

NEGLECTED QUESTIONS IN JOB DESIGN: HOW PEOPLE DESIGN JOBS, TASK-JOB PREDICTABILITY, AND INFLUENCE OF TRAINING

Michael A. Campion
Michael J. Stevens

Krannert School of Management, Purdue University

ABSTRACT: Three questions important to job design interventions but neglected in research were explored. First, how do people design jobs? Internal processes (e.g., growth needs) from psychological (or job enrichment) models of job design were not apparent. Instead, groupings of tasks into jobs suggested simple cognitive categorization based on task similarity, reflecting an engineering (or work simplification) orientation. Second, can job design be predicted from task design? Separate measures for job and task designs were unrelated, indicating that the whole is not predictable from the parts in job design. Third, can job design principles be trained? Subjects easily learned and applied different job design approaches.

This exploratory study is an initial attempt to address three basic questions that have been previously neglected in job design research. The three questions are related in that they are important to the application of job design knowledge in field settings. First, how do people such as managers go about designing jobs in the absence of explicit guidance? Because implicit values are critical to the successful implementation of innovation (e.g., Leonard-Barton, 1987), correspondence between the job design recommendations of experts and the intuitive way managers design jobs could improve job design interventions in actual organizations. Little research has examined this issue, and none could be found in the organizational behavior literature.

A condensed version of this article was presented at the meeting of the Academy of Management, Washington DC, August 1989 (also in F. Hoy (Ed), *Academy of Management Best Papers Proceedings*). This research was supported in part by a grant from the Center for the Management of Manufacturing Enterprises at the Krannert School of Management. Special thanks to Jack M. Feldman, Laurence S. Fink, Eugene F. Stone, Tom D. Taber, and Paul W. Thayer for their comments on an earlier version of this article.

Address correspondence to Michael A. Campion, Krannert School of Management, Purdue University, West Lafayette, IN 47907.

Second, can the design of a total job be predicted from the design of its constituent tasks when viewed separately? It would be of great practical value to be able to predict how well a job will be designed based only on prior knowledge about the tasks. This question is addressed only indirectly in the job design literature, and the answer is unclear.

Third, can job design principles be trained? If a job design intervention is to influence an organization in a broad and lasting manner, managers must not only be able to understand the principles, but they must be able to apply them to existing and new jobs. This issue is absent from the job design literature.

Although deriving from practical problems in job design interventions, these three questions also have theoretical importance. In the sections below, relevant literature is discussed and potential theoretical implications are illustrated. Then three studies are described which examine these questions.

1. HOW DO PEOPLE DESIGN JOBS?

In the organizational and psychological literature, much is known about the relationship between motivating characteristics of jobs and employee reactions to those characteristics (for classic early research see Ford [1969], Hackman & Lawler [1971], Herzberg [1966], and Turner & Lawrence [1965]; for recent reviews see Fried & Ferris [1987], Lohr, Noe, Moeller, & Fitzgerald [1985], and Stone [1986]). This research provides numerous recommendations for how to design jobs (e.g., increase variety, increase autonomy, form natural work units, etc.). Implementation advice has also been provided such as working within one department and picking a problem job (Ford, 1969), considering the impact on training and career development practices (Hackman & Oldham, 1980), and starting with a complete diagnosis of the work system (Griffin, 1982). It is unknown, however, how often this advice is followed.

Studying how people intuitively think of designing jobs is important theoretically because it may lead to insight regarding the cognitive processes that are used. Three precedents seem to suggest the potential value of a cognitive perspective on job design research. First, the role of internal processes are hypothesized in many of the psychological theories. For example, the Job Characteristics Model (JCM; Hackman & Lawler, 1971; Hackman & Oldham, 1976) postulates the existence of critical psychological states. Specifically, it is argued that core job dimensions, such as variety, autonomy, and feedback, influence outcomes like satisfaction and motivation through the mediating effect of the critical psychological states of experienced meaningfulness, responsibility, and knowledge of results. This theory also postulates the importance of

employees' needs for growth as moderators of these relationships. Employees with higher growth needs respond more positively to the job characteristics. As such, the theory implies internal cognitive processes which correspond to external job characteristics. Other psychological theories which have been applied to job design (Steers & Mowday, 1977) also allude to internal cognitive processes. For example, achievement motivation theory (McClelland, 1961) suggests that need for achievement moderates job design-outcome relationships, and activation theory (Scott, 1966) suggests that activation level mediates job design-outcome relationships.

The second precedent comes from research showing that the number of dimensions along which job design is conceptualized can be determined in part by studying the dimensions people actually perceive (Stone & Gueutal, 1985). These findings converge with findings of others that additional dimensions beyond just complexity or scope need to be considered, such as physical demands (e.g., Campion & Thayer, 1985; Taber, Beehr, & Walsh, 1985).

The third precedent for considering cognitive processes is seen in other areas of literature. For example, subordinates and observers may cognitively categorize leader behavior, thus shaping their perceptions of leaders (e.g., Lord, 1985; Lord, Foti, & De Vader, 1984; Lord, Foti, & Phillips, 1982). Similarly, categorization and other cognitive processes of the rater have provided insight into performance appraisal judgments (e.g., DeNisi, Cafferty, & Meglino, 1984; Feldman, 1981).

If a job's design can be viewed as categories of tasks, then the jobs people design are a reflection of their internal cognitive categories and categorization processes (Shiffrin & Schneider, 1977). In fact, it has recently been suggested that job perceptions are the result of active cognitive processing structures which consider both objective tasks and social influences (Feldman, 1988).

Although the present study does not directly explicate these cognitive processes, it does examine how people intuitively think about job design, thus contributing some insight into their thoughts and providing an initial starting point. Operationally, the present study examines how people spontaneously group tasks together to form jobs in order to discern their implicit strategies. Because of the exploratory nature of the study, a job design simulation is developed. It is intended to reflect the job design activity most common to managers, that of assigning tasks to employees.

The strategy people might use to design jobs is difficult to predict. At an elementary level, people may design jobs according to one of two basic philosophical orientations: they could maximize outcomes for the individual (such as satisfaction and meaningfulness of the work), or they could maximize outcomes for the organization (such as efficiency

and productivity). These two views represent the dominant themes in job design in this century. Their theoretical bases are psychology and engineering, respectively, and the corresponding popular names for their interventions are job enrichment and work simplification. The former grew historically out of a humanistic reaction against the latter, and the two are conceptually, ideologically, and empirically in conflict (Campion, 1988, 1989; Campion & Thayer, 1985; Davis & Taylor, 1979; Salvendy, 1978).

The organizational behavior literature might suggest that the job enrichment approach will predominate. This is tangentially supported by the heightened concern for quality of work life (e.g., the desire for more satisfying work) which presumably describes modern day workers (Ewing, 1983; Lawler, 1985; Raelin, 1987). On the other hand, surveys of job designers in organizations indicate that the simplification approach is still dominant (Davis, Canter, & Hoffman, 1955; Taylor, 1979). Furthermore, the historical roots of job design derive from the engineering concept of the division of labor and the ensuing economies of specialization (Babbage, 1835; A. Smith, 1776). Although it is expected that psychological and engineering orientations will be observed, the exploratory nature of the study does not encourage specific hypotheses.

2. CAN JOB DESIGN BE PREDICTED FROM TASK DESIGN?

The distinction between a job and a task is relative. A task is a distinct activity, while a job is a collection of tasks performed by a single worker (U. S. Department of Labor, 1972). Field studies have indicated that results of job design interventions are not always predictable in advance based on knowledge about changes in the tasks. For example, attempts to enhance the motivating and satisfying properties of clerical jobs have sometimes been successful (Ford, 1969; G. Graen, Scandura, & M. Graen, 1986; Griffeth, 1985; Orpen, 1979) and sometimes results have been mixed (Frank & Hackman, 1975; Griffin, 1991; Lawler, Hackman, & Kaufman, 1973; Locke, Sirota, & Wolfson, 1976).

The relationship between task design and job design can be framed in at least two ways. The first considers the *form* of the function which relates individual tasks to the whole. For example, in terms of combining the elements of the JCM (e.g., autonomy, feedback), early researchers proposed that a job's motivating potential was a multiplicative function of these characteristics (Hackman & Lawler, 1971). However, comparisons between this and other mathematical functions have found little support (e.g., Brief & Aldag, 1975; Brief, Wallace & Aldag, 1976; Hackman & Lawler, 1971; Hackman & Oldham, 1976), leading most reviewers to encourage the use of a simple additive combi-

nation strategy (Hackman & Oldham, 1980; Pierce & Dunham, 1976; Roberts & Glick, 1981). This is consistent with the common advice in psychological measurement that unit weighting is usually preferable to differential weighting schemes (e.g., Anderson & Shanteau, 1977; Dawes, 1979; Dawes & Corrigan, 1974; Einhorn & Hogarth, 1975; Wainer, 1976). These findings deal with how to combine job design dimensions and are suggestive that differentially weighting tasks may not be more effective than a simple averaging strategy. Furthermore, with the exception of weighting by importance or time spent on each task, differential weighting may be impossible when combining tasks because the tasks themselves differ across jobs.

The second way of framing the relationship between task design and job design considers the potential interactive *relationships* among the tasks (i.e., the higher order consequences of combining tasks). For example, there may be interdependencies (Hirst, 1988; Kiggundu, 1981, 1983) or coordinative complexities (Wood, 1986) among the tasks which influence the design of the jobs but which are not apparent from assessing the tasks separately.

As an exploratory examination of this issue, the present study asks whether the design of a total job can be predicted from the average design of the individual tasks?

3. CAN JOB DESIGN PRINCIPLES BE TRAINED?

The degree to which job design principles can be learned and correctly applied by practitioners has never been directly examined. Research has shown that transfer of training cannot merely be assumed (Goldstein, 1986; Wexley & Latham, 1981), and converting knowledge to changes in behavior is a frequent point of breakdown (Kirkpatrick, 1960). Most studies in organizational behavior do not bear on this issue. For example, those studies which have been successfully guided by job enrichment theories (e.g., Ford, 1969; Griffin, 1983; Orpen, 1979) do not provide any indication as to whether the changes were targeted by job design specialists or by managers who were trained in design principles.

Other studies indicate that job design modifications often resulted from other adjustments the organizations were making (e.g., changes in equipment or operating procedures), and they typically had negative or neutral consequences for individual outcomes (Billings, Klimoski, & Breaugh, 1977; Hackman, Pearce, & Wolfe, 1978; Hall, Goodale, Rabinowitz, & Morgan, 1978; Latack & Foster, 1985; Liden, Parsons, & Nagao, 1987; Oldham & Brass, 1979; Wall, Clegg, Davies, Kemp, & Mueller, 1987). This seems to indicate that the managers responsible for these job design changes were either untrained, unable, or unwilling to

apply job enrichment theory. Thus, the third question examined is whether people can learn and apply job design principles?

JOB DESIGN PERSPECTIVE

The interdisciplinary perspective on job design (Campion, 1988, 1989; Campion & Berger, 1990; Campion & Thayer, 1985, 1987) is utilized in the present study because its multiple approaches provide a fuller backdrop with which to address the questions. This perspective attempts to simultaneously consider all of the major approaches to job design. Included are the previously mentioned organizational psychology theories, here called the *motivational* approach, and the engineering theories, here called the *mechanistic* approach. Also included are a *biological* approach, reflecting the work physiology and ergonomics theories, and the *perceptual/motor* approach, reflecting the attention and information processing theories of human factors and experimental psychology. Table 1 illustrates key literature references and job design recommendations for each approach.

Use of the interdisciplinary perspective offers two unique advantages for our investigation. First, it shows that each of the approaches tries to maximize a different array of outcomes unique to its school of thought; and although there is some harmony, there is also much conflict in the intended outcomes. Because we are not able to make specific predictions regarding the outcomes subjects will try to maximize in the study, multiple approaches allow us to examine many possibilities.

Second, some approaches may be more intuitive for subjects to consider and thus reflective of spontaneous job design efforts. Additionally, certain approaches may allow us to better predict the design of whole jobs based on knowledge of the individual tasks, while other approaches may be more trainable.

THE PRESENT STUDY

The three questions are addressed in three separate studies. In study 1, a laboratory simulation of the job design process is developed, and the first question of how subjects intuitively design jobs is explored. In study 2, the second question is addressed by developing two alternative methods of scoring job design, one based on the average of the individual tasks and another on the total job; then these scoring methods are compared with a new sample of subjects scoring a set of jobs from study 1. In study 3, the third question is addressed by training a new sample of subjects on different approaches to job design, and then hav-

Table 1
Interdisciplinary Approaches to Job Design and Benefits and Costs from Previous Research

| APPROACH/ discipline base (example references) | Illustrative recommendations | Benefits | Costs |
|--|---|---|---|
| MOTIVATIONAL/ Organizational Psychology (Hackman & Lawler, 1971; Hackman & Oldham, 1980; Herzberg, 1966) | i-variety i-autonomy i-significance i-skill usage i-participation i-recognition i-growth i-achievement i-feedback | i-satisfaction i-motivation i-involvement i-performance d-absenteeism | i-training i-staffing difficulty i-errors i-mental fatigue i-stress i-mental abilities i-compensation |
| MECHANISTIC/ Classic Industrial Engineering (Barnes, 1980; Gilbreth, 1911; Taylor, 1911) | i-specialization i-simplification i-repetition i-automation d-spare time | d-training d-staffing difficulty d-errors d-mental fatigue d-mental abilities d-compensation | d-satisfaction d-motivation i-absenteeism |
| BIOLOGICAL/ Physiology, Biomechanics, Ergonomics (Astrand & Rodahl, 1977; Grandjean, 1980; Tichauer, 1978) | d-strength requirements d-endurance requirements i-seating comfort i-postural comfort d-environmental stressors | d-physical abilities d-physical fatigue d-aches & pains d-medical incidents | i-financial costs i-inactivity |
| PERCEPTUAL- MOTOR/ Experimental Psychology, Human Factors (Fogel, 1967; McCormick, 1976; Welford, 1976) | i-lighting quality i-display & control quality d-information processing requirements i-user friendly equipment | d-errors d-accidents d-mental fatigue d-stress d-training d-staffing difficulty d-compensation d-mental abilities | i-boredom d-satisfaction |

Note. Benefits and costs based on findings in previous interdisciplinary research (Campion, 1988, 1989; Campion & Berger, 1990; Campion & Thayer, 1985). i-increased, d-decreased.

ing them develop a well designed job and a poorly designed job using the same simulation. These jobs are then compared using the two scoring methods developed in study 2.

A laboratory setting was considered appropriate for this exploratory stage of research for several reasons. First, the simulation needed to be removed from the constraints on job design which exist in actual organizations (such as workload needs, staffing limitations, union agreements, tradition, and so on). Second, the subjects were management students at a university, and thus were similar to managers in real organizations in terms of interests, education, and career orientation. Third, there is meta-analytic evidence that the primary findings in previous job design research (e.g., relationships with satisfaction) are comparable in both laboratory and field settings (Stone, 1986).

STUDY 1

Study 1 developed the laboratory simulation on job design and addressed the first question of how subjects design jobs in a relatively unconstrained setting.

Method

Subjects. Subjects were 145 undergraduate students at a major Midwestern university. Nearly all (99.1%) were management majors in their junior or senior year. Age averaged 21.5 years ($SD = 1.1$), and 52.1% were male. Most had at least part-time or summer work experience. Only a few subjects indicated studying job design in previous course work.

Job Design Simulation. The simulation attempted to reflect the process of assigning tasks to employees (thereby forming jobs) which is the most common job design activity managers perform. In order to ensure that the tasks were realistic, task statements were taken from the *Task Analysis Inventories* (U. S. Department of Labor, 1973). The fairly generic and well known family of clerical jobs was chosen to avoid the requirement of any industry specific technical knowledge or the part of the subjects. All tasks in the clerical inventory were included, except those that overlapped or were relevant only to a particular industry. The final simulation had 40 tasks (e.g., types letters, forms, and documents according to standardized procedures; and weighs and records weights of materials and products). The tasks were independent in that none had to be performed in conjunction, in sequence, or in any manner that would predispose certain groupings (cf. Steiner, 1979).

Subjects were to assume they were the manager of a newly formed administrative support department. They were responsible for these 40 tasks and had five employees to perform them. They were told that the tasks could be combined in any manner, and employees could perform any combination of tasks. No information was given on employee skills or any characteristics of the organization. To ensure that the jobs designed would be comparable across subjects, the instructions stipulated that each task took one hour per day, thus five jobs should be designed with eight tasks each. The fidelity of this simulation is supported by the common view in industry of jobs as clusters of tasks performed by individuals (Davis & Wacker, 1982).

Procedure. Subjects were informed that the purpose of the study was to examine how people design jobs. The 40 task statements were written on individual slips of paper so that they could be easily laid-out and sorted on a desk. The ordering of the tasks was individually randomized for each subject. After the subjects designed the five jobs, they were asked to give each a descriptive title. Finally, subjects were asked two open-ended questions: (1) What method or *strategy* did you use in deciding how to assign tasks to your different jobs? and (2) Is there any particular *reason* why you chose to use this strategy? The simulation took approximately 50 minutes in each class.

Results

Subjects were able to perform the simulation with no difficulty, designing a total of 725 jobs. Content analyses were conducted by grouping together common strategies, reasons, and job titles. The reliability of the grouping process was assessed by having two independent analysts retranslate (Smith & Kendall, 1963) random samples of 30 strategies and 30 reasons back into the groups, with multiple assignments allowed. For grouping strategies, agreement on any one group assigned was 100% and agreement on the total number of groups assigned was 90.0%. Cohen's (1960) kappa, which controls for chance agreement, was 100% and 78%, respectively. For grouping reasons, agreement was 90.0% and 75.5%, respectively (kappa = 86.8% and 67.8%). Thus, the reliability of the content analyses was judged acceptable.

Table 2 shows the results of the content analyses. The majority of subjects indicated that their primary strategy for designing jobs was to group tasks based on similarity of function or activity. Nearly another fifth indicated similarity of skills, education, or difficulty as reflecting their strategy. Only small numbers of subjects mentioned similarity of equipment and location, similarity of level of responsibility, simple logic, or previous work experience.

Table 2
Content Analysis of the Job Design Strategies and Reasons
(Study 1)

| | <i>% of times mentioned</i> |
|--|---------------------------------|
| <i>Strategy for Grouping Tasks</i> | |
| 1. Similar functions or activities | 56.7 |
| 2. Similar skills, education, or difficulty | 18.2 |
| 3. Similar equipment, procedures, or location | 8.6 |
| 4. Logical approach | 4.3 |
| 5. Similar level of responsibility | 3.7 |
| 6. Observed grouping in previous work experience | 2.1 |
| 7. Other | 6.4 |
| <i>Reason for Choosing Strategy</i> | |
| 1. Best, most logical, organized, or systematic approach | 43.3 |
| 2. To increase specialization and utilization of skills | 21.1 |
| 3. To increase efficiency and productivity | 17.3 |
| 4. Observed grouping in previous work experience | 5.8 |
| 5. To give clear responsibilities | 4.3 |
| 6. To make more satisfying jobs | 2.9 |
| 7. Other | 5.3 |
| <i>Titles Given to Jobs</i> | |
| | <i>% of times mentioned</i> |
| 1. Secretary | 19.2 |
| 2. Accounting Clerk/Bookkeeper | 15.1 |
| 3. Personnel Assistant | 13.9 |
| 4. Warehouse/Stockroom Clerk | 13.0 |
| 5. Production Assistant | 9.0 |
| 6. Receptionist | 7.8 |
| 7. Supervisor | 7.0 |
| 8. Mail Room Attendant | 6.0 |
| 9. Data Processor | 5.9 |
| 10. Other | 3.1 |

Note. *n*'s = 145 subjects who mentioned 187 strategies, 208 reasons, and 714 titles after designing 725 jobs.

Over two fifths indicated their reason for choosing the job design strategy as it was the best or most logical, organized, or systematic strategy. Another fifth said they were trying to increase specialization and utilization of skills, and another fifth noted an attempt to increase efficiency and productivity. Only a small number of subjects said their reasoning was based on prior work experience or an attempt to improve the satisfying nature of the jobs. The titles given to the jobs were similar to the range of common clerical-related occupations.

STUDY 2

Study 2 addressed the second question by developing and comparing two alternative job design scoring systems. Study 2 also evaluated the realism of the jobs designed in study 1.

Method

Subjects. Subjects were 60 graduate students at a major Midwestern university. Nearly all (99.2%) were in a masters of science program in management, with an average age of 26.1 years ($SD = 4.1$). Nearly three-fourths (74.8%) had at least one year of full time work experience and were therefore more knowledgeable than the subjects in sample 1 about jobs in actual organizations.

Total-Job Scoring Method. A modified version of the self-report Multi-method Job Design Questionnaire (MJDQ) was used (Campion, 1988). Prior research suggested that the MJDQ had favorable psychometric qualities (Campion, 1988), and convergent and discriminant validity (Campion, Kosiak, & Langford, 1988) with the popular Job Diagnostic Survey (Hackman & Oldham, 1975). Its items reflect the recommendations in Table 1, with a separate scale for each of the four approaches (i.e., motivational, mechanistic, biological, and perceptual/motor). The primary content of each scale remained the same as in previous research, although several items were eliminated because they could not be judged outside of an organizational setting (e.g., promotion opportunities, pay adequacy, climate, and work place layout). All items used a 5-point response format (ranging from 5—*strongly agree* to 1—*strongly disagree*, with blank—don't know or not applicable). Scores reflecting the quality of a job's design were calculated as averages of items for each approach.

Subjects in study 2 evaluated a sample of jobs designed in study 1. Based on prior research (Campion, 1988), three subjects evaluated each job to ensure accurate measures. With each subject evaluating two jobs, the 60 subjects thus evaluated 40 different jobs (i.e., 60 subjects times 2

jobs each, divided by 3 subjects per job, equals 40 different jobs). This yielded statistical power of 83% to detect a correlation of .40 ($p < .05$, one-tailed, Cohen, 1977). Randomly selected jobs from those developed in study 1 were presented to the subjects as lists of eight tasks, and an explanation was given as to how they were designed. The subjects were instructed on the theories, purposes, and outcomes of the four job design approaches. Then they provided ratings independently of one another on all four MJDQ scales. To avoid leniency and severity effects, the scores provided by each subject for each job were standardized by subtracting that subject's mean score from the two jobs evaluated by the subject. Data collection took approximately 80 minutes in each class.

Task-Average Scoring Method. The same shortened version of the MJDQ described above was used, except a truncated rating system (ranging from 4—*agree* to 2—*disagree*) was found to be more operational for evaluating tasks. The ratings were provided independently by each author on each of the 40 tasks in advance of collecting the total-job ratings. To avoid leniency and severity, an effort was made to spread the ratings across the entire scale range for each item. By averaging applicable items, a score was calculated for each of the 40 tasks reflecting the quality of its design based on the four approaches. Because each job consisted of eight tasks, overall scores on each approach for a given job were calculated as the average of the scores of its eight constituent tasks. Therefore, unlike the total-job method which allowed raters to evaluate a job as a whole, this method evaluated the constituent tasks in isolation. It estimated the overall quality of a job's design based on the tasks separately, without consideration of potential interactions among tasks.

Realism Measure. The student subjects were also asked to evaluate whether each job was a realistic combination of tasks by indicating the extent to which they agreed with five statements (e.g., this job represents a realistic combination of tasks, and there are many jobs similar to this in actual organizations). Responses were made on a 5-point (strongly agree to strongly disagree) scale, and scores were averages across items.

Results

Table 3 shows that the total-job scoring method was reliable. Internal consistency reliabilities were in the .70s and above. Average inter-correlations among the individual raters were in the .50s, and the reliabilities of the means of the three raters were in the .70s to .80s (calculated using intraclass correlations; Cronbach, Gleser, Nanda, & Rajaratnam, 1972). Similarly, Table 3 shows that the task-average scor-

Table 3
Means, Standard Deviations, and Reliabilities of Alternative Job Design Scoring Methods

| Scale | <i>Total-Job Method</i> | | | | | <i>Task-Average Method</i> | | | | | <i>r</i> b/w methods |
|----------------------|-------------------------|-----------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-----------------------|-----------------------|-----------------------|----------------------|
| | <i>M</i> | <i>SD</i> | <i>r</i> ¹ | <i>r</i> ² | <i>r</i> ³ | <i>M</i> | <i>SD</i> | <i>r</i> ¹ | <i>r</i> ² | <i>r</i> ³ | |
| | Study 2 | | | | | | | | | | |
| Motivational | 3.15 | .52 | .73 | .51* | .76* | 2.79 | .14 | .92 | .66* | .79* | .10 |
| Mechanistic | 2.90 | .69 | .74 | .37* | .63* | 3.32 | .15 | .94 | .72* | .84* | -.10 |
| Biological | 3.59 | .79 | .90 | .51* | .76* | 3.70 | .09 | .95 | .57* | .73* | .22* |
| Perceptual/ Motor | 2.67 | .76 | .83 | .54* | .78* | 3.16 | .12 | .87 | .48* | .65* | .05 |
| | Study 3 | | | | | | | | | | |
| Motivational | 3.26 | .66 | .94 | .87* | .93* | 2.79 | .09 | | | | .15 |
| Mechanistic | 2.96 | .62 | .75 | .54* | .70* | 3.35 | .12 | | | | -.06 |
| Biological | 3.61 | 1.17 | .95 | .95* | .97* | 3.70 | .09 | | | | .53* |
| Perceptual/ Motor | 3.05 | .83 | .85 | .85* | .92* | 3.20 | .13 | | | | .63* |

Note. r^1 = internal consistency reliability (13 items in Motivational, 7 in Mechanistic, 7 in Biological, and 6 in Perceptual-Motor), r^2 = interrater reliability between individual raters, r^3 = interrater reliability of the mean of raters (Study 2 had three raters for Total-Job Method and two raters for Task-Average Method; Study 3 had two raters for Total-Job Method), and r b/w methods = correlation between the two scoring methods. Reliabilities of the Task-Average Method for Study 3 are the same as for Study 2. n = 40 jobs (Study 2) and 56 to 64 (Study 3).
 * $p < .05$.

ing method was reliable. Internal consistency reliabilities were higher than the total-job scores. Interrater reliabilities between individual raters were also somewhat higher, and reliabilities of the means of the two raters were similar in size to the reliabilities of the three raters in the total-job method. Despite the acceptable psychometric properties for both scoring methods, they were not significantly correlated for three of the scales. The exception was the biological scale which showed a small positive correlation.

Subjects felt the jobs as a group were quite realistic. Over 77% gave mean ratings more favorable than the neutral point ($M = 3.72$, $SD = 1.01$, $t = 7.45$, $p < .05$).

STUDY 3

Study 3 addressed the third question by training a new sample of subjects to apply the job design approaches.

Method

Subjects. Subjects were 118 undergraduate students at a major Midwestern university. They were highly comparable to the subjects in study 1 in terms of academic major, year in school, age, and sex. The university's computer assignment of students to sections of a course was based on enrollment size and could be considered random with respect to the usual demographics examined in psychological experiments. Statistical power was 84% to detect a .70 standard deviation difference between means in each condition ($p < .05$, one-tailed, Cohen, 1977).

Job Design Training. Each section was randomly assigned to one of the four job design approaches. A lecture was given on the theory, purposes, recommendations, outcomes, and examples of the treatment approach. A learning check was then administered. After collection, the learning check was reviewed and discussed, and any questions were answered. All training was given by the same instructor. The training took approximately 25 minutes.

Learning Check. The learning check assessed whether subjects could recognize tasks which were well designed on their given job design approach. The check consisted of eight pairs of tasks from widely diverse industries having no similarity to clerical jobs (e.g., electrical components manufacturing, food services, ore and metal processing, and air transportation). The pairs of tasks were selected to clearly represent well and poorly designed tasks on the approaches, with a separate learning check developed for each approach. Subjects responded by indicating which task from each pair was well designed on the approach. Scores consisted of the number correct out of the eight pairs.

Job Design Simulation. Immediately after the training, subjects were given the job design simulation developed in study 1, but with instructions to design only two jobs, one as well designed as possible on the approach and one as poorly designed as possible. Jobs could consist of any eight tasks, and the same task could be used in both the well and poorly designed jobs if the subject wished. The simulation took approximately 25 minutes.

Manipulation Check. After completing the simulation, subjects were asked about the usefulness of the job design approach by indicating the extent to which they agreed with four statements (e.g., I applied the job design approach to the simulation, and I found the job design approach easy to apply to the simulation). Responses were made on a 5-point (strongly agree to strongly disagree) scale, and scores were averages of items.

Job Design Measures. Both the task-average and the total-job scoring methods were applied. The task-average method used the task ratings derived in study 2. For the total-job method, all the procedures were the same as in study 2 except that two paid analysts were used who had familiarity with the interdisciplinary approaches and extensive training on the MJDQ.

Results

Data on the learning check indicated near perfect performance by subjects in the motivational and mechanistic conditions, but less clear learning for the biological and especially the perceptual/motor conditions (Table 4). Examination of scores for poorly performing subjects in the latter two conditions indicated they typically got *all* items wrong, suggesting they were making the distinctions but in the opposite direction. Such confusion appeared to be remedied in the subsequent discussion of the learning check, because subjects correctly applied the approaches as described below. The manipulation check suggested that most subjects applied the job design approach, with nearly everyone giving ratings more favorable than the neutral point in all conditions (Table 5).

Analyses of the job design scoring methods showed that the total-job method was even more reliable with two highly trained analysts (Table 3). Although there was again no significant relationship between the two methods for the motivational and mechanistic scales, convergence was observed on the biological and perceptual/motor scales.

Comparisons between the well and poorly designed jobs revealed significant differences in the expected direction for all the approaches

Table 4
Means, Standard Deviations, T-Tests, and Percents Correct on the Learning Check (Study 3)

| Group | <i>n</i> | <i>M</i> | <i>SD</i> | <i>t</i> | % |
|------------------|----------|----------|-----------|----------|------|
| Motivational | 29 | 7.38 | .90 | 20.15* | 96.6 |
| Mechanistic | 32 | 7.94 | .25 | 90.57* | 100 |
| Biological | 28 | 6.32 | 2.18 | 5.64* | 85.7 |
| Perceptual/Motor | 29 | 4.93 | 3.36 | 1.49 | 58.6 |

Note. *t* refers to comparison of the *M* with the chance level of number correct (i.e., 4).
**p* < .05.

Table 5
Means, Standard Deviations, T-Tests, and Percents Favorable on
the Manipulation Check (Study 3)

| Group | <i>n</i> | <i>M</i> | <i>SD</i> | <i>t</i> | % |
|------------------|----------|----------|-----------|----------|------|
| Motivational | 29 | 3.96 | .28 | 18.14* | 100 |
| Mechanistic | 32 | 4.02 | .40 | 13.99* | 100 |
| Biological | 28 | 3.70 | .51 | 7.11* | 92.6 |
| Perceptual/Motor | 29 | 3.90 | .37 | 12.53* | 92.3 |

Note. *t* and % refer to comparison of the *M* with the neutral point on the response scale (i.e., 3). **p* < .05.

within the total-job scoring method and for the biological and the perceptual/motor approaches within the task-average scoring method (Table 6). The differences were large, averaging 2.75 of the pooled standard deviations for the total-job scoring and 1.03 for the task-average scoring.

Table 6
Means, Standard Deviations, and T-Tests Between Well and
Poorly Designed Jobs on Each Approach (Study 3)

| Group | <i>n</i> | <i>Well</i> <i>Designed</i> <i>Jobs</i> | | <i>Poorly</i> <i>Designed</i> <i>Jobs</i> | | <i>t</i> |
|---------------------|----------|---|-----------|---|-----------|----------|
| | | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | |
| Total-Job Method | | | | | | |
| Motivational | 29 | 3.86 | .33 | 2.66 | .24 | -15.78* |
| Mechanistic | 32 | 3.32 | .42 | 2.60 | .57 | -4.80* |
| Biological | 28 | 4.40 | .69 | 2.81 | .99 | -6.00* |
| Perceptual/Motor | 29 | 3.74 | .46 | 2.37 | .48 | -9.13* |
| Task-Average Method | | | | | | |
| Motivational | 29 | 2.79 | .11 | 2.78 | .07 | -.53 |
| Mechanistic | 32 | 3.33 | .11 | 3.37 | .13 | 1.20 |
| Biological | 28 | 3.74 | .09 | 3.67 | .07 | -2.75* |
| Perceptual/Motor | 29 | 3.27 | .12 | 3.14 | .10 | -4.33* |

**p* < .05.

DISCUSSION

This study explored three basic questions that are important to the application of job design in organizations, but which have been previously ignored in the research.

1. How Do People Design Jobs?

This study simulated the job design activity most common to managers, that of forming jobs by assigning tasks to employees. In such a simulation with no organizational constraints and using management college students, it was found that tasks were combined into jobs based primarily on the similarity of functions or activities among tasks or the similarity of the skills required. The jobs appeared realistic and comparable to those commonly seen throughout industry, yet few subjects indicated that their groupings reflected previous work experience. Instead, a common explanation was that grouping based on similarity was simply the most logical strategy. An equally common, and more specific, explanation was that such a strategy increased specialization and utilization of skills or increased efficiency and productivity. As such, these results suggest that the mechanistic (or work simplification) approach to job design best reflects the unprompted efforts of these subjects. And it is noteworthy that only 2.9% of the subjects explicitly considered the psychological needs of employees so prominent in the job enrichment theories in the organizational behavior literature. The pervasiveness of efficiency considerations and the low priority given to job satisfaction among these subjects is highly consistent with practices among those who design jobs in industry (Davis et al., 1955; Taylor, 1979).

The findings of this study are consistent with cognitive psychological theories (e.g., Feldman, 1981; Lord, 1985; Shiffrin & Schneider, 1977) in that categorization processes appeared to be present. Subjects' design efforts seemed to represent the categorization of tasks based on a limited set of salient dimensions (e.g., similarity of function or skill). While not refuting the existence of internal psychological states (e.g., meaningfulness, responsibility, and growth needs; Hackman & Lawler, 1971), this study suggests they do not appear to have an explicit influence on the design of jobs the subjects constructed.

If the findings of this study are confirmed in future research, they suggest that considerations of employee satisfaction and motivation may not be as intuitive or spontaneous as are considerations of efficiency and skill utilization. Perhaps there is an implicit recognition of the potential costs of enlarged jobs in terms of factors like staffing, training, and compensation (Campion & McClelland, 1991). The traditional preoccupation with the advantages of the division of labor (Bab-

bage, 1835; Smith, 1776) may reflect this innate orientation, while quality of working life programs may have come about more as a social reform issue in western countries (Davies & Taylor, 1979) than as a natural way to think about the organization of work. This finding may also explain why some job enlargement interventions fail (e.g., Frank & Hackman, 1975), positive effects dissipate over time (Griffin, 1991), and work simplification is reinstated when workload demands increase (Campion & McClelland, 1991).

2. Can Job Design be Predicted from Task Design?

The findings suggest that the quality of the design of a total job does not appear to be highly predictable from the average quality of the individual tasks, especially for the motivational and mechanistic job design approaches. This was observed despite the fact that reliable measures of both job and task level design were developed. It appears that the sum of the parts does not always equal the whole when it comes to job design. A potential explanation might refer to task interdependencies which are ignored with a task averaging method. For example, the output of one task may be the input to another, or the resources (e.g., time, attention, skills) needed by one task may complement or compete with those needed by another.

Another potential explanation is that some job design dimensions simply cannot be aggregated from the task to the job level. The dimension of variety is an example. A task has low variety by its definition of being a single activity. But a combination of tasks can result in a job with high variety. Note that variety is a central concept in the motivational approach, and the antithesis of variety is specialization which is central to the mechanistic approach. Note also that neither the motivational nor mechanistic approach showed any correlation between the task-average and total-job scoring methods in either study 2 or 3.

The two scoring methods did show a small positive correlation for the biological approach in study 2, and moderately large positive correlations for both the biological and perceptual/motor approaches in study 3. These significant correlations were perhaps more likely in study 3 because the sample consisted only of jobs that were either very well or poorly designed, thus increasing the standard deviations of three of the scales for the total-job method from study 2 to study 3 (Table 3). Alternatively, it may be that for the set of 40 clerical tasks used in the simulation, interdependence may be somewhat less important in that physical and information processing aspects might simply be cumulative in their effect.

Inability to accurately predict job design from task design may explain the mixed results of many of the redesign interventions discussed

previously. This could be troublesome for job design practitioners who must experimentally develop and evaluate jobs in order to be confident of the outcomes.

3. Can Job Design Principles be Trained?

The findings indicate that subjects are able to learn job design concepts and apply them correctly, at least in the laboratory. All four approaches to job design were applied correctly by most subjects, but the motivational approach produced the largest mean difference between well and poorly designed jobs. This is especially encouraging in light of the above finding that subjects tend to be predisposed to mechanistic design, which can have negative psychological consequences for employees (Table 1). That job design principles can be easily learned is important to the successful implementation of redesign interventions in organizations.

Limitations and Future Research

This study has several limitations which are created by the contrived nature of the laboratory simulation. For example, in actual organizations there are many constraints on job design such as the existence of employees with specific skills and dispositions, workload pressures, technologies, unions, resource scarcities, and so on. The clerical tasks used here may have inadvertently predisposed certain groupings of jobs due to the ubiquitous nature of clerical job types. In actual organizations the managers might know the employees personally, thus making considerations of satisfaction and skills matching more salient. Similarly, job satisfaction might be a more important consideration when designing a job for oneself rather than others. Future research could examine the influence of these factors on how people design jobs.

Another limitation is that the subjects were college students majoring in management, but not yet real managers. Real managers might respond differently due to actual experience designing jobs. Additionally, the study was conducted at a university known for its engineering emphasis, thus an engineering approach to job design might have been somewhat predisposed.

This study attempts to consider how managers perform their job design activities, but it does not directly address how others who design jobs as their primary responsibility (e.g., engineers and systems analysts) might approach the process (cf. Davis et al., 1955; Taylor, 1979). Furthermore, combining tasks is only a limited case of job design—often the tasks themselves can be changed. These issues could also benefit from future research in a more naturalistic setting.

In terms of training, future research should explore whether the same subject can be trained in multiple approaches to job design. This would allow an explicit examination of the trade-offs subjects might make, as well as strategies for minimizing trade-offs. Also, developing a means of understanding and measuring task interdependencies is an important area of future research. The body of knowledge on interdependencies among tasks is just emerging (Wong & Campion, 1991).

Recommendations for Practice

This study provides several recommendations for practice. First, practitioners should be aware that different people may design jobs based on individual predispositions. A mechanistic or work simplification approach may be the most natural or predisposed orientation for untrained individuals. The interdisciplinary perspective suggests that several alternative approaches are available, each with a different set of expected outcomes. Second, the design of a total job may not be easily predictable from the design of the individual tasks. Care must be taken to evaluate different combinations of tasks, and follow-up measures and adjustments may be necessary after the jobs are designed. Third, although the mechanistic approach may be the most common among untrained people, they are able to apply other approaches if properly trained and guided.

REFERENCES

- Anderson, N. H., & Shanteau, J. (1977). Weak inference with linear models. *Psychological Bulletin*, 84, 1155-1170.
- Astrand, P. O., & Rodahl, K. (1977). *Textbook of work physiology: Physiological bases of exercise* (2nd ed.). New York: McGraw-Hill.
- Babbage, C. (1835). On the economy of machinery and manufacturers. Reprinted in L. E. Davis & J. C. Taylor (Eds.) (1979), *Design of jobs* (2nd ed., pp. 3-5). Santa Monica, CA: Goodyear.
- Barnes, R. M. (1980). *Motion and time study: Design and measurement of work* (7th ed.). New York: Wiley.
- Billings, R. S., Klimoski, R. J., & Breaugh, J. A. (1977). The impact of a change in technology on job characteristics: A quasi-experiment. *Administrative Science Quarterly*, 22, 318-339.
- Brief, A. P., & Aldag, R. J. (1975). Employee reactions to job characteristics: A constructive replication. *Journal of Applied Psychology*, 60, 182-186.
- Brief, A. P., Wallace, M. J., & Aldag, R. J. (1976). Linear vs. non-linear models of the formation of affective reactions: The case of job enlargement. *Decision Sciences*, 7, 1-9.
- Campion, M. A. (1988). Interdisciplinary approaches to job design: A constructive replication with extensions. *Journal of Applied Psychology*, 73, 467-481.
- Campion, M. A. (1989). Ability requirement implications of job design: An interdisciplinary perspective. *Personnel Psychology*, 42, 1-24.
- Campion, M. A., & Berger, C. J. (1990). Conceptual integration and empirical test of job design and compensation relationships. *Personnel Psychology*, 43, 525-553.

- Campion, M. A., Kosiak, P. L., & Langford, B. A. (1988, August). *Convergent and discriminant validity of the Multimethod Job Design Questionnaire*. Paper presented at the meeting of the American Psychological Association, Atlanta.
- Campion, M. A., & McClelland, C. L. (1991). Interdisciplinary examination of the costs and benefits of enlarged jobs: A job design quasi-experiment. *Journal of Applied Psychology, 76*, 186-198.
- Campion, M. A., & Thayer, P. W. (1985). Development and field evaluation of an interdisciplinary measure of job design. *Journal of Applied Psychology, 70*, 29-43.
- Campion, M. A., & Thayer, P. W. (1987). Job design: Approaches, outcomes, and trade-offs. *Organizational Dynamics, 15*(3), 66-79.
- Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 10*, 37-46.
- Cohen, J. (1977). *Statistical power analysis for the behavioral sciences* (Rev. ed.). New York: Academic Press.
- Cronbach, L. J., Gleser, G. C., Nanda, H., & Rajaratnam, N. (1972). *The dependability of behavioral measurements: Theory of generalizability for scores and profiles*. New York: Wiley.
- Davis, L. E., Canter, R. R., & Hoffman, J. (1955). Current job design criteria. *Journal of Industrial Engineering, 6*(2), 5-8, 21-23.
- Davis, L. E., & Taylor, J. C. (1979). *Design of jobs* (2nd ed.). Santa Monica, CA: Goodyear.
- Davis, L. E., & Wacker, G. J. (1982). Job design. In G. Salvendy (Ed.), *Handbook of industrial engineering* (pp. 2.5.1-2.5.31). New York: Wiley.
- Dawes, R. M. (1979). The robust beauty of improper linear models in decision making. *American Psychologist, 34*, 571-582.
- Dawes, R. M., & Corrigan, B. (1974). Linear models in decision making. *Psychological Bulletin, 77*, 95-106.
- DeNisi, A. S., Cafferty, T. P., & Meglino, B. M. (1984). A cognitive view of the performance appraisal process: A model and research proposition. *Organizational Behavior and Human Performance, 33*, 360-396.
- Einhorn, H. J., & Hogarth, R. M. (1975). Unit weighting schemes for decision-making. *Organizational Behavior and Human Performance, 13*, 171-192.
- Ewing, D. C. (1983). *Do it my way or you're fired*. New York: Wiley.
- Feldman, J. M. (1981). Beyond attribution theory: Cognitive processes in performance appraisal. *Journal of Applied Psychology, 66*, 127-148.
- Feldman, J. M. (1988, August). Social cognition, reality, and job perception. In M. A. Campion (Chair), *New directions in job design: Expanding predictors, criteria, and theory*. Symposium presented at the meeting of the Society of Industrial and Organizational Psychology, Dallas TX.
- Fogel, L. J. (1967). *Human information processing*. Englewood Cliffs, NJ: Prentice-Hall.
- Ford, R. N. (1969). *Motivation through the work itself*. New York: American Management Association.
- Frank, L. L., & Hackman, J. R. (1975). A failure of job enrichment: The case of the change that wasn't. *Journal of Applied Behavioral Science, 11*, 413-436.
- Fried, Y., & Ferris, G. R. (1987). The validity of the Job Characteristics Model: A review and meta-analysis. *Personnel Psychology, 40*, 287-322.
- Gilbreth, F. B. (1911). *Motion study: A method for increasing the efficiency of the workman*. New York: Van Nostrand.
- Goldstein, I. L. (1986). *Training in organizations: Needs assessment, development, and evaluation* (2nd ed.). Monterey, CA: Brooks/Cole.
- Graen, G. B., Scandura, T. A., & Graen, M. R. (1986). A field experimental test of the moderating effects of growth need strength on productivity. *Journal of Applied Psychology, 71*, 484-491.
- Grandjean, E. (1980). *Fitting the task to the man: An ergonomic approach*. London: Taylor & Francis.
- Griffeth, R. W. (1985). Moderation of the effects of job enrichment by participation: A longitudinal field experiment. *Organizational Behavior and Human Decision Processes, 35*, 73-93.
- Griffin, R. W. (1982). *Task design: An integrative approach*. Glenview, IL: Scott, Foresman.

- Griffin, R. W. (1983). Objective and social sources of information in task redesign: A field experiment. *Administrative Science Quarterly*, 28, 184-200.
- Griffin, R. W. (1991). Effects of work redesign on employee perceptions, attitudes, and behaviors: A long-term investigation. *Academy of Management Journal*, 34, 425-435.
- Hackman, J. R., & Lawler, E. E. (1971). Employee reactions to job characteristics. *Journal of Applied Psychology*, 55, 259-286. (Monograph).
- Hackman, J. R., & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, 60, 159-170.
- Hackman, J. R., & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, 16, 250-279.
- Hackman, J. R., & Oldham, G. R. (1980). *Work redesign*. Reading, MA: Addison-Wesley.
- Hackman, J. R., Pearce, J. L., & Wolfe, J. C. (1978). Effects of changes in job characteristics on work attitudes and behaviors: A naturally occurring quasi-experiment. *Organizational Behavior and Human Performance*, 21, 289-304.
- Hall, D. T., Goodale, J. G., Rabinowitz, S., & Morgan, M. A. (1978). Effects of top-down departmental and job change upon perceived employee behavior and attitudes: A natural field experiment. *Journal of Applied Psychology*, 63, 62-72.
- Herzberg, F. (1966). *Work and the nature of man*. Cleveland: World.
- Hirst, M. K. (1988). Intrinsic motivation as influenced by task interdependence and goal setting. *Journal of Applied Psychology*, 73, 96-101.
- Kirkpatrick, D. T. (1960). Techniques for evaluating training programs: Part 3—behavior. *American Society of Training Directors Journal*, 14(1), 13-18.
- Kiggundu, M. N. (1981). Task interdependence and the theory of job design. *Academy of Management Review*, 6(3), 499-508.
- Kiggundu, M. N. (1983). Task interdependence and job design: Test of a theory. *Organizational Behavior and Human Performance*, 31, 145-172.
- Latack, J. C., & Foster, L. W. (1985). Implementation of compressed work schedules: Participation and job redesign as critical factors for employee acceptance. *Personnel Psychology*, 38, 75-92.
- Lawler, E. E. (1985). Education, management style, and organizational effectiveness. *Personnel Psychology*, 38, 1-26.
- Lawler, E. E., Hackman, J. R., & Kaufman, S. (1973). Effects of job redesign: A field experiment. *Journal of Applied Social Psychology*, 3, 49-62.
- Leonard-Barton, D. (1987). Implementing structured software methodologies: A case of innovation in process technology. *Interfaces: An International Journal of the Institute of Management Sciences and the Operations Research Society of America*, 17(3), 6-17.
- Liden, R. C., Parsons, C. K., & Nagao, D. H. (1987). *A longitudinal investigation of the effects of office automation on perceived job characteristics and attitudes*. Paper presented at the meeting of the Academy of Management, New Orleans LA.
- Locke, E. A., Sirota, D., & Wolfson, A. D. (1976). An experimental case study of the successes and failures of job enrichment in a government agency. *Journal of Applied Psychology*, 61, 701-711.
- Lord, R. G. (1985). An information processing approach to social perceptions, leadership, and behavioral measurement in organizations. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 7, pp. 87-128). Greenwich, CT: JAI Press.
- Lord, R. G., Foti, R. J., & De Vader, C. L. (1984). A test of leadership categorization theory: Internal structure, information processing, and leadership perceptions. *Organizational Behavior and Human Performance*, 34, 343-378.
- Lord, R. G., Foti, R. J., & Phillips, J. S. (1982). A theory of leadership categorization. In J. G. Hunt, U. Sekaran, & C. Schriesheim (Eds.), *Leadership: Beyond establishment views* (pp. 104-121). Carbondale, IL: Southern Illinois University Press.
- Loher, B. T., Noe, R. A., Moeller, N. L., & Fitzgerald, M. P. (1985). A meta-analysis of the relation of job characteristics to job satisfaction. *Journal of Applied Psychology*, 70, 280-289.
- McClelland, D. C. (1961). *The achieving society*. Princeton, NJ: Van Nostrand.
- McCormick, E. J. (1976). *Human factors in engineering and design* (4th ed.). New York: McGraw-Hill.
- Oldham, G. R., & Brass, D. J. (1979). Employee reactions to an open-plan office: A naturally occurring quasi-experiment. *Administrative Science Quarterly*, 24, 267-284.

- Orpen, C. (1979). The effects of job enrichment on employee satisfaction, motivation, involvement, and performance: A field experiment. *Human Relations*, 32, 189-217.
- Pierce, J. L., & Dunham, R. B. (1976). Task design: A literature review. *Academy of Management Review*, 1(4), 83-97.
- Raelin, J. A. (1987). The '60s kids in the corporation: More than just "daydream believers." *Academy of Management Executive*, 1(1), 21-30.
- Roberts, K. H., & Glick, W. (1981). The job characteristics approach to task design: A critical review. *Journal of Applied Psychology*, 66, 193-217.
- Salvendy, G. (1978). An industrial engineering dilemma: Simplified versus enlarged jobs. In R. Muramatsu & N. A. Dudley (Eds.), *Production and industrial systems*. London: Taylor & Francis.
- Scott, W. E. (1966). Activation theory and task design. *Organizational Behavior and Human Performance*, 1, 3-30.
- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychological Review*, 84, 127-190.
- Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. Reprinted by R. H. Campbell & A. S. Skinner (Eds.). (1981). Indianapolis, IN: Liberty Classics.
- Smith, P. C., & Kendall, L. M. (1963). Retranslation of expectations: An approach to the construction of unambiguous anchors for rating scales. *Journal of Applied Psychology*, 47, 149-155.
- Steers, R. M., & Mowday, R. T. (1977). The motivational properties of tasks. *Academy of Management Review*, 2, 645-658.
- Steiner, I. D. (1979). Task-performing groups. In J. W. Thibaut, J. T. Spence, & R. C. Carson (Eds.), *Contemporary topics in social psychology* (pp. 393-422). Morristown, NJ: General Learning Press.
- Stone, E. F. (1986). Job scope-job satisfaction and job scope-job performance relationships. In E. A. Locke (Ed.), *Generalizing from laboratory to field settings* (pp. 189-206). Lexington, MA: Lexington Books.
- Stone, E. F., & Gueutal, H. G. (1985). An empirical derivation of the dimensions along which characteristics of jobs are perceived. *Academy of Management Journal*, 28, 376-396.
- Taber, T. D., Beehr, T. A., & Walsh, J. T. (1985). Relationships between job evaluation ratings and self-ratings of job characteristics. *Organizational Behavior and Human Decision Processes*, 35, 27-45.
- Taylor, F. W. (1911). *The principles of scientific management*. New York: Norton.
- Taylor, J. C. (1979). Job design criteria twenty years later. In L. E. Davis & J. C. Taylor (Eds.), *Design of jobs* (2nd ed., pp. 54-63). Santa Monica, CA: Goodyear.
- Tichauer, E. R. (1978). *The biomechanical basis of ergonomics: Anatomy applied to the design of work situations*. New York: Wiley.
- Turner, A. N., & Lawrence, P. R. (1965). *Industrial jobs and the worker: An investigation of response to task attributes*. Boston: Harvard Graduate School of Business Administration.
- U. S. Department of Labor. (1972). *Handbook for analyzing jobs*. Washington, DC: U. S. Government Printing Office.
- U. S. Department of Labor. (1973). *Task analysis inventories: A method for collecting job information*. Washington, DC: U. S. Government Printing Office.
- Wainer, H. (1976). Estimating coefficients in linear models: It don't make no nevermind. *Psychological Bulletin*, 83, 213-217.
- Wall, T. D., Clegg, C. W., Davies, R. T., Kemp, N. J., & Mueller, W. S. (1987). Advanced manufacturing technology and work simplification: An empirical study. *Journal of Occupational Behavior*, 8, 233-250.
- Welford, A. T. (1976). *Skilled performance: Perceptual and motor skills*. Glenview, IL: Scott-Foresman.
- Wexley, K. N., & Latham, G. P. (1981). *Developing and training human resources in organizations*. Glenview, IL: Scott-Foresman.
- Wong, C. S., & Campion, M. A., (1991). Development and test of a task level model of motivational job design. *Journal of Applied Psychology*, 76, 825-837.
- Wood, R., E. (1986). Task complexity: Definition of the construct. *Organizational Behavior and Human Decision Processes*, 37, 60-82.