to *changes* in employee satisfaction for each individual, rather than the between-subjects test that jobs which are higher in the amounts present of the characteristics are also higher in the levels of job satisfaction. Since the independent variables used in the analyses are expected to be correlated, correlation matrices were also generated and inspected.

To examine the dimensionality of "work" as perceived by the respondents in this sample, factor analysis was conducted using the Amount

Present measures of the twenty-five characteristics as variables. Factor

matrices were produced and rotated to arrive at interpretable factor

solutions. Additional factor analyses were performed as needed and are

more fully described in the next chapter.

# CHAPTER IV

## DATA ANALYSIS AND RESULTS

### DESCRIPTIVE ANALYSIS

#### Amount Present and Amount Desired of Job Characteristics

Means and standard deviations were computed for all raw and calculated data. For the data collection at $time_1$ the mean amount present and amount desired of each job characteristic, their standard deviations, and the mean discrepancy between the amount present and amount desired can be found in Table 6. A Wilcoxon Matched-Pairs Signed Ranks Test which matched the amount present score with the amount desired score for each respondent was performed to determine whether or not the discrepancy was significantly different from zero. Unlike the amount present score, a single item was used to measure the amount desired, thus the measure could not be considered continuous. Since a parametric test such as the $t$ test is based on the assumption that the measures are continuous, a nonparametric test was more appropriate. For 19 of the 25 job characteristics, there was a significant difference between the perceived amount present in the job and the amount desired using a significance criterion of $\alpha \leq .05$ (two-tailed). Table 7, which presents the results for the $time_2$ questionnaire administration, shows that the discrepancy scores for the same 19 job characteristics were found to be significantly different from zero as well as that for an additional characteristic.

53

TABLE 6

MEANS[a] AND STANDARD DEVIATIONS OF THE AMOUNT PRESENT,
AMOUNT DESIRED AND DISCREPANCY OF JOB CHARACTERISTICS
FOR DATA COLLECTED AT $TIME_1$

| Job Char. | Mean AP | Std. Dev. | Mean AD | Std. Dev. | Mean DIS | $z$[b] |
|---|---|---|---|---|---|---|
| Autonomy | 4.37 | 1.4 | 5.58 | 1.3 | -1.23 | -5.31** |
| Certainty | 3.45 | 1.6 | 3.97 | 1.8 | -0.54 | -2.25* |
| Challenge | 4.09 | 1.5 | 6.11 | 1.3 | -1.97 | -6.46** |
| Dealing with others | 5.16 | 1.2 | 4.44 | 1.7 | +0.76 | -3.18** |
| Effort | 5.33 | 1.2 | 4.77 | 1.5 | +0.61 | -2.46* |
| Feedback from agents | 3.82 | 1.7 | 5.67 | 1.5 | -1.86 | -5.87** |
| Feedback from job | 4.07 | 1.4 | 5.51 | 1.5 | -1.46 | -5.75** |
| Friendship opportunities | 4.73 | 1.5 | 5.05 | 1.5 | -0.31 | -1.75 |
| Interruptions | 5.54 | 1.4 | 2.90 | 1.5 | +2.66 | -7.38** |
| Knowledge/skills required | 5.16 | 1.5 | 5.55 | 1.3 | -0.36 | -1.89 |
| Learning opportunities | 3.97 | 1.6 | 6.47 | 1.0 | -2.50 | -7.14** |
| Initiated interdependence | 5.03 | 1.4 | 4.74 | 1.4 | +0.33 | -1.44 |
| Optional interaction | 4.23 | 1.2 | 5.41 | 1.5 | -1.11 | -5.91** |
| Pace control | 4.05 | 1.6 | 5.97 | 1.3 | -1.94 | -6.66** |
| Required interaction | 5.12 | 1.2 | 4.99 | 1.5 | +0.13 | -0.13 |
| Responsibility | 5.86 | 0.9 | 5.45 | 1.4 | +0.41 | -1.71 |
| Received interdependence | 4.90 | 1.3 | 3.90 | 1.6 | +1.02 | -4.36** |
| Rigidity | 2.59 | 1.0 | 3.12 | 1.4 | -0.49 | -3.39** |
| Role ambiguity | 3.64 | 1.5 | 1.82 | 1.1 | +1.81 | -6.86** |
| Role conflict | 4.32 | 1.5 | 5.63 | 1.9 | -1.29 | -4.75** |
| Role overload | 4.65 | 1.8 | 3.61 | 2.1 | +1.02 | -2.60** |
| Skill variety | 4.77 | 1.5 | 5.44 | 1.6 | -0.61 | -2.57** |
| Training adequacy | 4.41 | 1.5 | 2.92 | 1.6 | +1.49 | -5.72** |
| Task identity | 4.49 | 1.6 | 5.46 | 1.6 | -1.00 | -3.90** |
| Task significance | 5.36 | 1.3 | 5.12 | 1.5 | +0.24 | -0.55 |

[a]Scales range from 1 (low AP or AD) to 7 (high AP or AD).

[b]Wilcoxon Matched-Pairs Signed Ranks Test to determine significant differences from zero. * $p \leq .05$. ** $p \leq .01$.

TABLE 7

MEANS[a] AND STANDARD DEVIATIONS OF THE AMOUNT PRESENT,
AMOUNT DESIRED AND DISCREPANCY OF JOB CHARACTERISTICS
FOR DATA COLLECTED AT TIME$_2$

| Job Char. | Mean AP | Std. Dev. | Mean AD | Std. Dev. | Mean DIS | $z^b$ |
|---|---|---|---|---|---|---|
| Autonomy | 4.23 | 1.4 | 5.43 | 1.2 | -1.20 | -5.06** |
| Certainty | 3.52 | 1.3 | 4.36 | 1.6 | -0.84 | -3.21** |
| Challenge | 4.19 | 1.4 | 6.04 | 1.0 | -1.83 | -6.56** |
| Dealing with others | 5.07 | 1.2 | 4.59 | 1.5 | +0.48 | -2.56** |
| Effort | 5.28 | 1.2 | 4.55 | 1.4 | +0.73 | -3.44** |
| Feedback from agents | 3.84 | 1.6 | 5.96 | 1.1 | -2.12 | -6.38** |
| Feedback from job | 4.11 | 1.3 | 5.41 | 1.3 | -1.30 | -5.31** |
| Friendship opportunities | 4.82 | 1.4 | 5.04 | 1.5 | -0.24 | -0.91 |
| Interruptions | 5.59 | 1.3 | 3.01 | 1.4 | +2.59 | -6.66** |
| Knowledge/skills required | 5.35 | 1.4 | 5.71 | 1.1 | -0.34 | -1.79 |
| Learning opportunities | 4.00 | 1.5 | 6.36 | 1.0 | -2.36 | -7.05** |
| Initiated interdependence | 4.90 | 1.4 | 4.61 | 1.7 | +0.28 | -1.29 |
| Optional interaction | 4.42 | 1.2 | 5.31 | 1.4 | -0.89 | -5.14** |
| Pace control | 4.14 | 1.7 | 6.01 | 1.1 | -1.87 | -6.27** |
| Required interaction | 5.08 | 1.1 | 4.72 | 1.4 | +0.36 | -1.41 |
| Responsibility | 5.70 | 1.0 | 5.24 | 1.3 | +0.47 | -2.16* |
| Received interdependence | 4.96 | 1.2 | 3.81 | 1.5 | +1.13 | -4.65** |
| Rigidity | 2.71 | 1.0 | 3.15 | 1.3 | -0.44 | -2.79** |
| Role ambiguity | 3.64 | 1.5 | 2.03 | 1.3 | +1.61 | -5.76** |
| Role conflict | 4.43 | 1.5 | 5.65 | 2.1 | -1.21 | -3.99** |
| Role overload | 4.77 | 1.7 | 3.29 | 1.8 | +1.49 | -3.87** |
| Skill variety | 4.87 | 1.5 | 5.51 | 1.2 | -0.64 | -3.12** |
| Training adequacy | 4.32 | 1.6 | 2.93 | 1.2 | +1.36 | -4.85** |
| Task identity | 4.57 | 1.3 | 5.65 | 1.3 | -1.08 | -4.58** |
| Task significance | 5.11 | 1.3 | 4.99 | 1.5 | +0.12 | -0.26 |

[a]Scales range from 1 (low AP or AD) to 7 (high AP or AD).

[b]Wilcoxon Matched-Pairs Signed Ranks Test to determine significant
differences from zero. * $p \leq .05$. ** $p \leq .01$.

The employees report that they have a lot of responsibility, put forth a great amount of effort, and find their jobs meaningful. They also deal with people as part of their jobs and experience a lot of interruptions. They report a lack in the amount of challenge, opportunities to learn new skills and feedback from their work and from others. They desire to have jobs in which they have opportunities to learn new skills, have challenge, control the pace of the work and receive feedback on their performance. Since the job characteristics which they desire to have present are those which they report to be lacking, the discrepancy scores for these characteristics are among the highest of the twenty-five surveyed. Normative data for the amount present of seven job characteristics measured on the Job Diagnostic Survey are presented in Appendix C. These data show that the results obtained for this sample of respondents are well within the established norms of samples of respondents used in this type of research.

To determine whether or not there were differences in the amounts present of the characteristics which could be explained by job category, sex, age, tenure in job, educational level or location of office, the sample was stratified on each of those grouping variables and compared across categories. Comparisons of the amount present of each job characteristic were made using $t$ tests for two-category comparisons or one way analysis of variance using the $F$ statistic for comparisons among three or more categories. The results are presented in Appendices D through I. Given the large number of statistical tests performed at the .05 level of significance, some significant findings due to chance alone might be expected. Differences in amount present appear to be largely a function of job category and

location. Differences in amount desired by group were also examined. For any one of the grouping variables, no more than three job characteristics were found to differ in amount desired.

Reliability analysis of the scales used to measure the amount present of the twenty-five job characteristics included in this study is presented in Table 8. Twenty-three of the 25 scales exhibit internal consistency (alpha $\geq$ .46 for both administrations). The scales for Responsibility and Rigidity show poor internal consistency and should not be considered reliable.

After the data were collected at time$_2$, the *change* in the amount present and the *change* in the amount desired of each job characteristic was calculated for each respondent. The mean CAP of each job characteristic and its standard deviation is reported in Table 9. A one sample $t$ test ($\alpha$ = .05, two-tailed) was performed on the CAP scores to identify job characteristics which had significantly changed between the two questionnaire administrations. No significant differences were found. The mean CAD scores are reported in Table 10 as well as the results of a sign test which matched the AD scores at time$_1$ and time$_2$ for each respondent. This test was done to determine the significance of differences between the two questionnaire administrations for the amount desired of each of the job characteristics. The number of negative differences and positive differences along with the $p$ values are included. There were no differences in amount desired for any of the job characteristics, tested at the .05 level. Since there was no job redesign program undertaken in the offices when the new computer system was implemented, no assumptions had been made about which job

TABLE 8

RELIABILITY ANALYSIS OF THE AMOUNT PRESENT SCALES:
COEFFICIENT ALPHA AND MEDIAN CORRELATION
(3 ITEMS PER SCALE)[a]

| Scale | TIME$_1$ | | TIME$_2$ | |
| --- | --- | --- | --- | --- |
| | Coeff. Alpha | Median Corr. | Coeff. Alpha | Median Corr. |
| Autonomy | .57 | .36 | .65 | .37 |
| Certainty | .72 | .42 | .57 | .35 |
| Challenge | .63 | .36 | .62 | .35 |
| Dealing with others | .56 | .33 | .58 | .34 |
| Effort | .54 | .31 | .73 | .43 |
| Feedback from agents | .78 | .55 | .80 | .55 |
| Feedback from job | .69 | .41 | .71 | .43 |
| Friendship opportunities | .76 | .44 | .79 | .51 |
| Interruptions | .79 | .54 | .71 | .46 |
| Knowledge and skills required | .80 | .59 | .83 | .62 |
| Learning opportunities | .77 | .52 | .70 | .43 |
| Initiated interdependence | .72 | .48 | .73 | .49 |
| Optional interaction | .46 | .21 | .57 | .28 |
| Pace control | .75 | .52 | .90 | .77 |
| Required interaction | .60 | .31 | .49 | .27 |
| Responsibility | .11 | .04 | .35 | .24 |
| Received interdependence | .46 | .16 | .55 | .28 |
| Rigidity | .20 | .03 | .28 | .04 |
| Role ambiguity | .67 | .34 | .80 | .60 |
| Role conflict | .63 | .31 | .65 | .40 |
| Role overload | .80 | .61 | .83 | .58 |
| Skill variety | .70 | .42 | .65 | .31 |
| Training adequacy | .71 | .45 | .78 | .49 |
| Task identity | .70 | .40 | .61 | .30 |
| Task significance | .55 | .26 | .61 | .41 |

[a]Sample size for time$_1$ is 86, for time$_2$ is 73.

TABLE 9

MEANS AND STANDARD DEVIATIONS OF THE CHANGE IN AMOUNT
PRESENT OF JOB CHARACTERISTICS FOR DATA
COLLECTED AT TIME$_1$ AND TIME$_2$[a]

| Job Characteristic | Mean CAP | Standard Dev. | $t$[b] |
|---|---|---|---|
| Autonomy | -0.050 | 1.21 | -0.35 |
| Certainty | +0.164 | 0.99 | 1.44 |
| Challenge | +0.117 | 1.12 | 0.90 |
| Dealing with others | -0.076 | 1.30 | -0.50 |
| Effort | -0.067 | 1.16 | -0.50 |
| Feedback from agents | -0.009 | 1.22 | -0.06 |
| Feedback from job | -0.023 | 1.21 | -0.16 |
| Friendship opportunities | +0.095 | 1.11 | 0.73 |
| Interruptions | -0.014 | 1.16 | -0.10 |
| Knowledge and skills required | +0.167 | 0.90 | 1.60 |
| Learning opportunities | +0.032 | 1.18 | 0.23 |
| Initiated interdependence | -0.093 | 1.19 | -0.68 |
| Optional interaction | +0.135 | 0.99 | 1.17 |
| Pace control | +0.071 | 1.30 | 0.47 |
| Required interaction | -0.102 | 0.93 | -0.95 |
| Responsibility | -0.122 | 1.08 | -0.97 |
| Received interdependence | +0.149 | 1.16 | 1.10 |
| Rigidity | +0.076 | 0.98 | 0.66 |
| Role ambiguity | -0.071 | 1.15 | -0.54 |
| Role conflict | +0.041 | 1.11 | 0.31 |
| Role overload | +0.113 | 1.28 | 0.75 |
| Skill variety | +0.089 | 0.99 | 0.78 |
| Training adequacy | -0.086 | 1.19 | -0.62 |
| Task identity | +0.153 | 1.49 | 0.88 |
| Task significance | -0.222 | 0.99 | -1.94 |

[a]Sample sizes for each job char. vary between 70 and 75.

[b] $t$-test for significant change in the amount present of the job char.
* $p \leq .05.$  ** $p \leq .01.$

TABLE 10

MEAN CHANGES IN AMOUNT DESIRED OF JOB
CHARACTERISTICS FOR DATA COLLECTED
AT TIME$_1$ AND TIME$_2$[a]

| Job Characteristic | Mean CAD | No. of Negative Diff. | No. of Positive Diff. | $p$[b] |
|---|---|---|---|---|
| Autonomy | -0.123 | 24 | 18 | .44 |
| Certainty | +0.315 | 21 | 32 | .17 |
| Challenge | -0.197 | 17 | 9 | .17 |
| Dealing with others | +0.260 | 21 | 22 | 1.00 |
| Effort | -0.123 | 29 | 20 | .25 |
| Feedback from agents | +0.205 | 18 | 25 | .36 |
| Feedback from job | -0.080 | 29 | 20 | .25 |
| Friendship opportunities | -0.192 | 27 | 21 | .47 |
| Interruptions | +0.151 | 22 | 28 | .48 |
| Knowledge and skills required | +0.137 | 15 | 25 | .16 |
| Learning opportunities | -0.151 | 16 | 11 | .44 |
| Initiated interdependence | 0.000 | 25 | 29 | .68 |
| Optional interaction | -0.192 | 28 | 19 | .24 |
| Pace control | -0.055 | 23 | 20 | .76 |
| Required interaction | -0.314 | 30 | 16 | .06 |
| Responsibility | -0.137 | 22 | 14 | .24 |
| Received interdependence | -0.160 | 32 | 22 | .22 |
| Rigidity | +0.068 | 23 | 25 | .89 |
| Role ambiguity | +0.167 | 14 | 22 | .24 |
| Role conflict | -0.151 | 16 | 17 | 1.00 |
| Role overload | -0.247 | 31 | 23 | .34 |
| Skill variety | +0.096 | 19 | 22 | .76 |
| Training adequacy | +0.164 | 16 | 27 | .13 |
| Task identity | +0.151 | 21 | 22 | 1.00 |
| Task significance | -0.096 | 21 | 20 | 1.00 |

[a]Sample sizes for each job char. vary between 70 and 73.

[b]Sign test for significant difference between Before and After AD.

characteristics might change. Based on the results presented above, there were no detectable changes in the amounts present of any of the characteristics. The measures of amount desired exhibited stability from time$_1$ to time$_2$.

The power of the $t$ tests on the change scores was not adequate to reject the null hypothesis of no change for such small differences in amount present from time$_1$ to time$_2$ that were found in this sample. Calculations of power were made *post hoc* for the $t$ tests conducted on the twenty-five change scores.[1]  Power ranged from less than 9 percent to as large as 68 percent in some cases, with a median power of 13 percent. However, a difference of only 0.01 or even 0.1 does not hold much practical significance, since it could probably not be translated into a change in the tasks of the incumbent. In general, the tests had about 80 percent power to detect a difference in means of $\pm 0.29$, assuming that $\alpha - .05$, $\sigma - 1.16$ (the median standard deviation) and $r = .70$ (the median correlation between the time$_1$ and time$_2$ scores). A difference of 0.5 or greater would probably indicate

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[1]Estimates of power were obtained from tables in Cohen (1977). The following parameters must be specified:  the significance criterion, $\alpha$, the sample size, n, and the effect size, $d$.  In the case of matching time$_1$ and time$_2$ scores, the effect size is specified by the following formula:

$$d - \left( \frac{|\ m_x - m_y\ |}{\sigma} \right) \ / \ (1 - r)^{1/2}$$

where $m_x - m_y$ is the difference in mean scores at time$_1$ and time$_2$, $\sigma$ is the common within population standard deviation, approximated by the standard deviation of the change scores, and r is the correlation between the time$_1$ and time$_2$ scores.

that a meaningful change in task had occurred. The $t$ tests did have sufficient power to reject a null hypothesis of no difference in means if a difference as large as .5 had been observed.

## Levels of Satisfaction

The mean scores and standard deviations for job satisfaction that were measured by the short-form MSQ are presented in Table 11. On the average, none of the satisfaction scales showed any changes from $time_1$ to $time_2$. The large standard deviation associated with the change scores reduced the power of the $t$ test. Using the power tables in Cohen (1977), the $t$ test on the difference between the means of general satisfaction at $time_1$ and $time_2$ was found to have 47 percent power. The $t$ test had 80 percent power to reject the null hypothesis of no difference in means if a difference of $\pm 2.83$ had been observed. Still, a 2 point change in general satisfaction does not have much practical significance. Table 12 indicates that the satisfaction scales used in this study showed very good reliability as indicated by high internal consistency. Normative data for three occupational groups can be found in Appendix J. Job satisfaction for this sample of respondents appears to be on the lower end of the norms established for engineers, office clerks and salesmen, but close to only a one standard deviation difference.

To determine whether or not there were differences in the levels of job satisfaction which could be explained by job category, sex, age, tenure in job, educational level or location of office, the sample was stratified on each of those grouping variables and compared across categories. Comparisons of

TABLE 11

MEANS AND STANDARD DEVIATIONS OF JOB SATISFACTION
FOR DATA COLLECTED AT $TIME_1$ AND $TIME_2$

| | $TIME_1$ | | $TIME_2$ | | $CHANGE^a$ | | |
| | Mean | SD | Mean | SD | Mean | SD | $t^b$ |
|---|---|---|---|---|---|---|---|
| General Satisfaction[c] | 63.93 | 13.9 | 62.12 | 13.9 | -1.97 | 11.0 | -1.53 |
| Intrinsic Satisfaction[d] | 41.73 | 8.6 | 40.93 | 8.6 | -1.09 | 6.2 | -1.52 |
| Extrinsic Satisfaction[e] | 15.88 | 5.3 | 15.10 | 5.5 | -0.72 | 4.7 | -1.32 |

[a]Mean Change scores and $t$-tests are based on Matched Pairs of Satisfaction at $time_1$ and $time_2$. Sample size for these tests are 73. Mean scores at $time_1$ are based on all usable responses obtained at $time_1$, of which the sample size is 90.

[b] $t$-tests to determine significant differences from zero.
* $p \leq .05$.  ** $p \leq .01$.

[c]Scale ranges from 20 (low) to 100 (high).

[d]Scale ranges from 12 (low) to 60 (high).

[e]Scale ranges from 6 (low) to 30 (high).

TABLE 12
RELIABILITY ANALYSIS OF THE SATISFACTION SCALES:
COEFFICIENT ALPHA AND MEDIAN CORRELATION[a]

| Scale | TIME$_1$ | | TIME$_2$ | |
| | Coeff. Alpha | Median Correlation | Coeff. Alpha | Median Correlation |
|---|---|---|---|---|
| General Satisfaction[b] | .90 | .31 | .91 | .31 |
| Intrinsic Satisfaction[c] | .87 | .35 | .87 | .33 |
| Extrinsic Satisfaction[d] | .80 | .37 | .85 | .43 |

[a]Sample size is 90 for time$_1$ and 73 for time$_2$.

[b]The scale consists of 20 items.

[c]The scale consists of 12 items.

[d]The scale consists of 6 items.

the levels of job satisfaction were made using $t$ tests for two-category comparisons or one way analysis of variance using the $F$ statistic for comparisons among three or more categories. The results are presented in Appendix K. Job satisfaction appears to be a function of educational level and location. Levels of general satisfaction were higher for employees with less formal education.

## Importance of Job Characteristics

The means and standard deviations of the measures of importance of each job characteristic taken at the time$_1$ questionnaire administration are presented in Table 13. The percentage of respondents who chose each category of importance for each job characteristic is presented in Table 14. The category Very Important contained the largest percentage of responses for seven job characteristics: Challenge, Feedback from agents, Learning opportunities, Pace control, Role ambiguity, Role conflict and Role overload. Based on the lowest mean scores, the least important characteristics were Friendship opportunities, Initiated task interdependence, Received task interdependence and Dealing with others.

To examine the relationship between the Importance of a job characteristic and the Amount Present in the job, the sample was stratified into four groups based on the category of Importance that was chosen and an analysis of variance using the Amount Present as the dependent variable was conducted. The results are displayed in Table 15. For each job characteristic, the mean Amount Present for each group and the calculated $F$ value are reported. Only three characteristics show a significant difference

TABLE 13

MEANS[a] AND STANDARD DEVIATIONS OF THE
IMPORTANCE OF EACH JOB CHARACTERISTIC
FOR DATA COLLECTED AT $TIME_1$

| Job Characteristic | Mean | Standard Dev. |
|---|---|---|
| Autonomy | 2.20 | 0.6 |
| Certainty | 2.23 | 0.6 |
| Challenge | 2.58 | 0.6 |
| Dealing with others | 1.97 | 0.8 |
| Effort | 2.12 | 0.7 |
| Feedback from agents | 2.36 | 0.7 |
| Feedback from job | 2.23 | 0.7 |
| Friendship opportunities | 1.80 | 0.8 |
| Interruptions | 2.04 | 0.8 |
| Knowledge and skills required | 2.31 | 0.6 |
| Learning opportunities | 2.58 | 0.6 |
| Initiated interdependence | 1.83 | 0.7 |
| Optional interaction | 2.01 | 0.7 |
| Pace control | 2.51 | 0.6 |
| Required interaction | 2.09 | 0.6 |
| Responsibility | 2.28 | 0.7 |
| Received interdependence | 1.88 | 0.8 |
| Rigidity | 2.01 | 0.6 |
| Role ambiguity | 2.52 | 0.5 |
| Role conflict | 2.53 | 0.7 |
| Role overload | 2.38 | 0.7 |
| Skill variety | 2.31 | 0.6 |
| Training adequacy | 2.06 | 0.7 |
| Task identity | 2.19 | 0.7 |
| Task significance | 2.07 | 0.7 |

[a]Scale ranges from 0 (Not Important) to 3 (Very Important).

TABLE 14

PERCENTAGE OF RESPONDENTS WHO CHOSE
EACH CATEGORY OF IMPORTANCE
FOR DATA COLLECTED AT $TIME_1$

| Job Characteristic | Not IMP | | Slightly IMP | Moderately IMP | Very IMP |
|---|---|---|---|---|---|
| Autonomy | 0 | % | 11.1 % | 57.8 % | 31.1 % |
| Certainty | 0 | | 11.1 | 54.4 | 34.4 |
| Challenge | 1.1 | | 1.1 | 36.7 | 61.1 |
| Dealing with others | 4.5 | | 17.0 | 55.7 | 22.7 |
| Effort | 2.2 | | 10.1 | 60.7 | 27.0 |
| Feedback from agents | 2.2 | | 7.9 | 41.6 | 48.3 |
| Feedback from job | 2.2 | | 11.1 | 47.8 | 38.9 |
| Friendship opportunities | 10.0 | | 16.7 | 56.7 | 16.7 |
| Interruptions | 2.2 | | 24.4 | 40.0 | 33.3 |
| Knowledge and skills required | 0 | | 6.7 | 55.6 | 37.8 |
| Learning opportunities | 1.1 | | 0 | 38.2 | 60.7 |
| Initiated interdependence | 2.2 | | 27.8 | 54.4 | 15.6 |
| Optional interaction | 2.2 | | 15.6 | 61.1 | 21.1 |
| Pace control | 1.1 | | 3.4 | 39.3 | 56.2 |
| Required interaction | 0 | | 15.1 | 60.5 | 24.4 |
| Responsibility | 2.2 | | 7.8 | 50.0 | 40.0 |
| Received interdependence | 6.7 | | 18.9 | 54.4 | 20.0 |
| Rigidity | 1.1 | | 13.3 | 68.9 | 16.7 |
| Role ambiguity | 0 | | 2.3 | 43.2 | 54.5 |
| Role conflict | 1.1 | | 8.9 | 25.6 | 64.4 |
| Role overload | 0 | | 12.2 | 37.8 | 50.0 |
| Skill variety | 1.1 | | 3.4 | 58.4 | 37.1 |
| Training adequacy | 1.1 | | 16.7 | 57.8 | 24.4 |
| Task identity | 4.4 | | 6.7 | 54.4 | 34.4 |
| Task significance | 2.2 | | 17.8 | 51.1 | 28.9 |

TABLE 15

MEAN AMOUNT PRESENT BY CATEGORY OF IMPORTANCE
FOR EACH JOB CHARACTERISTIC FOR DATA
COLLECTED AT TIME$_1$

| Job Characteristic | Not IMP | Slightly IMP | Moderately IMP | Very IMP | $F$a |
|---|---|---|---|---|---|
| | | Category Chosen | | | |
| Autonomy | .00 | 4.30 | 4.31 | 4.50 | 0.18 |
| Certainty | .00 | 3.30 | 3.72 | 3.07 | 1.68 |
| Challenge | 4.67 | 5.33 | 4.17 | 4.01 | 0.35 |
| Dealing with others | 4.58 | 4.67 | 5.35 | 5.25 | 1.57 |
| Effort | 4.50 | 5.04 | 5.41 | 5.36 | 0.55 |
| Feedback from agents | 3.00 | 4.00 | 3.79 | 3.85 | 0.19 |
| Feedback from job | 1.83 | 4.03 | 4.14 | 4.12 | 1.84 |
| Friendship opportunities | 4.19 | 4.47 | 4.80 | 5.12 | 0.94 |
| Interruptions | 5.00 | 5.26 | 5.48 | 5.87 | 0.95 |
| Knowledge/skills required | .00 | 5.00 | 5.22 | 5.11 | 0.09 |
| Learning opportunities | 3.00 | .00 | 3.83 | 4.08 | 3.33 |
| Initiated interdependence | 5.83 | 4.91 | 4.98 | 5.36 | 0.55 |
| Optional interaction | 3.67 | 3.95 | 4.16 | 5.00 | 3.08* |
| Pace control | 3.33 | 4.22 | 4.27 | 3.90 | 0.43 |
| Required interaction | .00 | 4.36 | 5.17 | 5.41 | 3.48* |
| Responsibility | 6.17 | 5.91 | 6.00 | 5.65 | 1.15 |
| Received interdependence | 4.78 | 4.47 | 5.12 | 4.78 | 1.11 |
| Rigidity | 3.00 | 3.12 | 2.57 | 2.27 | 1.78 |
| Role ambiguity | .00 | 3.83 | 3.82 | 3.45 | 0.65 |
| Role conflict | 3.67 | 3.75 | 4.22 | 4.45 | 0.65 |
| Role overload | .00 | 4.06 | 3.98 | 5.31 | 6.37** |
| Skill variety | 6.00 | 3.78 | 4.84 | 4.75 | 0.70 |
| Training adequacy | 3.00 | 4.80 | 4.48 | 4.05 | 1.14 |
| Task identity | 5.33 | 3.94 | 4.44 | 4.58 | 0.67 |
| Task significance | 5.00 | 4.81 | 5.39 | 5.67 | 1.54 |

aOne way ANOVA. * $p \leq .05$. ** $p \leq .01$.

in Amount Present that could be explained by the category of Importance that was chosen. In general, there is little evidence that the characteristics which were most important to the respondents were the ones which were present in the greatest or the least amounts.

An analysis similar to the one reported above was conducted to examine the relationship between the Importance of a job characteristic and the Amount Desired in the job. The sample was stratified as described above and a Kruskal-Wallis one way ANOVA using the Amount Desired as the dependent variable was conducted. A nonparametric test was chosen since Amount Desired is measured by a single item. The results are reported in Table 16. For each job characteristic, the mean Amount Desired for each group and the chi-square statistic are reported. The Kruskal-Wallis H test approximates the chi-square distribution and H is equivalent to a chi-square value with 3 degrees of freedom. (Chi-square is adjusted for ties.) All job characteristics except Certainty, Received task interdependence and Role overload showed a significant difference in Amount Desired that could be explained by the category of Importance that was chosen. In general, the more important the job characteristic was to the respondent the greater the amount desired in the job (except for Rigidity and Training adequacy which showed an inverse relationship).

The reliability of the Importance scores as assessed by the stability of responses from $time_1$ to $time_2$ is presented in Table 17. Kappa, a measure of agreement using categories, was calculated to determine the agreement between the $time_1$ and $time_2$ Importance scores of each job characteristic (Fleiss, 1981). All characteristics show significance except Certainty and

TABLE 16

MEAN AMOUNT DESIRED BY CATEGORY OF IMPORTANCE
FOR EACH JOB CHARACTERISTIC FOR DATA
COLLECTED AT TIME$_1$

| | Category Chosen | | | | |
| Job Characteristic | Not IMP | Slightly IMP | Moderately IMP | Very IMP | Chi-square[a] |
|---|---|---|---|---|---|
| Autonomy | .00 | 4.33 | 5.39 | 6.39 | 24.81** |
| Certainty | .00 | 3.90 | 3.63 | 4.49 | 2.79 |
| Challenge | 2.00 | 4.00 | 5.42 | 6.64 | 33.84** |
| Dealing with others | 3.00 | 3.47 | 4.65 | 5.05 | 14.64** |
| Effort | 3.00 | 4.00 | 4.73 | 5.26 | 10.47* |
| Feedback from agents | 4.00 | 4.14 | 5.22 | 6.38 | 33.47** |
| Feedback from job | 4.00 | 4.33 | 5.37 | 6.09 | 23.95** |
| Friendship opportunities | 3.33 | 4.47 | 5.02 | 6.73 | 34.57** |
| Interruptions | 4.00 | 3.35 | 3.26 | 2.10 | 14.39** |
| Knowledge/skills required | .00 | 3.83 | 5.13 | 6.49 | 35.87** |
| Learning opportunities | 5.00 | .00 | 6.06 | 6.74 | 22.74** |
| Initiated interdependence | 2.00 | 3.86 | 4.92 | 5.86 | 25.71** |
| Optional interaction | 3.00 | 4.23 | 5.36 | 5.53 | 30.45** |
| Pace control | 1.00 | 4.67 | 5.35 | 6.56 | 34.69** |
| Required interaction | .00 | 4.08 | 4.96 | 5.57 | 14.57** |
| Responsibility | 2.00 | 4.29 | 5.21 | 6.09 | 21.34** |
| Received interdependence | 3.00 | 3.53 | 3.98 | 4.35 | 4.61 |
| Rigidity | 4.00 | 4.27 | 3.10 | 2.27 | 17.40** |
| Role ambiguity | .00 | 2.50 | 2.54 | 1.22 | 37.04** |
| Role conflict | 3.00 | 3.29 | 4.87 | 6.29 | 33.58** |
| Role overload | .00 | 3.44 | 4.21 | 3.20 | 5.92 |
| Skill variety | 2.00 | 5.00 | 4.88 | 6.47 | 34.41** |
| Training adequacy | 4.00 | 4.07 | 2.94 | 2.05 | 23.42** |
| Task identity | 1.67 | 4.50 | 5.09 | 6.58 | 35.23** |
| Task significance | 3.50 | 4.07 | 4.87 | 6.32 | 30.29** |

[a]Kruskal-Wallis one way ANOVA on mean ranks. Chi-square
corrected for ties is reported. * $p \leq .05$. ** $p \leq .01$.

TABLE 17

AGREEMENT BETWEEN IMPORTANCE SCORES
MEASURED AT TIME$_1$ AND TIME$_2$

| Job Characteristic | Cohen's Kappa | $t$[a] |
|---|---|---|
| Autonomy | .185 | 2.529** |
| Certainty | .108 | 1.571 |
| Challenge | .268 | 3.432** |
| Dealing with others | .201 | 2.934** |
| Effort | .192 | 2.803** |
| Feedback from agents | .324 | 4.407** |
| Feedback from job | .264 | 3.878** |
| Friendship opportunities | .146 | 2.311* |
| Interruptions | .203 | 3.066** |
| Knowledge and skills required | .283 | 3.704** |
| Learning opportunities | .256 | 3.240** |
| Initiated interdependence | .155 | 2.264* |
| Optional interaction | .144 | 2.117* |
| Pace control | .283 | 3.574** |
| Required interaction | .151 | 2.136* |
| Responsibility | .174 | 2.450** |
| Received interdependence | .146 | 2.193* |
| Rigidity | .153 | 2.197* |
| Role ambiguity | .336 | 4.315** |
| Role conflict | .394 | 5.342** |
| Role overload | .227 | 3.179** |
| Skill variety | .355 | 4.453** |
| Training adequacy | .092 | 1.338 |
| Task identity | .305 | 4.219** |
| Task significance | .177 | 2.620** |

[a]A significant $t$ value indicates that Kappa is significantly different from zero. * $p \leq .05$. ** $p \leq .01$.
The constant 1 was added to each cell before calculation of Kappa because of the occurrence of zeros in some cells.

Training adequacy. Except for these two job characteristics, the Importance measures exhibit good reliability.

## REGRESSION ANALYSIS

Table 18 lists the a priori models that were tested by regression analysis. At $time_1$, between-subjects hypotheses were tested. The coefficients of multiple determination, $R^2$, of the models were compared to determine if a significantly greater amount of the variance in job satisfaction could be explained by one of the proposed models. Additional models were generated upon inspection of the data in an attempt to discover which factors in addition to Hackman and Oldham's "core" characteristics contribute significantly to the task design—satisfaction relationship and which combinations of characteristics yield a significant improvement over the Job Characteristics Model with respect to the outcome measure of employee satisfaction. Regressions were fit and model comparisons made. Stepwise regressions were generated using the $time_1$ data. At $time_2$, results of the regressions using the same sets of predictors are also reported. Using difference scores ($score_{T2}$ - $score_{T1}$), within-subjects hypotheses were tested.

## Results of Between-Subjects Hypothesis Testing

Seven a priori models were tested by regression analysis using $time_1$ data. The appropriateness of using parametric tests to analyze these data was examined. The measure of General Satisfaction can be assumed to be continuous since a score can range from 20 to 100; ceiling and floor effects

## TABLE 18

### A PRIORI REGRESSION MODELS ANALYZED

| Model No. | Description of Model[a] |
|---|---|
| (1) | Hackman and Oldham's Job Characteristics Model—the core characteristics as independent variables. $$GENSAT = f ( AP_{Autonomy}, AP_{Feedback\ from\ job}, AP_{Skill\ variety}, AP_{Task\ identity}, AP_{Task\ significance} )$$ |
| (2) | Hackman and Oldham's Job Characteristics Model—formulation using Motivating Potential Score. $$GENSAT = f ( MPS )$$ |
| (3) | Amount Present of Each Job Characteristic in Study—Entire set of 25 job characteristics measured in study. $$GENSAT = f ( AP_1, \ldots AP_{25} )$$ |
| (4) | Model Weighted by Importance—Hackman and Oldham's core characteristics. $$GENSAT = f ( ( AP_{Autonomy} * IMP_{Autonomy} ), \ldots \ldots ( AP_{Task\ significance} * IMP_{Task\ significance} ) )$$ |
| (5) | Model Weighted by Importance—Entire set of 25 job characteristics measured in study. $$GENSAT = f ( ( AP_1 * IMP_1 ), \ldots ( AP_{25} * IMP_{25} ) )$$ |

[a]GENSAT is General Satisfaction, AP is the Amount Present of the job characteristic, IMP is the Importance, DIS is the Discrepancy between the Amount Present and the Amount Desired, MPS is the Motivating Potential Score.

TABLE 18—<u>Continued</u>

| Model No. | Description of Model[a] |
|---|---|
| (6) | Discrepancy Model—Hackman and Oldham's core characteristics. $$\text{GENSAT} = f\left(\text{DIS}_{\text{Autonomy}}, \text{DIS}_{\text{Feedback from job}}, \text{DIS}_{\text{Skill variety}}, \text{DIS}_{\text{Task identity}}, \text{DIS}_{\text{Task significance}}\right)$$ |
| (7) | Discrepancy Model—Entire set of 25 job characteristics measured in study. $$\text{GENSAT} = f\left(\text{DIS}_1, \ldots \text{DIS}_{25}\right)$$ |

[a]GENSAT is General Satisfaction, AP is the Amount Present of the job characteristic, IMP is the Importance, DIS is the Discrepancy between the Amount Present and the Amount Desired, MPS is the Motivating Potential Score.

are minimal. The Kolmogorov-Smirnov Goodness of Fit Test on the General Satisfaction scores yielded a $z$ of 0.537 with an associated two-tailed $p$ value of 0.935, showing no evidence that the dependent variable is not normally distributed. Graphic analysis of the residuals for each of the models was undertaken to examine the aptness of the model. In general, the models which contained five or fewer predictor variables showed little evidence of violating the assumptions upon which the parametric tests are based. Probability plots of the observed vs. the expected standard residual showed no evidence of nonnormal error terms or nonconstant error variance for these models. However, models in which twenty-five predictor variables were included indicated the presence of nonnormal error terms and nonconstant error variance. Tolerance levels for the five-variable model (ranging from .56 to .89) and for the 25-variable model (ranging from .20 to .58) were acceptable.

Table 19 provides the results for the seven models that were tested using $time_1$ data. These regressions test the hypotheses that job satisfaction is a function of the set of predictors which appear in the model, that employees who have higher levels of AP (Amount Present) or lower levels of DIS (Discrepancy) will have higher levels of GENSAT (General Satisfaction). The $F$ statistics obtained and the associated $p$ levels indicate that support was found for all of the models. $R^2$ values ranged from .2544 to .4248 for models using five predictors and from .6349 to .7615 for models using twenty-five predictors.

Model (2), which used Hackman and Oldham's (1980) formulation of the Motivating Potential Score (MPS), provided a good $R^2$ of .3570 for a

TABLE 19

REGRESSION ANALYSIS RESULTS OF $TIME_1$ DATA:
MODELS (1) THROUGH (7)

| Model No. | No. Indep. Vars. | $R^2$ | Adj. $R^2$ | $F$ | $p$ | Sample Size[a] |
|---|---|---|---|---|---|---|
| (1) | 5 | .4248 | .3893 | 11.96 | .0000 | 87 |
| (2) | 1 | .3570 | .3495 | 47.20 | .0000 | 87 |
| (3) | 25 | .7615 | .6621 | 7.66 | .0000 | 86 |
| (4) | 5 | .2544 | .2040 | 5.05 | .0005 | 80 |
| (5) | 25 | .7136 | .3881 | 2.19 | .0335 | 48 |
| (6) | 5 | .2624 | .2151 | 5.55 | .0002 | 84 |
| (7) | 25 | .6349 | .4523 | 3.48 | .0001 | 76 |

[a]Sample size differs from model to model due to missing data.

model using a single predictor variable. However, this variable is an index composed of five measured variables, so Model (2) should be considered a five-variable model. The following formula was used to compute MPS. (AP is the Amount Present of the subscripted job characteristic.)

$$MPS = [ (AP_{Skill\ variety} + AP_{Task\ identity} + AP_{Task\ signif}) / 3 ]$$
$$* AP_{Autonomy} * AP_{Feedback\ from\ job}$$

Three models containing five predictor variables were tested. Model (1) includes each of the core characteristics as predictor variables. An $R^2$ value of .4248 was obtained. Model (4) uses five predictor variables in which each variable is the Amount Present of a core characteristic weighted by the Importance of that characteristic to the respondent. An $R^2$ of .2544 was obtained. Model (6) includes the Discrepancy between the Amount Present and the Amount Desired of each of the core characteristics as predictor variables. An $R^2$ of .2624 was obtained. Based on these results, the models which use Discrepancy scores and scores based on weighting by Importance do not produce improved models of the job character-istics—satisfaction relationship.

The models which used twenty-five predictor variables would be expected to produce much higher $R^2$ values solely because of the large number of independent variables used. Once again, the model which used the Amount Present of the variables produces the highest $R^2$ of the three models. Use of Discrepancy scores and weighting schemes do not improve the model. Another problem encountered with all three of these models is the violations of the regression analysis assumptions of normality and

constant variance of the error terms. Few inferences can be drawn from
these results.

A problem encountered with all of the regression models analyzed is
that the independent variables are correlated among themselves to some
degree. The matrix of zero-order correlation coefficients for the Amount
Present variable of each of the twenty-five job characteristics at $time_1$ is
contained in Appendix L. Almost half of the coefficients (140 of 300) are
significantly different from zero at the $\alpha$ - .05 level. This problem of
multicollinearity can cause problems in interpreting the extra sum of
squares associated with independent variables that are incrementally added
to some models and in using the regression coefficients to decide whether or
not to add or delete variables.

In an attempt to construct an improved model of the job character-
istics—satisfaction relationship, alternatives to the use of Amount Present of
the characteristics were tried and found to be unsuccessful. The use of
twenty-five predictor variables rather than five variables would also seem
to yield a model which would be limited in its usefulness to understand the
factors which influence job satisfaction. A search was then undertaken to
find a subset of the job characteristics which would account for a signif-
icantly greater proportion of the variance in job satisfaction than did the
core characteristics used in Hackman and Oldham's model. Two approaches
to this search were used. First, the descriptive analysis of the data was used
to generate plausible models of the relationship. Second, stepwise regres-
sions were used to investigate the relationship from an empirical per-
spective.

Measures of the Amount Desired and the Importance of each of the twenty-five job characteristics were collected so that exploration of the relationship could be undertaken and improved models generated. One plausible hypothesis is that the job characteristics which are most important to the respondents would affect job satisfaction more than those character- istics that are less important. To test this hypothesis, Table 14 was con- sulted to find the characteristics which were most important to the respond- ents. Seven job characteristics were found in which the category Very Important contained the largest percentage of responses of the four cat- egories. These were: Challenge, Feedback from agents, Learning oppor- tunities, Pace control, Role ambiguity, Role conflict and Role overload. Models (8) and (9) were generated from this finding (see Table 20). Model (8) includes the Amount Present of each of the seven characteristics as independent variables. Model (9) uses the Discrepancy between Amount Present and Amount Desired. In formulating these models, the Amount Present and Discrepancy scores were not inspected. Only the Importance scores were used to generate a new set of job characteristics which would incorporate the Amount Present and Discrepancy scores as independent variables.

Table 21 presents the results of the regression analyses of Models (8) and (9). Once again, using the Amount Present measures rather than the Discrepancy as independent variables produces a larger $F$ value and a larger $R^2$. Model (8) yields an $R^2$ that is .2031 larger than the $R^2$ obtained by using Model (1). For an addition of two independent variables, this appears to be a large increase in explained variance of General Satisfaction.

## TABLE 20

### A POSTERIORI REGRESSION MODELS ANALYZED

| Model No. | Description of Model[a] |
|---|---|
| (8) | Amount Present of the Most Important Job Characteristics— Seven job characteristics measured in the study. |
| | $GENSAT = f \, (\, AP_{Challenge} , AP_{Feedback \, from \, agents} ,$ $AP_{Learning \, opportunities} , AP_{Pace \, control} ,$ $AP_{Role \, ambiguity} , AP_{Role \, conflict} , AP_{Role \, overload} \,)$ |
| (9) | Discrepancy of the Most Important Job Characteristics— Seven job characteristics measured in the study. |
| | $GENSAT = f \, (\, DIS_{Challenge} , DIS_{Feedback \, from \, agents} ,$ $DIS_{Learning \, opportunities} , DIS_{Pace \, control} ,$ $DIS_{Role \, ambiguity} , DIS_{Role \, conflict} , DIS_{Role \, overload} \,)$ |
| (10) | Amount Present of the Core Characteristics and Most Important Job Characteristics—Twelve job characteristics. |
| | $GENSAT = f \, (\, AP_{Autonomy} , AP_{Feedback \, from \, job} , AP_{Skill \, variety} ,$ $AP_{Task \, identity} , AP_{Task \, significance} , AP_{Challenge} ,$ $AP_{Feedback \, from \, agents} , AP_{Learning \, opportunities} ,$ $AP_{Pace \, control} , AP_{Role \, ambiguity} , AP_{Role \, conflict} ,$ $AP_{Role \, overload} \,)$ |
| (11) | Amount Present of the Job Characteristics in both the Stepwise Regression and Most Important Job Characteristics—Three job characteristics. |
| | $GENSAT = f \, (\, AP_{Challenge} , AP_{Pace \, control} , AP_{Role \, conflict} \,)$ |

[a]GENSAT is General Satisfaction, AP is the Amount Present of the job characteristic, DIS is the Discrepancy between the Amount Present and the Amount Desired.

TABLE 21

REGRESSION ANALYSIS RESULTS OF TIME$_1$ DATA:
MODELS (8) THROUGH (10)

| Model No. | No. Indep. Vars. | $R^2$ | Adj. $R^2$ | $F$ | $p$ | Sample Size |
|---|---|---|---|---|---|---|
| (8) | 7 | .6279 | .5953 | 19.28 | .0000 | 88 |
| (9) | 7 | .4991 | .4517 | 10.53 | .0000 | 82 |
| (10) | 12 | .6532 | .5970 | 11.61 | .0000 | 87 |

Since the two models contain different subsets of job characteristics, the $R^2$ values cannot be compared statistically. However, a model can be constructed which contains the Amount Present of each of the twelve job characteristics as independent variables [the five core characteristics from Model (1) and the seven characteristics from Model (8)], and Models (1) and (8) can each be compared to the full model to determine if the increase in the $R^2$ value from the reduced model to the full model is statistically significant. This model comparison test shows whether or not Model (8) explains a significantly greater amount of the variance in General Satisfaction than Model (1). The results of these tests are presented in Table 22. Starting with Model (1) and adding the seven variables from Model (8) to form Model (10) (see Table 18), $R^2$ is significantly increased by .2284 ($p = .0000$). Adding the seven job characteristics identified as most important significantly increases the explained variance. Starting with Model (8) and adding the five core characteristics to form Model (10), $R^2$ is increased by .0239, which is not significant at $p = .412$. Adding the five core characteristics does not significantly increase the explained variance. This indicates that the seven job characteristics identified as most important to the respondents explain a significantly greater proportion of the variance in General Satisfaction than the five core characteristics.

The second approach to generate improved models of the job characteristics—job satisfaction relationship was to perform stepwise regressions to determine which job characteristics statistically explain more of the variance in the dependent variable. Table 23 presents the results of a forward regression of general satisfaction on the set of the amount present

TABLE 22

MODEL COMPARISON TESTS:
MODEL (10) VS. MODELS (1) AND (8)
FOR DATA COLLECTED AT TIME$_1$

| Model Tested | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|---|---|---|---|---|---|
| Reduced Model —Model (1) | .4248 | 11.96 | .4248 | 11.96 | .0000 |
| Full Model —Model (10) | .6532 | 11.61 | .2284 | 6.96 | .0000 |
| Reduced Model —Model (8) | .6293 | 19.16 | .6293 | 19.16 | .0000 |
| Full Model —Model (10) | .6532 | 11.61 | .0239 | 1.02 | .4120 |

TABLE 23

RESULTS OF STEPWISE REGRESSIONS: FORWARD REGRESSION
OF GENERAL SATISFACTION ON THE AMOUNT PRESENT
OF THE 25 JOB CHARACTERISTICS FOR DATA
COLLECTED AT $TIME_1$[a]

| Step No. | Variable Entered | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|------|-----------------|-------|-------|--------|--------|--------|
| 1 | $AP_{Challenge}$ | .3099 | 37.72 | .3099 | 37.72 | .000 |
| 2 | $AP_{Pace\ control}$ | .4852 | 39.11 | .1753 | 28.26 | .000 |
| 3 | $AP_{Role\ conflict}$ | .5756 | 37.06 | .0904 | 17.46 | .000 |
| 4 | $AP_{Feedback\ from\ job}$ | .6105 | 31.74 | .0350 | 7.27 | .009 |
| 5 | $AP_{Optional\ interaction}$ | .6449 | 29.06 | .0344 | 7.75 | .007 |
| 6 | $AP_{Rigidity}$ | .6654 | 26.18 | .0204 | 4.83 | .031 |

[a]Sample size is 86.

of the twenty-five job characteristics. Six job characteristics were able to explain 66 percent of the variance: Challenge, Pace control, Role conflict, Feedback from the job, Optional interaction and Rigidity. Three of these characteristics are a subset of the seven job characteristics identified as most important to the respondents and included in Model (8). These three alone account for 57 percent of the variance in General Satisfaction.

A model was constructed which contained the amount present of the above-mentioned three job characteristics as independent variables: Challenge, Pace control and Role conflict. This model, Model (11) in Table 20, was compared to Model (8) to determine whether or not the inclusion of four additional variables (identified as Most Important) is significantly better than the three-variable model. Table 24 shows that $R^2$ was increased by .0510, which was significant at $p = .034$, with the addition of these four variables. Statistically, Model (8) is an improvement over Model (11).

After the $time_2$ data were collected, the seven a priori models and two a posteriori models were analyzed using that data. Amount Present, Amount Desired and Discrepancy scores were obtained from the $time_2$ data, but the Importance measures from $time_1$ were used in Models (4) and (5). Models (8) and (9) used the Most Important Job Characteristics Model generated from the $time_1$ analysis. The results are reported in Table 25. A pattern was obtained similar to that using the $time_1$ data; similar $F$ values and $R^2$ values were found. The regression analysis of Model (8) using $time_2$ data was once again found to have a high $R^2$ value given a modest number of independent variables. The correlation matrix of the independent variables (Amount Present) using $time_2$ data is not presented, but out of

## TABLE 24

### MODEL COMPARISON TEST:
### MODEL (8) VS. MODEL (11) FOR
### DATA COLLECTED AT TIME$_1$

| Model Tested | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|---|---|---|---|---|---|
| Reduced Model —Model (11) | .5769 | 38.18 | .5769 | 38.18 | .000 |
| Full Model —Model (8) | .6279 | 19.29 | .0510 | 2.74 | .034 |

TABLE 25

REGRESSION ANALYSIS RESULTS OF TIME$_2$ DATA:
MODELS (1) THROUGH (9)

| Model No. | No. Indep. Vars. | $R^2$ | Adj. $R^2$ | $F$ | $p$ | Sample Size |
|-----------|------------------|-------|------------|------|-------|-------------|
| (1) | 5 | .4714 | .4314 | 11.77 | .0000 | 72 |
| (2) | 1 | .3750 | .3661 | 42.00 | .0000 | 72 |
| (3) | 25 | .7612 | .6285 | 5.74 | .0000 | 71 |
| (4) | 5 | .3367 | .2848 | 6.50 | .0001 | 70 |
| (5) | 25 | .8103 | .5314 | 2.90 | .0132 | 43 |
| (6) | 5 | .3222 | .2709 | 6.28 | .0001 | 72 |
| (7) | 25 | .6816 | .5048 | 3.85 | .0000 | 71 |
| (8) | 7 | .6530 | .6150 | 17.20 | .0000 | 72 |
| (9) | 7 | .4348 | .3730 | 7.03 | .0000 | 72 |

300 correlation coefficients computed from 25 variables, the significance of 82 correlations had changed from the $time_1$ correlation matrix. Forty-two correlations that were found to be nonsignificant using $time_1$ data had become significant using $time_2$ data and 40 correlations that were previously significant were found to be nonsignificant using $time_2$ data. Previous research has shown that multicollinearity is a major problem in interpreting the results of analyses of the Job Diagnostic Survey. There does not appear to be a regular pattern of correlated variables from sample to sample, but each sample exhibits a different pattern. Since the $time_2$ data from this study are, in fact, a replication using the same sample, it is clearly indicated that the pattern of multicollinearity can vary over time even within the same sample of respondents. This finding should alert researchers to the problem of using models such as the Job Characteristics Model or alternative models for purposes of prediction.

A stepwise regression of General Satisfaction against the Amount Present of the entire set of twenty-five job characteristics [Model (3)] using $time_2$ data was run. The results are presented in Table 26. Four variables were able to explain 65 percent of the variance in General Satisfaction: Feedback from agents, Learning opportunities, Role conflict and Rigidity. There was an overlap of two job characteristics between the forward regression model using $time_1$ data and that using $time_2$ data: Role conflict and Rigidity. Three of the four variables that appear in the forward regression model using $time_2$ data had been incorporated into Model (8), the Most Important Job Characteristics model: Feedback from agents, Learning opportunities and Role conflict. These three variables account for 61

TABLE 26

RESULTS OF STEPWISE REGRESSIONS: FORWARD REGRESSION
OF GENERAL SATISFACTION ON THE AMOUNT PRESENT
OF THE 25 JOB CHARACTERISTICS FOR DATA
COLLECTED AT $TIME_2$[a]

| Step No. | Variable Entered | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|------|------------------|-------|-----|--------------|---------------|----------------------|
| 1 | $AP_{Feedback\ from\ agents}$ | .3449 | 36.33 | .3449 | 36.33 | .000 |
| 2 | $AP_{Learning\ opportunities}$ | .4853 | 32.06 | .1404 | 18.56 | .000 |
| 3 | $AP_{Role\ conflict}$ | .6151 | 35.70 | .1298 | 22.60 | .000 |
| 4 | $AP_{Rigidity}$ | .6547 | 31.28 | .0395 | 7.56 | .008 |

[a]Sample size is 71.

percent of the variance in General Satisfaction. However, Feedback from agents and Learning opportunities did not appear in the stepwise regression using $time_1$ data. The results of forward regressions using $time_1$ and $time_2$ data support the inclusion of five of the seven job characteristics contained in Model (8), the Most Important Job Characteristics model: Challenge, Feedback from agents, Learning opportunities, Pace control and Role conflict.

Using both the $time_1$ and the $time_2$ data, Hackman and Oldham's Job Characteristics Model peformed well, but the Most Important Job Characteristics Model performed better in terms of fit and portion of variance in job satisfaction explained by the set of independent variables. Stepwise regressions showed support for three of the seven job characteristics included in the MIJCM. Use of Discrepancy scores or Amount Present weighted by Importance resulted in poorer performance of the models.

## Results of Within-Subjects Hypothesis Testing

The seven a priori models and two a posteriori models were tested by regression analysis using difference scores between $time_2$ and $time_1$. (See Table 27.) The new variables are Change in the Amount Present of the job characteristic ($CAP_{Job\ char}$) and Change in the Discrepancy between Amount Present and Amount Desired of the job characteristic ($CDIS_{Job\ char}$). The Importance measures from $time_1$ were used in Models (4C) and (5C). Models (8C) and (9C) used the Most Important Job Characteristics Model generated from the $time_1$ analysis. These variables are used in regression models to test intra-individual hypotheses rather than inter-individual hypotheses. Whereas the previous section tested the relationship between

TABLE 27

A PRIORI AND A POSTERIORI REGRESSION MODELS
OF CHANGE ANALYZED

| Model No. | Description of Model[a] |
|---|---|
| (1C) | Hackman and Oldham's Job Characteristics Model— the core characteristics as independent variables. |

$$CGENSAT = f \{ CAP_{Autonomy} , CAP_{Feedback\ from\ job} ,$$
$$CAP_{Skill\ variety} , CAP_{Task\ identity} , CAP_{Task\ significance} \}$$

| | |
|---|---|
| (2C) | Hackman and Oldham's Job Characteristics Model— formulation using Motivating Potential Score. |

$$CGENSAT = f \{ CMPS \}$$

| | |
|---|---|
| (3C) | Amount Present of Each Job Characteristic in Study— Entire set of 25 job characteristics measured in study. |

$$CGENSAT = f \{ CAP_1 , \ldots CAP_{25} \}$$

| | |
|---|---|
| (4C) | Model Weighted by Importance— Hackman and Oldham's core characteristics. |

$$CGENSAT = f \{ ( CAP_{Autonomy} * BIMP_{Autonomy} ) , \ldots$$
$$\ldots ( CAP_{Task\ significance} * BIMP_{Task\ significance} ) \}$$

| | |
|---|---|
| (5C) | Model Weighted by Importance—Entire set of 25 job characteristics measured in study. |

$$CGENSAT = f \{ ( CAP_1 * BIMP_1 ) , \ldots ( CAP_{25} * BIMP_{25} ) \}$$

---

[a]CGENSAT is the Change in General Satisfaction, CAP is the Change in Amount Present of the job characteristic, BIMP is the Importance measured at $time_1$ (Before the change), CDIS is the Change in Discrepancy between the Amount Present and the Amount Desired, CMPS is the Change in the Motivating Potential Score.

TABLE 27—Continued

| Model No. | Description of Model[a] |
|---|---|
| (6C) | Discrepancy Model—Hackman and Oldham's core characteristics. |
| | $CGENSAT = f \{ CDIS_{Autonomy}, CDIS_{Feedback\ from\ job},$ $CDIS_{Skill\ variety}, CDIS_{Task\ identity}, CDIS_{Task\ significance} \}$ |
| (7C) | Discrepancy Model—Entire set of 25 job characteristics measured in study. |
| | $CGENSAT = f \{ CDIS_1, \ldots CDIS_{25} \}$ |
| (8C) | Amount Present of the Most Important Job Characteristics— Seven job characteristics measured in the study. |
| | $CGENSAT = f \{ CAP_{Challenge}, CAP_{Feedback\ from\ agents},$ $CAP_{Learning\ opportunities}, CAP_{Pace\ control},$ $CAP_{Role\ ambiguity}, CAP_{Role\ conflict}, CAP_{Role\ overload} \}$ |
| (9C) | Discrepancy of the Most Important Job Characteristics— Seven job characteristics measured in the study. |
| | $CGENSAT = f \{ CDIS_{Challenge}, CDIS_{Feedback\ from\ agents},$ $CDIS_{Learning\ opportunities}, CDIS_{Pace\ control},$ $CDIS_{Role\ ambiguity}, CDIS_{Role\ conflict}, CDIS_{Role\ overload} \}$ |

[a]CGENSAT is the Change in General Satisfaction, CAP is the Change in Amount Present of the job characteristic, BIMP is the Importance measured at $time_1$ (Before the change), CDIS is the Change in Discrepancy between the Amount Present and the Amount Desired, CMPS is the Change in the Motivating Potential Score.

TABLE 27—Continued

| Model No. | Description of Model[a] |
|---|---|
| (10C) | Amount Present of the Core Characteristics and Most Important Job Characteristics—Twelve job characteristics. |

$$CGENSAT = f\,(\,CAP_{Autonomy},\,CAP_{Feedback\ from\ job},$$
$$CAP_{Skill\ variety},\,CAP_{Task\ identity},\,CAP_{Task\ significance},$$
$$CAP_{Challenge},\,CAP_{Feedback\ from\ agents},$$
$$CAP_{Learning\ opportunities},\,CAP_{Pace\ control},$$
$$CAP_{Role\ ambiguity},\,CAP_{Role\ conflict},\,CAP_{Role\ overload}\,)$$

[a]CGENSAT is the Change in General Satisfaction, CAP is the Change in Amount Present of the job characteristic, BIMP is the Importance measured at $time_1$ (Before the change), CDIS is the Change in Discrepancy between the Amount Present and the Amount Desired, CMPS is the Change in the Motivating Potential Score.

job characteristics present in the job and job satisfaction across individual respondents, in this section the relationship being tested is between the *change* in the amounts present of the job characteristics and the *change* in job satisfaction for each individual. Regardless of the amount present in the job at either point in time, the research question only addresses whether or not a change in that amount is related to a change in job satisfaction. No assumption is made that jobs which were higher in levels of the job characteristics are also higher in levels of job satisfaction, only that a change in one produces a change in the other.

Graphic analysis of the residuals for each of the Models (1C) through (9C) was undertaken to examine the aptness of the models for regression analysis. Probability plots of the observed vs. the expected standard residual indicated nonconstant error variance for all of the models. This was least severe for Models (8C) and (9C), but quite severe for models containing 25 predictor variables. These results indicate that there were problems with using difference scores to fit regressions. Results of the regressions will be presented, but inferences drawn from the data are necessarily limited.

Table 28 presents the results for the nine change models tested using difference scores from $time_1$ and $time_2$ data. Regression models which used twenty-five predictor variables were not found to have significant $F$ values. The $R^2$ values were also low for regressions which contained such a large number of predictor variables. Hackman and Oldham's core characteristics model used as a change model, Model (1C), had a significant $F$ value $(p = .0385)$, as did the MPS formulation, Model (2C), $(p = .0057)$. The

TABLE 28

REGRESSION ANALYSIS RESULTS OF CHANGE
MODELS USING DIFFERENCE SCORES:
MODELS (1C) THROUGH (9C)

| Model No. | No. Indep. Vars. | $R^2$ | Adj. $R^2$ | $F$ | $p$ | Sample Size[a] |
|-----------|------------------|-------|------------|-----|-----|----------------|
| (1C) | 5 | .1739 | .1051 | 2.53 | .0385 | 66 |
| (2C) | 1 | .1134 | .0995 | 8.19 | .0057 | 66 |
| (3C) | 25 | .4780 | .1434 | 1.43 | .1556 | 65 |
| (4C) | 5 | .1604 | .0893 | 2.25 | .0605 | 65 |
| (5C) | 25 | .5236 | .1515 | 1.41 | .1798 | 58 |
| (6C) | 5 | .1747 | .1035 | 2.45 | .0438 | 64 |
| (7C) | 25 | .5210 | .1467 | 1.39 | .1873 | 58 |
| (8C) | 7 | .2878 | .2033 | 3.41 | .0040 | 67 |
| (9C) | 7 | .2545 | .1596 | 2.68 | .0183 | 63 |

[a]Sample size differs from model to model due to missing data.

Discrepancy form of the core characteristics, Model (6C), also fit the data well ($p$ - .0438). The model in which the core characteristics were weighted by importance, Model (4C), was very close to being significant ($p$ - .0605). Model (8C), the Change in Amount Present of the Most Important Job Characteristics, performed the best and yielded an $R^2$ of .2878. The Discrepancy form, Model (9C), performed less well. In general, a pattern similar to that found in the analyses of the static models appeared in the analyses of the change models, although the relationships were not as strong and the $R^2$ values were smaller. Models containing the Amount Present variables performed better than models which used weighted variables or discrepancy variables, both in significance of the regression fits and in percent of variance explained ($R^2$).

The matrix of intercorrelations between the Change in Amount Present variables is presented in Appendix M. Forty-nine of the 300 correlation coefficients are significantly different from zero at the $\alpha$ - .05 level. There is less of a problem of multicollinearity among the Change in Amount Present variables than in the Amount Present variables.

Model Comparison Tests of Model (10C) vs. Models (1C) and (8C) were conducted to determine if Model (8C) explains a significantly greater portion of the variance in the Change in General Satisfaction (CGENSAT) than Model (1C). This parallels the Model Comparison Test in Table 22. The results presented in Table 29 show that the addition of the seven variables from Model (8C) to the core characteristics Model (1C) significantly increases $R^2$ by .2077. However, adding the five core characteristics variables from Model (1C) to the seven variables in Model (8C) increases $R^2$ by .0556,

## TABLE 29

MODEL COMPARISON TESTS:
MODEL (10C) VS. MODELS (1C) AND (8C)
FOR $TIME_2$ - $TIME_1$ CHANGE SCORES

| Model Tested | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|---|---|---|---|---|---|
| Reduced Model —Model (1C) | .1739 | 2.53 | .1739 | 2.53 | .0385 |
| Full Model —Model (10C) | .3816 | 2.73 | .2077 | 2.54 | .0247 |
| Reduced Model —Model (8C) | .3260 | 4.01 | .3260 | 4.01 | .0012 |
| Full Model —Model (10C) | .3816 | 2.73 | .0556 | 0.95 | .4548 |

which is not significant ($p$ = .4548). This indicates that the Change in Amount Present of the seven job characteristics identified as Most Important to the respondents explains a significantly greater proportion of the variance in the dependent variable, Change in General Satisfaction, than the Change in Amount Present of the five core characteristics.

Stepwise regressions of Change in General Satisfaction (CGENSAT) against the Change in Amount Present of each of the twenty-five job characteristics were run. The results are presented in Table 30. Three variables explain 32 percent of the variance in CGENSAT: Change in Amount Present of Autonomy, Feedback from agents and Certainty. This finding does not provide support for any of the change models (1C) through (9C). The problems encountered with nonnormally distributed error terms and nonconstant error variance were considered serious enough to rule out any further exploration of the Change in Job Characteristics—Change in General Job Satisfaction relationship using this data.

Since weaker relationships were found in the change models, the regressions were re-run using two different dependent variables: Change in Intrinsic Satisfaction (CINSAT) and Change in Extrinsic Satisfaction (CEXSAT). This allowed further examination of the specific outcomes which result from changing the amounts of job characteristics in a job. Such changes might be expected to have more influence on one or the other type of job satisfaction. Table 31 presents the results of these regressions. In general, weaker relationships and poor $R^2$ values were found. Poor and negative Adjusted $R^2$ values for models containing large numbers of predictor variables indicated that the decreases in Sums of Squares for Residuals could not be

TABLE 30

RESULTS OF STEPWISE REGRESSIONS: FORWARD REGRESSION
OF CHANGE IN GENERAL SATISFACTION ON THE CHANGE IN
AMOUNT PRESENT OF THE 25 JOB CHARACTERISTICS[a]

| Step No. | Variable Entered | $R^2$ | $F$ | $R^2$ Change | $F$ of Change | $p$ of $F$ of Change |
|------|------------------|-------|------|--------------|---------------|----------------------|
| 1 | $CAP_{Autonomy}$ | .1556 | 11.61 | .1556 | 11.61 | .0011 |
| 2 | $CAP_{Feedback\ from\ agents}$ | .2616 | 10.98 | .1060 | 8.90 | .0041 |
| 3 | $CAP_{Certainty}$ | .3211 | 9.62 | .0594 | 5.34 | .0242 |

[a]Sample size is 65.

TABLE 31

REGRESSION ANALYSIS RESULTS OF CHANGE MODELS USING
DIFFERENCE SCORES:  MODELS (1C) THROUGH (9C) WITH
DEPENDENT VARIABLES CHANGE IN INTRINSIC
SATISFACTION (CINSAT) AND CHANGE IN
EXTRINSIC SATISFACTION (CEXSAT)[a]

| | Dependent Variable | | | | | | | |
| | Change in Intrinsic Satisfaction (CINSAT) | | | | Change in Extrinsic Satisfaction (CEXSAT) | | | |
| Model | $R^2$ | Adj. $R^2$ | $F$ | $p$ | $R^2$ | Adj. $R^2$ | $F$ | $p$ |
|---|---|---|---|---|---|---|---|---|
| (1C) | .177 | .113 | 2.76 | .026 | .028 | -.051 | 0.36 | .876 |
| (2C) | .109 | .096 | 8.31 | .005 | .000 | -.015 | 0.00 | .996 |
| (3C) | .401 | .053 | 1.15 | .335 | .517 | .216 | 1.71 | .063 |
| (4C) | .154 | .086 | 2.28 | .057 | .018 | -.064 | 0.22 | .953 |
| (5C) | .416 | .010 | 1.02 | .465 | .524 | .163 | 1.45 | .156 |
| (6C) | .131 | .061 | 1.86 | .114 | .126 | .051 | 1.69 | .150 |
| (7C) | .413 | .006 | 1.01 | .476 | .623 | .338 | 2.18 | .018 |
| (8C) | .227 | .141 | 2.64 | .019 | .270 | .185 | 3.17 | .006 |
| (9C) | .219 | .127 | 2.37 | .033 | .195 | .095 | 1.94 | .080 |

[a]Due to missing values, sample sizes vary between 59 and 71.

offset by losses in degrees of freedom. Nonsignificant relationships were found for Models (3C), (4C), (5C) and (6C) for both CINSAT and CEXSAT. Strong relationships were found for Model (8C) for both of the dependent variables. Differences in results between CINSAT and CEXSAT regressions occurred in Models (1C), (2C) and (9C). The CAP—CINSAT relationship was strong for the core characteristics model, but the CAP—CEXSAT relationship was almost nonexistent. This same pattern appeared for the CMPS—CINSAT and CMPS—CEXSAT relationships. In contrast, Model (8C), the Most Important Job Characteristics Model, showed strong CAP—CINSAT and CAP—CEXSAT relationships and relatively good $R^2$ values. The independent variables used in the MIJCM may be providing a more complete description of how job characteristics affect both intrinsic and extrinsic aspects of job satisfaction.

In order to provide a comparison of these results to the study undertaken by Hackman, Pearce and Wolfe (1978), Table 32 was prepared. Hackman et al. assessed changes in the core characteristics due to a change in jobs which resulted from the installation of computer-tape storage in a metropolitan bank. Assessments of the core characteristics, two additional job characteristics and various measures of satisfaction were made by administering the Job Diagnostic Survey two months before the planned change and then three months afterwards. After the data were collected, they divided their sample into three "quasi-experimental groups" based on changes in MPS scores: Employees whose jobs were enriched by the change, Employees whose jobs were neither enriched nor "de-enriched" by the change, and Employees whose jobs were "de-enriched" by the change. For

TABLE 32

MEAN CHANGE SCORE OF AMOUNT PRESENT OF EACH JOB CHARACTERISTIC
AND GENERAL SATISFACTION AS A FUNCTION OF
(QUASI-) EXPERIMENTAL CONDITION[a]

| Variable | Enriched Jobs (N-29) | Jobs that Did Not Change (N-20) | De- Enriched Jobs (N-23) | $F$ | $p$ |
|---|---|---|---|---|---|
| Autonomy | .655 | .250 | -1.203 | 26.90 | .0000 |
| Certainty | .333 | -.250 | .319 | 2.54 | .0865 |
| Challenge | .586 | .517 | -.870 | 19.62 | .0000 |
| Dealing with others | .126 | -.033 | -.362 | 0.90 | .4098 |
| Effort | -.069 | .150 | -.290 | 0.75 | .4768 |
| Feedback from agents | .023 | -.150 | .072 | 0.19 | .8269 |
| Feedback from job | .828 | -.217 | -.986 | 28.13 | .0000 |
| Friendship opportunities | .195 | .183 | -.072 | 0.42 | .6569 |
| Interruptions | .069 | -.300 | .101 | 0.76 | .4694 |
| Knowledge/skills required | .262 | .283 | .087 | 0.33 | .7178 |
| Learning opportunities | .425 | .117 | -.478 | 4.33 | .0170 |
| Initiated interdependence | .080 | -.200 | -.319 | 0.76 | .4715 |
| Optional interaction | .034 | .200 | .174 | 0.20 | .8188 |
| Pace control | .310 | .067 | -.232 | 1.08 | .3465 |
| Required interaction | -.046 | .017 | -.290 | 0.68 | .5118 |
| Responsibility | .138 | -.250 | -.348 | 1.46 | .2384 |
| Received interdependence | .563 | -.100 | -.261 | 4.05 | .0217 |
| Rigidity | -.230 | .367 | .130 | 2.33 | .1048 |
| Role ambiguity | -.184 | .000 | .072 | 0.33 | .7179 |
| Role conflict | .161 | -.017 | -.029 | 0.23 | .7976 |
| Role overload | .218 | .333 | -.246 | 1.28 | .2835 |
| Skill variety | .494 | -.183 | -.261 | 4.96 | .0097 |
| Training adequacy | .011 | -.233 | -.087 | 0.24 | .7880 |
| Task identity | .529 | .117 | -.246 | 1.73 | .1841 |
| Task significance | -.034 | -.167 | -.522 | 1.58 | .2139 |
| Change in Gen. Satisfaction | .621 | -2.632 | -5.864 | 2.22 | .1162 |

[a]These categories were formed using respondents' Motivating Potential Scores. This index is composed of Autonomy, Feedback from job, Skill variety, Task identity and Task significance.

the first group, the increase in MPS ranged from +28 to +103, with a median
increase of +72. For the second group, the change in MPS ranged from +11
to -13, with a median change of -2. The range of MPS decrease for the
third group ranged from -26 to -87, with a median decrease of -43. A
table similar to Table 32 was presented in which changes in reaction to
work were examined. The criteria which was used in the present study to
divide the respondents into three categories was developed by inspecting
the range of Change in Motivating Potential Scores (CMPS) and assigning the
respondents to the "Did Not Change" group if the CMPS was not significantly
different from zero at the $\alpha$ - .05 level. Respondents whose CMPS scores
were significant and positive were placed in the "Enriched" category (N-29);
respondents whose scores were significant and negative were placed in the
"De-enriched" category (N=23). For the "Enriched" category, CMPS ranged
from 12.1 to 121.9. For "De-enriched", CMPS ranged from -12.4 to -209.6.
Twenty respondents were placed in the "Did Not Change" category.

Using Analysis of Variance, Hackman et al. found significant differ-
ences among the three groups for Changes in the Amount Present of four of
the five core characteristics (Autonomy, Feedback from the job, Skill variety
and Task significance) as well as for their measures of General Satisfaction,
Internal work motivation and Growth Satisfaction. In the present study,
Analysis of Variance was used to detect differences among the groups at the
$\alpha$ - .05 level of significance. Levene's Test for Equal Variances showed that
variances within each group could be assumed to be equal for all variables
except Certainty. Significant differences were found for the Changes in the
Amount Present of Autonomy, Challenge, Feedback from the job, Learning

opportunities, Received task interdependence and Skill variety among the three groups. It would be expected that some of the core characteristics would show significant changes since the MPS index is composed of a formulation including those characteristics. For jobs which were de-enriched (using the Job Characteristics Model definition of enrichment), significant decreases were also found in the amounts of Challenge and Learning opportunities, two characteristics which were found to be very important to the respondents. General satisfaction also decreased for the de-enriched group, although the differences among the three groups was not significant at the .05 level.

Using difference scores between $time_1$ and $time_2$, the Most Important Job Characteristics Model performed better than Hackman and Oldham's Job Characteristics Model in terms of fit and portion of variance in change in job satisfaction explained by the set of independent variables. In general, the change models produced poorer fits and explained less variance in the dependent variable than the between-subjects models. Use of Discrepancy scores or Importance-weighted variables resulted in poorer performance of the models, similar to the findings in which between-subjects models were used. Stepwise regressions of the Change in Amount Present variables did not provide support for any of the change models.

## FACTOR ANALYSIS

Factor analysis was employed to examine the dimensionality of "work" as perceived by the respondents in this sample. The principal objective of factor analysis is to attain scientific parsimony or economy of

description through the analysis of correlations among a set of variables and resolution into a small number of categories or "factors" (Harman, 1967). With this objective in mind, factor analysis of the Amount Present measures of the 25 job characteristics was conducted in two separate applications, using $time_1$ data and $time_2$ data. These factor analyses provide an examination of the relationships among the job characteristics to assess the dimensionality of work. The long-term goal of this type of analysis is to achieve a better understanding of how individuals perceive their world of work.

Dunham, Aldag and Brief (1977) were unable to empirically reproduce the five-factor structure of the core characteristics assumed by the Job Diagnostic Survey in the majority of the 20 samples they tested. They strongly suggest that users of that instrument empirically examine the underlying dimensionality for each and every sample. A factor analysis of the 75 items of the Job Factors Study Questionnaire which measure the Amount Present of each job characteristic would provide an examination of the underlying structure of the instrument (the portion which assesses the Amount Present) as displayed in this sample, however the analysis could not be conducted due to an inadequate sample size for applying this technique. The smallest ratio of sample size to number of variables in a factor analysis that is generally considered adequate is 5:1 (Gorsuch, 1974). The stability of factor loadings is a direct function of sample size, and interpretation of the factor solution becomes problematic as the sample size decreases.

All of the computations for the factor analyses were performed using version 9.0 of the SPSS statistical package on the Cyber mainframe com-

puter of the University of Massachusetts Computing Center. Listwise deletion of missing data was used, i. e., a case was dropped from the analysis if missing data was found for any of the variables used. The following information is reported for the analysis: a description of the factor model used and initial factoring method, initial estimates of communality among the variables, eigenvalues obtained, variance accounted for by each factor, the criteria used to determine the number of factors retained for rotation, procedure used for rotation, factor loadings obtained and intepretation of the factor solution.

## Factor Analysis of the Amount Present Variables at Time$_1$

This factor analysis uses the measures of Amount Present of each of the 25 job characteristics as variables. For the time$_1$ administration, the sample size of 90 gives a sample size to number of variables ratio of 3.6 : 1. This ratio is not as good as generally recommended, thus the stability of the factor loadings is questionable.

Factor model. The classical factor analysis model was the math-ematical model employed to examine the relationships among the 25 job characteristics measured in this study. In this model, each observed variable is described in terms of several common factors and a unique factor. The problem is to discover how many of these factors there are and the composition of these factors in terms of job characteristics. Because the observed variables are assumed to be a result of an underlying regularity in the data, i.e. twenty-five job characteristics, the factors are inferred rather

than defined as in the principal components model. Principal Factor Analysis with iterations was conducted on the correlation matrix formed from the 25 variables using squared multiple correlations in the diagonal as initial communality estimates. The initial communality estimates are listed in Appendix N and the eigenvalues obtained and percent of variance accounted for by each factor for the unrotated factor matrix are presented in Appendix O.

Number of factors retained for rotation. No clear decision rule exists to determine the number of factors to retain prior to rotation. Several strategies have been proposed, and the best advice remains to use a combination of strategies and examine several solutions until the most interpretable solution is found (Ford, MacCallum & Tait, 1986). For this analysis two a priori factor solutions were examined. A 3-factor solution was chosen to verify the three dimensions of Individual, Social and Physical components of work proposed by Griffin et al. (1984). A 5-factor solution was conducted to examine the possibility that the core characteristics would each load on a separate factor and the remaining variables would fall within different factors. The most popular decision rule, according to Ford et al. (1986), is Kaiser's eigenvalues greater than one rule. Seven factors were retained to produce another solution which was based on this decision rule. The first 7 factors of the unrotated factor matrix account for 70.1% of the variance. The other two strategies that were used involved a graphic plot of the eigenvalue vs. factor number: scree test and parallel analysis.

For the scree test, the point at which the eigenvalues begin to level off forming a straight, almost horizontal, line is the point at which the

factoring should be stopped. This method has been criticized for the subjectivity involved in deciding precisely where the curve becomes a straight line. Another strategy which can be used is parallel analysis, which is based on the assumption that eigenvalues generated from data which have an underlying structure should be larger than eigenvalues generated from random data. This analysis involves plotting two curves. The first curve is a plot of the eigenvalues obtained from the data vs. factor number. A parallel curve is plotted which is generated from eigenvalues obtained from random data with the same number of variables and sample size. When the curve generated by the sample data dips below the curve generated from random data, the researcher will know that the corresponding eigenvalue is no larger than one which would have been expected to occur by chance. This method can only be used when the factoring method uses squared multiple correlations in the diagonal as communality estimates. Montanelli and Humphreys (1976) provide the equation to use to predict the size of the eigenvalues from a random correlation matrix.

Figure 2 shows the curves obtained by plotting the first 10 eigenvalues of the sample data (black boxes) and the eigenvalues generated from Montanelli and Humphreys' equation (white boxes) for the Amount Present variables measured at $time_1$. The curve generated from sample data (black boxes) never intersects the curve generated from random data (white boxes), but they come very close together at factor 4. This indicates that the fourth and subsequent eigenvalues obtained from the sample data are no larger than ones which would have been expected to occur by chance. Results of the parallel analysis suggest that no more than 4 factors should

Figure 2. Plot of the first 10 eigenvalues obtained from sample data (black boxes) and eigenvalues obtained from random data (white boxes) against factor number for the 25 time$_1$ Amount Present variables.

be retained for rotation, and perhaps only 3 factors are clearly indicated. A scree test suggests the same result as the parallel analysis since the curve begins to straighten after the third factor. Based on the results of the above decision rules, four rotations were performed using 3, 4, 5 and 7 factors.

Procedure used for rotation. Previous work in the job characteristics area has shown that many of the constructs developed are not wholly independent of one another. Some degree of interconnectedness appears in much of the research results. Based on the assumption that any factors we would find are most likely intercorrelated, oblique rotations of the factor matrices were conducted. The direct oblimin procedure, developed by Jennrich and Sampson was used (Harman, 1967, pp. 334-341). In the equation which is minimized, different values of a parameter $\delta$ can be used to produce solutions which are more or less oblique. When $\delta$ is 0, the factors are most oblique, allowing for moderate correlations among the factors if such correlations exist in the data. In the rotations conducted on these data, the value of $\delta$ was 0. Factor solutions using $\delta = -1$ were also derived, but the results were almost identical to the $\delta = 0$ solutions. Solutions are reported only for the value of $\delta = 0$.

Interpretation of factor solutions. In order to interpret the solutions, the following decision rules were used. For each variable, a factor loading was considered significant if it was high (over .40) and the other loadings in the row were much lower (less by .10). If several loadings were very high (above .50), all were considered significant (this was not generally the case). A loading had to be at least .05 higher than any other in the row or else

both loadings were considered significant. All four solutions which were derived for the correlation matrix of the Amount Present variables were somewhat interpretable. As more factors were retained, meaningful groups of job characteristics split off from the original factors to load on the added factors.

The factor structure matrix for the 3-factor solution is presented in Table 33. Significant loadings appear in boldface type in the table. Table 34 provides a listing of the job characteristics that composed each factor, in descending order of strength of the factor loading. Factor (3) clearly reflects a social component: Interaction with people on the job. Factors (1) and (2) are difficult to label, but factor (1) suggests the following component: Knowledge and skills used to perform the duties of the job. Factor (2) may be loosely interpreted as an inner directed component: What the incumbent gets from the job (e.g. challenge, chance to learn new things, feedback).

In the 4-factor and 5-factor solutions, there appears to be clearer separation of the job characteristics into more meaningful groups. The 7-factor solution shows this more clearly. The factor structure matrix for the 7-factor solution is presented in Table 35 and the listing of the job characteristics suggested by each factor is given in Table 36. The social component separates into factors (3) and (4) which might be labeled: Interaction necessary to perform the duties of the job and Interactions at the option of the incumbents. Factor (2) in the 7-factor solution is similar to factor (2) in the 3-factor solution. Several job characteristics which loaded on factor (1) in the 3-factor solution were split off from factor (1) and loaded on factor (7) in the 7-factor solution. Factor (7) appears to consist of

## TABLE 33

### FACTOR ANALYSIS OF TIME₁ AMOUNT PRESENT VARIABLES: OBLIQUE FACTOR STRUCTURE MATRIX FOR 3-FACTOR SOLUTION

| Variable | Factor Number 1 | 2 | 3 |
|---|---|---|---|
| Autonomy | .03 | **.57** | .30 |
| Certainty | **-.82** | -.07 | -.17 |
| Challenge | **.47** | **.67** | .12 |
| Dealing with others | .39 | .11 | **.62** |
| Effort | **.67** | .16 | -.11 |
| Feedback from agents | -.02 | **.44** | .14 |
| Feedback from job | -.02 | **.60** | .11 |
| Friendship opportunities | -.32 | .02 | **.39** |
| Interruptions | **.63** | -.26 | .13 |
| Knowledge and skills required | **.69** | .43 | .13 |
| Learning opportunities | .44 | **.65** | .23 |
| Initiated interdependence | .15 | .32 | **.49** |
| Optional interaction | -.21 | -.08 | .35 |
| Pace control | **-.45** | .36 | .08 |
| Required interaction | .26 | .17 | **.80** |
| Responsibility | .02 | .14 | -.17 |
| Received interdependence | -.04 | .21 | **.50** |
| Rigidity | -.26 | -.27 | -.29 |
| Role ambiguity | **.47** | **-.49** | .06 |
| Role conflict | **.66** | -.26 | .04 |
| Role overload | **.73** | -.23 | -.20 |
| Skill variety | **.76** | .35 | .05 |
| Training adequacy | **-.59** | .08 | -.07 |
| Task identity | -.21 | **.47** | -.14 |
| Task significance | **.56** | .43 | .33 |

TABLE 34

FACTOR ANALYSIS OF TIME$_1$ AMOUNT PRESENT VARIABLES:
FACTORS SUGGESTED BY THE 3-FACTOR
OBLIQUE SOLUTION

| Factor Number | Composition of Factor |
|---|---|
| (1) | Certainty, Skill variety, Role overload, Knowledge and skills required, Effort, Role conflict, Interruptions, Training adequacy (neg), Task significance, Challenge, Role ambiguity, Pace control (neg) |
| (2) | Challenge, Learning opportunities, Feedback from job, Autonomy, Role ambiguity (neg), Task identity, Feedback from agents |
| (3) | Required interaction, Dealing with others, Received interdependence, Initiated interdependence, Friendship opportunities |

TABLE 35

FACTOR ANALYSIS OF TIME$_1$ AMOUNT PRESENT VARIABLES:
OBLIQUE FACTOR STRUCTURE MATRIX
FOR 7-FACTOR SOLUTION

| Variable | Factor Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Autonomy | .31 | .33 | .35 | .09 | .22 | **-.62** | -.04 |
| Certainty | **-.73** | .09 | -.24 | .13 | -.07 | -.17 | -.65 |
| Challenge | **.64** | **.57** | .32 | -.21 | .17 | -.15 | .17 |
| Dealing with others | .36 | .14 | **.67** | .15 | -.05 | .17 | .31 |
| Effort | **.60** | .12 | -.06 | -.11 | .28 | .22 | **.49** |
| Feedback from agents | .10 | **.55** | .20 | .01 | .09 | -.19 | -.09 |
| Feedback from job | .18 | **.65** | .21 | .01 | .24 | -.28 | -.16 |
| Friendship opportunities | -.13 | .01 | .16 | **.66** | .02 | -.17 | -.26 |
| Interruptions | .31 | -.09 | .12 | -.02 | .05 | **.48** | **.68** |
| Knowledge and skills required | **.85** | .24 | .22 | -.08 | .16 | .06 | .33 |
| Learning opportunities | **.62** | **.54** | .38 | -.14 | .10 | -.22 | .17 |
| Initiated interdependence | .25 | .16 | **.64** | -.02 | .05 | -.24 | .06 |
| Optional interaction | -.09 | -.04 | .02 | **.92** | -.06 | -.11 | -.07 |
| Pace control | -.16 | .17 | .00 | .16 | .02 | **-.83** | -.37 |
| Required interaction | .31 | .15 | **.71** | .42 | .08 | -.02 | .24 |
| Responsibility | .03 | .09 | -.14 | -.03 | **.94** | -.02 | -.02 |
| Received interdependence | .05 | .15 | **.62** | .05 | -.13 | -.15 | -.11 |
| Rigidity | **-.51** | .12 | -.35 | -.08 | -.16 | .20 | -.01 |
| Role ambiguity | .15 | **-.47** | .02 | -.09 | -.16 | .35 | **.60** |
| Role conflict | .38 | -.25 | .04 | -.09 | .06 | .34 | **.68** |
| Role overload | .41 | -.05 | -.19 | -.18 | .05 | **.52** | **.71** |
| Skill variety | **.88** | .15 | .14 | -.16 | .07 | .12 | .40 |
| Training adequacy | -.31 | -.02 | -.11 | .17 | .00 | -.12 | **-.75** |
| Task identity | .04 | .32 | -.01 | -.11 | .32 | -.33 | -.36 |
| Task significance | **.68** | .20 | .44 | -.06 | .16 | -.13 | .31 |

TABLE 36

FACTOR ANALYSIS OF $TIME_1$ AMOUNT PRESENT VARIABLES:
FACTORS SUGGESTED BY THE 7-FACTOR
OBLIQUE SOLUTION

| Factor Number | Composition of Factor |
|---|---|
| (1) | Skill variety, Knowledge and skills required, Certainty (neg), Task significance, Challenge, Learning opportunities, Effort, Rigidity (neg) |
| (2) | Feedback from job, Challenge, Feedback from agents, Learning opportunities, Role ambiguity (neg) |
| (3) | Required interaction, Dealing with others, Initiated interdependence, Received interdependence |
| (4) | Optional interaction, Friendship opportunities |
| (5) | Responsibility |
| (6) | Autonomy (neg), Role overload, Interruptions, Pace control (neg) |
| (7) | Training adequacy (neg), Role overload, Role conflict, Interruptions, Role ambiguity (neg), Certainty (neg), Effort |

characteristics that have to do with lack of resources to do the job: time and training adequate to perform the duties of the job. There is still quite a bit of overlap between factors (1) and (7), as evidenced by the factor pattern correlation between the two factors of .367.

The 3-factor solution provides the most parsimonious interpretation of the "dimensionality of work" findings. With the 7-factor solution, some of the simplicity is lost, but clearer separation of components is seen. The 5-factor solution did not verify the assumption of the Job Characteristics Model that there are five components of work defined by their five job characteristics. Skill variety and Task significance loaded on one factor, Task identity and Feedback from the job loaded on another factor, and Autonomy had generally very weak loadings with the strongest loading on the same factor as Skill variety and Task significance.

## Factor Analysis of the Amount Present Variables at Time$_2$

A factor analysis was conducted on the data collected at time$_2$ using the same procedure that was used on the time$_1$ data. The sample size to variables ratio was 3 : 1 , with a sample size of 75. The initial communality estimates for each variable are listed in Appendix P and the eigenvalues obtained and percent of variance for the unrotated factor matrix are presented in Appendix Q. A plot of the eigenvalues obtained vs. factor number for the sample data and random data is presented in Figure 3. The curve obtained is very similar to the one obtained in the time$_1$ analysis. Oblique rotations of the 3-factor and 7-factor solutions were
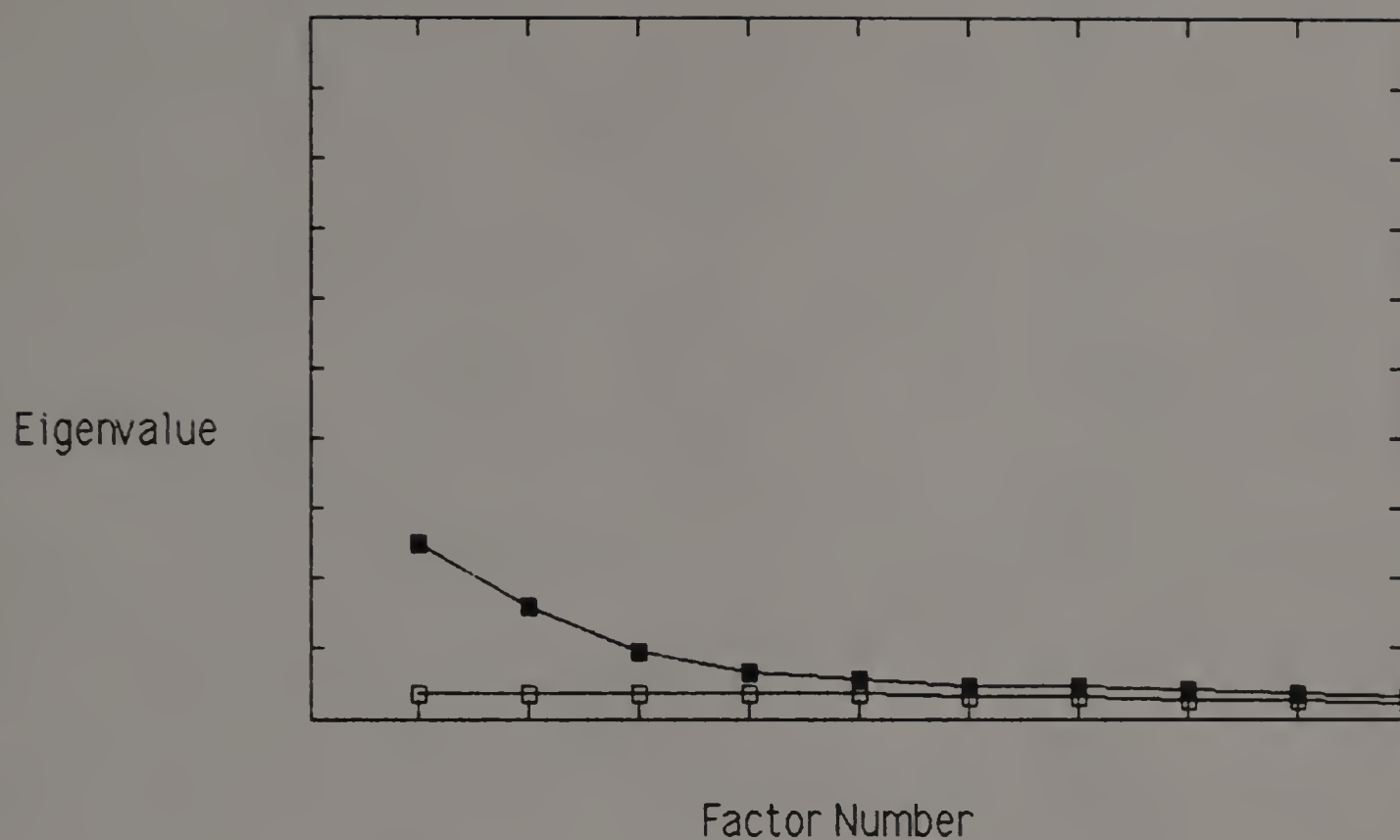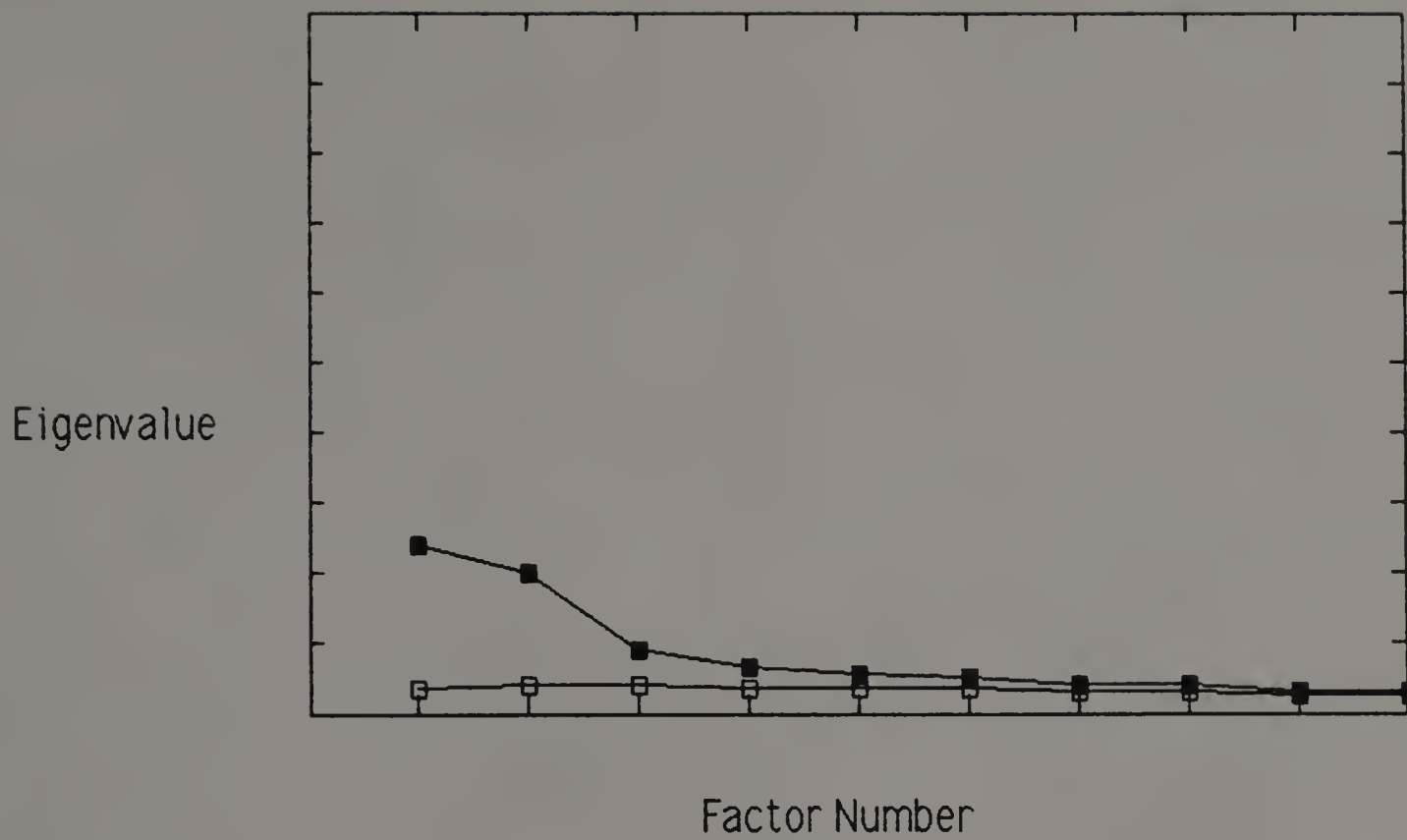
Figure 3. Plot of the first 10 eigenvalues obtained from sample data (black boxes) and eigenvalues obtained from random data (white boxes) against factor number for the 25 time$_2$ Amount Present variables.

conducted on the $time_2$ data. The results are reported in Appendices R through U.

The 3-factor solution of the $time_2$ data is presented in Appendix R. As can be seen from the factors suggested in Appendix S, there is a separation of job characteristics into the three components which could be labeled: Knowledge and skills used to perform the duties of the job, Resources to do the job (time, training, unambiguous feedback) and Interaction with others. The Resources component is similar to factor (7) in the 7-factor solution of the $time_1$ data. The 7-factor solution of the $time_2$ data is not easily interpretable. Appendix T shows that several variables had high loadings on more than one factor, which was not common in the previous analyses. Several high factor pattern correlations were observed: -0.331 for factors (2) and (4), 0.343 for factors (3) and (5), 0.292 for factors (2) and (6).

## SUMMARY

In this chapter, the procedures used for the analysis of the data and the results obtained have been presented. Descriptive analysis provided an overall examination of the data and allowed several issues to be investigated: comparison of sample with norms, reliability of the questionnaire, isolation of job characteristics that were important to the respondents, magnitude of changes in job characteristic and job satisfaction. Regression analysis was performed to investigate the job characteristics—job satisfaction relationship by generating and testing new models against previously defined models. The dimensionality of work was examined

through the use of factor analysis on the variables which measured amount present.

The employees report that they have a lot of responsibility, put forth a great amount of effort, find their jobs meaningful, deal with people and experience a lot of interruptions on the job. They report a lack in the amount of challenge, opportunities to learn new skills and feedback—job characteristics which they desired to have present. The amount present of all 25 job characteristics surveyed did not change significantly from $time_1$ to $time_2$, suggesting that the implementation of the new computer system did not have a large impact on the way work was done in the offices. Levels of job satisfaction remained the same also. Measures of the importance of each of the 25 job characteristics were stable between the first and second questionnaire administration. No relationship between the Amount Present and Importance of a job characteristic was indicated for 22 of the 25 job characteristics. A strong relationship was found between the Amount Desired and Importance of 22 job characteristics (not the same set as above). Seven characteristics were identified as being very important to the respondents and were labeled the Most Important Job Characteristics: Challenge, Feedback from agents, Learning opportunities, Pace control, Role ambiguity, Role conflict and Role overload.

Multiple regression analyses of seven a priori models of the job design—job satisfaction relationship were conducted using data obtained at $time_1$ and, separately, data obtained at $time_2$. Two a posteriori models were formulated from the Most Important Job Characteristics and analyzed using $time_1$ and $time_2$ data. The Most Important Job Characteristics Model using

the Amount Present variables provided a better regression fit and explained a significantly greater portion of the variance in job satisfaction than the Job Characteristics Model. Difference scores were used to test the within-subjects hypothesis that changes in job design are related to changes in job satisfaction. The Most Important Job Characteristics Model used in its form as a change model performed better than the Job Characteristics Model used as a change model, although relationships were weaker and poorer $R^2$ values were found than in the tests of the between-subjects hypotheses. Stepwise regressions provided some support for the between-subjects models, but did not support the within-subjects change models. When changes in intrinsic and extrinsic satisfaction were analyzed separately it was found that changes in the core characteristics were related to changes in intrinsic satisfaction, but changes in the seven Most Important Job Characteristics were related to changes in both intrinsic and extrinsic satisfaction.

The dimensionality of task design was examined by factor analysis of the 25 Amount Present variables using both $time_1$ and $time_2$ data. Interpretable 3-factor and 7-factor solutions were found. This suggests that researchers may be able to obtain measurements of many distinct constructs, but the meaning which is assigned to those constructs can be understood on several different levels. At the simplest level, task may be understood as three components: Knowledge and skills used, Resources available to do the job, and Social interaction. As more aspects of task are identified, these three components can be broken down even further.

A discussion of the results obtained through these analyses and the conclusions which can be drawn from them will be presented in the next chapter.

# CHAPTER V

## DISCUSSION AND CONCLUSIONS

The three types of analyses which were conducted on these data yielded different information which can be used to help researchers under-stand how employees react to the characteristics of their jobs. The descriptive analyses provided a profile of the jobs held by the respondents in this sample, allowed comparisons to normative groups to be made, showed which job characteristics employees desired to have present and which characteristics were most important to them, gave an assessment of job satisfaction and allowed an assessment of changes in satisfaction and in the presence, desirability and importance of job characteristics. The multiple regression analyses allowed testing of alternative models of the job characteristics—job satisfaction relationship in the search for a model which yielded a significant improvement over the Job Characteristics Model with respect to the outcome measure of job satisfaction. The factor analyses provided an examination of the dimensionality of work, the factors which employees perceive in their jobs in terms of job characteristics. This chapter presents a discussion of the results obtained from the data analysis, conclusions which can be drawn from the results, limitations of the methodology of the research study and suggestions for future research in the area of employee response to changes in job design.

## DISCUSSION

### Descriptive Analyses

In general, these employees report that they have a lot of respon-
sibility, put forth a great amount of effort, and find their jobs meaningful.
They also deal with people as part of their jobs, which may explain the high
levels of interruptions they experience. The jobs do appear to lack in
amount of challenge (skills and abilities used), opportunities to learn new
skills, and feedback both from the job itself and from supervisors and co-
workers. Employees report that they know what is expected from them on
the job (low Role ambiguity), but also find that their jobs are not predictable
(low Certainty) and require them to adapt to new and unusual situations
(low Rigidity). Comparison of the mean scores obtained for the amount
present scales to the normative data provided by the developers of the Job
Diagnostic Survey showed that the sample responses of the seven job
characteristics assessed by Hackman and Oldham (see Appendix C) fell
within one standard deviation of the norm, although generally on the lower
side. This indicates that respondents in this sample have jobs which have
somewhat lower amounts of the core characteristics present than the norm,
limiting the generalizability of these results.

The four job characteristics that the respondents desire to have
present in the highest amounts are, according to their reporting, actually
present in the lowest amounts—Learning opportunities, Challenge, Pace
control and Feedback from agents. There is no evidence that the respond-
ents strongly desire to have jobs in which they work closely with other

people, although this is clearly a major component of their jobs. Examin-
ation of the discrepancy scores at $time_1$ and $time_2$ shows that the four
characteristics listed above exhibit the largest negative discrepancies.
Interruptions on the job and Role ambiguity showed the largest positive
discrepancies.

Levels of job satisfaction reported by this sample are slightly lower
than the averages reported by Weiss, Dawis, England and Lofquist (1967),
but still within the norms established for clerical and professional
employees. Mean scores for all three scales which measure satisfaction
were approximately one standard deviation below the norm.

On the average, the amounts present of the job characteristics and
levels of job satisfaction did not change significantly for respondents in this
sample. There was no job redesign program undertaken in conjunction with
the implementation of the new computer system, and so there were no
assumptions made about which job characteristics would show increases or
decreases in amounts present. The purpose of the study was to measure the
degree of change in the amounts present of each job characteristic and job
satisfaction and test the models to see if they performed satisfactorily.

Although the mean scores indicated no significant changes from $time_1$
to $time_2$, there were employees who experienced changes in some of the
characteristics and satisfaction. For any single job characteristic, there were
some respondents who reported increases and some who reported
decreases. Levels of job satisfaction changed for some respondents. Table
32 reported the mean change scores for respondents who were divided into
three groups based on their Motivating Potential Scores. Twenty-nine

employees experienced enrichment of their jobs, 23 experienced de-enrichment and 20 did not experience enrichment or de-enrichment as defined by the MPS. Analysis of Variance showed that six of the job characteristics had significantly ($p \leq .05$) different mean change scores across the three groups: Autonomy, Challenge, Feedback from the job, Learning opportunities, Received task interdependence and Skill variety. Jobs which were de-enriched by the change showed a marked decrease in the amounts present of these characteristics, especially in the levels of Autonomy, Feedback from the job and Challenge. However, the change in job satisfaction was not significantly different across the three groups. The differences were in the expected direction, increases in satisfaction for enriched jobs and decreases in satisfaction for de-enriched jobs, but the magnitude was small.

Examination of the measures of importance of each of the job characteristics identified seven characteristics for which the category Very Important contained the largest percentage of responses of any of the four categories. These seven job characteristics were labeled the Most Important Job Characteristics: Challenge, Feedback from agents, Learning opportunities, Pace control, Role ambiguity, Role conflict and Role overload. The mean scores for importance of these characteristics were also the highest of all the characteristics. In general, the importance of each of the job characteristics did not appear to be related to the amount present in the jobs of the respondents. The amounts present of only three characteristics—Optional interaction, Required interaction and Role overload—showed a relationship to importance, as indicated by significant values of $F$ when

the sample was stratified by category of importance. However, the importance of a job characteristic *did* appear to be related to the amounts desired. The amounts desired of only three characteristics—Certainty, Received task interdependence and Role overload—were *not* significantly different when the sample was stratified by category of importance. This result may indicate that the constructs measured by amount desired and importance of a job characteristic are not conceptually distinct. Another possibility may be that the wording or placement of the questionnaire items made the questions indistinguishable. The stability of the importance scores over an eight month time period was shown to be good, as indicated by significant values of kappa for all characteristics except Certainty and Training adequacy.

## Multiple Regression Analyses

Between-subjects hypothesis testing. The dependent variable used in these analyses, General Satisfaction, is continuous and normally distributed. The independent variables may be considered to be continuous in most cases, but this is not essential for using regression analysis. The regression model was appropriate for use in the models which contained seven or fewer independent variables, but models in which twenty-five variables were included showed evidence of nonnormal error terms and nonconstant variance. The multicollinearity among the independent variables was most severe for these models.

Using both the $time_1$ and $time_2$ data, Hackman and Oldham's Job Characteristics Model (JCM) which used the amount present of the five core

characteristics as independent variables performed well, showing a signif-
icant relationship between the set of characteristics and general satisfaction
and a good $R^2$ value. The MPS formulation, a commonly used measure, also
showed a good fit and a large percentage of the variance in satisfaction was
explained by this composite variable. Use of discrepancy scores or amount
present weighted by importance rather than the amount present scores did
not improve the model and, in fact, yielded a poorer fit and a lower $R^2$
value.

In an attempt to generate an improved model of the task de-
sign—satisfaction relationship, a model was formulated which included the
amount present of the seven job characteristics identified as the Most
Important Job Characteristics: Challenge, Feedback from agents, Learning
opportunities, Pace control, Role ambiguity, Role conflict and Role conflict.
None of these seven job characteristics were present in Hackman and
Oldham's JCM. This seven-characteristic model, the Most Important Job
Characteristics Model (MIJCM), was able to explain more of the variance in
job satisfaction than the JCM was able to explain. Results using $time_1$ and
$time_2$ data are similar. This increase in explained variance was shown to be
significant through two Model Comparison Tests of the seven-variable
model and the five-variable model against a model composed of all twelve
variables.

A second approach was taken to generate an improved model of the
task design—satisfaction relationship by performing forward stepwise
regressions on the amount present scores of the entire set of twenty-five
independent variables. Using $time_1$ data, six job characteristics were able to

account for 66.5 percent of the variance in general satisfaction. The first three characteristics—Challenge, Pace control and Role conflict—accounted for 57.5 percent of the variance. These three job characteristics were among the seven characteristics included in the MIJCM. A Model Comparison Test of the three-variable model against the seven-variable model showed that the addition of the four variables significantly improved the percent of variance explained. Using time$_2$ data, four job characteristics were able to account for 65.5 percent of the variance in general satisfaction. Two of these characteristics were the same characteristics found using time$_1$ data: Role conflict and Rigidity. The other two characteristics which appeared in this forward regression were Feedback from agents and Learning opportunities, which were included in the MIJCM.

Within-subjects hypothesis testing. In general, a pattern similar to that found in the analysis of the between-subjects models was found in the change models, but the regression fits were poorer and the $R^2$ values were smaller. The large variances associated with the independent variables reduced the statistical power of the tests. Hackman and Oldham's JCM used as a change model yielded a good fit, but a low $R^2$. The MPS formulation yielded a slightly better fit and a slightly lower $R^2$. The MIJCM used as a change model yielded the highest $R^2$ of the models which were composed of fewer than 25 predictor variables and the highest adjusted $R^2$ and best fit of all the change models tested. The Model Comparison Tests indicated that the MIJCM performed better than Hackman and Oldham's JCM. The use of discrepancy scores in the JCM produced a very similar result to that found using the amount present variables, but discrepancy scores used in the

MIJCM produced a slightly poorer fit and a lower $R^2$ value. The weighted measure also produced a poorer fit and a lower $R^2$ value.

Two additional relationships were tested: (i) the relationship between changes in task design and changes in intrinsic satisfaction and (ii) the relationship between changes in task design and changes in extrinsic satisfaction. Changes in the core characteristics (JCM) were found to be related to changes in intrinsic satisfaction only, and not to changes in extrinsic satisfaction. The MPS formulation of the model yielded the same result. Changes in the Most Important Job Characteristics (MIJCM) were related to changes in both intrinsic and extrinsic satisfaction. The items in the MSQ which assess extrinsic satisfaction ask respondents to decide how satisfied they feel with their supervisor, company policies, compensation, chances for advancement and recognition for doing a good job. The results suggest that changes in the core characteristics do not influence satisfaction with these aspects of the job, but changes in the MIJC's do. Characteristics such as Feedback from agents, Role ambiguity, Role conflict and Role overload would be likely to relate to the supervisor or company policies which shape the incumbent's role in the organization. Learning opportunities would be likely to influence chances for advancement. The MIJCM provides a more complete description of the relationship between task design and both intrinsic and extrinsic aspects of job satisfaction.

## Factor Analyses

The results of the factor analyses of the twenty-five amount present variables at $time_1$ and $time_2$ can be combined into a discussion of the

dimensionality of "work", conceptualized as perceived task design (or job design). A 3-factor and a 7-factor solution were found adequate to represent the dimensionality of task design, but even the 4-factor and 5-factor solutions were somewhat interpretable. This suggests that researchers may be able to obtain measurements of several distinct constructs, but the meaning which is assigned to those constructs can be understood on different levels. For example, if our research objective is to examine as many factors as possible, the 7-factor solution can give us one interpretation of task dimensionality. If our objective is to generate the simplest model, the 3-factor solution can give us another interpretation at a different level of abstraction. Both interpretations are useful for understanding the phenomenon under investigation, but they yield different information.

The 3-factor solution from analysis of the amount present variables at $time_2$ shows a separation of job characteristics into three components which could lend evidence for the conceptualization of task proposed by Griffin and Skivington (1984). The three factors can be labeled: Knowledge and skills used to perform the duties of the job, Resources to do the job (time, training, unambiguous feedback) and Interaction with others. Griffin and Skivington suggest that tasks can be described along three dimensions: Physical, Individual and Social. Their physical dimension refers to objective elements of the task, regardless of the individual performing the task. This may be comparable to the Resources component, which can be understood as a physical constraint on doing the job. Griffin and Skivington's individual dimension refers to unique variations among individuals in terms of what

they bring to the task and what they expect from their work. This may be comparable to the Knowledge and Skills component which may vary as different individuals fill a job. The social dimension in Griffin and Skivington's conceptualization refers to interpersonal aspects of the individual's work setting, comparable to the Interaction component found in the factor solution.

The factor solutions which include four, five or seven factors can provide additional information to understand how the dimensionality of task can be perceived. For example, the 7-factor solution which resulted from analysis of the $time_1$ amount present variables suggests that the Interaction component can be broken down further into two subcomponents: Required Interaction and Optional Interaction. The responsibility which comes with a job may be an additional component which is perceived by incumbents, as suggested by the 7-factor solution.

The five dimensional factor structure assumed by the Job Characteristics Model was not confirmed by the results of a 5-factor oblique rotation. Autonomy, Skill variety and Task significance loaded on one factor and Task identity and Feedback from the job loaded on another factor. Autonomy had weak loadings on all factors. There is no evidence in these data that task design is perceived as a five-dimensional phenomenon as described by the JCM.

CONCLUSIONS

## Descriptive Analyses

The mean scores for amount present and amount desired reveal the following profile of the respondents in this sample: they work in jobs in which they perceive themselves to have responsibility, put forth a great deal of effort, work closely with other people and find their jobs meaningful. They desired to have more opportunities for learning, more challenge, greater control over the pace of the work and more feedback from supervisors and co-workers than they presently had in their jobs. On an absolute level, these were also the job characteristics which they desired to have present in the highest amounts. Comparison of the mean scores obtained from this sample to normative data shows that the sample respondents perceive themselves to have lower amounts of the seven characteristics for which normative data are available, but still within a one standard deviation range. Job satisfaction levels are also low, but within a one standard deviation range.

These were not large differences from the norms, but the consistent appearance of scores on the lower side of the norms suggests that interpretations of the results of regression analysis may be limited to jobs which exhibit these profiles. On average, these jobs were lower in amounts of the core characteristics than the norm. Changes in job scope may have a differential impact on job satisfaction depending on the levels of the job characteristics present at the time the jobs are changed. The external validity of

this study may be limited to jobs in which the amounts present of each characteristic are similar to those in this sample.

On the average, there were no significant changes in the amounts present of any of the 25 job characteristics or job satisfaction. The statistical power of the tests to detect such small changes in amount present was low, however such small differences in amount present from $time_1$ to $time_2$ probably have no practical significance. For example, if an employee reported a score of 4.00 for the amount present of Skill variety at $time_1$ and reported a score of 4.33 at $time_2$, the difference is not going to be practically significant. Even if the measurement was taken without error, it is unlikely that a 0.33 difference could be translated into a meaningful change in job design. A change in magnitude of ±1 or more may hold practical significance, since a job could be changed to include more Skill variety such that an employee would report a change of ±1 on the questionnaire. The statistical tests used in these analyses were powerful enough to detect a significant change of ±1 or more, but on the average no significant differences were found. A similar argument can be made for the job satisfaction scores, since a difference of 2 points cannot be translated into a meaningful change in job satisfaction. For each individual case, the level of satisfaction and amounts present of some job characteristics usually did change by some degree. This was the relationship that was tested by multiple regression analysis: the relationship between changes in job characteristics and changes in job satisfaction. One would expect a strong relationship to be found if, for each individual case, (i) there were no changes in either the job characteristics or job satisfaction or (ii) there were commensurate changes

in both variables in either the positive or negative direction. That was, in fact, what was found for most of the models tested.

The levels of importance of each of the job characteristics was reported by the respondents. The measures of importance were found to be related to the amount desired of the characteristic, but were not related to the amount present. Seven characteristics were identified as most important to the respondents: Challenge, Feedback from agents, Learning opportunities, Pace control, Role ambiguity, Role conflict and Role overload. These job characteristics were used to construct two a posteriori regression models, one of which proved to be superior to the Job Characteristics Model with respect to the outcome measure of job satisfaction. The measures of importance are stable over an eight month time period, so model generation based on the importance of job characteristics was expected to yield replicable results.

## Multiple Regression Analyses

Between-subjects hypothesis testing. All of the regression models performed well, in terms of fit of the model and percent of variance in the dependent variable explained by the set of independent variables. Some models were able to explain more of the variance than others, which was the criterion used to generate improved models of the task design—job satisfaction relationship. The seven-variable Most Important Job Characteristics Model (MIJCM) was generated as an alternative model to Hackman and Oldham's five-variable Job Characteristics Model (JCM). The MIJCM

provided a better fit and explained a significantly greater amount of variance in satisfaction than the JCM for this sample of respondents.

The MIJCM is not proposed as a better model of the task design—job satisfaction relationship. Rather, the results of this analysis indicate that the core characteristics included in the JCM may not be the best indicators of job satisfaction for every sample of respondents, or for all job incumbents in general. By identifying the characteristics that were most important to the respondents in this sample, an improved model of the relationship was found. From this study alone, there is no basis to conclude that this same set of characteristics would be found to be the most important job characteristics in every sample, or that a new set of characteristics generated in a similar fashion would yield the same results. But it is suggested that the job characteristics which are important to employees will have the greatest impact on job satisfaction. The results of this study show that a better description of the task design—job satisfaction relationship could be found by examining the importance of characteristics.

Within-subjects hypothesis testing. The same models that tested the between-subjects hypotheses were used to test within-subjects hypotheses using change scores. The seven-variable MIJCM provided the best fit of all the models tested and explained a significantly greater amount of variance in changes in job satisfaction than the JCM used as a change model for this sample of respondents. It is suggested here, as above, that changes in job characteristics which are important to employees have the greatest impact on changes in job satisfaction. In general, the regression fits were poorer and $R^2$ values were lower than in the tests of between-subjects hypotheses.

This may indicate that there are variables which affect changes in job satisfaction other than those included in the models.

Changes in the core characteristics affected changes in intrinsic satisfaction only, whereas changes in the Most Important Job Characteristics affected changes in both intrinsic and extrinsic satisfaction. In this study, general job satisfaction was operationalized by the MSQ as an additive combination of intrinsic and extrinsic components, thus providing an opportunity to investigate each component separately. The MIJCM may provide a more complete framework for understanding how components of the job affect general satisfaction. The JCM was originally developed to describe the factors which affect internal work motivation, so the core characteristics may be sufficient to explain intrinsic aspects of an incumbent's job. The MIJCM was developed from an exploratory approach to generate a model which best fit the data obtained from a sample of respondents. This finding may be purely an artifact of the methods used to generate the model, or it may be an indication that extrinsic aspects of the job have been neglected in past theoretical models and should be included in new models to obtain a more complete description of the task design—job satisfaction relationship.

Due to the limitations of the research design few conclusions can be drawn regarding changes in job characteristics that are directly attributable to computerization. However, this study does provide a longitudinal investigation of the impact that job characteristics have on job satisfaction. On the average, no significant changes in the configuration of the job characteristics were detectable between the two questionnaire admin-

istrations. There was no a priori assumption made about which character-istics would change as a result of the computer system implementation, only that an increase or decrease in job scope as assessed by the instrument would lead to an increase or decrease in job satisfaction as assessed by the MSQ. For most of the models tested, this relationship was confirmed.

## Factor Analyses

The results of the exploratory factor analyses provide evidence to suggest that a three-component model of task design fits the data obtained from this sample of questionnaire respondents. A seven-component model provides some additional information, but also poses some problems in interpretation. There is no evidence that a five-component model composed of the five core characteristics of the JCM fits these data.

## LIMITATIONS OF THE METHODOLOGY

Since these data were obtained by self-report instrument, some of the limitations of using this type of assessment device must be considered. First, the scaling issue is addressed. The Likert 1 to 7 scale is commonly used to obtain measures such as those obtained from the Job Diagnostic Survey and the Job Factors Study Questionnaire. A common problem with this type of scale is that each respondent may interpret the meaning of the numbers on the scale differently, e. g., a "2" to one individual may mean the same as a "4" to another. In addition, some respondents have difficulty when presented with as many as 7 categories from which they must make a judgment, others have stated that they need *more* than 7 categories. As an

individual goes through the questionnaire, the anchor points that he or she has used at the beginning may shift near the end of the questionnaire. In fact, the 1 to 7 scale is not truly an interval-level scale but rather an ordinal-level scale, contraindicating the use of parametric tests on the data obtained. The difference between a rating of "3" and a rating of "4" may not be the same as the difference between a rating of "6" and a rating of "7". By averaging three items into one score for amount present some of this response error may be alleviated. Task design research has made extensive use of parametric tests even though the assumptions upon which these tests are based have not always been clearly met. The problem becomes more acute for the measures of amount desired and importance, which are assessed by a single item on the questionnaire. These variables cannot be considered continuous and normally distributed with constant variance. Nonparametric tests, which do not make these assumptions about the data, were used when they were appropriate.

A second limitation of using a self-report instrument is that the measures that are obtained are not measures of the "objective" job characteristics, but rather they are measures of job characteristics as they are perceived by the respondents. The link between "objective" and "subjective" job characteristics is currently a popular research topic (Slusher & Griffin, 1985), but so far there has been no way to definitively state the nature of the link. However, Hackman and Lawler (1971) state that researchers should be interested in the perceptions of job characteristics since it is the way these characteristics are experienced by job holders that affect employee reactions to jobs. The important point is that conclusions

drawn from an analysis of self-report data are necessarily limited to incumbent perceptions of job characteristics. The job satisfaction measures obtained through the Minnesota Satisfaction Questionnaire are evaluative in nature and less subject to the problems which occur in trying to measure amounts of characteristics present in a job. The problems of scaling and response bias are also present to some degree in the MSQ, although extensive testing and revision of this instrument has led to many improvements.

The scaling problem mentioned above is especially acute when change scores are calculated as the difference between two variables. The measures are not perfectly reliable, and calculating a new variable from a combination of unreliable measures may compound the problem. Even if the measures were shown to exhibit high degrees of reliability, changes in job characteristics may be difficult to detect due to the ordinal nature of the scale used. The assumption that the scores obtained are interval in nature may be tenable for the amount present scores, but this assumption may not be adequate for the change scores obtained. Small differences in numbers may really be large differences in the variable that an ordinal scale is not designed to detect. The large standard deviations of the change scores show this instability in the measure. Large standard deviations also contributed to the low statistical power of the $t$ tests on the change scores.

The set of job characteristics that composed the Most Important Job Characteristics Model was chosen after inspection of the importance scores obtained from the data. Any one of a number of criteria could have been used to determine which job characteristics were most important to the

respondents of this sample. Using mean scores, the cutoff could have been made at a number of places. The decision rule was not made a priori, so the results obtained do not have the same practical significance that would be attributed to a confirmatory test of the model.

Although the models which included seven independent variables or less were shown to be appropriate for regression analysis, the models which consisted of twenty-five variables violated several assumptions. A contributing factor to this instability was the small sample size which resulted in much lower residual degrees of freedom for the statistical tests involving large numbers of independent variables. Another factor which resulted in lower degrees of freedom for the models with large numbers of independent variables was that the chance of finding cases with missing data increased, which resulted in fewer cases being used in the regression. The statistical power of the tests was adequate for regressions involving small numbers of independent variables, but weakened when larger numbers were involved.

Multicollinearity was also a problem which affected the models containing large numbers of independent variables to a greater extent than models which included fewer variables. Although tolerances were adequate, almost half of the correlation coefficients which measured the degree of association between independent variables were significant. Unfortunately, this has been a common problem with research done in the task characteristics framework. Some of the problem results from wording of the questionnaire items which do not distinguish well enough among the characteristics, and some of the problem is a result of true covariation of the

presence of characteristics in jobs. For example, jobs which are higher in task identity may be more likely to be higher in skill variety as well, since completing an entire portion of a task requires more skills than peforming a small part of a task.

The reliability of the measures are adequate, but not perfect. This causes some inflation of the error variance by an amount which cannot be determined. Only one method of measuring the presence of the job characteristics was used—paper and pencil questionnaire—but an attempt was made to vary the wording and use negative as well as positively worded items (Cook & Campbell, 1979). Harvey, Billings and Nilan (1985) found that a substantial amount of method variance was contributed by the different response scales used in the Job Diagnostic Survey and recommended that negatively worded items be reversed.

This was not a random sample of employees, thus the generalizability of the conclusions drawn from the research results may be questionable. Three-fourths of the respondents were female and all respondents worked in the public sector in a very narrow range of jobs. However, within this group there was a wide age range and a broad range of educational level. Since participation by employees was voluntary and not all employees participated, generalization to the entire group of workers in this type of job may also be inappropriate.

Some of the conclusions which were hoped to be drawn regarding changes in job characteristics due to computerization suffer from many limitations of the research design. This design may be characterized as a one-group pretest-posttest design (Cook & Campbell, 1979): pretest

measures were obtained at $time_1$, the "treatment" was received (implementation of new computer system), and posttest measures were obtained at $time_2$. An equivalent group was not used to control for extraneous effects. Some of the major flaws of this design are history effects, statistical regression, effects of maturation, testing and instrumentation. Each of these effects were examined.

The history effect is the strongest effect that cannot be ruled out. Between the $time_1$ and $time_2$ questionnaire administrations, many events besides the computer system implementation occurred which could have had an impact on employee job satisfaction. The strongest effect could have been a result of the Gramm-Rudman bill which was implemented in early 1986 in all federal offices. The deficit-reducing objectives of the bill resulted in across-the-board cost-cutting measures in the Workers' Compensation Offices as well as in federal offices all across the United States. Significant reductions in staff and funds available for travel and supplies could have exerted a large impact on the job satisfaction of employees in these offices, most likely a reduction in satisfaction when faced with a lack of physical resources to perform the duties of the job. Although no changes in the amounts present of job characteristics or levels of job satisfaction were found in the sample as a whole, approximately one-third of the employees did experience increases or decreases in levels of job characteristics. Levels of satisfaction may have changed if negative impacts of the Gramm-Rudman bill were not felt. The problem remains that there is no way to *separately* assess the effect of implementation of the Gramm-Rudman bill, the effect of the computer system implementation, or any

other effect.  Although this poses a problem in attributing changes or lack of

changes to computerization, the models of the relationship between changes

in job design and changes in job satisfaction that were tested by regression

analysis were not dependent on the factors underlying the changes.

The remaining flaws inherent in the research design were not

considered to be as serious as the history effect, although they still con-

tribute to limitations of the study.  The effect of statistical regression to a

population mean operates to increase low scores and decrease high scores

from the $time_1$ to the $time_2$ administration.  Effects of maturation should not

be a large factor since the outcome measure is not increased or decreased

by the passage of time, such as performance measures.  Job satisfaction can

be expected to change over time, but eight months is a relatively short

period of time to expect changes to result from experience on the job when

over 60 percent of the respondents have been in their jobs for four or more

years.  Testing is not expected to have a great impact on the respondents'

reports of amounts present of job characteristics or job satisfaction, although

it is not inconceivable that an employee might try to change the

configuration of job characteristics in his or her job after being exposed to

questions about those characteristics.  Instrumentation should have little

effect since the same questions were used at both administrations.

Several limitations of the factor analyses conducted on the data

obtained from this sample should also be addressed.  The small ratio of

sample size to number of variables is a major limitation of drawing

conclusions based on the results of the factor analyses.  As noted in the

previous chapter, a 5:1 ratio is considered adequate. Ratios of 3.6:1 and 3:1 were used in the analyses reported in this study.

The same concerns about generalizing results are appropriate for the factor analytic results as were expressed in the section on regression analysis. Dunham, Aldag and Brief (1977) concluded that the underlying dimensionality of the construct tapped by the Job Diagnostic Survey was not consistent across samples. This implies that either the instrument cannot adequately assess multidimensionality or that the underlying dimensionality varies from sample to sample. There is no way to assess whether or not the underlying dimensionality of task design is perceived by this sample in the same way as it would be perceived in the general population unless the entire population was sampled.

In the process of conducting a factor analysis of any data, many decisions must be made such as type of model, type of factor solution to use, which communality estimates to use, number of factors to retain for rotation, rotation procedure, etc. The numerical results obtained and the interpretations which are based on those results depend upon the procedures followed. In most investigations, there is sufficient justification for following one of a number of different procedures. This leads to the situation where numerous factor solutions can be generated which are all conceptually "correct", but may yield different interpretations of what is happening in the data. This basic indeterminacy of any factor analysis suggests that numerical results should be interpreted cautiously.

## SUGGESTIONS FOR FUTURE RESEARCH

Several conclusions were drawn from the results of this study and several suggestions can be made for future research in the area of employee response to task design. The main objective of this study was to explore new approaches to generating models of the task design—job satisfaction relationship. Using measures of the importance of various job characteristics to respondents, the Most Important Job Characteristics Model was constructed which explained a significantly greater portion of the variance in job satisfaction than that explained by the core characteristics of the Job Characteristics Model. This model was also used to investigate the dynamic relationship between *changes* in task design and *changes* in job satisfaction. The MIJCM performed significantly better than the JCM used as a change model. Examination of the dimensionality of task design as perceived by this sample is another approach which can contribute to theoretical development in this area.

Individuals can identify which job characteristics are most important to them. These characteristics are not necessarily those which are lacking in their present jobs. Although much research has been undertaken on what things are important to employees in their jobs, more research which uses the job characteristics framework would help researchers identify particular job characteristics for model development. It may be the case that specific job characteristics tend to be important to most individuals in the general population, which supports the case for a general model of task design. If the findings indicate that importance of job characteristics is not generalizable, development of the field should proceed in a different direction.

Alternative operationalizations of the construct and alternative ways of measuring the importance of job characteristics should be examined.

Of the various models constructed, using discrepancy measures and amounts present weighted by importance as independent variables produced poorer regression fits than using only the amounts present of the job characteristics. Although there are many alternative formulations which could have been used, the amount present variables appear to perform well and may be good indicators of job satisfaction. Using multiple methods of measuring the amounts present of job characteristics has been proposed to establish the link between "objective" characteristics and "subjective" (perceptual) characteristics, i. e., what employees report on a questionnaire. That approach is also advocated here.

The model which best described the cross-sectional relationship between task design and job satisfaction was also the best description of the within-person relationship between changes in task design and changes in job satisfaction. Although on an intuitive level it may make sense that the set of job characteristics should be the same, the dependent variables are really quite different. The factors which result in detectable differences in satisfaction levels for different job holders in the population may not be the same factors that cause the job satisfaction of an individual to change in response to a change in job design. Since few studies in the job character-istics framework have investigated changes in job design and satisfaction or performance, this is an issue which has not been examined. The basis of the Job Characteristics Model was diagnostic: Assess the levels of the core characteristics and redesign the jobs to increase those levels so that there

would be an increase in the levels of internal motivation, growth satisfaction, general satisfaction and work effectiveness. However, the model is seldom used in research to assess changes. More research is needed to explore other determinants of changes in employee response when jobs are redesigned.

In this study, competing models of the task design–job satisfaction relationship were tested using the data drawn from a single sample. Exploratory investigations of this sort are needed to develop more accurate models of the relationship. They provide insight into the factors which affect job satisfaction and changes in job satisfaction, and direct future research toward the most promising avenues. The results obtained in this study indicate that using measures of the amount present is superior to using measures of discrepancy or weighting by importance. Including job characteristics in addition to Hackman and Oldham's core characteristics has also yielded an improved model of the task design–job satisfaction relation- ship. Future research can proceed in one of two directions. The job characteristics identified in this study may be used in developing a new model of the relationship, or additional job characteristics may be assessed and competing models tested using other samples of respondents in different job settings.

Other employee response variables in addition to job satisfaction can be measured and models of the relationship between job design and various outcomes can be tested. The Job Characteristics Model has never shown as strong a relationship between job design and performance as between job design and satisfaction. An exploratory approach to investigating the job

characteristics which affect work performance may prove more fruitful than continuing to use a model containing characteristics which have never shown a strong relationship to performance.

The longitudinal investigation of the impact of job characteristics on job satisfaction has provided a much needed study of the nature of the task design—job satisfaction relationship over time. In this investigation, there were no significant differences in either the job characteristics or satisfaction, which confirms the basis of the task attributes framework. Cross-sectional studies cannot provide the information needed to assess the validity of the basic conceptualization that enriched jobs lead to greater satisfaction and higher levels of performance on the job. Job incumbents need to be studied over a period of time to determine whether or not changes in the design of work affect the *individual's* response. As was suggested earlier, the factors which affect *changes* in job satisfaction may not be the same factors which affect job satisfaction across individuals. This has implications for beginning a search for the job characteristics that affect job satisfaction. More longitudinal studies which directly address this issue are strongly advocated.

The issue of causality has not been directly addressed previously in this paper. Although the causal link between job design and job satisfaction cannot be proven through statistical analysis, its existence has been inferred in all previous research which uses the task attributes framework. Job redesign projects which are based on the Job Characteristics Model have as their goal to increase satisfaction and work effectiveness by increasing the amounts present of the core characteristics, inferring that low levels of the

characteristics cause low levels of these work outcomes and high levels of the characteristics cause high levels of work outcomes. In fact, there is no clear evidence which establishes the direction of the link. Rather than assuming that large job scope causes greater job satisfaction, it may be just as plausible to conclude that employees who are satisfied with their jobs perceive their jobs to be larger in scope than might "objectively" be assessed and thus report high levels of the job characteristics. Based on the results of two studies they conducted, Caldwell and O'Reilly (1982) suggest that affect can indeed influence job perceptions.

The results of the factor analysis of the twenty-five amount present variables can provide some support for a three-factor model of task design based on Griffin and Skivington's three dimensions: Individual, Social and Physical. Replication of this study using a broader range of job categories in many different work settings is needed to confirm this finding. Many measurement and interpretation problems remain for developing such a model, but this approach can provide empirical justification for proceeding in this direction. Another approach to the dimensionality issue would be to build factor scores from the data in this sample and conduct subsequent studies using the constructed factors as variables.

The research on task design conducted over the past twenty years has run its course from exploratory to confirmatory. The shortcomings of the Job Characteristics Model have led many researchers to call for a fresher approach to studying this topic area. It is suggested here that more exploratory research is necessary to generate alternative models of the task design—employee response relationship. Confirmatory research was

appropriate when we were still confronted with the newness of the JCM, but exploratory testing of many different models may now provide a broader understanding of the phenomenon.

## PRACTICAL IMPLICATIONS OF THE STUDY

As was mentioned in the introductory chapter, a vital issue which needs to be addressed is the way in which jobs in the organization change as work is redesigned around the new technology and the effect such changes may have on employee satisfaction and performance. In and of itself, the technology does not impose its own structure on the organization, but choices must be made by the designers of the computer systems and by organizational members to direct the implementation of these systems in specified ways. Each choice that is made has implications for the design of the jobs in which the computer system will become a part. If management's objective is to maintain or increase the levels of employee satisfaction and performance, the integration of a new system into the work of the organizational members must be done in such a way as to positively affect the components of work which are linked to satisfaction and performance.

The Job Characteristics Model provides managers with a framework which can be used to understand the factors which influence employee satisfaction and work performance. The concept of the "enriched job", which possesses high levels of the core characteristics and positively affects satisfaction and performance, is one of the most widely understood and accepted applications of theory used by practicing managers. A job characteristics approach to understanding changes in job duties which result from changes

implemented in the work place not only provides researchers with a theoretical basis for studying change, but also provides practicing managers with a framework within which to understand and predict the effects of changes in the task configuration of their subordinates. Continued theoretical refinement of the job design—employee response model contributes to the understanding of the factors which influence job satisfaction and work performance.

# APPENDIX A

## JOB FACTORS STUDY QUESTIONNAIRE

The complete JFSQ is contained in this appendix. A key to locating the items used to measure each variable follows.

### ITEMS WHICH MEASURE
### AMOUNT PRESENT

| | 1st Item | | 2nd Item | | 3rd Item | |
|---|---|---|---|---|---|---|
| Variable | Sec. No. | Ques. No. | Sec. No. | Ques. No. | Sec. No. | Ques. No. |
| Autonomy | I | 6 | III | 6 * | III | 10 |
| Certainty | I | 13 | III | 30 * | III | 48 |
| Challenge | I | 21 | III | 2 * | III | 37 |
| Dealing with others | I | 3 | III | 34 | III | 50 * |
| Effort | I | 7 | III | 3 | III | 29 * |
| Feedback from agents | I | 24 | III | 8 | III | 13 * |
| Feedback from the job | I | 9 | III | 5 | III | 25 * |
| Friendship opportunities | I | 17 | III | 15 | III | 36 * |
| Interruptions on the job | I | 14 | III | 22 * | III | 35 |
| Knowledge/skills required | I | 22 | III | 1 | III | 45 * |
| Learning opportunities | I | 5 | III | 4 * | III | 18 |
| Initiated interdependence | I | 15 | III | 11 * | III | 12 |
| Optional interaction | I | 16 | III | 14 | III | 38 * |
| Pace control | I | 2 | III | 26 * | III | 28 |

*Reverse-worded item.

152

## ITEMS WHICH MEASURE
## AMOUNT PRESENT (cont.)

| Variable | 1st Item | | 2nd Item | | 3rd Item | |
|---|---|---|---|---|---|---|
| | Sec. No. | Ques. No. | Sec. No. | Ques. No. | Sec. No. | Ques. No. |
| Required interaction | I | 8 | III | 46 * | III | 49 |
| Responsibility | I | 25 | III | 23 | III | 32 * |
| Received interdependence | I | 18 | III | 33 * | III | 44 |
| Rigidity | I | 23 * | III | 20 * | III | 27 |
| Role ambiguity | I | 12 * | III | 21 | III | 24 * |
| Role conflict | I | 11 | III | 9 * | III | 41 |
| Role overload | I | 20 | III | 19 | III | 42 * |
| Skill variety | I | 4 | III | 17 | III | 47 * |
| Training adequacy | I | 19 * | III | 7 | III | 40 * |
| Task identity | I | 1 | III | 31 | III | 39 * |
| Task significance | I | 10 | III | 16 | III | 43 * |

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*Reverse-worded item.

## ITEMS WHICH MEASURE AMOUNT DESIRED
## AND IMPORTANCE

| | Amount Desired | | Importance | |
|---|---|---|---|---|
| Variable | Sec. No. | Ques. No. | Sec. No. | Ques. No. |
| Autonomy | II | 9(a) | II | 9(b) |
| Certainty | II | 16(a) | II | 16(b) |
| Challenge | II | 2(a) | II | 2(b) |
| Dealing with others | II | 8(a) | II | 8(b) |
| Effort | II | 14(a) | II | 14(b) |
| Feedback from agents | II | 5(a) | II | 5(b) |
| Feedback from the job | II | 11(a) | II | 11(b) |
| Friendship opportunities | II | 17(a) | II | 17(b) |
| Interruptions on the job | II | 23(a) | II | 23(b) |
| Knowledge and skills required | II | 3(a) | II | 3(b) |
| Learning opportunities | II | 6(a) | II | 6(b) |
| Initiated task interdependence | II | 13(a) | II | 13(b) |
| Optional interaction | II | 22(a) | II | 22(b) |
| Pace control | II | 15(a) | II | 15(b) |
| Required interaction | II | 25(a) | II | 25(b) |
| Responsibility | II | 21(a) | II | 21(b) |
| Received task interdependence | II | 1(a) | II | 1(b) |
| Rigidity | II | 19(a) | II | 19(b) |
| Role ambiguity | II | 18(a) | II | 18(b) |
| Role conflict | II | 4(a) | II | 4(b) |
| Role overload | II | 20(a) | II | 20(b) |
| Skill variety | II | 7(a) | II | 7(b) |
| Training adequacy | II | 10(a) | II | 10(b) |
| Task identity | II | 24(a) | II | 24(b) |
| Task significance | II | 12(a) | II | 12(b) |

CODE NUMBER _____

JOB FACTORS STUDY

On the following pages, you will find several different kinds of questions about your job. Specific instructions are given at the start of each section. Please read them carefully. It should take no more than 40 minutes to complete the entire questionnaire. Please move through it quickly.

The questions are designed to obtain your perceptions of your job and your reactions to it. There are no trick questions. Your individual answers will be kept completely confidential. Please answer each item as honestly and frankly as possible.

Thank you for your cooperation.

SECTION ONE

This part of the questionnaire asks you to describe your job, as objectively as you can.

Please do not use this part of the questionnaire to show how much you like or dislike your job. Questions about that will come later. Instead, try to make your descriptions as accurate and as objective as you possibly can.

Two sample questions are given below.

|  | | To a very little extent | | | | To a moderate extent | | | | To a very great extent |
|---|---|---|---|---|---|---|---|---|---|---|

Example 1. To what extent does your job require you to work with mechanical equipment?

1 -- 2 -- 3 -- 4 -- 5 -- ⑥ -- 7

Example 2. To what extent does your job require you to work outdoors?

1 -- 2 -- 3 -- ④ -- 5 -- 6 -- 7

You are to circle the number which is the most accurate description of your job.

If, for example, your job requires you to work with mechanical equipment a good deal of the time--but also requires some paperwork--you might circle the number six, as was done in Example 1 above. If your job requires a moderate amount of working outdoors, you might circle the number four, as was done in Example 2.

Please turn the page and begin.

|  | To a very little extent | To a moderate extent | To a very great extent |
|---|---|---|---|

1.  To what extent does your job involve doing a whole piece of work, that is, a complete piece of work that has a beginning and an end, as opposed to a small part of an overall piece of work?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

2.  To what extent do you have control over the pace at which your work is done?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

3.  To what extent do you work closely with other people?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

4.  To what extent do you do many different things during the day at work?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

5.  To what extent does your job provide the opportunity to acquire job-related skills and information?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

6.  To what extent do you decide on your own how to do the work?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

7.  To what extent does your job require that you expend a great deal of effort trying to perform well?   1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

To a very little extent

To a moderate extent

To a very great extent

8. To what extent is communication between you and other employees required to solve a job problem or exchange information necessary to do the job?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

9. To what extent does doing the job itself provide you with information about your work performance--aside from any "feedback" co-workers or supervisors may provide?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

10. To what extent does your job signif- icantly affect the lives or well- being of other people, either inside or outside the organization?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

11. To what extent does your job require you to work under incompatible policies and guidelines?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

12. To what extent do you feel that you know exactly what is expected of you on your job?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

13. To what extent is your job predict- able?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

14. To what extent do you experience interruptions on the job?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

|  | To a very little extent | To a moderate extent | To a very great extent |
|---|---|---|---|

15. To what extent do you provide the means for other people to fulfill their job requirements?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

16. To what extent does your job allow you to communicate with other employees on an informal basis?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

17. To what extent does your job provide the opportunity to establish informal relationships with other employees at work?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

18. To what extent do you receive materials or information from other people to fulfill your job requirements?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

19. To what extent do you need more training and skills to do your job?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

20. To what extent do you need more time to do all of your work well?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

21. To what extent is the work itself challenging?

1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

| | To a very little extent | To a moderate extent | To a very great extent |
|---|---|---|---|

22. To what extent does your job require education, experience and/or training to develop a skill necessary to perform the duties of your job?  1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

23. To what extent does your job require that you adapt to new and unusual situations?  1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

24. To what extent do managers or co-workers let you know how well you are doing on your job?  1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

25. To what extent are you held responsible for whether or not the job gets done right?  1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7

SECTION TWO

This part of the questionnaire asks you to describe the extent to which you would like each job factor to be present and how important you consider that factor to be in a job.

A sample question is given below.

Example 1.(a)  To what extent would you like a job in which you are required to work with mechanical equipment?

1 ----- 2 ----- ③ ----- 4 ----- 5 ----- 6 ----- 7

I would like a job in which I am not required to work with mechanical equipment.

I would like a job somewhere in between.

I would like a job in which I do a lot of work with mechanical equipment.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

__X__ Moderately Important

_____ Very Important

If, for example, you would like a job in which you do some work with mechanical equipment, you might circle the number three in Example 1, part (a).  If the extent to which you are required to work with mechanical equipment is moderately important to you, you might place an "X" on that line in part (b).  Or, if this job factor was not important to you, you might place an "X" on the line marked Not Important.

Please turn the page and begin.

1. (a) To what extent would you like a job in which you receive materials or information from other people to fulfill your job requirements?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like
a job in which
I am not dependent
upon other people
to receive materials
or information nec-
essary to do my job.

I would like
a job somewhere
in between.

I would like
a job in which
I receive mater-
ials or informa-
tion from other
people to fulfill
my job require-
ments.

   (b) How important is this factor to you?

   _____ Not Important

   _____ Slightly Important

   _____ Moderately Important

   _____ Very Important

2. (a) To what extent would you like a job in which the work itself is challenging?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like
a job in which
I seldom have
to use all of
my skills and
abilities to
get my work done.

I would like
a job somewhere
in between.

I would like
a job in which
the work itself
is challenging.

   (b) How important is this factor to you?

   _____ Not Important

   _____ Slightly Important

   _____ Moderately Important

   _____ Very Important

3. (a) To what extent would you like a job in which education, exper-
ience and/or training is required to develop a skill necessary
to perform the duties of the job?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like
a job in which
I do not need a
lot of education,
experience, or
training to develop
skills necessary to
perform the duties
of the job.

I would like
a job somewhere
in between.

I would like
a job in which
I need a lot of
education, exper-
ience, or train-
ing to develop
skills necessary
to perform the
duties of the
job.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

4. (a) To what extent would you like a job in which you are required
to work under incompatible policies and guidelines?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like
a job in which
I work under
vague directives
or orders.

I would like
a job somewhere
in between.

I would like
a job in which
I have clear
policies and
guidelines to
follow.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

5. (a) To what extent would you like a job in which managers or co-workers let you know how well you are doing on your job?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                I would like
a job in which                  a job somewhere             a job in which
feedback about my               in between.                 managers or
performance comes                                           co-workers let
from sources other                                          me know how
than managers or                                            well I am doing
co-workers.                                                 my job.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

6. (a) To what extent would you like a job in which there is an opportunity to acquire job-related skills and information?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                I would like
a job in which                  a job somewhere             a job in which
I do not have                   in between.                 I can acquire
to learn new                                                job-related
skills on the                                               skills and
job.                                                        information.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

7. (a) To what extent would you like a job in which you do many
different things during the day at work?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
I work on only                  in between.                     I work on many
a few different                                                 different things
things during                                                  during the day.
the day.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

8. (a) To what extent would you like a job in which you work closely
with other people?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
I do most of my                 in between.                     I work closely
work on my own,                                                with other
without talking                                                people.
or checking with
other people.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

9. (a) To what extent would you like a job in which you decide on your own how to do the work?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like            I would like            I would like
a job in which          a job somewhere         a job in which
I am not the            in between.             I decide on my
only person who                                 own how to do
decides how the                                 the work.
work must be
done.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

10. (a) To what extent would you like a job in which you need more training and skills to do your job?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like            I would like            I would like
a job in which          a job somewhere         a job in which
I have enough           in between.             I need to acquire
training and                                    more training and
skills to do                                    skills to do my
my job.                                         job.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

11. (a)  To what extent would you like a job in which doing the job itself
         provides you with information about your work performance--aside
         from any "feedback" co-workers or supervisors may provide?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

    I would like                I would like              I would like
    a job in which              a job somewhere           a job in which
    feedback about              in between.               doing the job
    my performance                                        itself provides
    comes from sources                                    me with informa-
    other than the                                        tion about my
    work itself.                                          work performance.

    (b)  How important is this factor to you?

         _____  Not Important

         _____  Slightly Important

         _____  Moderately Important

         _____  Very Important


12. (a)  To what extent would you like a job which significantly affects
         the lives or well-being of other people, either inside or
         outside the organization?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

    I would like                I would like              I would like
    a job in which              a job somewhere           a job in which
    few people are              in between.               my work affects
    affected by the                                       the lives or
    outcomes of my                                        well-being of
    job.                                                  other people.

    (b)  How important is this factor to you?

         _____  Not Important

         _____  Slightly Important

         _____  Moderately Important

         _____  Very Important

13. (a)   To what extent would you like a job in which you provide the
          means for other people to fulfill their job requirements?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like              I would like              I would like
a job in which            a job somewhere           a job in which
other people are          in between.               I provide the
not dependent upon                                  means for other
me for materials or                                 people to fulfill
information which                                    their job re-
they need to do                                      quirements.
their work.

    (b)   How important is this factor to you?

          _____   Not Important

          _____   Slightly Important

          _____   Moderately Important

          _____   Very Important


14. (a)   To what extent would you like a job in which you are required
          to expend a great deal of effort trying to perform well?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like              I would like              I would like
a job in which            a job somewhere           a job in which
I can perform             in between.               I must expend
well without                                        a great deal of
expending a                                         effort trying to
great deal of                                       perform well.
effort.

    (b)   How important is this factor to you?

          _____   Not Important

          _____   Slightly Important

          _____   Moderately Important

          _____   Very Important

15. (a)   To what extent would you like a job in which you have control
          over the pace at which the work is done?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
the work pace is                in between.                     I control the
set and not under                                               pace at which
my control.                                                     my work is done.

(b)   How important is this factor to you?

_____   Not Important

_____   Slightly Important

_____   Moderately Important

_____   Very Important

16. (a)   To what extent would you like a job that was predictable?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
each day's activ-               in between.                     the day to day
ities may be highly                                             activities are
unpredictable, re-                                              highly predict-
quiring me to be                                                able, presenting
prepared to handle                                              few surprising
surprising situa-                                               situations.
tions.

(b)   How important is this factor to you?

_____   Not Important

_____   Slightly Important

_____   Moderately Important

_____   Very Important

17. (a)  To what extent would you like a job in which there is an
         opportunity to establish informal relationships with other
         employees at work?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
there is little                 in between.                     I am able to
chance of estab-                                                establish in-
lishing informal                                                formal relation-
relationships with                                              ships with other
other employees at                                              employees at
work.                                                           work.

(b)  How important is this factor to you?

_____  Not Important

_____  Slightly Important

_____  Moderately Important

_____  Very Important


18. (a)  To what extent would you like a job in which you know exactly
         what is expected of you on your job?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
I do not have                   in between.                     I know exactly
clear, planned                                                  what is expected
goals and ob-                                                   of me.
jectives.

(b)  How important is this factor to you?

_____  Not Important

_____  Slightly Important

_____  Moderately Important

_____  Very Important

19. (a)  To what extent would you like a job in which you had to adapt
         to new and unusual situations?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
I seldom have to                in between.                     I have to face
face new and un-                                                new and unusual
usual situations.                                               situations in my
                                                                work quite often.

(b)  How important is this factor to you?

_____  Not Important

_____  Slightly Important

_____  Moderately Important

_____  Very Important

20. (a)  To what extent would you like a job in which you feel you
         need more time to do all of your work well?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                    I would like                    I would like
a job in which                  a job somewhere                 a job in which
I have enough                   in between.                     I experience a
time to do all                                                  moderate amount
of my work well.                                                of time pressure
                                                                to get my work
                                                                done.

(b)  How important is this factor to you?

_____  Not Important

_____  Slightly Important

_____  Moderately Important

_____  Very Important

21. (a)  To what extent would you like a job in which you are held
         responsible for whether or not the job gets done right?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                I would like                I would like
a job in which              a job somewhere             a job in which
I am not held               in between.                 I am held re-
responsible                                             sponsible for
for whether or                                          whether or not
not the job                                             the job gets
gets done right.                                        done right.

   (b)  How important is this factor to you?

   _____  Not Important

   _____  Slightly Important

   _____  Moderately Important

   _____  Very Important


22. (a)  To what extent would you like a job which allows you to
         communicate with other employees on an informal basis?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                I would like                I would like
a job in which              a job somewhere             a job in which
the opportunity             in between.                 I am able to
to communicate                                          communicate with
with other                                              other employees
employees is at                                         on an informal
a minimum.                                              basis.

   (b)  How important is this factor to you?

   _____  Not Important

   _____  Slightly Important

   _____  Moderately Important

   _____  Very Important

23. (a)  To what extent would you like a job in which you experience
         interruptions on the job?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                 I would like                 I would like
a job in which               a job somewhere              a job in which
I do not have                in between.                  there may be
a lot of inter-                                           frequent inter-
ruptions while                                            ruptions.
I'm doing my
work.

    (b)  How important is this factor to you?

         _____  Not Important

         _____  Slightly Important

         _____  Moderately Important

         _____  Very Important


24. (a)  To what extent would you like a job which involves doing a
         whole piece of work, that is, a complete piece of work that
         has a beginning and an end, as opposed to a small part of an
         overall piece of work?

    1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like                 I would like                 I would like
a job in which               a job somewhere              a job in which
I do a small                 in between.                  I complete a
part of an over-                                          whole piece of
all piece of work.                                        work, from
                                                          beginning to
                                                          end.

    (b)  How important is this factor to you?

         _____  Not Important

         _____  Slightly Important

         _____  Moderately Important

         _____  Very Important

25. (a) To what extent would you like a job in which communication
between you and other employees is required to solve a job
problem or exchange information necessary to do the job?

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6 ------- 7

I would like
a job in which
communication
between other
employees and
myself is not
a necessary part
of the job.

I would like
a job somewhere
in between.

I would like
a job in which
I must communi-
cate with other
employees in
order to solve
a job problem
or exchange
information
necessary to
do the job.

(b) How important is this factor to you?

_____ Not Important

_____ Slightly Important

_____ Moderately Important

_____ Very Important

SECTION THREE

---

Listed below are a number of statements which could be used to de-
scribe a job. You are to indicate whether each statement is an
accurate or inaccurate description of your job. Please try to be
as objective as you can.

---

Write a number in the blank beside each statement, based on the
following scale:

How accurate is the statement in describing your job?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Very Inac-curate | Mostly Inac-curate | Slightly Inac-curate | Uncertain | Slightly Accurate | Mostly Accurate | Very Accurate |

_____ 1. It takes a long time to learn the skills required to do my job well.

_____ 2. On my job, I seldom get a chance to use my special skills and ability.

_____ 3. The person in this job must expend a lot of effort trying to perform his or her job well.

_____ 4. One can not learn much by doing this job.

_____ 5. Just doing the work required by the job provides many chances for me to figure out how well I am doing.

_____ 6. The job denies me any chance to use my personal initiative or judgment in carrying out the work.

_____ 7. I have all the skills necessary to perform all the duties of my job well.

_____ 8. Supervisors often let me know how well they think I am performing the job.

_____ 9. I am seldom put in a position where the duties of my job are incompatible with one another.

_____ 10. The job gives me considerable opportunity for independence and freedom in how I do the work.

_____ 11. My job has no effect on the jobs of other people in this organization.

_____ 12. Other people's work depends directly on my job.

_____ 13. The supervisors and co-workers on this job almost never give me any "feedback" about how well I am doing in my work.

_____ 14. There is a lot of interaction between me and the other employees on a social level.

_____ 15. There is almost always an opportunity to talk with other employees about non-business topics.

_____ 16. The job is one where a lot of other people can be affected by how well the work gets done.

_____ 17. The job requires me to use a number of complex or high-level skills.

_____ 18. There is plenty of opportunity to learn new things on this job.

_____ 19. I have too much work to do to do everything well.

_____ 20. I have no difficulty adapting to new and unusual situations on this job.

_____ 21. At times, I am uncertain about what I am supposed to do on this job.

_____ 22. One could work a long while on this job without being interrupted.

_____ 23. I feel I should personally take the credit or blame for the results of my work on this job.

_____ 24. I always understand fully what I am supposed to do on this job.

_____ 25. The job itself provides very few clues about whether or not I am performing well.

_____ 26. I have very little control over the pace of my work.

_____ 27. I have difficulty adapting to new and unusual situations on this job.

_____ 28. The job allows me to set my own work pace.

How accurate is the statement in describing your job?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Very Inac- curate | Mostly Inac- curate | Slightly Inac- curate | Uncertain | Slightly Accurate | Mostly Accurate | Very Accurate |

_____ 29. I could perform my job well without expending a great deal of effort.

_____ 30. The job requires me to be prepared to handle surprising or unpredictable situations.

_____ 31. The job provides me the chance to completely finish the pieces of work I begin.

_____ 32. If mistakes are detected in my work output, I am not the person held responsible.

_____ 33. Most of my job activities are not affected by the work activities of other people.

_____ 34. The job requires a lot of cooperative work with other people.

_____ 35. I am frequently interrupted while doing my work.

_____ 36. There is almost no chance to talk to other employees except about "business".

_____ 37. To be successful on my job requires all my skill and ability.

_____ 38. I seldom talk to other employees unless it involves fulfilling the duties of my job.

_____ 39. The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end.

_____ 40. I would benefit from further training to develop skills which I need to do my job.

_____ 41. Sometimes different people expect me to perform my job in different ways, such that I cannot satisfy both expectations at the same time.

_____ 42. The amount of work I am asked to do is fair.

_____ 43. The job itself is <u>not</u> very significant or important in the broader scheme of things.

_____ 44. I depend on other people's work for information I need to do my work.

_____ 45. The job is so simple that virtually anybody could handle it with little or no initial training.

_____ 46. I seldom interact with other people for the purpose of fulfilling my job duties.

_____ 47. The job is quite simple and repetitive.

_____ 48. The job is one that is highly predictable, and that rarely presents me with surprising or unexpected problems.

_____ 49. The job requires a lot of interaction with other people.

_____ 50. The job can be done adequately by a person working alone--without talking or checking with other people.

# APPENDIX B

## MINNESOTA SATISFACTION QUESTIONNAIRE
(short-form)

# minnesota satisfaction questionnaire

**(short-form)**

# minnesota satisfaction questionnaire

The purpose of this questionnaire is to give you a chance to tell **how you feel about your present job,** what things you are **satisfied** with and what things you are **not satisfied** with.

On the basis of your answers and those of people like you, we hope to get a better understanding of the things people **like and dislike about their jobs.**

On the next page you will find statements about your **present** job.

• Read each statement carefully.

• Decide **how satisfied you feel about the aspect of your job** described by the statement.

Keeping the statement in mind:

—if you feel that your job gives you **more than you expected,** check the box under **"Very Sat."** (Very Satisfied);

—if you feel that your job gives you **what you expected,** check the box under **"Sat."** (Satisfied);

—if you **cannot make up your mind** whether or not the job gives you what you expected, check the box under **"N"** (Neither Satisfied nor Dissatisfied);

—if you feel that your job gives you **less than you expected,** check the box under **"Dissat."** (Dissatisfied);

—if you feel that your job gives you **much less than you expected,** check the box under **"Very Dissat."** (Very Dissatisfied).

• Remember: Keep the statement in mind when deciding **how satisfied you feel about that aspect of your job.**

• Do this for **all** statements. Please answer **every** item.

**Be frank and honest.** Give a true picture of your feelings about your **present job.**

2

*Ask yourself: How **satisfied** am I with this aspect of my job?*

**Very Sat.** *means I am very satisfied with this aspect of my job.*

**Sat.** *means I am satisfied with this aspect of my job.*

**N** *means I can't decide whether I am satisfied or not with this aspect of my job.*

**Dissat.** *means I am dissatisfied with this aspect of my job.*

**Very Dissat.** *means I am very dissatisfied with this aspect of my job.*

| On my present job, this is how I feel about . . . | Very Dissat. | Dissat. | N | Sat. | Very Sat. |
|---|---|---|---|---|---|
| 1. Being able to keep busy all the time | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2. The chance to work alone on the job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3. The chance to do different things from time to time | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4. The chance to be "somebody" in the community | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5. The way my boss handles his/her workers | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6. The competence of my supervisor in making decisions | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7. Being able to do things that don't go against my conscience | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8. The way my job provides for steady employment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9. The chance to do things for other people | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10. The chance to tell people what to do | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11. The chance to do something that makes use of my abilities | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12. The way company policies are put into practice | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13. My pay and the amount of work I do | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14. The chances for advancement on this job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15. The freedom to use my own judgment | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16. The chance to try my own methods of doing the job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17. The working conditions | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18. The way my co-workers get along with each other | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19. The praise I get for doing a good job | ☐ | ☐ | ☐ | ☐ | ☐ |
| 20. The feeling of accomplishment I get from the job | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Very Dissat. | Dissat. | N | Sat. | Very Sat. |

3

# APPENDIX C

## JOB DIAGNOSTIC SURVEY NORMATIVE DATA FOR THREE JOB FAMILIES[a]

| Job Char. | Professional or Technical | | Managerial | | Clerical | |
|---|---|---|---|---|---|---|
| | Mean AP | Standard Dev. | Mean AP | Standard Dev. | Mean AP | Standard Dev. |
| Skill variety | 5.4 | 1.0 | 5.6 | 0.94 | 4.0 | 1.3 |
| Task identity | 5.1 | 1.2 | 4.7 | 1.1 | 4.7 | 1.2 |
| Task significance | 5.6 | 0.95 | 5.8 | 0.85 | 5.3 | 1.1 |
| Autonomy | 5.4 | 1.0 | 5.4 | 0.92 | 4.5 | 1.2 |
| Feedback from job | 5.1 | 1.1 | 5.2 | 1.0 | 4.6 | 1.3 |
| Feedback from agents | 4.2 | 1.4 | 4.4 | 1.2 | 4.0 | 1.4 |
| Dealing with others | 5.8 | 0.96 | 6.4 | 0.58 | 5.2 | 1.1 |
| MPS | 154 | 55 | 156 | 55 | 106 | 59 |

[a]These data, as reported in Hackman and Oldham (1980), were obtained from 6930 employees who worked on a wide variety of jobs in 56 organizations throughout the United States.

# APPENDIX D

## SAMPLE STRATIFIED BY JOB CATEGORY: MEAN AMOUNT PRESENT OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | Clerical Employees (N=35) | Claims Examiners (N=44) | $t$[a] |
|---|---|---|---|
| Autonomy | | | |
| Certainty | 4.56 | 2.70 | 5.82** |
| Challenge | 3.56 | 4.39 | -2.40* |
| Deal w/others | | | |
| Effort | 4.78 | 5.81 | -4.02** |
| Feedbk/agents | | | |
| Feedbk/job | | | |
| Frndshp opp | | | |
| Interruptions | 4.97 | 6.11 | -3.71** |
| Know/skill req | 4.10 | 6.02 | -6.64** |
| Learning opp | 3.33 | 4.28 | -2.62* |
| Init interdep | | | |
| Opt interact | | | |
| Pace control | 4.47 | 3.60 | 2.49* |
| Req interact | | | |
| Responsibility | | | |
| Recd interdep | | | |
| Rigidity | 2.81 | 2.39 | 2.06* |
| Role amb | 2.93 | 4.23 | -4.20** |
| Role conflict | 3.57 | 4.96 | -4.44** |
| Role overload | 3.51 | 5.65 | -6.06** |
| Skill variety | 3.79 | 5.54 | -5.65** |
| Training adeq | 5.19 | 3.98 | 3.84** |
| Task identity | | | |
| Task signif | 4.88 | 5.80 | -3.35** |

[a] $t$-test for significant differences between job categories.
* $p \leq .05$.  ** $p \leq .01$.

184

# APPENDIX E

## SAMPLE STRATIFIED BY SEX: MEAN AMOUNT PRESENT OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | Male (N=22) | Female (N=67) | $t^a$ |
|---|---|---|---|
| Autonomy | | | |
| Certainty | | | |
| Challenge | | | |
| Deal w/others | | | |
| Effort | | | |
| Feedbk/agents | | | |
| Feedbk/job | | | |
| Frndshp opp | | | |
| Interruptions | 5.97 | 5.45 | 2.19* |
| Know/skill req | | | |
| Learning opp | | | |
| Init interdep | | | |
| Opt interact | | | |
| Pace control | | | |
| Req interact | | | |
| Responsibility | | | |
| Recd interdep | | | |
| Rigidity | | | |
| Role amb | 4.29 | 3.44 | 2.36* |
| Role conflict | | | |
| Role overload | 5.45 | 4.42 | 2.77** |
| Skill variety | | | |
| Training adeq | | | |
| Task identity | | | |
| Task signif | | | |

a $t$-test for significant differences between males and females.
* $p \leq .05$. ** $p \leq .01$.

# APPENDIX F

## SAMPLE STRATIFIED BY AGE CATEGORY: MEAN AMOUNT PRESENT OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | Under 30 (N=14) | 30-39 (N=46) | 40-49 (N=16) | 50 or Over (N=13) | $F^a$ |
|---|---|---|---|---|---|
| Autonomy | | | | | |
| Certainty | 4.14 | 2.99 | 3.54 | 4.26 | 3.52* |
| Challenge | | | | | |
| Deal w/others | | | | | |
| Effort | 4.57 | 5.62 | 5.25 | 5.18 | 2.95* |
| Feedbk/agents | | | | | |
| Feedbk/job | 3.38 | 3.90 | 4.90 | 4.25 | 3.70* |
| Frndshp opp | | | | | |
| Interruptions | | | | | |
| Know/skill req | 3.98 | 5.42 | 5.31 | 5.23 | 3.84* |
| Learning opp | | | | | |
| Init interdep | | | | | |
| Opt interact | 4.67 | 4.51 | 3.71 | 3.86 | 3.20* |
| Pace control | | | | | |
| Req interact | | | | | |
| Responsibility | | | | | |
| Recd interdep | | | | | |
| Rigidity | | | | | |
| Role amb | | | | | |
| Role conflict | | | | | |
| Role overload | | | | | |
| Skill variety | | | | | |
| Training adeq | | | | | |
| Task identity | | | | | |
| Task signif | | | | | |

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[a] $F$-test for significant differences between age groups. Brown-Forsythe statistic is reported for groups which had unequal variances.
* $p \leq .05$. ** $p \leq .01$.

## APPENDIX G

SAMPLE STRATIFIED BY LENGTH OF JOB TENURE:  MEAN AMOUNT
PRESENT OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY
DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | Less than 4 Years On the Job (N=32) | 4 or More Years On the Job (N=57) | $t^a$ |
|---|---|---|---|
| Autonomy | | | |
| Certainty | | | |
| Challenge | | | |
| Deal w/others | | | |
| Effort | | | |
| Feedbk/agents | | | |
| Feedbk/job | | | |
| Frndshp opp | | | |
| Interruptions | | | |
| Know/skill req | | | |
| Learning opp | | | |
| Init interdep | | | |
| Opt interact | | | |
| Pace control | 4.58 | 3.73 | 2.48* |
| Req interact | | | |
| Responsibility | | | |
| Recd interdep | | | |
| Rigidity | | | |
| Role amb | | | |
| Role conflict | | | |
| Role overload | | | |
| Skill variety | | | |
| Training adeq | | | |
| Task identity | | | |
| Task signif | | | |

[a] $t$-test for significant differences between categories of job tenure.
   * $p \leq .05.$  ** $p \leq .01.$

# APPENDIX H

## SAMPLE STRATIFIED BY EDUCATIONAL LEVEL: MEAN AMOUNT PRESENT OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | High School Only (N=27) | Beyond H.S./ No College Deg. (N=31) | College Degree (N=31) | $F$[a] |
|---|---|---|---|---|
| Autonomy | | | | |
| Certainty | 4.24 | 3.23 | 2.91 | 5.61** |
| Challenge | | | | |
| Deal w/others | | | | |
| Effort | | | | |
| Feedbk/agents | | | | |
| Feedbk/job | | | | |
| Frndshp opp | | | | |
| Interruptions | 4.85 | 5.78 | 6.02 | 6.23** |
| Know/skill req | | | | |
| Learning opp | | | | |
| Init interdep | | | | |
| Opt interact | | | | |
| Pace control | | | | |
| Req interact | | | | |
| Responsibility | | | | |
| Recd interdep | | | | |
| Rigidity | | | | |
| Role amb | 2.99 | 3.36 | 4.53 | 10.56** |
| Role conflict | 3.44 | 4.37 | 5.07 | 10.45** |
| Role overload | 3.68 | 4.87 | 5.37 | 7.35** |
| Skill variety | | | | |
| Training adeq | | | | |
| Task identity | | | | |
| Task signif | | | | |

[a] $F$-test for significant differences between categories of educational level. * $p \leq .05$. ** $p \leq .01$.

# APPENDIX I

SAMPLE STRATIFIED BY LOCATION: MEAN AMOUNT PRESENT
OF JOB CHARACTERISTICS WHICH WERE SIGNIFICANTLY
DIFFERENT (AT .05 LEVEL) BETWEEN GROUPS

| Variable | J (N=37) | G (N=12) | W (N=12) | C (N=18) | P (N=11) | $F^a$ |
|---|---|---|---|---|---|---|
| Autonomy | 4.15 | 3.44 | 5.58 | 4.48 | 4.70 | 5.47** |
| Certainty | | | | | | |
| Challenge | | | | | | |
| Deal w/others | | | | | | |
| Effort | | | | | | |
| Feedbk/agents | | | | | | |
| Feedbk/job | | | | | | |
| Frndshp opp | | | | | | |
| Interruptions | 5.24 | 6.19 | 4.50 | 6.18 | 6.00 | 5.71** |
| Know/skill req | | | | | | |
| Learning opp | | | | | | |
| Init interdep | | | | | | |
| Opt interact | | | | | | |
| Pace control | 4.15 | 2.81 | 4.86 | 4.20 | 3.94 | 2.93* |
| Req interact | | | | | | |
| Responsibility | | | | | | |
| Recd interdep | | | | | | |
| Rigidity | | | | | | |
| Role amb | 3.76 | 3.58 | 2.53 | 4.24 | 3.58 | 2.60* |
| Role conflict | 4.29 | 4.97 | 3.19 | 4.74 | 4.27 | 2.93* |
| Role overload | 4.23 | 5.58 | 3.44 | 5.29 | 5.36 | 4.59** |
| Skill variety | | | | | | |
| Training adeq | 4.76 | 3.94 | 5.03 | 3.63 | 4.36 | 2.79* |
| Task identity | 4.87 | 3.36 | 5.14 | 4.30 | 4.09 | 3.08* |
| Task signif | | | | | | |

a $F$-test for significant differences between locations.
 * $p \leq .05$. ** $p \leq .01$.

189

## APPENDIX J

### NORMATIVE DATA FOR THE SHORT-FORM MSQ
### FOR THREE JOB GROUPS[a]

|  | Engineers | | Office Clerks | | Salesmen | |
|---|---|---|---|---|---|---|
|  | Mean | SD | Mean | SD | Mean | SD |
| General Satisfaction | 77.88 | 11.92 | 74.48 | 12.45 | 79.82 | 11.82 |
| Intrinsic Satisfaction | 48.53 | 7.54 | 47.32 | 7.67 | 50.24 | 7.58 |
| Extrinsic Satisfaction | 21.32 | 4.38 | 19.37 | 4.95 | 21.38 | 4.71 |

[a]These data, as reported in Weiss, Dawis, England and Lofquist (1967), were obtained from 387 engineers, 227 office clerks, and 195 salesmen.

# APPENDIX K

## SAMPLE STRATIFIED BY VARIOUS CATEGORIES: MEAN LEVELS OF JOB SATISFACTION BETWEEN GROUPS

| Grouping Variable | Category | Sample Size | Mean Job Satisfaction | $t$ or $F$[a] |
|---|---|---|---|---|
| Job Category | Clerical | 35 | 64.60 | 0.34 |
| | Claims Examiners | 44 | 63.50 | |
| Sex | Males | 22 | 60.77 | -1.18 |
| | Females | 67 | 64.82 | |
| Age | Under 30 | 14 | 58.79 | 2.49 |
| | 30-39 | 46 | 62.33 | |
| | 40-49 | 16 | 65.94 | |
| | 50 or Over | 13 | 71.92 | |
| Job Tenure | Less than 4 Years | 32 | 67.09 | 1.68 |
| | 4 or More Years | 57 | 61.98 | |
| Educational Level | High School Only | 27 | 68.67 | 4.75* |
| | Beyond H.S. | 31 | 65.29 | |
| | College Degree | 31 | 58.13 | |
| Location | J | 37 | 61.35 | 2.84* |
| | G | 12 | 64.25 | |
| | W | 12 | 75.00 | |
| | C | 18 | 62.83 | |
| | P | 11 | 62.00 | |

[a] $t$-test for two groups, $F$-test for 3 or more groups.
* $p \leq .05$. ** $p \leq .01$.

# APPENDIX L

## PEARSON CORRELATION COEFFICIENTS: AMOUNT PRESENT OF EACH OF THE JOB CHARACTERISTICS FOR DATA COLLECTED AT $TIME_1$ [a]

|     | Number of the Job Characteristic | | | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|
|     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1   |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2   | -.13 |      |      |      |      |      |      |      |      |      |      |      |      |
| 3   | .40 | -.43 |      |      |      |      |      |      |      |      |      |      |      |
| 4   | .20 | -.33 | .20 |      |      |      |      |      |      |      |      |      |      |
| 5   | .06 | -.54 | .37 | .07 |      |      |      |      |      |      |      |      |      |
| 6   | .18 | .08 | .29 | .18 | .03 |      |      |      |      |      |      |      |      |
| 7   | .31 | .05 | .37 | .10 | .11 | .47 |      |      |      |      |      |      |      |
| 8   | .10 | .24 | -.12 | .01 | -.22 | .12 | .05 |      |      |      |      |      |      |
| 9   | -.10 | -.46 | .15 | .38 | .33 | -.10 | -.15 | -.15 |      |      |      |      |      |
| 10  | .22 | -.59 | .54 | .37 | .60 | .19 | .21 | -.14 | .24 |      |      |      |      |
| 11  | .42 | -.42 | .73 | .29 | .28 | .24 | .46 | -.08 | .14 | .52 |      |      |      |
| 12  | .30 | -.23 | .30 | .36 | .06 | .16 | .23 | .07 | -.01 | .12 | .35 |      |      |
| 13  | .11 | .09 | -.16 | .07 | -.06 | -.07 | -.03 | .63 | -.06 | -.09 | -.09 | -.05 |      |
| 14  | .45 | .31 | -.09 | -.28 | -.29 | .22 | .25 | .22 | -.45 | -.16 | .03 | .08 | .18 |
| 15  | .26 | -.31 | .22 | .66 | .14 | .14 | .23 | .24 | .28 | .28 | .28 | .38 | .32 |
| 16  | .10 | .01 | .14 | -.15 | .21 | .05 | .16 | .03 | .05 | .01 | -.04 | -.04 | -.07 |
| 17  | .15 | .01 | .24 | .32 | -.14 | .15 | .11 | .17 | -.05 | .08 | .23 | .48 | -.12 |
| 18  | -.31 | .31 | -.22 | -.24 | -.13 | .06 | -.06 | -.09 | -.11 | -.39 | -.28 | -.25 | .01 |
| 19  | -.22 | -.45 | -.18 | .12 | .22 | -.25 | -.33 | -.11 | .39 | .12 | -.07 | .01 | -.11 |
| 20  | -.15 | -.52 | .12 | .21 | .46 | -.16 | -.14 | -.18 | .45 | .36 | .08 | .08 | -.10 |
| 21  | -.16 | -.50 | .18 | .12 | .51 | -.08 | -.06 | -.23 | .65 | .39 | .15 | -.10 | -.17 |
| 22  | .12 | -.66 | .56 | .35 | .55 | .09 | .11 | -.20 | .34 | .77 | .54 | .11 | -.16 |
| 23  | -.12 | .50 | -.24 | -.27 | -.35 | .00 | .14 | .30 | -.50 | -.27 | -.23 | -.18 | .12 |
| 24  | .27 | .18 | .20 | -.07 | -.05 | .10 | .25 | .01 | -.26 | .07 | .18 | .02 | -.09 |
| 25  | .37 | -.54 | .51 | .39 | .40 | .27 | .13 | -.02 | .20 | .60 | .46 | .38 | -.08 |

[a]Correlation coefficients $\geq .21$ or $\leq -.21$ are significant at $\alpha = .05$.

APPENDIX L[a] —Continued

| | Number of the Job Characteristic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | -.05 | | | | | | | | | | | |
| 16 | -.04 | -.03 | | | | | | | | | | |
| 17 | .06 | .37 | -.19 | | | | | | | | | |
| 18 | -.11 | -.30 | -.05 | -.11 | | | | | | | | |
| 19 | -.32 | .04 | -.14 | -.01 | -.02 | | | | | | | |
| 20 | -.29 | .17 | .06 | -.07 | -.12 | .56 | | | | | | |
| 21 | -.49 | -.07 | .03 | -.24 | -.04 | .44 | .59 | | | | | |
| 22 | -.21 | .21 | -.05 | -.08 | -.40 | .17 | .35 | .44 | | | | |
| 23 | .17 | -.21 | .00 | .06 | -.04 | -.39 | -.43 | -.44 | -.36 | | | |
| 24 | .26 | -.10 | .31 | .04 | .02 | -.35 | -.31 | -.26 | .01 | .20 | | |
| 25 | -.05 | .34 | .05 | .20 | -.38 | .12 | .24 | .22 | .59 | -.32 | .00 | |

[a]Correlation coefficients ≥ .21 or ≤ -.21 are significant at $\alpha$ = .05.

# APPENDIX M

PEARSON CORRELATION COEFFICIENTS: CHANGE IN AMOUNT
PRESENT OF EACH OF THE JOB CHARACTERISTICS
FROM $TIME_1$ TO $TIME_2$[a]

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of the Job Characteristic | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | |
| 2 | -.07 | | | | | | | | | | | | |
| 3 | .30 | -.16 | | | | | | | | | | | |
| 4 | .24 | -.05 | .22 | | | | | | | | | | |
| 5 | .13 | -.16 | .22 | .06 | | | | | | | | | |
| 6 | .06 | .04 | .09 | .22 | -.06 | | | | | | | | |
| 7 | .26 | .08 | .32 | .23 | -.05 | .17 | | | | | | | |
| 8 | .15 | -.02 | .05 | .39 | .02 | .05 | .09 | | | | | | |
| 9 | .03 | -.01 | -.08 | .11 | .09 | -.01 | .11 | -.19 | | | | | |
| 10 | -.05 | -.07 | .19 | .13 | .50 | -.06 | -.01 | .24 | -.03 | | | | |
| 11 | .30 | .08 | .29 | .25 | .09 | .27 | .28 | .16 | .05 | .08 | | | |
| 12 | .10 | -.05 | .14 | .33 | .24 | .04 | -.00 | .17 | -.03 | .28 | .12 | | |
| 13 | .10 | .01 | -.06 | .09 | -.06 | .09 | -.01 | .45 | .01 | -.08 | .04 | -.03 | |
| 14 | .37 | .28 | -.04 | -.01 | -.03 | .17 | .20 | .11 | -.07 | .07 | .00 | -.06 | .03 |
| 15 | .18 | -.01 | .16 | .39 | .13 | .13 | .06 | .10 | .01 | .07 | -.03 | .32 | -.03 |
| 16 | .28 | -.07 | .00 | .21 | .34 | .07 | .20 | .08 | .22 | .09 | .15 | .18 | .03 |
| 17 | .19 | -.01 | .23 | .39 | .08 | -.08 | .12 | .30 | -.22 | .13 | .22 | .35 | -.12 |
| 18 | -.02 | -.24 | .10 | .00 | .04 | .14 | -.10 | -.11 | -.02 | -.16 | -.08 | -.07 | .13 |
| 19 | -.10 | -.03 | -.12 | -.06 | .06 | -.17 | -.01 | .25 | -.10 | .20 | -.02 | -.16 | .10 |
| 20 | -.11 | -.12 | .06 | -.08 | .02 | .09 | .04 | -.18 | -.00 | -.00 | -.01 | -.11 | -.14 |
| 21 | .13 | -.09 | .24 | .13 | .45 | -.05 | .20 | .11 | .17 | .06 | .00 | -.10 | .03 |
| 22 | .17 | -.02 | .35 | .34 | .18 | .08 | .12 | .21 | .21 | .25 | .25 | .16 | .04 |
| 24 | .05 | .20 | .24 | -.15 | .06 | .03 | .10 | -.17 | .06 | .08 | .03 | -.02 | -.14 |
| 25 | .22 | -.10 | .22 | .38 | .32 | .14 | .24 | .26 | .06 | .33 | .22 | .37 | .15 |

[a]Correlation coefficients $\geq .23$ or $\leq -.23$ are significant at $\alpha = .05$.

194

APPENDIX M[a] —Continued

| | Number of the Job Characteristic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | .07 | | | | | | | | | | | |
| 16 | -.06 | .23 | | | | | | | | | | |
| 17 | -.06 | .25 | .06 | | | | | | | | | |
| 18 | -.01 | -.28 | -.05 | -.15 | | | | | | | | |
| 19 | .09 | -.13 | -.18 | -.00 | -.12 | | | | | | | |
| 20 | -.20 | .10 | .08 | -.12 | -.04 | .10 | | | | | | |
| 21 | -.09 | .07 | .17 | .12 | .01 | .20 | .19 | | | | | |
| 22 | -.05 | .26 | .13 | .26 | -.19 | -.14 | .03 | .15 | | | | |
| 23 | .13 | -.14 | .04 | .14 | -.02 | -.22 | -.16 | -.16 | -.05 | | | |
| 24 | .18 | -.13 | .09 | -.16 | .21 | -.20 | .03 | -.11 | .11 | .10 | | |
| 25 | .10 | .10 | .23 | .25 | -.06 | -.04 | -.08 | .10 | .10 | .09 | -.15 | |

[a]Correlation coefficients $\geq$ .23 or $\leq$ -.23 are significant at $\alpha$ = .05.

# APPENDIX N

## FACTOR ANALYSIS OF TIME$_1$ AMOUNT PRESENT VARIABLES: INITIAL COMMUNALITY ESTIMATES FOR EACH VARIABLE[a]

| Variable | Est. of Communality | Variable | Est. of Communality |
|---|---|---|---|
| Autonomy | .62717 | Pace control | .71294 |
| Certainty | .70314 | Req interact | .69218 |
| Challenge | .76402 | Responsibility | .40005 |
| Deal w/others | .73200 | Recd interdep | .50973 |
| Effort | .62175 | Rigidity | .46387 |
| Feedbk/agents | .48199 | Role amb | .59326 |
| Feedbk/job | .57426 | Role conflict | .63093 |
| Frndshp opp | .57867 | Role overload | .74750 |
| Interruptions | .63778 | Skill variety | .78591 |
| Know/skill req | .74322 | Training adeq | .55510 |
| Learning opp | .66897 | Task identity | .40693 |
| Init interdep | .46398 | Task signif | .59856 |
| Opt interact | .58939 | | |

[a]Estimates are the squared multiple correlations between the variable and the rest of the variables in the analysis.

## APPENDIX O

### FACTOR ANALYSIS OF TIME₁ AMOUNT PRESENT VARIABLES: EIGENVALUES OBTAINED AND PERCENT OF VARIANCE FOR THE UNROTATED FACTOR MATRIX

| Factor Number | Eigenvalue | Percent of Variance | Cumulative Percent of Variance |
|---|---|---|---|
| 1 | 6.21672 | 24.9 % | 24.9 % |
| 2 | 3.99135 | 16.0 | 40.8 |
| 3 | 2.29314 | 9.2 | 50.0 |
| 4 | 1.53313 | 5.1 | 56.1 |
| 5 | 1.29644 | 5.2 | 61.3 |
| 6 | 1.11581 | 4.5 | 65.8 |
| 7 | 1.07154 | 4.3 | 70.1 |
| 8 | .93412 | 3.7 | 73.8 |
| 9 | .83327 | 3.3 | 77.1 |
| 10 | .73915 | 3.0 | 80.1 |
| 11 | .66669 | 2.7 | 82.8 |
| 12 | .63645 | 2.5 | 85.3 |
| 13 | .51439 | 2.1 | 87.4 |
| 14 | .45677 | 1.8 | 89.2 |
| 15 | .42617 | 1.7 | 90.9 |
| 16 | .39685 | 1.6 | 92.5 |
| 17 | .30519 | 1.2 | 93.7 |
| 18 | .29421 | 1.2 | 94.9 |
| 19 | .25170 | 1.0 | 95.9 |
| 20 | .23871 | 1.0 | 96.8 |
| 21 | .22567 | .9 | 97.7 |
| 22 | .17539 | .7 | 98.5 |
| 23 | .16174 | .6 | 99.1 |
| 24 | .14022 | .6 | 99.7 |
| 25 | .08516 | .3 | 100.0 |

# APPENDIX P

## FACTOR ANALYSIS OF $TIME_2$ AMOUNT PRESENT VARIABLES: INITIAL COMMUNALITY ESTIMATES FOR EACH VARIABLE[a]

| Variable | Est. of Communality | Variable | Est. of Communality |
|---|---|---|---|
| Autonomy | .67568 | Pace control | .70772 |
| Certainty | .78092 | Req interact | .63002 |
| Challenge | .84671 | Responsibility | .54248 |
| Deal w/others | .68470 | Recd interdep | .50521 |
| Effort | .65522 | Rigidity | .27368 |
| Feedbk/agents | .56340 | Role amb | .80514 |
| Feedbk/job | .70869 | Role conflict | .77289 |
| Frndshp opp | .78163 | Role overload | .76300 |
| Interruptions | .48377 | Skill variety | .76491 |
| Know/skill req | .73843 | Training adeq | .63151 |
| Learning opp | .70679 | Task identity | .38443 |
| Init interdep | .64508 | Task signif | .69942 |
| Opt interact | .74223 | | |

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[a]Estimates are the squared multiple correlations between the variable and the rest of the variables in the analysis.

## APPENDIX Q

FACTOR ANALYSIS OF TIME$_2$ AMOUNT PRESENT VARIABLES:
EIGENVALUES OBTAINED AND PERCENT OF VARIANCE
FOR THE UNROTATED FACTOR MATRIX

| Factor Number | Eigenvalue | Percent of Variance | Cumulative Percent of Variance |
|---|---|---|---|
| 1 | 5.98515 | 23.9 % | 23.9 % |
| 2 | 4.98234 | 19.9 | 43.9 |
| 3 | 2.22661 | 8.9 | 52.8 |
| 4 | 1.53654 | 6.1 | 58.9 |
| 5 | 1.33503 | 5.3 | 64.3 |
| 6 | 1.19420 | 4.8 | 69.0 |
| 7 | .94068 | 3.8 | 72.8 |
| 8 | .90173 | 3.6 | 76.4 |
| 9 | .73092 | 2.9 | 79.3 |
| 10 | .63987 | 2.6 | 81.9 |
| 11 | .60644 | 2.4 | 84.3 |
| 12 | .54256 | 2.2 | 86.5 |
| 13 | .50090 | 2.0 | 88.5 |
| 14 | .45928 | 1.8 | 90.3 |
| 15 | .40184 | 1.6 | 91.9 |
| 16 | .38567 | 1.5 | 93.5 |
| 17 | .31553 | 1.3 | 94.7 |
| 18 | .25509 | 1.0 | 95.8 |
| 19 | .23820 | 1.0 | 96.7 |
| 20 | .20624 | .8 | 97.5 |
| 21 | .17163 | .7 | 98.2 |
| 22 | .15409 | .6 | 98.8 |
| 23 | .12518 | .5 | 99.3 |
| 24 | .10527 | .4 | 99.8 |
| 25 | .05900 | .2 | 100.0 |

# APPENDIX R

FACTOR ANALYSIS OF TIME$_2$ AMOUNT PRESENT VARIABLES:
OBLIQUE FACTOR STRUCTURE MATRIX
FOR 3-FACTOR SOLUTION

| Variable | Factor Number | | |
| | 1 | 2 | 3 |
|---|---|---|---|
| Autonomy | .43 | .41 | .32 |
| Certainty | -.32 | **.74** | -.00 |
| Challenge | **.70** | -.08 | .41 |
| Deal w/others | .35 | -.04 | **.71** |
| Effort | **.62** | -.34 | .19 |
| Feedbk/agents | .36 | **.43** | .35 |
| Feedbk/job | **.47** | **.50** | **.49** |
| Frndshp opp | .04 | .22 | **.72** |
| Interruptions | .17 | -**.46** | .13 |
| Know/skill req | **.75** | -.34 | .12 |
| Learning opp | **.68** | .03 | **.55** |
| Init interdep | .33 | .08 | **.47** |
| Opt interact | -.15 | .10 | **.79** |
| Pace control | .02 | **.46** | .19 |
| Req interact | .27 | -.11 | **.68** |
| Responsibility | .39 | .28 | -.05 |
| Recd interdep | .32 | .08 | .38 |
| Rigidity | -.26 | -.01 | .06 |
| Role amb | -.08 | -**.83** | -.21 |
| Role conflict | -.00 | -**.80** | -.18 |
| Role overload | .35 | -**.72** | .09 |
| Skill variety | **.78** | -.21 | .39 |
| Training adeq | -.21 | **.60** | -.11 |
| Task identity | .08 | .33 | -.05 |
| Task signif | **.73** | -.14 | .32 |

## APPENDIX S

FACTOR ANALYSIS OF TIME$_2$ AMOUNT PRESENT VARIABLES:
FACTORS SUGGESTED BY THE 3-FACTOR
OBLIQUE SOLUTION

| Factor Number | Composition of Factor |
|---|---|
| (1) | Skill variety, Knowledge and skill required, Task significance, Challenge,Learning opportunities, Effort, Feedback from the job |
| (2) | Role ambiguity (neg), Role conflict (neg), Certainty (neg), Role overload (neg), Training adequacy, Feedback from the job, Interruptions (neg), Pace control, Feedback from agents |
| (3) | Optional interaction, Friendship opportunities, Dealing with others, Required interaction, Learning opportunities, Feedback from the job, Initiated interdependence |

# APPENDIX T

## FACTOR ANALYSIS OF TIME$_2$ AMOUNT PRESENT VARIABLES: OBLIQUE FACTOR STRUCTURE MATRIX FOR 7-FACTOR SOLUTION

| Variable | Factor Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Autonomy | .35 | .14 | .18 | -.62 | .38 | -.26 | .28 |
| Certainty | -.25 | .66 | .17 | -.38 | -.15 | .36 | .50 |
| Challenge | .92 | -.25 | .24 | -.11 | .35 | -.25 | .02 |
| Deal w/others | .22 | -.16 | .60 | -.04 | .61 | -.44 | .03 |
| Effort | .44 | -.62 | .03 | .02 | .35 | -.28 | .06 |
| Feedbk/agents | .46 | .18 | .35 | -.25 | .25 | .07 | .51 |
| Feedbk/job | .39 | .17 | .44 | -.42 | .36 | -.28 | .54 |
| Frndshp opp | .23 | .12 | .81 | -.22 | .21 | .09 | .10 |
| Interruptions | .02 | -.45 | .04 | .37 | .24 | -.27 | -.17 |
| Know/skill req | .59 | -.64 | -.03 | .07 | .23 | -.41 | .13 |
| Learning opp | .71 | -.21 | .41 | -.14 | .40 | -.39 | .19 |
| Init interdep | .11 | -.15 | .31 | -.20 | .76 | -.14 | .17 |
| Opt interact | .03 | .14 | .90 | -.08 | .21 | .05 | -.06 |
| Pace control | .01 | .27 | .19 | -.98 | .06 | .04 | .10 |
| Req interact | .18 | -.18 | .57 | -.08 | .53 | -.42 | -.12 |
| Responsibility | .16 | -.03 | -.09 | -.06 | .15 | -.23 | .67 |
| Recd interdep | .28 | -.04 | .22 | -.05 | .66 | .03 | .13 |
| Rigidity | -.13 | .07 | .10 | .03 | .07 | .51 | -.14 |
| Role amb | -.04 | -.68 | -.25 | .36 | -.20 | .07 | -.71 |
| Role conflict | -.17 | -.75 | -.22 | .43 | -.07 | -.09 | -.45 |
| Role overload | .12 | -.84 | -.02 | .43 | .24 | -.25 | -.20 |
| Skill variety | .71 | -.46 | .23 | .02 | .35 | -.50 | .13 |
| Training adeq | -.30 | .50 | .00 | -.26 | -.09 | .15 | .52 |
| Task identity | .23 | .25 | -.02 | -.31 | -.15 | .16 | .20 |
| Task signif | .54 | -.44 | .11 | -.07 | .52 | -.41 | .19 |

# APPENDIX U

## FACTOR ANALYSIS OF TIME$_2$ AMOUNT PRESENT VARIABLES: FACTORS SUGGESTED BY THE 7-FACTOR OBLIQUE SOLUTION

| Factor Number | Composition of Factor |
|---|---|
| (1) | Challenge, Learning opportunities, Skill variety, Knowledge and skill required, Task significance |
| (2) | Role overload (neg), Role conflict (neg), Role ambiguity (neg), Certainty, Knowledge and skill required (neg), Effort (neg), Training adequacy, Interruptions (neg) |
| (3) | Optional interaction, Friendship opportunities, Dealing with others, Required interaction |
| (4) | Pace control (neg), Autonomy |
| (5) | Initiated interdependence, Received interdependence, Dealing with others, Required interaction, Task significance |
| (6) | Rigidity, Skill variety (neg) |
| (7) | Role ambiguity (neg), Responsibility, Feedback from the job, Training adequacy, Feedback from agents, Challenge |

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