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ABSTRACT This paper discusses communication and physical-setting variables as a subset of organizational climate variables and attempts to provide a theoretical and methodological framework for organizational communication research. Attention is focused on the effects of immediate physical surroundings, the physical settings in which people work, and how these settings influence communication and organizational climate, along with perceptions of working conditions and their relationship to other organizational perceptions. The review of the literature dealing with communication and climate concludes that there has been a lack of theoretical and methodological work, although interest in these dimensions has been on the increase. Research on communication and climate requires a major effort to devise and investigate theoretical models such as the proposed multiple criterion model based on that of L.R. James. Investigation of existing theory has been methodologically limited by the use of bivariate analysis that largely ignores level of analysis. Multivariate techniques should be used in investigating such models, with level of analysis included as a relevant variable. Diagrams of the communication models are included, along with references. (DF)

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Relating Communication and The Physical Setting
In Organizational Climate Research

Paper presented at Western Speech Communication Association
San Francisco
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Porter and Roberts (1976) reach several conclusions regarding the state of research on communication in organizations, two of which are of concern here. First, "no adequate theories exist to explain the nature of communication in organizations (p. 1553)," and second, "more varied and more innovative methodologies for studying organizational communication are necessary for future advances in knowledge in this area (p. 1553)." This paper is an attempt to provide a theoretical and methodological framework for organizational communication research.

The initial focus of the paper is on communication and physical setting variables as a subset of organizational climate variables. The concern is with immediate physical surroundings, the working conditions or the physical setting in which people work, and how these settings influence communication and organizational climate. Perceptions of working conditions and their relationship to other organizational perceptions are also discussed.

Existing organizational research involving communication and physical setting variables provides a graphic example of the need for a theoretical and methodological framework for research. Few discussions of organizational climate mention both communication and physical setting variables. Those which do provide little information regarding the relationship of these variables; yet the relationship of such organizational climate variable subsets is of primary concern.

Possibly the most well-known discussion of communication and physical setting variables is by Herzberg, Mausner, and Snyderman (1959). Herzberg and his associates used semi-structured interviews to get respondents to recall experiences at work which resulted in significant improvement or reduction in their job satisfaction. Content analysis of these interviews lead Herzberg, et al. to conclude that certain job characteristics led to job satisfaction, while different job characteristics led to job dissatisfaction. Two of the characteristics leading to dissatisfaction were interpersonal relations and working conditions.

Verbalization about the characteristics of interaction with superiors, subordinates, and peers (interpersonal relations) occurred in 26% of the stories told by respondents. Working conditions, including the physical conditions in which work occurred, the amount of work, and the facilities available for doing work, were mentioned in 11% of the stories.

Both interpersonal relations and working conditions, along with salary, technical supervision, company policy and administration, personal life, status, and job security, Herzberg classified as hygiene factors. Hygiene factors are those features which surround the doing of a job; they are work-supporting, contextual, or extrinsic. If these features fall below a certain level of satisfaction they become job dissatisfiers, although the reverse is not true, i.e., they are in no way related to job satisfaction.

The implication is that hygiene factors are related in some way to each other as well as to job dissatisfaction. Herzberg, et al. did not examine or attempt to explain this interaction. In addition, Dunnette, Campbell, and Hakel (1967) conclude that the two factor theory is dangerously oversimplified, one of its problems being that the functioning of hygiene factors may depend on the level of satisfaction with the intrinsic variables of the motivation factor. Clearly the two factor theory is of little value in relating communication and physical setting variables in organizational climate.

Other studies of organizational behavior which involve communication and physical setting variables also provide little or no information about the relationship of these variables or their place in a theoretical model. In a survey to analyze the accuracy of upward communication, Kahn (1958) found that workers, foremen, and general foremen mentioned communication as one of the three major things they wanted in a job in 24-43% of the cases and good working conditions in 11-21% of the cases. Kahn, however, does not examine the relationship of these variables.

Likert (1961) does make a statement of relationship between the variables under consideration. He reports, "Supervisory behavior which yields a high level of productivity also yields favorable attitudes on such job-related matters as supervision, working conditions, compensation, and the work itself (p. 16)." This supervisory behavior includes communication elements such as "informs men on what is happening in the company (p. 16)," "keeps men posted on how well they

are doing (p. 16)," "hears complaints and grievances (p. 16)," "feel free to discuss important things about job with supervisor (p. 17)," "supervisor likes to get our ideas and tries to do something about them (p. 17)," "does some good to discuss important things about job with supervisor (p. 17)." Likert does not, however, discuss the magnitude of the variable relationships.

The Management Audit Survey (MAS) (Ellison, Fox, Abe, Coray, and Taylor, 1975) analyzes employee perceptions of organizational operations and management behavior to isolate areas for improvement and encourage improved performance by all levels of management. The MAS includes five score areas concerned with communication and one concerned with physical setting variables as follows. Climate for Innovation reflects the number of discussions held on new methods and ideas, the manner of receiving new ideas, and the follow-up treatment of suggestions for new methods or approaches to work. Performance Feedback is a measure of the quantity and quality of the work performance discussions held with employees. Downward Communication is a measure of employee perception of the abilities of supervisors at all levels to communicate successfully with employees at lower levels. Upward Communication measures management's willingness to consider the ideas and problems of lower level employees. Co-Worker Cooperation is a measure of employee perception of the level of cooperation among co-workers in their unit. Physical Working Conditions and Equipment is a measure of the quality of light, heat, air, equipment, supplies, work space, furniture, and cleanliness of facilities.

Intercorrelations between the physical setting score area and the 5 communication score areas across work groups range from .15 to .29 ($N = 1,267$; $p < .01$).

Pendell and Coray (1976) developed the Nursing Unit Questionnaire (NUQ) to examine the joint organizational and design characteristics of hospital nursing units. The ten score areas of the NUQ focus on one communication related dimension, Co-Worker Cooperation (from the MAS), and five physical setting dimensions particular to nursing unit design.

Intercorrelations between the communication score area and the 5 physical setting score areas range from -.08 to +.25 ($N = 450$).

The communication score area is significantly related to only one physical setting score area, Nursing Station Design. The remaining four physical setting score areas describe areas of patient care design.

LaRocco, Gunderson, Dean, James, Jones, and Sells (1974) describe in detail the methodology and test instruments employed in a large scale study of naval and civilian organizations. The study was designed to include a wide range of individual, environmental, and organizational variables, and the areas of data were designed to represent major components of James and Jones' (1974a, 1974b, 1976) model of organizational functioning.

The primary instrument of the study was a 400-item "Habitability and Shipboard Climate Questionnaire." The questionnaire consists of six major areas: biographical information, physical setting perceptions, organizational climate perceptions, job attitude measures, self-report of health status, and mission effectiveness.

Physical setting variables include lighting, temperature, ventilation, cleanliness, odor, size, number of people, color, privacy, noise, and safety. Physical setting items are grouped according to crew member perceptions of physical conditions in five main areas of the ship. Organizational climate items fall into 35 score areas including nine communication-related score areas. These are: Job Feedback, Opportunities for Dealing with Others, Leadership Support, Leadership Interaction Facilitation, Work Group Cooperation, Total Organizational and/or Subsystem Openness of Expression, Organizational Communication--Downward, and Interdepartmental Cooperation. Data on the relationship of physical setting and organizational climate perceptions are not currently available.

Considering the extensive number of studies on organizational climate, reviewed in detail elsewhere (James and Jones, 1974b; Lau, 1976), that so few involve both communication and physical setting variables is surprising. Two reasons for the paucity of these variables in organizational climate studies may be the use of theoretical models limited in scope and confusion about the nature of the physical environment and its relationship to organizational climate. The exact nature of the relationship of physical environments and human behavior is open to question. However, the concept of the "enacted" environment (Weick, 1969, 64) is gaining in favor. This concept comes from the interaction theory of Symbolic Interactionism. (See Sells, 1963a, 1963b, 1966, 1975 for an applied discussion of interaction theory, and Mead, 1934 and Blumer, 1969 for the philosophical bases).

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Interaction theory emphasizes the existence of adaptive processes between physical settings and the individuals within those settings. Instead of on a priori environment into which an individual enters, the environment is in a sense created by the individual, and the individual is in turn created by the environment:

An individual is sensitive to certain elements of the environment depending upon the meaning assigned to these elements. Meanings are not intrinsic to environmental elements but come from how an individual is prepared to act toward these elements. Meanings are based on ways other individuals act toward or refer to elements; so one is prepared to act toward an element, or give it meaning, as others have done. Environmental elements are, therefore, social products because their definition occurs in social interaction.

People operate within environments which have meaning for them, not a priori environments. Physical elements such as fc of light or degrees of temperature are a priori but light and temperature are enacted only if people attach meaning to them. The individual selects and organizes those elements which have meaning out of the total environment, thereby creating an enacted environment. The individual then adjusts to this enacted environment, in a sense becoming a different person, so the environment creates the individual as well. The process is one of interaction.

Environmental psychologists call this process of enacting the environment "cognitive mapping." According to Downs and Stea (1973), "Cognitive mapping is a process composed of a series of psychological

transformations by which an individual acquires, codes, stores, recalls, and decodes information about the relative locations and attributes of phenomena in his everyday spatial environment (p. 9)."

Cognitive mapping processes are those processes which enable individuals to cope with their physical environments.

These processes involve the attachment of meaning to certain elements of the environment and the organization of those elements. The resulting cognitive map includes only those elements of the environment which are enacted by the individual. A cognitive map is an internalized image of the environment. By comparing the actual physical environment to an individual's cognitive map salient features of the actual environment may be isolated.

A theoretical model of organizational functioning which takes into account the interaction of individual and environment and outlines the relationship of the physical setting to organizational climate is presented by James and Jones (1974a, 1974b, 1976; Jones and James, in press) (See Figure 1). The components of the model include the sociocultural and external physical environments; the total organizational context, structure, systems values and norms, process, climate and internal physical environment; psychological climate and perceived physical environment; organizationally related attitudes and motivation; individual resources; individual job behaviors and job performance; and end-result criteria. The components are further categorized as situational, intervening, individual characteristics, and individual behaviors and criteria.

A brief explanation of the components of the model will clarify the various levels of analysis. The external environment includes both sociocultural and physical environments. The sociocultural environment includes the social, linguistic, technological, and aesthetic culture that provides an external context and cultural frame of reference (Sells, 1963). The external physical environment includes elements of geographic location and community characteristics.

The study of organizational climate involves the situational variables of context, structure, system values and norms, process, and the internal physical environment at the organizational, subsystem, and group levels. Organizational climate is based on organizational attributes and defined as a "set of situational influences which reflect relationships among organizational conditions and which characterizes the ways in which the organization and its subunits affect their members (Jones and James, in press, p. 9)."

In contrast, psychological climate is based on individual attributes or the perceptions which represent interaction between actual organizational characteristics and individual characteristics. Psychological climate is defined as "the individual's internalized representations of organizational conditions and reflects a cognitive transformation and structuring into perceived situational influences (Jones and James, in press, p. 8)." Psychological climate is directly related to the perceived physical environment at the individual level of analysis and both are intervening variables between the individual and the situation.

Organizationally related attitude and motivation, including job

satisfaction, etc., is both an intervening variable and an individual characteristic for two reasons. First, the variables in this component tend to change due to an individual's experiences in an organization, and second, these variables operationalize intervening psychological processes.

Individual resources, including intelligence, aptitudes, etc., are less susceptible to change due to organizational experiences and are therefore considered individual characteristics. Individual job behaviors and performance includes what people do on their jobs (behavior) that are relevant to the organization and measurable (performance).

Finally, the end-result component includes criteria which are a function of performance as well as situational measures such as promotion, productivity, turnover, and salary.

The relationships among components are reflected by the embedded levels of group within subsystem within organization, one and two-way arrows representing events and feedback, and crossed arrows representing interaction. The interaction symbols illustrate among other things the idea that "the relationships between situational measures and intervening variables may partially be a function of situation-situation, individual-individual, or individual-situation interaction (James and Jones, 1976, p. 101)."

Altman's and Lett's (1970) model for interperson ecology provides a more detailed description of interpersonal functioning which amplifies the interaction of situational measures and intervening variables in James and Jones' model. (See Figure 2). Ecology is here defined as the mutual interaction of a person and the immediate

environment. First, based on a set of antecedent conditions, including interpersonal properties and environmental factors, an individual establishes a projected definition of the situation. Interpersonal properties include properties of the group as a group, such as a group's history, as well as the state of relationships among individuals. Environmental factors include physical elements which surround a group, dyad, or individual. Both individual properties and environmental factors can be descriptively analyzed.

The resulting situational definitions then contribute to overt behaviors or the use of environmental props, such as space and objects, and self-markers, such as gestures and body positions. The use of props and "self" then combine into complex behavior patterns hopefully appropriate to the original definition of the situation.

These complex behavior patterns occur over time in social interaction. Feedback occurs during and after the interaction, and each participant evaluates and assesses the performance and resulting state of affairs. If a discrepancy exists between desired expectations and outcomes, two types of change may occur. One is to redefine the situation to bring expectations and outcomes more in line. Another is to change behavior patterns while maintaining the original definition of the situation. Process analysis is required to analyze complex behavior patterns.

According to Altman and Lett's model, environmental factors are not only antecedent conditions of behavior but are also used as props for behaviors. Individuals enact an environment, then incorporate elements of that environment into their behavior patterns. Only the



physical objects which are enacted can be used as props. The remainder of the physical "world that is there" remains "out there."

Altman and Lett's model for interpersonal ecology and James and Jones' model of organizational functioning provide three levels which communication and physical setting variables of organizational functioning can be studied. One level is the external physical and sociocultural environment. A second level is that of the organization, its subsystems, and groups or the macro level of the organization.

Studying the macro aspects of a organization calls for relating the actual physical environment of an organization to observed patterns of communication within that organization, i.e., who communicated with whom, how frequently, and where in the building. Focus on macro aspects involves questions such as the relationship of size and structure of an organization to the physical layout of its facilities and the resulting communication patterns, as suggested by Gibson, Ivancevich, and Donnelly (1973) and Rogers and Agarwala-Rogers (1976).

However, discussions of organizational climate, a macro aspect of organizational functioning, customarily focus on composites of individual's perceptions of communication and the physical setting at the work group or organizational level. Yet individual perceptions are micro aspects of the organization (Katz and Kahn, 1966). With the exception of LaRocco, et al. (1974), the studies reviewed previously discuss organizational climate although the variables of interest are at the psychological and perceived physical environment level of James and Jones' model.

Yet the same information collected from different levels often provides different results. This problem is one of level of analysis

or aggregation/disaggregation. While a discussion of level of analysis is beyond the scope of this paper, the problem lies primarily in the inability of the micro-theory to account for the data at a higher level and vice-versa. As such, the level of analysis problem is both theoretical and statistical.

Theoretical models should at least include level of analysis in their conceptualization. Methods for investigating these models should include level as a variable, and studies should, where possible, systematically investigate this problem (Blalock, 1964; Hannon, 1971).

Methods and Measurement

Surveys are the typical vehicle for collecting both situational and individual perception data. Thus, designs and statistical methods appropriate for survey data are of primary interest here. Similarly, in order to test all or part of the interactional and integrative models discussed herein, model testing and longitudinal techniques are appropriate. Further, since most of the data available is from field studies in which direct control and observation of the crucial parameters is difficult or impossible, the classical ANOVA experimental designs are largely inappropriate.

Thus, the methods discussed below are correlational in nature and inherently multivariate. This section of the paper briefly discusses some of the statistical techniques appropriate for testing elements of the models presented to provide interdisciplinary researchers with some "feel" for when to use what technique and where to go to find out more about them.

The need for multivariate techniques is apparent in that both individuals and environments include many differences which impinge upon and affect behavior. Behavioral outcomes are also affected by both individual and environmental variations. Further, the interactions among these sets of situational and personalistic variables have been shown to affect behavior.

Prior to discussing methods for analyzing the affect of personalistic, situational, level of analysis, or interactional variables on various criteria,

mention should be made of the criterion model itself. James (1973), in his review of criterion measurement methods, discusses the two primary models. These are the ultimate criterion model and the multiple criterion model. The first is "...based upon combining all criteria acquired for a particular job into one linear composite which reflects overall success (p. 76)." However, if any of the measures are independent of each other, no general overall factor exists. Thus, to employ an ultimate criterion model is to possibly ignore important behavioral variance. By using a multiple criterion model this general factor assumption need not be met. Individuals may be more uniquely described, and a more broadly focused and accurate understanding of behavior is possible.

Techniques appropriate for a multiple criterion model include factor analysis, canonical correlation, confirmatory factor analysis, cross-lagged correlation, and ordinary and two-stage least squares analysis. These techniques are briefly discussed below.

Since the number of variables which can be obtained from both personal and situational data instruments is so high, a family of techniques including factor analysis (FA) and internal consistency analysis (ICA) can be employed. FA and ICA identify the underlying dimensions of variable sets and reduce these variable sets to smaller sets of non-redundant measures containing almost all of the information initially present.

Thus, FA is a valuable technique for use with field study data because of its reduction capabilities. However, with the exception of reducing sets of variables in as yet little explored components of

the integrating model, FA will probably not greatly extend our understanding of the relationships among elements of the theoretical model. Further, FA cannot be used to draw causal conclusions. Consequently, the use of FA should be limited to the early steps in analysis of the model in question; or, alternately, existing constructs defined by previous factor studies should be used in subsequent analyses.

Another quite general multivariate technique can also prove useful early in the analysis scheme. This technique is canonical variate analysis (CVA) and is typically used to examine the relationships between two sets of variables. One set is usually of independent variables and the other of dependent variables. Generally more than one variable makes up each set. If only one variable makes up the dependent variable set, CVA can be shown to be equivalent to multiple regression. CVA is most appropriate for "...studying the number and nature of relations between two sets of variables, but is rarely appropriate for assessing the overlap or redundancy between two sets (Walberg and Amick, 1975, p. 4)."

Thus, use of CVA in the present model would involve perceptual communication factors or dimensions as one set of variables and perceptual physical setting factors or dimensions as the other set of variables. Submitting these variable sets to CVA would result in a set of canonical correlations and canonical weights indicating to the researcher how many traits must be measured in order to explain the cross set variable intercorrelations and the nature of these relationships. Stated differently, CVA yields the number of traits (always less than or equal to the number of variables in the smaller set)

necessary to partial out correlations among composites of independent and dependent variables in order to yield $r_{xy} = 0$. Correlations between either the canonical correlations or the canonical weights and variables from either set (depending on the nature of the study; see Darlington, Weinberg, and Walberg, 1975) describe the nature of the traits:

CVA is a relatively new technique and several misapplications of it have been made. Nevertheless, in the initial stages of analysis CVA is useful in further understanding and perhaps reducing the variable sets resulting from FA.

CVA may also be used to test hypotheses about theoretical models in which hypotheses concern whether or not the number of traits resulting from CVA is equal to the number of hypothesized traits. Further hypotheses can be made regarding the magnitude of correlations between canonical variates and variables within sets. In this way, CVA is very similar to confirmatory factor analysis (CFA).

CFA differs from and extends exploratory factor analysis. While FA is primarily descriptive and heuristic CFA is designed to test hypotheses concerning theoretical models. Essentially the method is to ". . . formulate at the outset a factor analytic model about how certain factor variables determine the common variance of some observed variables, and then test the goodness of fit of the model to the data (Mulaik, 1975, p. 176)."

In the present model, one hypothesis might concern how many common factors would be obtained from a set of person by situation variables, and this hypothesis tested with CFA. Another example would

be to hypothesize what sources account for specified amounts of variance and test the hypothesis with CFA. Additionally, the researcher doing large survey studies might want to examine what proportion of variance was method variance and from multimethod-multitrait analyses (Campbell and Fiske, 1959) could derive hypotheses which would be testable with CFA.

If a research program using the present integrative model is underway and has progressed through one or more of the above techniques, chances are the researcher is currently involved in longitudinal data collection. The techniques for use in longitudinal studies include cross-lagged panel correlations (CLC) and ordinary and 2-stage least squares analysis.

CLC is the first step in investigating longitudinal data for possible explanations of relationships due to the effects of third variables. As such, CLC is a technique for testing hypotheses about spuriousness and, according to the results, may indicate that causal analyses of the data are warranted.

In the simplest case, the CLC involves measuring two variables at two times as per Figure 3. The correlations in Figure 3 represent

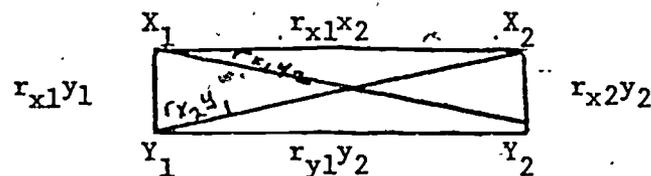


Figure 3. Paradigm for CLC.

two synchronous r's ($r_{x_1y_1}$, $r_{x_2y_2}$), two auto correlations ($r_{x_1x_2}$, $r_{y_1y_2}$), and two cross-lagged correlations ($r_{x_1y_2}$, $r_{x_2y_1}$).

Explication of the implications and assumptions of this paradigm are given elsewhere (Kenny, 1975; Neale and Liebert, 1973). However, if the assumptions of stationarity and synchronicity are met; if the reliabilities of X and Y are not differentially increasing or decreasing over time (the stability assumption) and if $r_{x_1y_2} - r_{x_2y_1}$ is not equal to zero (Case A), then further causal analysis is warranted, and third variable explanations are ruled out. However, if $r_{x_1y_2} - r_{x_2y_1}$ is about equal to zero and stationarity, synchronicity, and stability assumptions are met (Case B), then causal analysis may be warranted, and third variable explanations are quite tenable.

CLC is thus an obvious step in understanding the integrative model. For example, before a researcher can dismiss spuriousness as an explanation for observed relationships among situational and personal variables measured at different times, CLC must be undertaken. Further, the result of the CLC can direct the researcher toward causal analyses. If Case A is the result of CLC, then recursive causal models of analysis are appropriate; whereas, if Case B is the result, non-recursive causal models are appropriate.

Recursive and non-recursive causal models cannot infer causation, but they can be used to reject causal hypotheses (Spaeth, 1975). Discussion of structural equations - the essence of causal models - is beyond the scope of this paper. However, if non-recursive models are



indicated by CLC and theory, then two-stage least squares analysis is called for since time lags among the variable cannot be identified.

If recursive models are indicated by CLC and theory, then ordinary least squares analysis is appropriate since time lags can be identified.

These methods are widely used in econometrics and to a lesser extent in sociology (Namboodiri, Carter, and Blalock, 1975).

This section has briefly reviewed some of the multivariate techniques available for investigating interdisciplinary models with a focus on communication and climate. The point should be made again that a criterion system is the beginning of any such investigative effort and that level of analysis should be included in the conceptualization and/or the analysis of the model.

Conclusion

The review of the literature with regard to communication and climate indicates a lack of theoretical and methodological work, although interest has been increasing. This paper posits that in order for research to progress in the area of communication and climate, a major step must be taken to setup and systematically investigate theoretical models such as those presented. Further, as was noted, investigation of existing theory has been limited methodologically with most results coming from bivariate analysis. These analyses also largely ignore level of analysis. Thus, this paper suggests that multivariate techniques should be used to

investigate such models and that level of analysis be included as a relevant variable.

While such theoretical investigation is complex, the techniques are available and should be used in order to advance knowledge in the area. These investigations will likely be longitudinal in order to systematically investigate all the theoretical components accurately. Thus, effort should be put forth in developing interdisciplinary teams to work on integrated research programs.

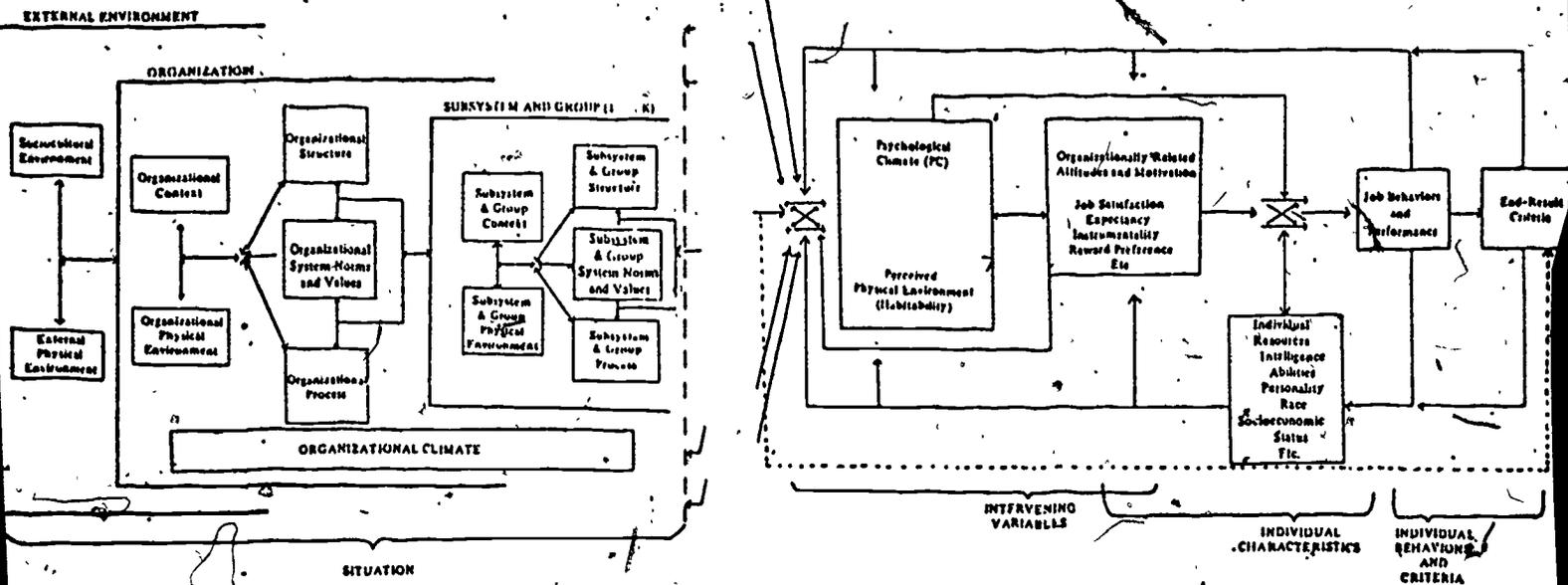


Fig. 1. A Model of Organizational Functioning (James and Jones, 1974).

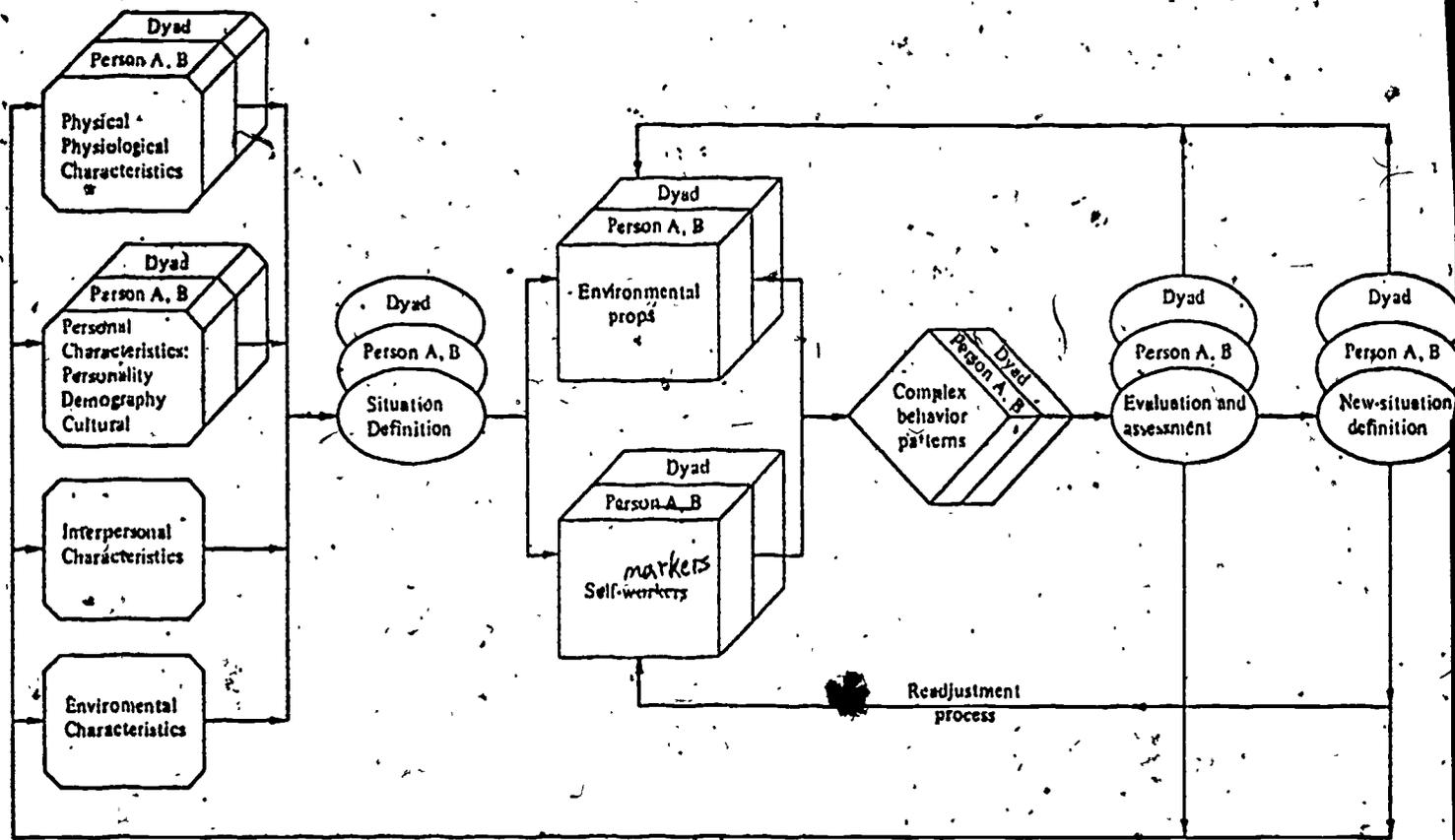


Fig. 2. General classification model for interpersonal ecology (Altman & Leff, 1970,).

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