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Interdisciplinary Approaches to Job Design: A Constructive Replication With Extensions

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This study replicated Campion and Thayer's (1985) research, which drew from many disciplines (e.g., psychology, engineering, human factors, physiology) to demonstrate four approaches to job design and their corresponding outcomes: motivational approach with satisfaction outcomes, mechanistic approach with efficiency outcomes, biological approach with comfort outcomes, and perceptual/motor approach with reliability outcomes. This study extended the research in five ways. First, it used an expanded sample of 92 jobs and 1,024 respondents from a different industry. Second, a self-report measure was developed and evaluated, because many jobs cannot be analyzed observationally. Third, method bias was addressed by not finding evidence of priming effects, by demonstrating strong relationships even when within-subject bias was avoided, and by relating job design to independent opinion survey data. Fourth, reliability of aggregate responses was demonstrated, and relationships at the job level of analysis were larger than at the individual level. Fifth, neither individual differences in terms of preferences/tolerances for types of work nor demographics moderated job design–outcome relationships. It was concluded that different approaches to job design influence different outcomes, each approach has costs as well as benefits, trade-offs may be needed, and both theory and practice must be interdisciplinary in perspective.

Job design theorizing and research in psychology and the organizational sciences have focused almost exclusively on job enrichment and enlargement (Ford, 1969; Herzberg, 1966) or characteristics of motivating jobs (Griffin, 1982b; Hackman & Lawler, 1971; Hackman & Oldham, 1980). This framework concentrates on those features of jobs that enhance psychological meaning and motivational potential, such as variety, autonomy, and task significance. Other academic disciplines, such as industrial engineering and ergonomics, also examine job design, but they too are fairly parochial in approach. That is, they focus primarily on their particular school of thought without significant consideration of other perspectives.

Although there is some overlap in the recommendations made for proper job design by the different disciplines, there is also considerable divergence and even some direct conflict in advice. Yet proponents from each school claim that their approach has a positive influence on a wide spectrum of outcomes for both individuals and organizations—from individual job satisfaction and performance to productivity and efficiency of the work system (e.g., Barnes, 1980, p. v; Grandjean, 1980, pp. ix–x; Hackman & Oldham, 1980, p. 94; McCormick, 1976, p. 4). Campion and Thayer (1985) addressed this confusion by adopting an interdisciplinary perspective. They reviewed and integrated this diverse literature and delineated taxonomies of job design approaches and outcomes. Subsequently, in a field study, they demonstrated that each approach is actually oriented toward the optimization of different categories of outcomes. The four approaches to job design that were discovered and their corresponding outcomes are as follows.[1]

First, a *motivational* approach emerged from the aforementioned literature on job enrichment, enlargement, and characteristics of motivating jobs as well as from theories of work motivation (Mitchell, 1976; Steers & Mowday, 1977; Vroom, 1964) and psychological principles from sociotechnical approaches (Cherns, 1976; Englestad, 1979; Rousseau, 1977). It represents an encompassing collection of recommendations intended to enhance the motivational nature of jobs. It derives from organizational psychology and is associated with job satisfaction, intrinsic motivation, and job involvement as well as job performance and attendance.

Second, a *mechanistic* approach, reflecting classic industrial engineering, emerged with recommendations from scientific management, time and motion study, and work simplification (Barnes, 1980; Gilbreth, 1911; Maynard, 1971; Mundel, 1970; F. Taylor, 1911). It is oriented toward human resource efficiency

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[1] The reviewers correctly noted that there may well be other approaches to job design not included here. For example, one reviewer stated that there is an Occupational Analysis approach to job design that clusters tasks into jobs on the basis of aptitude and training requirements. It is frequently used in the military, and its goal is to make best use of available and predicted future skills.

and flexibility outcomes such as staffing ease and low training requirements.

Third, a *biological* approach emerged from biomechanics (Tichauer, 1978), work physiology (Astrand & Rodahl, 1977), anthropometry (Hertzberg, 1972), and much of the ergonomics literature (Grandjean, 1980). This approach focuses on the minimization of physical stress and strain on the worker by making recommendations for such features as strength and endurance requirements and noise and climate limits. Employees who have well-designed jobs are more comfortable and report less physical effort and fatigue, fewer aches and pains, and fewer actual health complaints. Other recent studies in the organizational sciences have also suggested expanding the scope of job design research to include physical demands (Cornell, 1984; Stone & Gueutal, 1985; Taber, Beehr, & Walsh, 1985).

Fourth, a *perceptual/motor* approach, deriving largely from experimental psychology, emerged from research on human factors engineering (McCormick, 1976; Van Cott & Kinkade, 1972), skilled performance (Welford, 1976), and human information processing (Fogel, 1967; Gagne, 1962). It is oriented toward human mental capabilities and limitations, primarily with regard to attention and concentration requirements of jobs. This approach relates favorably to reliability outcomes (e.g., reduced error- and accident-likelihoods) and positive user reactions (e.g., reduced mental overload, fatigue, stress, and boredom as well as favorable attitudes toward work stations and equipment).

Although there are commonalities, the conflicts among the job design approaches uncovered in this research are more enlightening. Jobs can be simultaneously high on the mechanistic and perceptual/motor approaches because they both generally recommend design features that minimize mental demands, but the motivational approach gives nearly opposite advice by encouraging design features that enhance mental demands. As such, jobs high on the motivational approach may be more difficult to staff, require more training, have greater error-likelihood, and more mental overload and stress. Jobs high on the mechanistic and perceptual/motor approaches may have less satisfied and motivated employees and higher absenteeism. This suggests a basic trade-off between organizational benefits, such as efficiency and reliability, and individual benefits, such as satisfaction. The physical demands of jobs, characterized by the biological approach and comfort outcomes, are largely unrelated to the mental demands of jobs, but are influenced by costs of changing equipment and environments.

Purposes of the Present Study

The purposes of this study are to replicate and extend constructively Campion and Thayer's (1985) interdisciplinary research on job design by attempting to improve and develop both substantive and methodological understanding. The specific goals of and the differences between the original and the present studies can be described by the following five research questions (see Table 1).

Research Question 1. Are findings influenced by a different sample of jobs? The original study was limited to only one sample of jobs—blue-collar manufacturing jobs from the fairly low-technology forest-products industry. The present study examined a new and expanded sample from a very different industry—both blue- and white-collar manufacturing and development jobs from the high-technology electronics industry.

Research Question 2. Are findings influenced by different job design instrumentation? The original research used an analyst-completed Multimethod Job Design Questionnaire (MJDQ; Campion, 1985). This study examined many managerial and professional jobs that cannot be easily analyzed via observation (e.g., long task cycles, difficult-to-observe tasks, complex job content, confidential information, obtrusiveness of observational approach, etc.). Therefore, this study developed and evaluated a self-report version of the MJDQ.

Research Question 3. Are findings influenced by different controls for method bias? This bias refers to the potential for obtaining inflated correlations between measures because of collecting them from the same persons on the same instruments. Explanations include a desire by people to appear consistent or a priming effect created by initial questions (Salancik & Pfeffer, 1977). The original study used separate methods and multiple sources of data collection (see Table 1). The present study took three approaches. First, in order to examine potential priming effects directly, two alternate forms of the questionnaire were used with the order of job design and outcome measures reversed. This allowed a comparison of outcome responses that follow job design questions with those that do not. Second, in order to avoid within-subject bias, data were collected in a manner to produce two statistically reliable subsamples per job. This allowed job design measures from one subsample to be compared with outcome measures from the other subsample, thus avoiding within-subject bias. Third, in addition to collecting data directly from incumbents, employee opinion survey data were collected as a methodologically independent source of outcome information. It was predicted that the opinion survey would relate to job design in a pattern similar to satisfaction outcomes, because most items assessed aspects of job satisfaction.

Research Question 4. Are findings influenced by different levels of analysis? The latter two approaches to method bias discussed above require job level analysis. In the conceptual formulation of the motivational approach, researchers were clear that the focus was on the job (e.g., Hackman & Oldham, 1975, pp. 159, 161, and 168). However, measurement and analysis since that time have nearly always been at the level of individual incumbents. The original study focused primarily on the job level, but did not directly address the issue of level of analysis. Therefore, this study examined the reliability of aggregate incumbent responses and compared correlations between job design and outcome measures at the individual versus job level of analysis. It was expected that aggregation would increase correlations because it reduces random error and the effects of perceptual differences among incumbents.

Research Question 5. Are findings influenced by other individual differences? There is considerable research within the motivational approach on this topic. Most commonly, studies have operationalized individual differences in terms of growth-need strength that reflects needs for accomplishment, learning, and development (Hackman & Oldham, 1980). People with high growth-need strength are predicted to respond more positively to jobs high on motivating features. This study extended

Table 1
Comparison Between the Original Study (Campion & Thayer, 1985) and the Present Study

Research question	Campion & Thayer (1985)	Campion (1988)
1. Sample of jobs	Blue collar, manufacturing, low technology	Blue and white collar, manufacturing and development, high technology
2. Job design instrumentation	Analyst-completed	Incumbent self-report
3. Controls for method bias	(a) Separate methods (observations for job design, interviews for outcomes) (b) Multiple sources (incumbents, supervisors, and archives)	(a) Check for priming effects (b) Separate subsamples within each job for job design and outcome data (c) Multiple sources (many incumbents, and archives)
4. Level of analysis	Primarily job	Both job and incumbent
5. Individual differences	Demographics only	(a) Preferences/tolerances for types of work (b) Demographics

the concept of individual differences to other job design approaches. Instead of proposing "needs" with respect to other approaches, however, this study used the notion of preferences or tolerances for types of work. That is, preferences or tolerances were assessed for work relating to each of the approaches: motivational (e.g., challenging work), mechanistic (e.g., routine work), biological (e.g., physically demanding work), and perceptual/motor (e.g., fast-paced work). The hypothesis in the latter two cases was that incumbents who have low preference or tolerance for those types of work would respond more negatively to jobs designed poorly on those approaches.

Individual differences in terms of demographics are often examined by a number of approaches. Age and sex differences in physical abilities (Astrand & Rodahl, 1977; Henschel, 1970; Laubach, 1976; Snook, 1971; Snook & Ciriello, 1974) may moderate biological job design (Cornell, 1984). Motivational job design can be influenced by age (Aldag & Brief, 1975a; Cornell, 1984; Lawler, Hackman, & Kaufman, 1973; Robey & Bakr, 1978) as well as education (Aldag & Brief, 1975b; Cornell, 1984; Lawler et al., 1973) and, especially, tenure (Aldag & Brief, 1975b; Cornell, 1984; Katz, 1978a, 1978b; Kemp & Cook, 1983; Kozlowski & Hultz, 1986; Lawler et al., 1973; Robey & Bakr, 1978). The importance of these variables is also recognized in the perceptual/motor (Salvendy & Knight, 1982) and mechanistic (Barnes, 1980) approaches. Therefore, even though the original study found no demographic moderators, this study again explored the potential moderating influence of tenure, sex, age, and education.

Method

Sample

Power analysis and sample selection. Two statistical power considerations were relevant in the development of the sampling plan in order to allow job level analyses. First, in order to detect a minimum correlation between job designs and outcomes of .30 with power of 90%, a sample of at least 92 jobs was needed (according to the tables provided by Cohen, 1977). Second, using variance estimates from previous research, employee population figures provided by the organization, and standard sampling formulas (Warwick & Lininger, 1975), 95% confidence intervals around job design estimates with 10% accuracy (i.e., .4, on the 1 to 5 scales) would require approximately four randomly selected incumbents for most of the range of incumbent populations in this study. Data were needed on two independent subsamples per job, and 100% oversampling was used to accommodate a wide range of return rates. Thus, questionnaires were sent to 16 randomly selected incumbents for each of the 92 jobs, for a total of 1,472 incumbents. The 92 jobs were a 79.3% representative sample of all the jobs with 16 or more employees in this organizational setting.

Setting and sample description. The research setting was a manufacturing and development site of a large electronics company. Questionnaires were returned by 1,024 respondents for a 69.6% overall return rate (which is high for a mail survey; Warwick & Lininger, 1975). Returns by job ranged from 18.7% to 100%. Jobs ranged from entry-level assembler to third-level development manager, with a position breakdown of 17.4% managerial, 27.2% professional, 19.6% technical, 21.7% manufacturing, and 14.1% administrative. Return rates by job type were slightly higher for professional (75.5%) and lower for manufacturing (53.1%) jobs.

Nearly all (99.8%) incumbents had at least 1 year of company tenure, with 80.6% having 5 years or more; 91.4% had at least 6 months job tenure, with 56.0% having 2 years or more; and 60.5% had at least 2 years of college, with 36.6% having 4 years or more.

Job Design Measurement

Like the original analyst-completed MJDQ, the self-report version developed for this study assessed the quality of a job's design on the basis of each of the four approaches described above. The number of items was reduced from 70 to 48 by eliminating redundancy and items with low applicability to the entire range of jobs (e.g., items applicable only to manufacturing jobs). Incumbents were asked to indicate the extent to which each statement was descriptive of their job using a common 5-point response scale that ranged from *strongly agree* (1) to *strongly disagree* (5) and that included a *don't know or not applicable* (blank) alternative. A total score for each scale was calculated as an average across applicable items, because differential weighting schemes are generally not preferred (Einhorn & Hogarth, 1975; Wainer, 1976). The items of the self-report MJDQ are contained in the Appendix.

Three pilot studies were conducted to assess the reliability of the self-report MJDQ. First, as an assessment of alternate-forms reliability or convergent validity, the self-report MJDQ was completed on 30 diverse jobs from the Campion and Thayer (1985) sample and compared with the original analyst-completed MJDQ ratings. These ratings were completed by the author on the basis of a knowledge of the jobs without referring to the original MJDQ ratings. Correlations with the original MJDQ ranged from .88 ($p < .05$) to .95 across the scales, except for the

perceptual/motor scale, which correlated .68 ($p < .05$). (This correlation may have been lower because of the substantial reduction in items from the original to the self-report version of that scale: from 23 to 12, respectively.) Mean absolute agreement ranged from .58 to .77 across the scales, which is good given the substantial differences in the rating formats between the versions.

Second, to assess interrater reliability and agreement between analysts, three independent analysts completed the self-report MJDQ on 30 diverse jobs from the present sample on the basis of a review of detailed job descriptions. Average correlations (using r to z transformation here and in all future averages of correlations) ranged from .78 ($p < .05$) to .95, and mean absolute agreement ranged from .40 to .65, across the four scales. These results are similar to those using the original MJDQ (Campion & Thayer, 1985).

Third, to assess similarity between analysts and incumbents and to avoid concerns about basing reliability studies on analyses of job descriptions (compare Jones, Main, Butler, & Johnson, 1982, with Friedman & Harvey, 1986, and with Harvey & Hayes, 1986), average analyst data from the second pilot study were compared with average incumbent data. Correlations ranged from .66 ($p < .05$) to .89, and mean absolute agreement ranged from .43 to .62, across the four scales. Note that these aggregate analyses do not ensure agreement between individual analysts and incumbents (James, 1982).

Job Outcome Measurement

Campion and Thayer's (1985) examination of the theories and research revealed that each job design approach was actually oriented toward a specific category of outcomes. Thus, the fourfold taxonomy of job design approaches suggested a corresponding fourfold taxonomy of outcome categories. Each category represented a common theme or purpose. The primary outcome measures used in this study were also modeled after this taxonomy of outcomes. In addition, multiple measures were included for each category, objective wording and descriptive rating scale anchors were used to the extent possible, and many items were taken from research in each area. Five-point scales were used for all items for ease of response, but scale anchors for most items varied widely from those used for the job design measures including frequencies of occurrence, actual counts, absolute and percentage estimates, and relative comparisons with other jobs. Any adjective anchors needed were selected so that their psychophysical values aided discriminability (Bass, Cascio, & O'Connor, 1974).[2]

Satisfaction. This category referred to affective or attitudinal outcomes from work and corresponded to the motivational approach. Two items each were included for job satisfaction (Brayfield & Rothe, 1951), intrinsic work motivation (Hackman & Lawler, 1971), and job involvement (Lodahl & Kejner, 1965). This category may also include behavioral indices that reflect satisfaction, and one item was asked on the average number of days absent per month for reasons other than vacation.

Efficiency. This category referred to human resource efficiency and flexibility outcomes and corresponded to the mechanistic approach. Two items measured utilization levels: percentages of people who could perform the jobs with training and without training. Three items measured training and experience requirements: experience needed to attain full performance, formal education required, and yearly outside training needed.

Comfort. This category referred to physical well-being outcomes and corresponded to the biological approach. Included were one item on physical effort (Borg, 1962), one on physical fatigue (Kinsman & Weiser, 1976), and one each on the frequency of backaches and aches and pains in general.

Reliability. This category referred to system reliability and user reaction outcomes and corresponded to the perceptual/motor approach. One item each measured likelihoods of errors and accidents (Swain, 1973), one assessed mental fatigue (Pearson, 1957), one measured average overtime per week as an indicator of stress, three items measured frequency of work overload and underload (too many tasks, tasks too difficult, and boredom; Ivancevich & Matteson, 1980; McCormick, 1976), and there was one item on overall attitude toward the office, work station, and any equipment used on the job (Bare, 1966).

A composite score was computed for each outcome category by averaging an intercorrelated subset of items (reliabilities are reported in the Results section). These composites range from *1* to *5*, with *1* being most favorable. Only four items were excluded because of near zero or negative intercorrelations with the other items in their composites: absenteeism, from the satisfaction composite, and boredom, accident-likelihood, and attitude toward work station, from the reliability composite. These items were analyzed separately.

As an empirical assessment of the theoretical clustering of outcome items, the entire set was submitted to a principal components factor analysis with varimax rotation. Factors were retained on the basis of the criterion of a minimum eigenvalue of 1.0 and an examination of the scree test (Harman, 1976). Five factors emerged, explaining 54.8% of the variance. Factor scores were computed and correlated with the outcome composites. As can be seen in the factor loadings and correlations in Table 2, the five factors largely reproduced the outcome composites, with the exception of the comfort category, which split into two separate factors. Because of this high similarity, further analyses are only shown for the outcome composites.

Other Measures

Opinion survey. Data were obtained from an opinion survey conducted 3 months prior to this study. It was completed by 92% of the entire employee population of approximately 10,000, which included the participants in this study. On the survey, respondents indicated their jobs on a condensed coding scheme of 9 manager titles and 48 nonmanager titles. For the purposes of this study, data could only be analyzed at the job level by assigning aggregate opinion survey data to each job on the basis of the title that contained that job. In only 13% of the cases was there any uncertainty regarding which title respondents used. Analyses conducted without these jobs showed little difference in results, thus only results with all jobs are presented.

The 68 items of the opinion survey were divided into 11 topic categories on the instrument: company, job, salary/benefits, management, performance plan, career development, job demands, productivity, quality, work environment, and communication. All items used (or were converted to) a 5-point response scale, with *1* being most favorable. A composite was formed by averaging the intercorrelated items within each category (reliabilities are reported in the Results section). Only 6 items were excluded because of low or negative intercorrelations with other items in their composites.

Individual differences. Individual differences in preferences or tolerances for types of work were assessed on 18 items included in the outcomes portion of the questionnaire. Six items assessed the motivational approach: "I prefer highly challenging work that taxes my skills and abilities; I have a high tolerance for mentally demanding work; I prefer work that gives a great amount of feedback as to how I am doing; I prefer work that regularly requires the learning of new skills; I prefer work that requires me to develop my own methods, procedures, goals, and schedules; and I prefer work that has a great amount of variety in duties and responsibilities." Four items assessed the mechanistic approach: "I have a high tolerance for routine work; I prefer to work on one task at a time; I have a high tolerance for repetitive work; and I prefer work that

[2] All measurement protocols and item statistics are available from the author.

Table 2
Factor Loadings of the Outcome Items and Correlations Between Outcome Composites and Factor Scores

Item/Composite	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
			Factor loadings of the outcome items		
Job satisfaction 1	.76	−.24	.03	.03	.06
Job satisfaction 2	.79	−.14	.03	.03	.04
Intrinsic motivation 1	.81	−.24	.09	.09	.05
Intrinsic motivation 2	.70	−.01	.01	.06	.04
Job involvement 1	.64	.11	−.11	−.04	.03
Job involvement 2	.70	−.08	−.25	−.02	.05
Absenteeism	.12	−.15	−.08	.02	.31
Perform with training	−.22	.70	.03	.00	−.02
Perform without training	−.12	.69	.18	−.03	−.10
Experience needed	−.06	.79	.06	.02	.03
Education required	−.03	.64	.20	−.30	−.20
Training needed	−.08	.63	.14	−.08	.05
Physical effort	−.07	−.12	.13	.81	.14
Physical fatigue	−.11	−.07	.43	.50	.28
Backaches	.04	.03	.14	.06	.83
Aches and pains	.05	.00	.11	.18	.82
Error likelihood	.06	.45	.13	.29	−.04
Accident likelihood	.02	−.02	−.16	.83	.00
Mental fatigue	−.02	.21	.71	−.08	.21
Overtime	−.11	.17	.51	.13	−.21
Too many tasks	−.03	.13	.80	.04	.06
Tasks too difficult	.00	.19	.83	.09	.03
Boredom	−.40	.42	.21	−.13	−.15
Attitude toward work station	.17	.01	.09	.51	.06
Eigenvalue	3.57	3.11	2.60	2.13	1.74
			Correlations between outcome composites and factor scores		
Satisfaction	.98*	−.13*	−.04	.03	.06
Efficiency	−.14*	.94*	.17*	−.11*	−.06
Comfort	−.02	−.05	.27*	.50*	.78*
Reliability	−.03	.30*	.90*	.12*	.02

Note. $N = 1{,}024$.
*$p < .05$, two-tailed.

is easy to learn." Four items assessed the biological approach: "I have a high tolerance for physically demanding work; I have a fairly high tolerance for hot, noisy, or dirty work; I prefer work that gives me some physical exercise; and I prefer work that gives me some opportunities to use my muscles." Four items assessed the perceptual/motor approach: "I prefer work that is very fast paced and stimulating; I have a high tolerance for stressful work; I have a high tolerance for complicated work; and I have a high tolerance for work where there are frequently too many things to do at one time." The items were randomly ordered and all used a *strongly agree* (1) to *strongly disagree* (5) response format. Composites were formed by averaging the items (reliabilities are reported in the Results section).

The demographic measures (and their response scales) were: for company tenure, *less than 1 year* (1) to *20 years or more* (5); for job tenure, *less than 6 months* (1) to *5 years or more* (5); for sex, *male* (1) or *female* (2); for age, *less than 25 years* (1) to *55 years or older* (5); and for education, *high school or equivalent or less* (1) to *masters degree or more* (5).

Procedure

Random selection of incumbents within each job was accomplished via systematic sampling from alphabetized computer listings. Two alternate forms of the questionnaire were constructed by reversing the order of the job design and outcome measures. In the systematic sampling process, every other incumbent was sent the same form. Questionnaires were sent through company mail. A cover letter from the Director of Personnel explained that the study was for research purposes, that all questionnaires were anonymous and confidential, and that the data would not affect the employees' jobs. A 2-week response deadline was given, and a postcard reminder was sent. Opinion survey data were obtained from archival sources.

Results

Scale Characteristics and Reliability

Table 3 shows means, standard deviations, and internal consistency reliabilities for the job design scales and outcome composites. Only the comfort composite had an internal consistency below .60. Larger values for the scales are due partly to the greater number of items.

The reliability of aggregate (average) incumbent job design and outcome responses was assessed using the intraclass correlation for the mean of a group of raters (Cronbach, Gleser, Nanda, & Rajaratnam, 1972; James, 1982; Jones, Johnson, Butler, & Main, 1983; Shrout & Fleiss, 1979; Tinsley & Weiss,

Table 3
Means, Standard Deviations, Internal Consistency Reliabilities, and Intraclass Correlations Among Incumbents on the Measures

Scale/Composite	*M*	*SD*	*N* Items	Internal consistency reliability[a]	Intraclass *r*	
					All incumbents[b]	Half incumbents[c]
Job design scales						
Motivational	2.35	.56	18	.87	.55	.43
Mechanistic	3.23	.53	8	.64	.86	.76
Biological	2.44	.73	10	.86	.84	.72
Perceptual/Motor	3.12	.52	12	.85	.74	.58
Outcome composites						
Satisfaction	2.32	.69	6	.75	.43	.27
Efficiency	3.26	.91	5	.64	.93	.87
Comfort	2.24	.88	4	.43	.63	.46
Reliability	2.95	.84	5	.60	.61	.46

Note. $N = 1{,}024$.
[a] Based on coefficient alpha (Cronbach, 1951).
[b] M incumbents per job = 10.13 ($SD = 2.65$; $df = 91, 931$).
[c] Averages of analyses on four divisions of half the data. All intraclass correlations are significant at $p < .05$.

1975). Results range from .43 to .93, with only the satisfaction composite having an intraclass correlation value below .55 (see Table 3). Unlike internal consistencies, which are heavily influenced by the number of items in the scales, the intraclass correlations are more influenced by the objective and observable nature of the items. For example, the motivational scale has more items than the mechanistic scale, but the items may be less objective (e.g., autonomy and achievement are less objective than skill simplification and repetition). Thus, the motivational scale has a larger internal consistency and a smaller intraclass correlation.

Because this study also compares job design data taken from one subsample per job with outcome data taken from another subsample in order to avoid within-subject bias, the reliabilities of four divisions of the incumbents in each job were examined: odd and even returns and the two alternate forms of the questionnaire. The average intraclass correlations across these four subsamples tended to be slightly lower than when the entire sample was used (see Table 3), but all were significant ($p < .05$).

Research Questions

Research Questions 1 and 2. Are findings influenced by a different sample of jobs? Are findings influenced by different job design instrumentation? Intercorrelations among job design scales and among outcome composites are presented in Table 4. Correlations at the incumbent level and from Campion and Thayer (1985) were relevant to these research questions. The correlations were of a consistent direction, although the measures were somewhat more independent in the present study (average $r = .19$ vs. .31). The coefficient of congruence (Wrigley & Neuhaus, 1955), which is sensitive to both pattern and magnitude of similarity between sets of correlations (Levine, 1977), was .74.

Correlations between job design scales and outcome composites are contained in Table 5. Correlations at the incumbent level and correlations from Campion and Thayer (1985) were relevant to these research questions. Again the results were highly consistent, with a coefficient of congruence of .86. Of special interest are the correlations between the job design

Table 4
Intercorrelations Among the Measures

Job design scale	Mechanistic	Biological	Perceptual/Motor
Motivational			
Incumbent	−.13*	.22*	.07*
Campion & Thayer	−.69*	.33*	−.29*
Job level	−.43*	.31*	−.38*
Mechanistic			
Incumbent	—	−.15*	.39*
Campion & Thayer	—	−.06	.21*
Job level	—	−.42*	.72*
Biological			
Incumbent	—	—	.19*
Campion & Thayer	—	—	.47*
Job level	—	—	−.23*
Outcome composite	**Efficiency**	**Comfort**	**Reliability**
Satisfaction			
Incumbent	−.23*	.08*	−.07*
Campion & Thayer	−.21*	.27*	.09
Job level	−.33*	.32*	−.15
Efficiency			
Incumbent	—	−.10*	.34*
Campion & Thayer	—	−.12*	.58*
Job level	—	−.52*	.46*
Comfort			
Incumbent	—	—	.27*
Campion & Thayer	—	—	.26*
Job level	—	—	−.27*

Note. $N = 1{,}024$, for incumbent level. Ns = 121 and 206, for job design scales and outcome composites, respectively, for Campion and Thayer (1985). $N = 92$, for job level.
*$p < .05$, two-tailed.

Table 5
Correlations Between Job Design Scales and Outcome Composites

Job design scale	Outcome composite			
	Satisfaction	Efficiency	Comfort	Reliability
Motivational				
Incumbent	**.62***	−.31*	.22*	−.02
Campion & Thayer	**.32***	−.77*	.28*	−.49*
Bias	**.32***	−.42*	.25*	−.17
Job level	**.79***	−.57*	.42*	−.25*
Mechanistic				
Incumbent	−.06*	**.49***	−.14*	.23*
Campion & Thayer	−.22*	**.54***	−.06	.39*
Bias	−.15	**.71***	−.37*	.34*
Job level	−.24*	**.81***	−.47*	.51*
Biological				
Incumbent	.14*	−.12*	**.48***	.15*
Campion & Thayer	.15	−.12	**.50***	.01
Bias	.11	−.38*	**.51***	−.24*
Job level	.22*	−.42*	**.75***	−.22*
Perceptual/Motor				
Incumbent	.08*	.46*	.12*	**.41***
Campion & Thayer	−.08	.49*	.01	**.45***
Bias	.13*	.64*	−.32*	**.21***
Job level	−.16	.78*	−.36*	**.44***

Note. N = 1,024, for incumbent level. N = 121, for Campion and Thayer (1985). N = 92, for bias, which represents the average of four correlations that avoid within-subject bias. N = 92, for job level. Correlations in boldface relate job design scales with their corresponding outcome composites.
*$p < .05$, two-tailed.

scales and their corresponding outcome composites (in boldface in Table 5). All values were positive and generally large, averaging .50 at the incumbent level and .46 in Campion and Thayer. With the exception of the correlations between the perceptual/motor scale and efficiency outcome composite, these correlations were also typically larger than those with other outcomes, suggesting partial evidence for convergent and discriminant validity (Campbell & Fiske, 1959).

The four items not included in the outcome composites also showed significant correlations ($p < .05$). As expected, absenteeism correlated negatively with the motivational scale ($r = -.10$). Contrary to expectations, boredom correlated positively with the perceptual/motor scale ($r = .15$). Boredom also correlated positively with the mechanistic scale ($r = .24$), but negatively and strongly with the motivational scale ($r = -.44$). Contrary to expectations, accident-likelihood did not correlate significantly with the perceptual/motor scale, but it correlated positively with the mechanistic scale ($r = .16$) and negatively and strongly with the biological scale ($r = -.56$). Finally, attitudes toward the work station correlated positively with the perceptual/motor scale as expected ($r = .25$) as well as positively with the motivational ($r = .26$) and biological ($r = .48$) scales.

Research Question 3. Are findings influenced by different controls for method bias? Three analyses were conducted to assess or avoid method bias. First, the existence of a priming effect was assessed by comparing alternate forms of the questionnaire. No significant variance and only one mean difference were observed across all job design scales and outcome composites. The satisfaction composite had a less favorable mean in the form where the items were placed after (compared with before) the job design scales ($t = 3.55$, $p < .05$), but the difference was small ($SD = .22$).

Second, correlations were calculated between job design data from one subsample with outcome data from another within each job. Table 5 presents the average of four such correlations (i.e., job design data from the even returns with outcome data from the odd returns and vice versa, and job design data from one alternate form with outcome data from the other and vice versa). It is noteworthy that these correlations were comparable in magnitude with those computed within-subject (i.e., at the incumbent level) and those in Campion and Thayer (average $r = .33$, .25, and .31, respectively). Correlations between scales and their corresponding composites were also similar (average $r = .46$, .50, and .46, respectively). Coefficients of congruence were .82 with within-subject and .84 with Campion and Thayer.

Third, opinion survey composites were analyzed. Standard deviations were small because they were based on aggregate data, but all internal consistency reliabilities were .75 or above (see Table 6). Many significant correlations were observed. As expected, the pattern of correlations was similar to that with the satisfaction composite in Table 5. That is, positive correlations existed with the motivational and biological scales, and negative correlations existed with the mechanistic scale. Negative correlations were also common with the perceptual/motor scale. The reverse pattern occurred with the quality composite. This may have been because jobs higher on the mechanistic and perceptual/motor scales and lower on the biological scale are closer to the actual manufacturing of the product and have a more positive view of quality.

Research Question 4. Are findings influenced by different levels of analysis? Correlations at the job level of analysis are also contained in Tables 4 and 5. The most noteworthy effect was that they were larger than at the incumbent level (e.g., average $r = .39$ vs. .19 in Table 4, and .46 vs. .25 in Table 5). The

Table 6
Means, Standard Deviations, and Internal Consistency Reliabilities on Opinion Survey Composites and Correlations With Job Design Scales

Opinion survey composite	*M*	*SD*	*N* Items/ Reliabilities[a]	Correlation with job design scales			
				Motivational	Mechanistic	Biological	Perceptual/Motor
Company	1.83	.14	10/.88	.14	−.20*	.16	.01
Job	2.27	.22	7/.96	.45*	−.62*	.36*	−.44*
Salary/Benefits	2.35	.17	5/.77	−.01	.13	.09	.32*
Management	2.24	.10	13/.90	.24*	−.27*	.25*	−.08
Performance plan	2.36	.11	4/.83	.22*	−.11	.04	−.12
Career development	2.67	.16	5/.93	.35*	−.41*	.21*	−.29*
Job demands	3.00	.26	3/.90	.35*	−.59*	.52*	−.38*
Productivity	2.29	.11	5/.75	.21*	−.14	.28*	.02
Quality	1.98	.19	4/.86	−.07	.28*	−.29*	.42*
Work environment	2.26	.23	2/.92	.32*	−.62*	.57*	−.44*
Communication	2.48	.22	4/.93	.31*	−.41*	.42*	−.14

Note. $N = 92$ jobs.
[a] Coefficient alpha.
*$p < .05$, two-tailed.

average correlation between job design scales and their corresponding outcome composites was .72 at the job level and .50 at the incumbent level of analysis. The pattern of correlations was similar, with a coefficient of congruence of .87.

Research Question 5. Are findings influenced by other individual differences? Means and standard deviations on the preferences/tolerances measures were comparable with those of the job design and outcome measures (*M*s = 1.83 to 3.24, *SD*s = .45 to .75). Internal consistency reliabilities ranged from .64 to .79. Regression was used to test for moderators rather than subgroup correlations (Champoux & Peters, 1980; Peters & Champoux, 1979; Stone & Hollenbeck, 1984; Zedeck, 1971). In this method, the job design scale and preferences/tolerances measure were added first to the equation to predict the outcome composite, then the incremental contribution of the interaction term was tested. In no case did the interaction terms add significant incremental variance or have significant regression coefficients ($p > .05$).

Wide range and variation was also observed on the demographic measures (for company tenure, $M = 3.56$, $SD = 1.10$; for job tenure, $M = 3.51$, $SD = 1.21$; for sex, $M = 1.31$, $SD = .46$; for age, $M = 3.05$, $SD = 1.03$; and for education, $M = 3.18$, $SD = 1.50$). A few of the interaction terms added significant incremental variance ($p < .05$), but the amount of variance explained was .5% or less in all cases. Furthermore, the sizes of the regression coefficients for the interactions were very small compared with the additive terms, and the coefficients for the additive terms did not change appreciably when the interactions were included.[3]

Additional Analyses

Multivariate analyses. Canonical correlation analysis provided an overall multivariate examination of the relationship between job design scales and outcome composites (Darlington, Weinberg, & Walberg, 1973; Harris, 1975). Table 7 shows that three canonical correlations emerged indicating three orthogonal links between the sets of measures. Insight into the nature of the links was gained by examination of correlations between measures and variates (Cooley & Lohnes, 1971; Darlington et al., 1973; Levine, 1977; Meredith, 1964). The first variate had substantial correlations with all measures. The positive correlations with the motivational and biological scales and their outcomes as well as the negative correlations with the mechanistic and perceptual/motor scales and their outcomes suggested that this variate taps a mental-demands or job-complexity component. The second variate had the largest correlations with the motivational scale and satisfaction composite, indicating an attitudinal component. The many positive correlations with other scales and composites may suggest that once mental demands are considered, many of the approaches are consistent with positive attitudinal outcomes. The third variate had the largest correlations with the biological scale and comfort composite, thus representing a physical-demands component. Redundancy indices (Cooley & Lohnes, 1971; Stewart & Love, 1968) indicated that 58% of the total variance in the outcome composites was explained by the job design scales.

Although Table 7 presents results at the job level, results at the incumbent level were highly similar, with the exception of appearance of a small fourth canonical correlation primarily reflecting the reliability outcome composite. In this analysis, 31% of the variance was explained in the outcomes, which is similar to the 35% explained in Campion and Thayer (1985). Canonical correlation analyses that avoided within-subject bias showed very similar results, with 31% of the variance explained on the average.

Analyses of the opinion survey data revealed one large and two very small canonical correlations. The large variate had a pattern of correlations with the measures similar to the mental-demands link discussed above. The job design scales accounted for nearly 24% of the total variance in the opinion survey composites.

[3] More detailed analyses of the individual differences measures are available from the author.

Table 7
Canonical Correlation Analyses Between Job Design Scales and Outcome Composites

Measure	Correlation with canonical variates		
	Variate 1	Variate 2	Variate 3
Job design scale			
Motivational	.79*	.61*	−.04
Mechanistic	−.85*	.36*	.18
Biological	.57*	−.17	.80*
Perceptual/Motor	−.77*	.41*	.31*
Outcome composite			
Satisfaction	.59*	.81*	.02
Efficiency	−.94*	.25*	.19
Comfort	.68*	−.11	.73*
Reliability	−.51*	.25*	.16
Canonical correlation	.91*	.74*	.66*
Redundancy	.41	.11	.06

Note. $N = 92$ jobs. *$p < .05$, two-tailed.

Controlling for job evaluation level. Higher-level jobs typically have more mental-ability and less physical-ability requirements. Thus, discriminant validity can be addressed by demonstrating that correlations between job design scales and outcome composites remain significant while controlling for job evaluation level. An overall level index was used that was based on the organization's multiple-factor point-method job evaluation system (Milkovich & Newman, 1987). Controlling for level reduces the magnitudes of correlations, especially for those between job design scales and noncorresponding outcome composites (Table 8). But correlations between job design scales and their corresponding outcome composites remain significant in all cases.

Discussion

The purposes of this study were to replicate and extend constructively Campion and Thayer's (1985) interdisciplinary research by measuring four approaches to job design and demonstrating differential relationships with a broad array of outcomes in a field setting. The substantive and methodological contributions of this study and the differences between the original study and this study were conveyed in five research questions (see Table 1).

Research Questions

Research Question 1. Are findings influenced by a different sample of jobs? No. Compared with the original study, the jobs here were more diverse in terms of development and manufacturing, white and blue collar, and professional and nonprofessional, and they came from a technologically different industry.

Research Question 2. Are findings influenced by different job design instrumentation? No. A self-report version of the MJDQ was developed so that jobs could be included that cannot be analyzed through observation, such as many managerial and professional jobs. Pilot data suggested convergent validity, interrater reliability, and strong correlations between average analyst and incumbent ratings. Incumbent data demonstrated high internal consistency and reliable aggregate estimates. Ease of use was indicated by the high return rate and few incorrectly completed returns.

Despite the differences in sample and instrumentation, relationships between job designs and outcomes were quite similar in both pattern and magnitude to Campion and Thayer (1985). Jobs higher on motivational design were higher on satisfaction and motivation, and lower on boredom and absenteeism. On the other hand, high motivational jobs had more estimated training requirements and staffing difficulties and slightly higher mental overload and stress. Favorable relationships were also observed with reported physical effort and aches and pains, but these may have been the spurious results of the level of the jobs in the organization. Jobs higher on mechanistic design had less estimated training and experience requirements and staffing difficulties and lower mental overload and stress. In terms of disadvantages, high mechanistic jobs had slightly lower satisfaction, more boredom, and more physical demands.

Jobs higher on biological design had less reported physical effort and aches and pains, lower estimated accident-likelihood, favorable attitudes toward the work station, and sometimes slightly higher satisfaction. Jobs high on biological design had more estimated training requirements and staffing difficulties, perhaps again explained by hierarchical level of the jobs. Finally, jobs higher on perceptual/motor design had lower reported mental overload, mental fatigue, and stress, and less estimated training requirements and staffing difficulties. High scores on perceptual/motor design were also associated with favorable attitudes toward the work station, but also with more boredom.

The job design scales accounted for 31% of the variance in the outcomes. As an examination of discriminant validity, controlling for job evaluation level did not eliminate relationships between each approach and its corresponding outcomes. As in Campion and Thayer (1985) and subsequent research (Campion, 1987), a simplified interpretation of the relationships between job designs and outcomes involves a large mental-demands or job-complexity component and a smaller physical-

Table 8
Correlations Between Job Design Scales and Outcome Composites Controlling for Job Evaluation Level

Job design scale	Outcome composite			
	Satisfaction	Efficiency	Comfort	Reliability
Motivational	.77*	−.22*	.13	.00
	(.79*)	(−.57*)	(.42*)	(−.25*)
Mechanistic	.05	**.30***	.09	.25*
	(−.24*)	**(.81*)**	(−.47*)	(.51*)
Biological	.04	.23*	**.61***	.08
	(.22*)	(−.42*)	**(.75*)**	(−.22*)
Perceptual/Motor	.06	.60*	.03	**.21***
	(−.16)	(.78*)	(−.36*)	**(.44*)**

Note. $N = 92$ jobs. Numbers in parentheses reflect zero-order correlations from Table 5. Correlations in boldface relate job design scales with their corresponding outcome composites.
*$p < .05$, two-tailed.

demands component. An attitudinal component was also observed that did not appear previously. The pattern of relationships further suggested that after the mental demands are considered, many of the approaches are consistent with positive attitudinal outcomes.

Research Question 3. Are findings influenced by different controls for method bias? No. The research on the motivational approach has often been criticized for common method bias (e.g., Pierce & Dunham, 1976; Roberts & Glick, 1981; Salancik & Pfeffer, 1977; Schwab & Cummings, 1976). Attempts to overcome this problem have included obtaining job design information from observers (Campion & Thayer, 1985; Jenkins, Nadler, Lawler, & Cammann, 1975; Johns, 1978), supervisors (Oldham, Hackman, & Pearce, 1976), or nontask performers (Algera, 1983); or obtaining objective outcome data like productivity (Griffin, 1982a), or outcome data from a completely separate source like the *Dictionary of Occupational Titles* (Gerhart, 1988). Many recent studies on the motivational approach have attempted to address this issue directly (Glick, Jenkins, & Gupta, 1986; James & Jones, 1980; James & Tetrick, 1986; Spector, 1987; Stone & Gueutal, 1984).

Separate methods and multiple data sources were used in the original Campion and Thayer (1985) study (see Table 1). In the present study, method bias was addressed in three ways. First, potential priming effects were assessed by using two alternate forms of the questionnaire with the job design and outcome measures reversed. Little evidence for priming effects was observed. Second, sufficient data were collected within each job so that job design measures from one statistically reliable subsample could be compared with outcome measures from another. Results were highly similar in pattern and magnitude to within-subject results and results from Campion and Thayer. Third, opinion survey data were examined as an independent outcome measure. As expected, the pattern of relationships was similar to that with other satisfaction outcomes. The job design scales accounted for 24% of the variance in the survey composites, which is a large percentage given that the survey data were collected with a different method 3 months earlier from the entire employee population. Taken together, these findings suggest that within-subject method bias may not be as great a concern as many believe.

Research Question 4. Are findings influenced by different levels of analysis? No. The issue as to the proper level of analysis has created considerable conceptual and empirical confusion over whether we are examining within-person relationships, person–situation relationships, or situational relationships (Roberts & Glick, 1981). Because of either measurement unreliability or differences between jobs with the same title, another difficulty is that correlations between incumbents or between incumbents and observers on job design measures have tended to be only moderate (Aldag, Barr, & Brief, 1981).

Although the original Campion and Thayer (1985) study focused primarily on job level, the present study examined both individual and job levels. The reliability of aggregate incumbent responses was moderate to high in most cases, especially for the more objective measures like the mechanistic and biological scales and efficiency outcomes. Analyses at the job level showed larger relationships than either the incumbent level or the Campion and Thayer study. This finding was likely the result of cancelling random errors and reducing effects of differences in perceptions among incumbents. This finding is also expected if aggregating increases the variance between jobs (Glick & Roberts, 1984) and it is consistent with the findings of Algera (1983). Rousseau (1978) found a reduction in size of relationships, but data were aggregated to the department level and may have combined different jobs, thus reducing between-job variance. Focus on the job as the level of analysis is consistent with original theorizing in the motivational approach (e.g., Hackman & Oldham, 1975). It is the obvious focus of the other approaches and is the level of treatment (Haney, 1980) in job design or redesign projects. It may also more accurately estimate the importance of these measures. At the job level of analysis, 58% of the variance in a broad array of outcomes was accounted for by the job design scales.

Research Question 5. Are findings influenced by other individual differences? No. Even though controversy surrounds both the value of need satisfaction theories (Alderfer, 1977; Salancik & Pfeffer, 1977) and the value of the growth–need–strength moderator (O'Connor, Rudolf, & Peters, 1980; White, 1978), nearly half of all the motivational job design studies have included these measures of individual differences (for recent conceptual and empirical reviews see Roberts & Glick, 1981, and Loher, Noe, Moeller, & Fitzgerald, 1985, respectively).

This study developed the notion of preferences or tolerances for work designed according to each job design approach, because the other approaches do not have concepts analogous to growth need strength. Measures exhibited adequate range and reliability, but they did not moderate the relationships. This is not considered a strong test, however, because the preferences/tolerances concept is slightly different than the growth-need strength moderator in the motivational approach, and it is not supported by theory or research in the other job design approaches.

Demographic variables were also explored as moderators. As with the original study, no differences or only trivial differences were observed. This may not be surprising given the inconsistent findings of demographic moderators of job design. For example, in the motivational job design literature, more tenured employees sometimes respond more positively (Aldag & Brief, 1975a), sometimes more negatively (Lawler et al., 1973), sometimes the effect is curvilinear (Katz, 1978a, 1978b; Kemp & Cook, 1983; Kozlowski & Hultz, 1986), and sometimes there is no effect (Robey & Bakr, 1978). Even in the biological approach, decrements with age may not be apparent at submaximal work levels (Snook, 1971).

Validity of Correlational Research

The design of this study was evaluated with respect to Mitchell's (1985) recommendations for enhancing the validity of correlational research conducted in organizations. A careful sampling plan considered statistical power and accuracy of estimation calculations. The sample was large and randomly selected. A high return rate occurred, and differences between job types were examined. Multiple assessments of reliability and agreement were conducted with both pilot and main study data, including internal consistency, convergence among alternate measures, and interrater reliability. Three methods of examining

method bias were used, including analysis of priming effects, comparison of data gathered from separate incumbents, and analysis of methodologically independent opinion survey data. Multiple measures of constructs were used that drew heavily from previous literature. Hypothesized structures and relationships were empirically tested using factor and canonical correlation analyses. Convergent and discriminant validity of the main relationships in the study were assessed, and further evidence of discriminant validity was offered by controlling for job evaluation level.

Implications

There are several implications of this research for the theory and practice of job design. In terms of practice, an interdisciplinary perspective must be adopted. Multiple approaches exist, and each approach relates to different sets of outcomes. No single approach can explain all variance, but together they can explain a substantial proportion of variance in a broad array of outcomes.

A comprehensive theory of job design must be interdisciplinary in perspective as well. The taxonomy of four job design approaches and corresponding taxonomy of outcome categories described here may provide a start in this regard. They were derived from a content evaluation of the literature and have been empirically related in two separate studies. Furthermore, the interdisciplinary perspective adopted in this study is neither definitive nor exclusive. When (not if) other approaches and outcomes of job design emerge, they can be easily integrated. Lastly, an interdisciplinary perspective provides strong inference research (Platt, 1964; Roberts & Glick, 1981) wherein alternative theories can be compared.

Another implication is that inherent trade-offs and conflicts among some of the approaches must be recognized. Most notably, the motivational approach strives to produce jobs that are stimulating and mentally demanding, but it may have the unintended consequence of increasing training times and creating staffing difficulties (Campion, 1987). Work designed according to mechanistic or perceptual/motor approaches may err at the other extreme, because the jobs may be designed inadequately in terms of satisfaction and growth potential. The biological approach is constrained primarily by the costs of modifying equipment and environments.

Because job designs are partly inventions, they reflect the values of the designers and the eras in which they are constructed (Cornell, 1984; Davis & J. Taylor, 1979). These values include the economic goal of minimizing immediate costs (Davis, Canter, & Hoffman, 1955; J. Taylor, 1979) and the theories about human work motivation (Steers & Mowday, 1977; Warr & Wall, 1975). This research suggests that which trade-offs to make depends on the outcomes one wants to maximize, and the underlying values may reflect either an individual-outcomes orientation or an organizational-outcomes orientation. Recognizing these values may help make job design trade-offs more explicit.

Another consequence of these conflicts is that experts holding partisan views on job design may find themselves working toward different goals within an organization. The compartmentalization of specialties in organizations (e.g., industrial engineers in manufacturing, human factors engineers in development, ergonomists in industrial hygiene or safety departments, and organizational psychologists in personnel departments) and in universities (e.g., engineering vs. psychology), may tend to perpetuate this problem (Campion & Thayer, 1987).

Future research should examine conditions under which trade-offs among the approaches are necessary. Future research and theorizing may also consider the potential for a simplified conceptualization of job design–outcome relationships consisting of a large mental-demands or job-complexity component, a smaller physical component, and perhaps a small attitudinal component. An encouraging, yet tentative, implication of this study is that, once mental demands are considered, many of the approaches may relate to positive attitudinal outcomes.

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(Appendix follows on next page)

Appendix

Self-Report Multimethod Job Design Questionnaire (MJDQ)

Motivational scale

1. *Autonomy.* The job allows freedom, independence, or discretion in work scheduling, sequence, methods, procedures, quality control, or other decision making.
2. *Intrinsic job feedback.* The work activities themselves provide direct and clear information as to the effectiveness (e.g., quality and quantity) of your job performance.
3. *Extrinsic job feedback.* Other people in the organization, such as managers and co-workers, provide information as to the effectiveness (e.g., quality and quantity) of your job performance.
4. *Social interaction.* The job provides for positive social interaction such as team work or co-worker assistance.
5. *Task/goal clarity.* The job duties, requirements, and goals are clear and specific.
6. *Task variety.* The job has a variety of duties, tasks, and activities.
7. *Task identity.* The job requires completion of a whole and identifiable piece of work. It gives you a chance to do an entire piece of work from beginning to end.
8. *Ability/skill level requirements.* The job requires a high level of knowledge, skills, and abilities.
9. *Ability/skill variety.* The job requires a variety of knowledge, skills, and abilities.
10. *Task significance.* The job is significant and important compared with other jobs in the organization.
11. *Growth/learning.* The job allows opportunities for learning and growth in competence and proficiency.
12. *Promotion.* There are opportunities for advancement to higher level jobs.
13. *Achievement.* The job provides for feelings of achievement and task accomplishment.
14. *Participation.* The job allows participation in work-related decision making.
15. *Communication.* The job has access to relevant communication channels and information flows.
16. *Pay adequacy.* The pay on this job is adequate compared with the job requirements and with the pay in similar jobs.
17. *Recognition.* The job provides acknowledgment and recognition from others.
18. *Job security.* People on this job have high job security.

Mechanistic scale

19. *Job specialization.* The job is highly specialized in terms of purpose, tasks, or activities.
20. *Specialization of tools and procedures.* The tools, procedures, materials, and so forth, used on this job are highly specialized in terms of purpose.
21. *Task simplification.* The tasks are simple and uncomplicated.
22. *Single activities.* The job requires you to do only one task or activity at a time.
23. *Skill simplification.* The job requires relatively little skill and training time.
24. *Repetition.* The job requires performing the same activity(ies) repeatedly.
25. *Spare time.* There is very little spare time between activities on this job.
26. *Automation.* Many of the activities of this job are automated or assisted by automation.

Biological scale

27. *Strength.* The job requires fairly little muscular strength.
28. *Lifting.* The job requires fairly little lifting and/or the lifting is of very light weights.
29. *Endurance.* The job requires fairly little muscular endurance.
30. *Seating.* The seating arrangements on the job are adequate (e.g., ample opportunities to sit, comfortable chairs, good postural support, etc.).
31. *Size differences.* The work place allows for all size differences between people in terms of clearance, reach, eye height, leg room, and so forth.
32. *Wrist movement.* The job allows the wrists to remain straight without excessive movement.
33. *Noise.* The work place is free from excessive noise.
34. *Climate.* The climate at the work place is comfortable in terms of temperature and humidity and it is free of excessive dust and fumes.

35. *Work breaks.* There is adequate time for work breaks given the demands of the job.

36. *Shift work.* The job does *not* require shift work or excessive overtime.

Perceptual/Motor scale

37. *Lighting.* The lighting in the work place is adequate and free from glare.

38. *Displays.* The displays, gauges, meters, and computerized equipment on this job are easy to read and understand.

39. *Programs.* The programs in the computerized equipment on this job are easy to learn and use.

40. *Other equipment.* The other equipment (all types) used on this job is easy to learn and use.

41. *Printed job materials.* The printed materials used on this job are easy to read and interpret.

42. *Work place layout.* The work place is laid out so that you can see and hear well to perform the job.

43. *Information input requirements.* The amount of information you must attend to in order to perform this job is fairly minimal.

44. *Information output requirements.* The amount of information you must put out on this job, in terms of both action and communication, is fairly minimal.

45. *Information processing requirements.* The amount of information you must process, in terms of thinking and problem solving, is fairly minimal.

46. *Memory requirements.* The amount of information you must remember on this job is fairly minimal.

47. *Stress.* There is relatively little stress on this job.

48. *Boredom.* The chances of boredom on this job are fairly small.

Note. Respondents indicate extent to which each statement is descriptive of their job on a common scale: (1) *strongly agree,* (2) *agree,* (3) *neither agree nor disagree,* (4) *disagree,* (5) *strongly disagree,* and (blank) *don't know or not applicable.* Scores for each scale are averages of applicable items. Instrument used in this study and item statistics are available from the author.

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