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Job Design, Technology, and Social System Structure: A Technostructural Perspective

Jon L. Pierce

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Abstract

Multiple dimensions of social system structure and technology were examined as correlates of job design. Technology, as predicted, was found to account for more variance in job scope than was the structure of the social system in which the technology and jobs were embedded.

Job Design, Technology, and Social System Structure: A Technostructural Perspective

A concern over the scope of an employee's job has marked management history at two different points in time and with diverse philosophies. With the emergence of the industrial revolution in the late 1700's forces for "task simplification and task specialization" arose. Economists (Smith, 1776), industrial engineers (Babbage, 1832), and scientific management advocates (Taylor, 1911; Gilbreth, 1914) saw task simplification and specialization as a means of coping with the new technologies being adopted. This engineering model was also seen as a means of achieving greater productivity, efficiency, control, and standardization of work operations. For decades the perceived utility of this approach to designing work was based on experiences of increased labor effectiveness, lower production costs, and greater predictability of system performance.

It was not until the late 1940's that numerous students of organization behavior (Walker, 1950; Walker & Guest, 1952; Argyris, 1957; McGregor, 1960; Likert, 1960) began to suggest that tasks designed solely in accord with the engineering model may lead to dysfunctional outcomes for the organization and the individual worker. More specifically it was posited that employees occupying simplified, low skill-level, and short cycle jobs will eventually perceive their jobs as monotonous (i.e., have a high degree of sameness). Continued and frequent performance on tasks perceived as similar and/or repetitive will cause feelings of boredom and job dissatisfaction. These affective responses will eventually translate into behavioral responses of absenteeism, turnover, and output restriction.

While the viability and universality of this conceptual model has been challenged (see Hulin & Blood, 1968) a new look at the design of jobs emerged. For the past three decades there has been an intensive re-examination of the job design issue. The thrust of the contemporary job design literature has almost exclusively focused on the job design-employee response relationship. Empirically the job design literature supports a strong and consistently positive job scope-employee job satisfaction relationship. Worker motivational responses have also been commonly linked to job design, while evidence linking behavioral responses is less consistent and weaker (Pierce and Dunham, 1976).

Theoretical statements and empirical evidence which serves to address the relationship between the design of jobs and the structure of the social system housing those jobs, and the linkage between the design of jobs and components of the technology with which those jobs interface has for the most part been ignored. As an attempt to enrich the job design nomological network this study has as its primary purpose the examination of the linkages between social system structure, social system technology, and the properties of the jobs that interface with that structure and technology. Job design as a global construct and its various dimensions will be treated as the dependent variable in this exploratory investigation.

Technostructural Approaches to Organizational Analysis

Technostructural approaches to organizational analysis provides the foundation for this inquiry. Friedlander and Brown (1974) note that the essence of technostructural approaches to organization inquiry involves an examination of job design and sociotechnical systems theory. Sociotechnical systems theory has as its primary focus the study of technology (e.g., task,

methods and processes) and social system structure (e.g., relationships, roles and arrangements).

Job Design

Theoretically the job scope-employee response relationship has been approached from a number of different perspectives. Three of the more popular conceptual models will be briefly mentioned. Activation theory posits that the low levels of stimulation that stems from low scope jobs will result in low levels of physiological brain stimulation and activation which will lead to boredom, job dissatisfaction, and performance decrements (Scott, 1966). Employing the expectancy theory paradigm, Lawler (1969) explains that if an increase in job scope can increase the task demand-individual ability fit, alter the value of rewards, increase the accuracy of role perceptions, and/or increase the perceived probability that effort will lead to rewards then job enlargement-enrichment can affect job behavior, work motivation, and job attitudes. Hackman and Oldham (1975) offer a third conceptual argument. They posit that three psychological states (i.e., the experienced meaningfulness of work, the experienced responsibility for work outcomes, and knowledge of results of work activities) are necessary for high levels of work quality, intrinsic motivation, organizational attachment, and job satisfaction. The model also posits that variety, significance, and identity play a major role in shaping meaningfulness, while autonomy contributes to the sense of experienced responsibility, and feedback provides for an employee's knowledge of results.

Numerous attempts to conceptually define tasks and job design have been made. Hare (1962, p. 248-249) defined the task as the situation that is imposed on the employee. This definition could include all internal

features of the social system as being relevant to task specification. Thibaut and Kelly (1959, p. 150) suggest that a task is "a problem, assignment, or stimulus complex to which the individual responds ... by performing various ... operations ..." McGrath and Altman (1966, p. 75) define the task as that "pattern of stimuli" impinging on the employee, i.e., the physical or objective nature of the stimuli sent to the role occupant. Dawis, England and Lofquist's (1968) theory of work adjustment implicitly defines tasks in terms of the role requirements (i.e. ability and behavior requirements) required of the indivíiual so as to achieve "satisfactoriness" in the work adjustment process. This definition corresponds with Steiner's (1966) suggestion that the task can be defined in terms of responses that role occupants should emit in a given stimulus situation so as to achieve some criterion of success. McCormick, Jeanneret and Mecham (1972) define job in terms of behaviors actually emitted on a given job (i.e., in a particular stimulus situation). Finally, Hackman (1969) offered the following definition of task:

> A task may be assigned to a person (or group) by an external agent or may be self-generated. It consists of a stimulus complex and a set of instructions which specify what is to be done vis a vis the stimuli. The instructions indicate what operations are to be performed by the subject(s) with respect to the stimuli and/or what goal is to be achieved (p. 113).

This definition revolves around three main parts (stimuli, instructions about operations, and/or instructions about goals) which, as Hackman notes, may be employed separately to aid in the understanding of the possible multi-dimensional nature of job design.

If one examined the operational approaches to tasks and job design two observations emerge. Objective measures of the stimulus condition and/or the instructions have given way to perceptual based measures of task dimensions and job design. Implicitly or explicitly researchers have assumed that role occupants subjectively redefine the stimuli pattern and instructions such that the redefinition is assumed to be a more powerful predictor of employee responses and work outcomes. Along similar lines, researchers have adopted Hackman and Lawler's (1971, p. 264) suggestion that "it is not (the) objective state which affects employee attitudes and behavior, but how they are experienced by the employee ... it is how much he perceives that he has which affect his reactions to the job."

Whether or not measures of perceived job design represent unique personal psychological reactions to the stimulus complex, or indicators of objective properties of the tasks as suggested by Hackman and Oldham (1978) remains to be empirically resolved. In spite of this observation, it is quite clear that the stimulus condition and its set of instructions occupies a different temporal position to the perceptions and redefinition of those task attributes. Within this context the vast majority of the contemporary job design literature appears to conceptually define job design as that set of cues which the employee perceives as defining his/her job within the organization. Operationally this definition has been approached as a multidimensional measure of the employee's perceptions and descriptions of that set of cues (e.g., perceptions of variety and autonomy).

Sociotechnical Systems

Sociotechnical systems theory was developed by social scientists at the Tavistock Institute. Their conceptualization of an organization was

that of a sociotechnical system. Rice (1958) notes that any production system requires both a "technological organization" and a "work organization."

The "technological organization," according to Rice serves to define the relationships that people have with the work process (i.e., methods, processes and the man-machine/work activity interaction). Technology in a very generic sense refers to the system of treatment (transformation) performed on some object (animate or inanimate). It refers to the actions that are performed upon the object with or without the aid of tools or mechanical devices (Perrow, 1967) as well as to the linkages that exist between stages in the transformation process (Thompson, 1967). The system can be associated with jobs exercised by a single individual (e.g., a blacksmith), a work unit or department, an organization, an industry, and may even extend to the level of a society (e.g., an agrarian society).

Conceptual and operational references to technology in literature reveal its multidimensional nature. Hickson, Pugh and Pheysey (1969) provide one typology which serves to organize this diversity. They define technology as composed of three dimensions: operations technology refers to the equipping and sequencing of the workflow; materials technology refers to characteristics of the materials worked on in the transformation process; and knowledge technology characterizes the knowledge used in the workflow process.

The "work organization's" structure stems from the linking of people-to-work methods, and the linking of people-to-people (Rice, 1958) so as to accomplish in an integrative fashion the goals of the work organization. The work organization defines the relatively enduring interaction patterns

that allows for the performance, coordination, and control of work activities (Child, 1972).

Since the work of Weber (1947) organization theorists have demonstrated uncommon agreement on the dimensions that serve to define the multidimensional character of a social system's structure. Modern organization theorists (e.g., Litwak, 1961; Hall, 1962; Lawrence & Lorsch, 1967; Van de Ven & Delbecq, 1974) also recognize that work units can be defined and their structure can be measured along the same bureaucratic dimensions that are used to define and measure the structure of the macro-organization.

What emerges from this discussion is the observation that social system structure, technology, and job design represent three phenomenologically distinct organizational attributes. While conceptually distinct these organizational attributes are believed to be interrelated.

The Social System, Technology, Job Design Linkage

The social system is said to have structural properties of its own that are independent of the technology housed in that system (Rice, 1958). Yet, as Emery and Trist (1960) note there is a linkage between the technological and work organization. The technological system creates constraining parameters which define the type of work organization possible. Along this line a large literature has emerged which builds linkages between an organization's core technology and the structure of the macro organization. Woodward (1965), for example, found that her classification of technological complexity was associated with multiple dimensions (e.g., hierarchical levels, centralization, formalization, spans of control, etc.) of the organization's structure. Support for the Woodward findings come from a number of investigations (e.g., Zwerman, 1970). In addition theoretical

and empirical linkages have been suggested which serve to link subunit technology and subunit structure. Litwak (1961), Hall (1962), and Mahoney and Frost (1974) suggest that there are multiple technologies in an organization. Each work unit in the organization may have differing degrees of bureaucratization as a result of the use of different technologies in those units. Van de Ven and Delbecq (1974) provided empirical evidence which demonstrates that the structure of the organizational subcomponents (work units) covaries with variation in materials and knowledge technology.

This implied "technology imperative" is not without its critiques. Hickson, Pugh and Pheysey (1969) found that when organization size was controlled for the relationships between technology and macro-organization structure disappeared. This lead Hickson et al to conclude that size is more of a critical variable in defining structure than is technology. In small organizations like those studied by Woodward the effect of technology may be spread throughout the organization, however, in large organizations this impact on structure stemming from technology will be limited to the technical core. In work unit analysis the technology employed in the work unit should remain a critical variable in the determination of work unit structure.

The linkages between technology and job design in addition to the linkage between social system structure and job design have not been detailed in the literature, yet references to these linkages have surfaced. In Trist and Bamforth's (1951) accounting of the shift from the short to the long work method of mining coal in England it was noted that a new form of social system structure followed the change in mining technology. In addition, constraints on job scope also emerged leading to jobs with less

variety and autonomy, lower levels of worker identity with work activities, and less performance feedback. Emery and Trist (1960) suggest that an understanding of tasks and the interrelationship among tasks may derive from the technological system. For example, Emery and Trist said "the only justification for a rigid division of labor is a technology which demands specialized non-substitute skills ..." (p. 287). This suggests that certain technology attributes may constrain the skill variety of the jobs that interface with that technology. Turner and Lawrence (1965) in their examination of the task design-employee response relationship suggested that certain intrinsic task attributes may be technologically determined. Unfortunately they did not elaborate upon this nature and dynamics of this relationship.

With regard to the social systems structure and job design relationship Indik (1965) suggested that the impact of organization size on employee behavior may be an indirect relationship and one that operates through task specialization. Child (1963) noted that the specificity of role prescriptions may provide an important link in establishing the relationship between organization properties and employee behavioral responses. While both of these references imply that job design is an intervening variable in the social system structure-employee response relationship it also suggests that there is some dynamic between social system structure and the design of jobs housed within these systems. In addition, Morse and Lorsch (1970), and Porter, Lawler and Hackman (1975) argue that organic organizations and horizontally and vertically enlarged jobs define a congruent combination as is the match between mechanistic social system structure and routine job designs. In both cases the im-

portance of maintaining this congruency is said to have outcome implications for the individual worker as well as for the organization.

Research Question and Predictions

Adopting Hackman's (1969) conceptual and Hackman and Oldham's (1975) operational approach to the definition of task(s), job design is seen as composed of that set of cues which the employee perceives as defining his/her job within the organization. The scope of the job varies with a variation in perceptions of: the skills and abilities required, freedom and independence exercised, feedback received, job importance, and the completion of whole and identifyable pieces of work.

In accord with Hare's (1962) suggestion that "the task is the situation, with McGrath and Altman's (1966) notion that the task can be defined as all of the factors impinging on an individual that are not properties of the individual or the group, and Thibaut and Kelly's (1959) suggestion that the task consists of a "stimulus complex to which an individual responds by performing various operations, the following assumption is made. The employee will implicitly and/or explicitly receive cues from multiple sources in the work environment. Two of the potential sources of stimuli which may serve to define an employee's job are the technology with which the employee interacts and the structure of the social system in which the job and technology are embedded.

This investigation attempts to answer the following research questions. Is an employee's perception and description of job attributes related to technology and social system structure? Is technology or social system structure potentially a more viable predictor of variance in job scope? It is predicted that perceptions and descriptions of job scope

are related to technology and social system structure. It is also predicted that the employee's perception and description of his/her job will be more a function of the cues received from the technology employed in the work transformation process than from the structure of the social system. This hypothesis is based on the assumption that jobs are created to facilitate the transformation process and they are therefore closely linked to the adopted technology.

Method

Sample and Data Collection

This study was conducted in the home office of a 5000 employee, midwest based, multiple-line insurance company. Ninteen distinct work units were included in the investigations such that the social systems spanned the organization's vertical and horizontal hierarchy including both line and support components. Data defining social systems structure derived from organizations records, documents, and the supervisions of the work units. Descriptions of the technology employed in each of these work units derived from a key informant inside the host organizations. The key informant was not one of the work unit supervisions and he did not provide any of the work unit structure descriptive data. Each employee in the 19 work units was invited to complete a paper and pencil questionnaire where they were asked to describe five dimensions of the jobs that they occupied. Over ninety percent of the employees (n=398) working in these 19 units completed the questionnaire which was administered on job release time.

Research Scales

Technology. As previously noted technology is a multidimensional construct. In an attempt to categorize the variety of conceptualizations

of an organization's technology, Hickson, Pugh, and Pheysey (1969) identified three dimensions: operations technology, knowledge technology, and materials technology.

Operations technology refers to the "techniques used in work flow activities ...," and to the" equipping and sequencing of activities in the workflow" (Hickson, et al., p. 378-379). An operationalization of operations technology included such variables as: automaticity, the degree to which manual sources of energy are replaced by equipment used in the workflow process (Inkson, Pugh, & Hickson, 1970); rigidity denotes the degree of fixedness of the workflow process (Hickson et al., 1969), where the workflow follows a fixed, predetermined path and where a breakdown in one area would immediately stop the work along the entire workflow path; evaluation specificity refers to the degree to which exact standards, or personal opinion and judgment is employed in assessing operations that are performed (Hickson et al., 1969); computerized operations focuses on the percent of activities in a work unit's production process that are performed by a computer; and production continuity refers to the continuity of objects of throughout in the work process (Hickson et al., 1969) (operationally speaking the percent of custom versus standardized output for the work unit was assessed). The final dimensions of operations technology examined in this investigation were the degree of interdependence between activities and work units engaged in the transformation process. Intra-unit workflow interdependence measured the percent of work performed within the work unit that was characterized by pooled, sequential, reciprocal, and team forms of interdependence. Inter-unit workflow interdependence measured the degree

of interdependence between the focal work unit and other units in the workflow process inside of the host organization. These scales were adopted from Van de Ven, Delbecq and Koenig (1976).

As a construct materials technology derives from the work of Perrow (1967). In his definition of technology reference is made to the characteristics of the object or raw material being focused on in the transformation process. This dimension of technology references the uniformity and stability of the materials used in the workflow. Operationally, Van de Ven and Delbecq's (1974) three item scale to measure work variability was employed to assess the stability/uniformity of the input that is worked on by the focal work unit.

Knowledge technology also stems from the work of Perrow (1967) and characterizes the knowledge used in the workflow process. More specifically Perrow focused on the degree of logical analysis employed when exceptions or problems were encountered in the workflow process. Van de Ven and Delbecq's (1974) four item scale measuring problem difficulty was employed to assess one dimension of knowledge technology. An attempt was also made to determine the level of knowledge needed in order to successfully perform activities in the workflow process. Operationally this measurement was based on a measure of (1) formal education, professional or technical training of the unit's role incumbents, and (2) work experience required for successful performance. The third dimension of knowledge technology was discretion. A number of attempts have been made to operationalize Thompson's (1967) technological classification (Mahoney & Frost, 1972; Rousseau, 1977). These authors have noted that the major criterion differentiating these three levels of technology is

the amount of discretion exercised in the workflow process. This dimension of technology was operationalized by identifying which of three levels of discretion characterized the workflow in each of the focal work units. Long-linked technologies are characterized by the use of standard operating procedures and the exercise of very low levels of discretions by the people component of the productions system. Under mediating technologies the people component is required to survey the input along a number of prescribed dimensions and subsequently assign the work/object to one of a number of preprogrammed operating procedures. The intensive technology is distinguished by the lack of standardized procedures and by the use of discretionary behavior where the selections, combination, and order of applications of techniques is determined by the consequences of previous operations and not by the applications of a set of preprogrammed activities. The final dimension of knowledge technology represented a measure of the time span on the availability of performance feedback (time span of feedback) to the work unit concerning the effectiveness of its performance activities. The availability of this information is going to affect the level of knowledge pertaining to subsequent operations.

Job Design. The 398 participating employees were asked to describe their jobs along five dimensions. Hackman and Oldham's (1975) Job Diagnostic Survey (JDS) was employed as a measure of the degree to which: (1) the job requires performing a variety of different activities which involve its use of different skills and abilities, (2) the job requires completion of a whole and identifyable piece of work, (3) the job has a substantial impact on the lives or work of other people, (4) the job

provides freedom and independence is doing the job, and (5) the job provides direct and clear information relating to ones performance effectiveness. The JDS represents a 15 item (three items per dimension) scale that derives its measurement from the perceptions of the job holder. Hackman and his associates have attempted to examine the degree of objectivity of the measurement scale by assessing the convergence between the descriptions given by the role occupants with the job descriptions provided by other key informants. Hackman and Oldham (1975) claim that moderate convergence and therefore they suggest that these research scales are measuring something other than differences in individual perceptual processes.

Social System Structure. Organizational analysis has increasingly examined the structural properties of organizational subcomponents (e.g., work units). Conceptually (Litwak, 1961; Van De Ven, 1976) and empirically based literature (Hall, 1963; Lawrence & Lorsch, 1967; Van de Ven & Delbecq, 1974) suggests that work units can be differentiated from one another in terms of their structural dimensions.

For the social system design data on six work unit (i.e., the supervisor and his/her span of non-supervisory personnel) variables was collected from company records, organization documents, and the work unit supervisor. Work unit size was measured by the number of all full time and one-half of the permanent part time employees (full-time equivalent) in the work unit (data obtained from company records) (Blau & Schoenherr, 1971). Structural complexity was represented by the number of distinct job titles in the work unit standardized by work unit size (data obtained from company records) (Hage, 1974). Formalization referred to the extent

to which work unit norms (rules, policies, and procedures) were codified and expressed in written form for the work unit employees--the percent of work unit employees governed by specific written documents (self report of unit supervisors). Level refers to the number of organization levels of authority between the work unit supervisor and the chief executive (data obtained from company records) (Blau & Schoenherr, 1971). Group coordination refers to the extent to which workers and work activities were coordinated with standing committees, staff meetings, and specially assembled problem solving groups (unit supervisor) (Van de Ven, et. al., 1976). Work unit autonomy defines the operating authority or independence that the work unit has from the organization hierarchy. The unit supervisor identified the locus of control and degree of independence between the work unit and the organization hiearchy for the making of twelve decisions that impact on intra-unit activities (Inkson, Pugh and Hickson, 1970).

Analysis

The first step in data analysis involved an examination of the reliability for the research scales along with an examination of the dimensionality of the job design measure. Secondly, zero order and multiple correlations were examined treating job design as a global construct (i.e., through an additive model employing the five job dimensions) in addition to an examination of each job dimension as a single facet of job design. This stage of the data analysis employed technology and social system structure as rival predictive models.

Results

Scale Reliability and Dimensionality

Cronbach's (1951) coefficient alpha was employed to assess the internal consistency (scale reliability) and test-retest reliability was assessed by the time 1-time 2 correlation coefficients for the self report multiple item scales which measured three dimensions of social system structure and all five job design variables. A key informant provided the data pertaining to the assessment of the different dimensions of the technology employed in the 19 organizational work units. The reliability of this data was examined by having a second key informant provide the same data which permitted an examination of the inter-rater reliability. The reliability coefficients are reported in Table 1, along with other descriptive statistics.

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Insert Table 1 about here

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Nunnelly (1967, p. 226) suggests that alpha values > .70 are necessary for established research scales, and that values of .50's and .60's suffice for measures in the early stages of development. The alpha values reported here meet this criterion and are judged acceptable. The stability coefficients range from .64 (feedback) to .95 unit autonomy and based on commonly accepted practices in organizational research these coefficients are also judged acceptable. The inter-rater reliability coefficients range from a low of .43 to .94 with only two values following below .50 (i.e., .43 for interchangeability and .44 for time span of feedback). Because of the low reliability estimates for these

two variables they were excluded from subsequent analysis.

While the dimensionality of Hackman and Oldham's (1975) Job Diagnostic Survey (JDS) has been called into question (Dunham, Aldag & Brief, 1977; Pierce & Dunham, 1978), Barr and Brief's (1978) comparative examination of the psychometric properties of a number of indices of task design lead to the conclusion that the JDS remains the most psychometrically sound measure of perceived task design. The instability of the five job design dimensions, however, lead Dunham et al., (1977) to recommend a sample-by-sample examination of this research measure.

As a result of the dimensional uncertainty of the JDS, factor analyses with oblique rotations were performed on the fifteen items. This empirical examination of the theoretical dimensionality of the JDS suggested a three factor solution (autonomy, feedback, with variety and significance collapsing into a single factor).

The zero-order correlations (see Table 2) reveal that four of the

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Insert Table 2 about here

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six social system structure variables are significantly correlated with job scope. Formalization and unit autonomy did not achieve a statistically significant correlation ($p < .05$) with feedback, variety/significance, autonomy, nor with the global construct job scope. The feedback correlation with social system complexity and group coordination represented the two other non-significant zero-order correlations. The results of this analysis indicates that jobs broad in scope are associated with large, structurally complex, high level work units, in which

the coordination of people and work activities is to a large degree achieved by group means. The average social system structure job scope correlation was .21 ranging in size from .01 with unit autonomy to -.41 with hierarchical level.

An examination of the zero-order correlations between job scope and the technology variables reveals an average correlation of .42 ranging between .17 ($p < .01$) for computerized operations and .54 ($p < .01$) for discretion. For materials technology the relationship indicate that the greater the variability of the work coming into the work unit the greater the feedback, variety/significance, and autonomy of the jobs in the unit. Each of the three knowledge technology variables (difficulty, performance based knowledge requirement, and discretion) were positively associated with each of the three job design variables. Such that the greater the difficulty, knowledge needed, and discretion exercised by the people component in the transformation process the more feedback, variety/significance, and autonomy associated with each job. Seven variables constitute the operations technology construct. These relationships suggest that jobs that are broad in scope covary with high levels of interdependence, high levels of work automation, custom versus standardized production continuity, and high levels of computerized operations. Only two of the operations technology variables had a negative association with each of the three job design variables. Non-rigid work flow pattern and low levels of evaluation specificity were associated with routine jobs.

The eleven technology variables combine to account for 34 percent of the variance in job scope (see Table 3). The partial correlations

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Insert Table 3 about here

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($p < .01$) in the job scope-technology regression model reveals that: the greater the importance of knowledge for successful performance, the greater the percent of computerized operations, the more performance evaluations are based on judgment and personal opinion, and the greater the interdependence between the focal work unit and other units inside the organization the more the jobs will be described as broad in scope.

When task scope was regressed on the six social system structure variables a multiple correlation of .49 was produced. Thus, 24 percent of the variance in job scope was associated with social system structure. Three of the six social system variables had significant ($p < .01$) partial correlation coefficients with job scope. These relationships suggest that jobs broad in scope are embedded in large, structurally complex, and high level work units.

The combined (social system structure-technology) regression model adds one percent to the variance above that accounted for by the technology variables acting alone, and eleven percent to the criterion variance explained by the social system variables. Table 4 shows the order in which these variables were entered into the regression equation based upon the amount of the unexplained criterion variance account-

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Insert Table 4 about here

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ed for by each variable. It is noted that discretion has the single

strongest correlation and that the technology and social system structure variables are intermingled in this process of accounting for criterion variance. The partial correlation coefficients in the combined regression model reveals no significant relationships at the .05 level and only one significant partial at the .01 level. The amount of discretion exercised by the people component in the work transformation process positively associates with task scope.

DISCUSSION

A vast theoretical and empirical literature has developed which contributes to the eventual development of a job design nomological network. This literature has, for the most part, limited its inquiry to the job design employee response relationship. In this literature job scope has been treated as the independent variable. Technostructural approaches to organizational analysis, however, provides the framework through which the interrelationship between social system structure, social system technology, and job design can be explored, thus enriching the job design nomological network.

Phenomenologically social system structure, technology, and job design represent three distinct organization constructs. The sociotechnical systems literature explictly identifies linkages between social system structure and technology and implies a linkage with the design of the employees job which is housed in that social system for the transformation of work activities.

This investigation sought to statistically treat job scope as the dependent variable in an exploratory, cross-sectional field study. An attempt was made to determine whether or not structural characteristics

of the social system is linked with the employee's perception and description of his/her job. Along similar lines dimensions of operations, knowledge and materials technology were also examined as a correlates of job scope. It was predicted that the technology employed would be more strongly associated with the design of employee jobs than the structure of the social system.

As predicted technology was more strongly correlated with job scope than the strength of association with social systems structure. The technology variables accounted for 34 percent of the job scope variance compared to 24 percent associated with social system structure. Through a combined technology-social system structure regression model, an additional one percent of the variance was accounted for above that accounted for by the technology variables acting alone. The addition of the technology variables to the social system structure regression model resulted in an increase of 11 percent of the criterion variance.

Regressing job scope on social system structure revealed that jobs broad in scope appear to be embedded in large, structurally complex work units, that are lodged at upper levels in the organization hierarchy. When job scope was regressed on the technology variables the following observations emerge. One knowledge technology and three operations technology variables emerge as important. More specifically jobs broad in scope positively associate with: (1) a technology where knowledge embedded in the people component is important for successful work accomplishment; (2) a production continuity characterized by the production of custom versus standardized output; (3) a technology where operations necessitate performance evaluation based on opinion and

judgment; and (3) a high degree of workflow interdependence between the focal work unit and other units inside the organization.

The research conducted here serves to expand the job design nomological network through the examination of job design and its relation with technology and social system structure. This study should stimulate future examinations of job design and its organizational context. The study make use of multiple sources of data collection and avoids method variance across the three major construct categories (job design, social system structure, and technology) employed in the investigation. While these features serve to highlight some of the major contributions of this research there are a number of limiting factors that should be noted. The data derives from a single macro-organizations and as a consequence these findings may reflect organizational and/or industry uniqueness. The number of social systems (work units) included in the investigation was small. Consequently the external validity for these research findings must await the replication process.

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TABLE 1
DESCRIPTIVE STATISTICS AND RELIABILITY ESTIMATES

riable	Number of Items	Sample Size	Mean	Std Dev	Alpha	Stability Coefficient
cial System Structure:						
Formalization	4	19	16.34	5.16	.74	.85
Unit Autonomy	12	19	39.13	3.45	.66	.95
Group Coordination	3	19	5.47	1.55	.74	.73
Complexity	1	19	.29	.24	(b)	(c)
Size	1	19	43.91	33.04	(b)	(c)
Level	1	19	4.44	1.06	(b)	(c)
b Design:						
Autonomy	3	397	13.31	4.95	.78	.81
Feedback	3	397	14.34	4.22	.75	.64
Variety/Significance	6	397	28.85	8.01	.80	.81
Task Complexity	15	398	70.49	16.57	-	-
chnology:					Inter-Rater Reliability	
Intra-unit Workflow Interdependence	1	19	191.17	50.42	.67	
Inter-unit Workflow Interdependence	1	19	239.03	34.53	.65	
Workflow Rigidity	1	19	3.81	1.31	.86	
Specificity of Evaluation	1	19	3.78	1.07	.74	
Automaticity	1	19	3.16	1.60	.71	
Input Variability	1	19	6.87	1.84	.87	
Difficulty	1	19	10.79	3.18	.80	
Custom Output	1	19	3.27	2.57	.80	
Computerized Operations	1	19	3.56	3.43	.94	
Discretion	1	19	2.63	1.68	.92	
Knowledge Requirement	1	19	6.07	1.59	.64[B]	

Test-retest reliability estimates were based on a sample of 30 additional employees derived from the host organization for the sole purpose of checking the stability coefficient for the research scales.

Knowledge requirement is based on the aggregation of two variable elements (a) performance based on education, professional or technical training (reliability estimate .78) and (b) performance based on experience (reliability estimate .50) such that the average reliability is .64.

TABLE 2

TECHNOLOGY, SOCIAL SYSTEM STRUCTURE, JOB DESIGN CORRELATIONS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 Size	--																				
2 Level	-02	--																			
3 Complexity	-52	-58	--																		
4 Formalization	48	50		--																	
5 Group Coordination	05	-64	36	-04	--																
6 Unit Autonomy	-52	-22	61	-35	18	--															
7 Workflow-intra	68	-54	08	06	45	-29	--														
8 Workflow-inter	41	-55	-04	-04	17	03	39	--													
9 Rigidity	-55	71	-29	12	-43	14	-88	-59	--												
10 Specificity	-14	73	-53	21	-57	-14	-70	-37	85												
11 Automaticity	92	-17	-36	40	25	-44	78	44	-68	-37	--										
12 Variability	43	-63	37	-22	32	-22	82	46	-93	-78	51	--									
13 Difficulty	29	-68	44	-27	40	-12	80	40	-90	-88	46	91	--								
14 Custom Output	60	-60	23	-13	31	-30	82	51	-89	-64	68	88	86	--							
15 Computer Operations	72	-21	-26	-06	17	-29	60	30	-49	-15	77	36	24	49	--						
16 Discretion	60	-54	13	08	57	-14	79	52	-86	-77	72	75	77	79	44	--					
17 Knowledge	53	-50	10	05	47	-04	68	47	-80	-71	70	64	64	64	51	87	--				
18 Feedback	11	-12	07	-01	04	00	11	12	-16	-10	10	16	10	17	07	17	18	--			
19 Variety/Significance	21	-35	19	-03	34	02	34	26	-44	-41	32	37	39	41	21	51	51	44	--		
20 Autonomy	18	-48	26	-07	35	00	46	39	-54	-53	29	51	55	49	10	48	41	33	59	--	
21 Task Complexity	22	-41	22	-05	32	01	40	34	-50	-48	32	45	46	45	17	54	51	65	88	78	--

a. decimals have been omitted.

b. n = 19, df = 18, p < .05 = .38
< .01 = .52

c. n = 398, df = 397, p < .05 = .08
< .01 = .12
< .001 = .15
< .0001 = .19

TABLE 3
REGRESSION MODELS

	Task Complexity (n=386)		Task Complexity (n=382)		Task Complexity (n=375)	
	Partials	Significance	Partials	Significance	Partials	Significance
ize	206	001*			-065	105
evel	-169	001*			-060	122
omplexity	173	001*			-010	422
ormalizations	093	034			001	496
roup Coordination	025	310			-085	051
nit Autonomy	-035	275			022	338
orkflow-intra			040	218	008	439
orkflow-inter			123	008*	-030	284
pecificity			-124	008*	016	378
igidity			106	019	001	496
utomaticity			-010	421	083	055
ariability			089	040	040	221
ifficulty			-115	012	-071	086
ustom Output			147	002*	012	411
omputer Operation			-035	247	-042	206
iscretion			014	395	105	021
nowledge			151	001*	002	484
ultiple Correlation Coefficient (R)	.4938		.5806		.5916	
oefficient of Determination (R^2)	.2440		.3370		.3499	

*p < .05

TABLE 4
STEPWISE REGRESSION AND R CHANGES

	Multiple Correlation Coefficient (R)	Coefficient of Determination (R^2)	Change in the Coefficient of Determination (ΔR^2)	Significance Level
Discretion	5386	2901	2901	0
Complexity	5591	3126	0225	000
Workflow-inter	5666	3210	0084	029
Knowledge	5722	3274	0064	056
Computer Operation	5752	3308	0034	162
Unit Autonomy	5783	3344	0036	149
Difficulty	5803	3368	0024	244
Automaticity	5814	3380	0012	396
Formalization	5844	3415	0035	154
Workflow-intra	5851	3424	0009	477
Size	5863	3438	0014	372
Group Coordination	5876	3453	0016	343
Custom Output	5885	3464	0010	441
Variability	5890	3469	0005	585
Level	5906	3488	0019	294
Specificity	5916	3499	0012	412

a. decimals have been omitted.
b. Rigidity did not enter the equation