The relevance of the structural contingency model for organizational effectiveness

Pennings, J.M.

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The Relevance of the Structural-Contingency Model for Organizational Effectiveness
Author(s): Johannes M. Pennings
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This paper examines the structural-contingency model. Both subjective and objective data were used to explore the degree of association between measures of structure and of environmental uncertainty and related measures of complexity, resourcefulness, competition and instability. The analysis of the data did not support the model; that is, environment has structural correlates, except for the variables of resourcefulness and complexity. The results show further that the goodness of fit between environmental and structural variables fails to explain variance in effectiveness.

One of the newer paradigms in organizational research focuses on structural contingency; that is that environment and technology are related to the structure of complex organizations (Katz and Kahn, 1966; Thompson, 1967). Dill’s (1958) earlier case study was probably one of the first attempts to trace variations in organizational structure to environmental factors. The implication is that for a given environment or technology a particular structure is appropriate. Thompson (1967) saw the emergence of a “new perspective” in which organizations were viewed as open systems subject to environmental and technological conditions, a perspective departing from the traditional practice of endorsing or prescribing an ideal, universal type of organization (Likert, 1967; McGregor, 1962). Current empirical investigations (Lawrence and Lorsch, 1967; Hage and Aiken, 1969; Hickson et al., 1969; Mohr, 1971; Pfeffer and Leblebici, 1973; Duncan, 1971; and Freeman, 1973), however, provide no conclusive evidence to support the model. For example, the studies quoted show little agreement as to whether organizational environment and/or technology have structural correlates. Also, there have not been many studies that try to show that the structural-contingency model is useful for explaining why organizations differ in effectiveness.

This paper provides a brief critique of the pertinent literature. Its purpose is to determine whether certain environmental characteristics have structural correlates. The analysis then tests the assumption that organizational effectiveness is a function of the goodness of fit or consistency between environmental and structural variables.

LITERATURE

Environment, Technology, and Task Characteristics

The literature on the structural-contingency theory shows a good deal of conceptual confusion. The measurement instruments vary, so that many of the studies are not comparable. It is often not clear what is meant by environment and which of its variables have explanatory power for structural differences among organizations. Furthermore, it seems that some authors equate dimensions of environment with dimensions of technology. The structural-contingency model has been used both by those who focus on environmental and those who focus on technological concepts. Indeed, there seems to be a tendency to combine variables descriptive of environment and technology.

In this paper, environment is the organization’s source of inputs and sink of outputs; that is, the set of persons, groups, and
organizations with which the focal organization has exchange relations. Technology pertains to the internal operations of the organization; that is, the means that the organization uses to convert inputs into outputs. The organizational outputs are contingent upon the internal operations as well as the factors beyond the control of the organization—the environmental contingencies and constraints. Even though the organization buffers its core technology (Thompson, 1967) it cannot seal off itself completely from external constraints. So perhaps it is not too surprising that the distinction between the two concepts has not been sharp. For example, Pfeffer and Leblebici (1973) in formulating their hypothesis on competition and structure, discussed the writings of Lawrence and Lorsch (1967) and Thompson (1967), who defined the contingency model in terms of environment; and others (Woodward, 1965; Hage and Aiken, 1969; Mohr, 1971), who focused on technology. Duncan (1971) in his study on environmental uncertainty and structure quoted Woodward (1970) and Perrow (1967) who focused on technology, and others who focused on environment (Dill, 1958; Lawrence and Lorsch, 1967) for justifying his hypothesis. Lawrence and Lorsch themselves acknowledged their debt to Thompson (1967) and Woodward (1965) as having strongly influenced their thinking. Taylor (1971) quoted environment and technology even though his research was on technology of work groups. Many more examples could be given.

Uncertainty in Environment and Technology

The confusion between environment and technology may be explained by the concept of uncertainty. The organization may be unable to predict future events, it may have to process a large amount of information, or it may be unable to determine the results of an action. The environment can be described with many variables, such as, stability, differentiation or complexity, resourcefulness, and competitiveness; but all these variables are characterized by uncertainty. If the environment is highly unstable, the same events may have different consequences (Burns and Stalker, 1961). If the environment is highly differentiated or complex uncertainty can result from the information-processing requirements arising from the number of stimuli as well as their interrelationships. Resourcefulness can also reflect the amount of information to be processed. Competitiveness also reflects environmental uncertainty (Pfeffer and Leblebici, 1973).

Technology too is commonly defined in terms of uncertainty. There are authors who adhere to the traditional term such as equipment, automation, and other technical definitions (Hickson et al., 1969; Taylor, 1971). Others, however, view uncertainty in technology in terms of problem solving (Perrow, 1967, 1972; Hunt, 1970; Mohr, 1971; Hage and Aiken, 1969). For example Perrow (1967) defines technology as the operations required to bring about changes in objects, involving the amount of logical analysis possible and the number of exceptional cases encountered. Hunt (1970) and Miller, Galanter, and Pribam (1960) have been especially preoccupied with how individuals who have to perform tasks make a choice among a number of plans of actions, or develop a plan of action if no precedent exists. These contingency-oriented researchers claim that organizations or groups develop a task-oriented structure in order to facilitate the required problem solving or searching behavior.
Structural-Contingency Model

Nevertheless there are still many problems with the concept of uncertainty and with the primary concern of this paper; that is, how uncertainty affects the pattern of relations among people who are engaged in concerted action. It seems that the link between technology in the sense of human problem solving and structure is more plausible than the link between environment and structure. Environmental uncertainty may translate itself into task or technological uncertainty (Duncan, 1971), although it is not clear how external uncertainty relates to internal uncertainty. The operational definition of environmental uncertainty, moreover, tends to be less rigorous than operational definitions of technological uncertainty.

All these approaches emphasize a single variable or a cluster of conceptually similar variables to characterize the environment (or technology). Hage (1974) calls such approaches "sociological-general." Such approaches can be contrasted with typological ones such as Burns and Stalker’s (1961) who developed historical specific models of the environment.

Uncertainty and Structure

Burns and Stalker (1961) developed a dichotomy of organizational structure corresponding to differential abilities to process information, and distinguished between mechanistic and organic structure. Hickson (1966) organized the many existing typologies that could be included in the Burns and Stalker classification—he used the term “role specificity,” for roles as well specified in mechanistic organizations and not so in organic organizations. Others have paraphrased Burns and Stalker (1961) as to why uncertainty has structural correlates. Perrow (1972) stressed the necessity for formal hierarchical coordination patterns when the procedures of the organization are routine and predictable. Galbraith (1972) and Becker and Gordon (1966) were more explicit in viewing organizations as information-processing systems. They focused on environment, whereas Perrow (1972) focused on technology. However, they all agreed that searchingsness, uncertainty, complexity, and heterogeneity of inputs were related to degree of decentralization and de-emphasis of rules and procedures.

Lawrence and Lorsch (1967), also provided strong support for environmental uncertainty being related to organizational variables. Their study, however, was based on a collection of six organizations having a consulting relation with the researchers. Pfeffer and Leblebici (1973) in a study on the relation between uncertainty (as measured by competitiveness) and structure found some supportive evidence, but their results were not unambiguous. Their measure of competitiveness was based on a single item. Duncan (1971) and Hinings et al. (1974) found a moderate relation between perceived environmental uncertainty and dimensions of organizational structure. The study of Hinings et al. (1974), based on five organizations, was intended to be only exploratory and differs from the others in the use of both questionnaire and nonquestionnaire measures to avoid the method-boundness of hypothesis testing.

Methodological Problems

Also results of research on the structural-contingency model have been rather meager because of methodological shortcomings. For example, studies relying on subjective data (question-
naires or interviews) provide rather strong support for the idea that environmental variables have structural correlates (Lawrence and Lorsch, 1967; Duncan, 1971; Pfeffer and Leblebici, 1973). Studies that use objective data, that is company records, do not. Naturally it is also possible that the theoretical constructs have been misrepresented by the subjective data operations or by the objective data operations, or by both. Lawrence and Lorsch (1967) used a questionnaire approach but Tosi et al. (1973) using records, were not able to replicate the results. Woodward (1965, 1970) used anthropological methods of data collection and Hickson et al. (1969) using institutional data, and Mohr (1971) using a questionnaire were not able to confirm her results.

There may be other reasons for the difficulty in replicating studies on the structural-contingency model. Although it seems that structures most consistent with environmental and technological conditions should be most effective it may be difficult to develop comparable criteria of effectiveness across different types of organizations. It is also difficult to provide a criterion of consistency. In its simplest operational form this criterion could be described as the similarity in normalized scores on the environmental and structural variables. It is arbitrary to determine what is similar or to choose the number of levels on independent and dependent variables. Unfortunately, there are not many studies which have used the consistency criterion as a predictor of organizational effectiveness. Indeed, with the exception of Mohr (1971) and studies on small-group and leadership behavior (Steiner, 1972), nobody has examined whether it is in fact consistency that explains organizational effectiveness. Mohr did not find evidence for the consistency hypothesis.

OBJECTIVES AND METHOD

Objectives

This study aims at examining further the hypothesis that variables of the environment are related to structure. Thus, it examines whether there are structural variations between organizations that are due to differences in aspects of their environments. It is predicted that the greater the environmental uncertainty; that is, instability, resourcefulness, demand volatility, competitiveness and complexity, the greater the amount of informal communication, participativeness, frequency of meetings, specialization, and power-equalization. Finally, an analysis will be made to see whether organizations that are classified as showing consistency between environment and structure are more effective as measured by five criteria than those classified as inconsistent.

Method

The data for the study were collected in 40 widely dispersed branch offices of a large United States brokerage organization, which bought and sold investment securities, mutual funds, and commodities for its clients. It had recently diversified its operations by acquiring a substantial amount of business in underwriting, investment banking, and principal transactions. The head office controlled the branch offices in formulating policies, enforcing the rules of the SEC, and providing various supportive facilities such as research and marketing.
Structural-Contingency Model

Although all branch offices studied carried out similar services some offices were more oriented to certain types of transactions. Each office had been allocated a territory for its sales activities. Its income is from commissions and its productivity was expressed as commission earned for the organization. The offices had 31 to 141 employees and a similar formal authority structure. They were headed by an office manager. Each of his subordinates, the salesmen or brokers, served a roster of clients and mediated between the various investment markets and the clients.

The 40 branches studied were all in different parts of the United States, foreign ones being excluded. There were three criteria in selecting the purposive, nonrandom sample: size, length of service of the office managers, and performance ratio. Two subsamples of 24 small and 16 large offices were selected. Only those offices were selected whose office managers had had at least two years of tenure. The performance ratio was obtained by dividing the actual by the expected productivity (commission) of the office. This ratio was calculated by computing the ratio of each broker’s earned commission to the mean commission of his own seniority category. These ratios were aggregated for all brokers in each office and the mean thus obtained represented the performance ratio for each office. A performance ratio of 1.0 indicated average performance of an office relative to other offices. The offices were selected on the basis of the performance ratio in 1968, alternately from top down and bottom up, until 40 offices had been chosen. The selection of the sample in this way was largely imposed by the sponsor of the research project. The 40 offices did not deviate significantly, however, from the remaining offices, as was evident from t-tests of means and z-transformed differences between product-moment correlation coefficients of the selected versus the nonselected offices on all relevant variables.

The data were collected initially for different purposes; therefore they put some constraints on the indicators that could be extracted from them. Included were objective data from company records or census information compiled by the organization, as well as financial information on customers’ characteristics, their investment patterns, and accounting information on performance criteria, such as commission earned.

Subjective data were obtained from questionnaires. Since the amount of information desired from questionnaires was too great to be obtained in one questionnaire, two were used; in the first primarily the structure of each office and aspects such as the compensation system, the patterns of collaboration and communication, participativeness, and the distribution of power; in the second, environmental instability, uncertainty, competitiveness, and resourcefulness and other environmental variables. The data were collected during the end of 1969 and the beginning of 1970. Because the number of questions in the first questionnaire was too large, two versions, A and B, were used; however, some of the items in the two versions were identical or near so. The response rate for the two questionnaires was approximately 88 percent. A random sample of 50 percent of all brokers in each office received the A version while the other 50 percent received the B version. The questionnaire data were aggregated without assigning weights to generate scores on the office level.
Data obtained through different media made it possible to examine whether environment had structural correlates regardless of the type of the measurement instruments used. The Appendix provides a listing of the measures that describe environmental, structural, and effectiveness variables.

RESULTS

Validity

Table 1 gives the Spearman-Brown coefficients of the questionnaire measures listed in the Appendix, computed to obtain an estimate of their reliability. The coefficients indicate that questionnaire measures were very reliable. The four replication coefficients were not computed according to the Spearman-Brown formula. Although they were one-item indices, since they were given to the two random subsets of employees, it was possible to determine the extent to which one half replicated the other half. The replication coefficients were obtained by correlating the aggregate ratings of the 40 pairs of subsamples. The replication coefficients for the slope and total amount of power were .34 (p < .05) and .35 (p < .05); the coefficients for lateral and vertical communication were .07 (N.S.) and .43 (p < .01) respectively. The control graph (Tannenbaum, 1968) ratings of the two samples were reasonably replicable even though the relative magnitude varied with the questionnaire used. The magnitude appeared to be a function of the number of hierarchical levels rated by respondents; three for the A version, four for the B version.

Despite the high reliability of the measures, it is not certain how valid they are. Some of the data provided by the organization could be related to variables measured by the questionnaires. For example, from company records it was known whether a particular office derived its income from one, a few, or many
Table 2

Product-Moment Correlations between Measures of Environmental Variables (N=40)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Complexity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Demand volatility</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Resourcefulness</td>
<td>-0.32*</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Knowledge about competition</td>
<td>0.03</td>
<td>0.04</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Quality of organizational intelligence</td>
<td>-0.09</td>
<td>-0.17</td>
<td>-0.02</td>
<td>0.75*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Environmental uncertainty</td>
<td>-0.10</td>
<td>0.27</td>
<td>-0.04</td>
<td>0.13</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Environmental instability</td>
<td>-0.00</td>
<td>-0.33*</td>
<td>0.05</td>
<td>-0.08</td>
<td>-0.15</td>
<td>0.36*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Number of competitors</td>
<td>0.06</td>
<td>-0.03</td>
<td>0.10</td>
<td>-0.11</td>
<td>-0.11</td>
<td>0.37*</td>
<td>0.34*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Feedback specificity</td>
<td>-0.23</td>
<td>-0.18</td>
<td>0.14</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.05</td>
<td>-0.12</td>
<td>-0.20</td>
<td></td>
</tr>
<tr>
<td>10. Complexity</td>
<td>0.32*</td>
<td>-0.09</td>
<td>-0.13</td>
<td>-0.10</td>
<td>-0.29</td>
<td>-0.17</td>
<td>-0.09</td>
<td>-0.04</td>
<td>-0.21</td>
</tr>
</tbody>
</table>

*p < .05

(N=7) categories of income sources (such as commodities, securities, institutional customers). To compare these objective data with subjective data dealing with a percentage distribution of types of transactions, a complexity score analogous to the uncertainty measure in information theory was extracted from these data.

As Table 2 shows this score correlated .32 with a similar scale obtained from the aggregate questionnaire responses, which suggests a low convergent validity. These two measures were rather weakly related to the other indicators (that is, number of competitors, environmental instability), which would suggest the existence of discriminant validity (Campbell and Fiske, 1959). The measure of demand volatility correlated positively with environmental instability (r = .33, p < .05) and with environmental uncertainty (r = .27, p < .10), but many of the other coefficients were rather low and insignificant. Indeed, the pattern of correlations of Table 2 appears somewhat similar to the valida-
tion analysis of the Lawrence and Lorsch (1967) questionnaire by Tosi et al. (1973), who showed that questionnaire measures of environmental uncertainty were not related to such indicators as fluctuations in sales figures.

However, the low convergence between the two types of measures may not indicate lack of validity. Perhaps convergent validity is only to be expected when one measures the very same concept in different ways. Variation in sales figures may represent coping with uncertainty or performance rather than perceived uncertainty. Tosi et al. (1973) acknowledged that their measure of uncertainty may have been conceptually different from that of Lawrence and Lorsch (1967). This suggests the necessity of developing operational definitions of environmental uncertainty to measure the "unobservable variables" (Mayer and Younger, 1974). In the present study it seemed best to treat the indicators of Table 2 as reflecting a general construct, uncertainty, and examine how they related to structural dimensions.

The questionnaire measures of environmental, structural, and effectiveness variables were aggregated to obtain means for each office. The 40 offices were compared on the differences in
Table 3

One-Way Analysis of Variance of Environmental and Structural Variables as Perceived by Organizational Members

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sums of Squares Between</th>
<th>Within</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge about competition</td>
<td>43.1</td>
<td>580.8</td>
<td>1.58</td>
<td>.05</td>
</tr>
<tr>
<td>Specificity of feedback</td>
<td>39.1</td>
<td>642.9</td>
<td>1.10</td>
<td>NS</td>
</tr>
<tr>
<td>Number of competitors</td>
<td>.867 (D + 6)</td>
<td>.1947 (D + 7)</td>
<td>9.41</td>
<td>.01</td>
</tr>
<tr>
<td>Quality of organizational intelligence</td>
<td>41.7</td>
<td>393.9</td>
<td>2.32</td>
<td>.01</td>
</tr>
<tr>
<td>Environmental uncertainty</td>
<td>40.6</td>
<td>611.4</td>
<td>1.43</td>
<td>.10</td>
</tr>
<tr>
<td>Environmental instability</td>
<td>42.5</td>
<td>360.9</td>
<td>2.50</td>
<td>.01</td>
</tr>
<tr>
<td>Complexity</td>
<td>16.7</td>
<td>97.7</td>
<td>1.04</td>
<td>NS</td>
</tr>
<tr>
<td>Organizational</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power (slope of distribution)</td>
<td>79.3</td>
<td>600.7</td>
<td>2.17</td>
<td>.01</td>
</tr>
<tr>
<td>Power (total amount)</td>
<td>70.7</td>
<td>610.3</td>
<td>1.91</td>
<td>.01</td>
</tr>
<tr>
<td>Lateral communication</td>
<td>281</td>
<td>.414</td>
<td>1.33</td>
<td>.10</td>
</tr>
<tr>
<td>Vertical communication</td>
<td>3581.0</td>
<td>36163.0</td>
<td>1.96</td>
<td>.01</td>
</tr>
<tr>
<td>Participativeness</td>
<td>33.7</td>
<td>153.4</td>
<td>1.74</td>
<td>.01</td>
</tr>
<tr>
<td>Meeting frequency (lecture)</td>
<td>34.4</td>
<td>81.6</td>
<td>3.34</td>
<td>.01</td>
</tr>
<tr>
<td>Meeting frequency (market)</td>
<td>59.5</td>
<td>167.9</td>
<td>2.56</td>
<td>.01</td>
</tr>
</tbody>
</table>

responses relative to the dispersion of responses among them, and Table 3, which gives the results of a one-way analysis of variance, shows that the F-ratios for structural measures tended to be higher than the F-ratios for environmental measures. This can be determined by examining the proportion of the variance accounted for by office membership, that is, the relative size of the between sums of squares.

Because the 40 offices were in one organization, similarity on structural variables would be expected; since they were subject to policy guidelines, control systems, and other instruments that impose uniformity. Also belonging to a single organization reduced the variance in structure resulting from other variables not crucial for the evaluation of the structural-contingency model, such as charter and age. The F-ratios revealed, however, considerable variations in structure.

Table 3 also shows that most environmental measures discriminated the units of analysis reasonably well, except for the complexity measure, which was almost significant. The failure to reach a significant F-ratio here was probably due to the combination of various types of transactions differing strongly among brokers within an office and the marked specificity of feedback of brokers within each office. Complexity and feedback specificity are therefore less useful in assessing the influence of environment on structure.

Environment and Structure

Table 4 shows the product-moment correlations between the environmental and structural variables. All the structural variables were scaled such that a low score had mechanistic, bureaucratic implications. Similarly all the uncertainty, instability, and resourcefulness variables were scaled from low to high. For example, the correlation of −.38 between resourcefulness and total amount of power implied that offices with a lean environment have a high amount of power whereas rich environments would result in office personnel expressing little power in their office.

400/ASQ
Table 4

Product-Moment Correlations between Environmental and Structural Variables (N=40)

<table>
<thead>
<tr>
<th>Environmental variables</th>
<th>Structural Variables</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Lateral communication</td>
<td>Vertical communication</td>
<td>Participativeness</td>
<td>Meetings (lecture)</td>
<td>Meetings (market)</td>
<td>Power (slope)</td>
<td>Power (total amount)</td>
<td>Specialization</td>
<td>Social interdependence</td>
</tr>
<tr>
<td>Resourcefulness Complexity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(objective)</td>
<td>- .09</td>
<td></td>
<td></td>
<td>-.22</td>
<td>-.31*</td>
<td>.06</td>
<td>-.38*</td>
<td>.06</td>
<td>-.31*</td>
</tr>
<tr>
<td>Complexity (subjective)</td>
<td>-.11</td>
<td></td>
<td></td>
<td>.28</td>
<td>.01</td>
<td>.36*</td>
<td>-.15</td>
<td>.49*</td>
<td>.03</td>
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<tr>
<td>Knowledge about competition</td>
<td>-.12</td>
<td></td>
<td></td>
<td>-.09</td>
<td>-.02</td>
<td>.08</td>
<td>.24</td>
<td>.21</td>
<td>.32*</td>
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<tr>
<td>Organizational intelligence</td>
<td>-.15</td>
<td></td>
<td></td>
<td>-.03</td>
<td>.06</td>
<td>-.02</td>
<td>.34*</td>
<td>.12</td>
<td>.30</td>
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<tr>
<td>Uncertainty</td>
<td>-.02</td>
<td></td>
<td></td>
<td>.07</td>
<td>-.11</td>
<td>.06</td>
<td>-.16</td>
<td>.21</td>
<td>-.17</td>
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<tr>
<td>Instability</td>
<td>-.03</td>
<td></td>
<td></td>
<td>-.16</td>
<td>-.04</td>
<td>.09</td>
<td>.03</td>
<td>.06</td>
<td>.08</td>
</tr>
<tr>
<td>Number of competitors</td>
<td>-.24</td>
<td></td>
<td></td>
<td>-.21</td>
<td>-.17</td>
<td>-.24</td>
<td>.37*</td>
<td>-.28</td>
<td>.07</td>
</tr>
<tr>
<td>Feedback specificity</td>
<td>.06</td>
<td></td>
<td></td>
<td>.10</td>
<td>.12</td>
<td>.11</td>
<td>-.01</td>
<td>.16</td>
<td>.08</td>
</tr>
<tr>
<td>Demand volatility</td>
<td>.00</td>
<td></td>
<td></td>
<td>-.09</td>
<td>-.02</td>
<td>.09</td>
<td>.00</td>
<td>.12</td>
<td>-.17</td>
</tr>
</tbody>
</table>

* p < .05

On the basis of the structural-contingency model, it was expected that all correlations would be high and positive. However, as Table 4 shows most correlations were negative and/or insignificant. Indeed most coefficients were in the wrong direction. Furthermore the average correlation involving all subjective measures of the environment was approximately .22 while the mean coefficient was .13 for the relationships involving all objective environmental measures. In some instances where the coefficients reached a significant level, their sign was in the unexpected direction.

In general the relationships between the information-processing variables, that is, quality of organization intelligence, competition, uncertainty and instability, did not explain the variance in organizational structure.

It is also striking that some environmental variables tend to correlate significantly with structural variables; for example, complexity and resourcefulness which are crucial factors in the acquisition of scarce resources or the rendering of services to the financial community. Although these aspects are also pertinent to the information-processing capabilities of the organization, they seem to revolve more around the resource acquisition aspects of the environment. These two variables related primarily to indices of organizational power and communication; for example, the greater the complexity (as measured by two indices), the lower the centralization as reflected by participativeness (r = .28 and .31) and the higher the total amount of power (r = .05 and .49). Earlier it was shown that the two complexity measures had some convergent validity. These correlations yield at least some support for the structural-contingency model.
It is striking, however, that objective complexity was not related to specialization, particularly since it could affect the level of specialization among brokers. It could be even speculated that specialization in turn would be negatively related to the subjective complexity measure. While the two complexity indicators correlated with each other, they were not related to specialization even when applied to the small versus the large offices. One might expect a positive correlation between complexity in large offices and none in small offices, but no such interaction was found; perhaps because of the relatively large within office variance in subjective complexity or specialization not being commensurate with objective and subjective complexity.

Resourcefulness was also expected to have a positive correlation with participativeness, since in rich environments, employees would have a large say in their goal and task definition, but resourcefulness correlated negatively with meeting (market) frequency (−.30), participativeness (−.53), and total amount of power (−.38). These negative correlations are even more striking, since these variables do not have specific method bias resulting from the measurement of variables by a single instrument. The resourcefulness measure was obtained from census data provided by the firm; most structural measures came from questionnaire data. Strictly speaking, they are highly insignificant, positively, under a one-tailed test! It may be speculated that resourcefulness implies a nonthreatening environment so that there is no cost-benefit payoff in participation. Resourcefulness tends to foster competitiveness among the brokers as measured by social interdependence (r=−.31).

Elsewhere (Pennings, 1975) social interdependence was shown to be related nonlinearly to the degree of specialization of the office. The relationships were not moderated, however, by size.

Complexity (income sources) and complexity (transactions) correlated negatively with resourcefulness (r=−.45 and −.55 respectively). This may explain why complexity and resourcefulness related differently to structure. Perhaps environmental affluence allowed the offices to be dependent on one or a few income sources. A lean environment forces the offices to diversify their pool of customers, resulting in a decentralized, communicative and participative structure. This conclusion remained valid after it was examined, whether the relationship between complexity and structure was spurious. For example, it could be argued that resourcefulness is associated with both complexity and centralization.

It was found, however, that the correlation between these latter variables did not disappear when controlling for resourcefulness. Partial correlation coefficients between complexity and three centralization measures, controlling for resourcefulness (1st order) and resourcefulness, knowledge about competition and number of competitors (3rd order) for N=39 gave the following results, with the bullets indicating p = .05:

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Subjective Complexity 1st order</th>
<th>Objective Complexity 1st order</th>
<th>Subjective Complexity 3rd order</th>
<th>Objective Complexity 3rd order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participativeness</td>
<td>.45*</td>
<td>.46*</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>Power (slope)</td>
<td>−.39*</td>
<td>−.34*</td>
<td>−.14</td>
<td>−.18</td>
</tr>
<tr>
<td>Power (total amount)</td>
<td>.00</td>
<td>.10</td>
<td>.43*</td>
<td>.50*</td>
</tr>
</tbody>
</table>

The partial correlation coefficients are almost identical, however, to the zero-order correlations involving the same indices. It
Structural-Contingency Model

follows that the relation between complexity and some aspects of structure was independent of these three other environmental indices, and one can conclude that the zero-order correlations are not spurious.†

Summarizing, with the exception of complexity and resourcefulness, none of the environmental variables seemed to be relevant for understanding why organizations differed structurally. The environmental variables were only weakly related to the structure of the brokerage offices. Perhaps it may be more important to determine whether there are environmental variables that have structural correlates. In a later stage it may then be determined whether uncertainty encompasses many aspects, so that it has to be described in more than one dimension.

Structural Contingency and Effectiveness

For many the structural-contingency model must incorporate effectiveness. One could argue that the results obtained do not necessarily invalidate the structural-contingency model; since the 40 offices included both effective and ineffective offices and, the ineffective offices would have reduced the magnitude of the correlations based on the total sample.

The implication of the research of Burns and Stalker (1961) was that organizational effectiveness was contingent upon the structure being consistent with the environment. However, Mohr (1971) pointed to the weak evidence upon which such conclusions were based. Furthermore it is not always clear what is meant by consistency. Perrow (1967) for example claimed that effective organizations had to be bureaucratized if their technology is routine. However, bureaucracy is a multi-faceted concept and bureaucratic dimensions vary independently of each other.

Also it is usually not clear what writers mean when they refer to effectiveness, and only a few studies provide operational definitions (Mohr, 1971). Seashore and Yuchtman (1967) viewed effectiveness as the ability of the organization to exploit the environment in the acquisition of critical resources. Price (1968) defined effectiveness as the degree of goal achievement. Mohr (1973) saw that the emphasis on acquisition of resources required the identification of output goals to determine which resources were critical for goal achievement. He stated that such a distinction was somewhat parallel to the classification of reflexive goals, which have an internal referent (for instance retention of personnel), while transitive goals have an external referent (for example, market share, sales, turnover of customers).

Organizations may be effective according to some criteria and ineffective according to others. Perrow’s (1972) view of bureaucratic structure as superior if the technology is routine may mean that such organizations may be effective in their profit-making or market share, though job satisfaction or morale may be low. Burns and Stalker (1961) similarly hinted that effectiveness in terms of prevalent feelings of satisfaction may be orthogonal to profit or market penetration. One should therefore not rely on a composite criterion or a single effectiveness criterion in studying the structural-contingency model.

Some of the criteria of organizational effectiveness (Appendix) had an external referent, for example, production, number of

† The subjective data were further subjected to a so-called contextual analysis (Tannenbaum, 1968: 185–228). This analysis yields estimates of individual and structural effects. Both a general linear model and log-linear model yielded rather weak effects and explained little variance in structural variables; these results corroborated the outcomes of the correlational analysis of Table 4.
new customers, while others had an internal referent, for example, satisfaction. These criteria represent reasonably well the pool of all possible criteria available. A two-way analysis of variance was used to determine the effects of environment and structure as well as their interaction effects on the effectiveness indices. A factorial design was used rather than a regression model, incorporating a multiplicative interaction term, since the latter is inadequate in detecting interaction, especially when interaction is not multiplicative. Table 5 shows the effect of six environmental variables and three structural variables. Some variables were omitted because they were redundant or to simplify the presentation of results. Partitioning on the uncertainty and instability variables resulted in nearly identical subsets. The F-ratios were omitted to reduce complexity of the table. They were associated with the effects of environmental variables of structural variables (J), and the interaction effects (IJ). An I after the F-ratios indicates a significant main effect of environmental variables, a J a significant main effect of structural variables and the cross-product IJ a significant interaction effect. The F-ratios listed were from a one-way analysis of variance across four types of offices which were low—low or high—high or mixed on environmental and structural variables. The most critical columns are those dealing with interaction (IJ), since one can compare offices that are either low or high on both dimensions (consistent types) and those that are inconsistent because they are either low-high or high-low on any pair of factors. The results in table 5 show that most of the tests for interaction between structural and environmental variables were not significant.

Table 5

<table>
<thead>
<tr>
<th>Environmental Variables</th>
<th>Loss Due to Errors F</th>
<th>Morale F</th>
<th>Anxiety F</th>
<th>Total Production F</th>
<th>Decline in Production F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity (transactions)</td>
<td>1.11  J</td>
<td>5.67 J,I,J</td>
<td>.23</td>
<td>2.56 IJ</td>
<td>2.05 J</td>
</tr>
<tr>
<td>Demand</td>
<td>.89  J</td>
<td>3.68 J</td>
<td>1.15</td>
<td>.84</td>
<td>1.47</td>
</tr>
<tr>
<td>Volatility</td>
<td>.69  J</td>
<td>2.50 J</td>
<td>.13</td>
<td>1.07</td>
<td>4.65 I,J</td>
</tr>
<tr>
<td>Resourcefulness</td>
<td>.38  J</td>
<td>2.38 J,I,J</td>
<td>.89</td>
<td>1.13</td>
<td>3.02 I</td>
</tr>
<tr>
<td></td>
<td>.40  J</td>
<td>2.19 J</td>
<td>.07</td>
<td>.54</td>
<td>4.40 I,J</td>
</tr>
<tr>
<td></td>
<td>2.20 J</td>
<td>2.93 J,I,J</td>
<td>.75</td>
<td>2.18 J</td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>.12  J</td>
<td>1.76 J</td>
<td>1.75</td>
<td>2.31</td>
<td>3.68 I,J</td>
</tr>
<tr>
<td>Subjective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity (transactions)</td>
<td>.74  J</td>
<td>6.40 J,J,I,J</td>
<td>.34</td>
<td>1.05</td>
<td>2.48 J</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>.88  J</td>
<td>3.61 J</td>
<td>.18</td>
<td>1.27</td>
<td>2.00 J</td>
</tr>
<tr>
<td>Knowledge about competition</td>
<td>2.64 J</td>
<td>2.93 J</td>
<td>.77</td>
<td>2.72 J</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>.85  J</td>
<td>2.74 J</td>
<td>.39</td>
<td>1.46</td>
<td>2.24 I,J</td>
</tr>
</tbody>
</table>

The structural variables (J) are found in the first 3 rows for each environmental variable. The first row is participativeness, the second is total amount of power and the third is meeting (market) frequency.

A significant effect is indicated by I for the environmental variables, J for structural variables and U for interaction effects.
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The goodness of fit between environmental and structural variables has little bearing on the effectiveness of the organization, regardless of whether it has an external referent or internal referent.

Table 5 makes it clear that the variance in effectiveness explained was primarily due to structural variables. The total amount of power appeared to be the strongest predictor of organizational effectiveness. Participativeness and the frequency of market meetings had a strong effect on morale or general satisfaction, but they were not very relevant for the other effectiveness criteria. The significance of the variable, total amount of power, as a predictor was further illustrated by the fact that it had excellent explanatory power for effectiveness variables measured by nonverbal objective measurement instruments. Table 5 shows that the total amount of power was strongly related to both total production and decline in production. The greater the total amount of power the higher the productivity and the smaller decline in total production from 1967 to 1969.

In contrast the environmental variables did not explain variance in effectiveness; except for resourcefulness and complexity in interaction with the total amount of power. This interaction might be promising in further research on the structural-contingency model.

The superiority of the structural variables in explaining variance in effectiveness was further established by the high to very high correlations between the other structural and effectiveness variables. If the employees of the organization were left on their own, did not share ideas, were not informationally integrated, did not participate in decisions, and did not receive support, the effectiveness on any criterion will be below average. This is probably the best single statement that could summarize the relationship between structural variables and effectiveness.

INTERPRETATIONS AND IMPLICATIONS

From the results obtained, one questions the usefulness of the structural-contingency model. Clearly the results do not concur with the sharp criticisms which Perrow (1972) directs at some psychologists (Likert, 1967; Argyris, 1972), for wishful thinking when they allegedly distort empirical evidence so as to prove the superiority of participative management. The results are similar to the only study aimed at testing the consistency hypothesis (Mohr, 1971). Mohr’s study of public health units focussed on participativeness as the dependent variable with uncertainty and task interdependence among the independent variables. He discovered that the consistency hypothesis could not be confirmed, but that participativeness was strongly related to the agencies’ effectiveness as measured by six questionnaire scales.

It is difficult to generalize Mohr’s outcomes or the results of this study; for unlike the organizations studied either here or by Mohr, most organizations are larger and are organized around a work flow. Therefore these studies cannot resolve the Perrow-Argyris controversy.

Data are not shown, but matrices are available on request.
Organizations having mass production or a continuous work flow are more likely to have so called sequential or reciprocal interdependence, while the branch offices of the present study tend to show pooled interdependence (Thompson, 1967). Sequential and reciprocal interdependence involve the exchange of objects or services between organizational components to perform their tasks; pooled interdependence is associated with each part of the organization contributing to the whole and being supported by the total organization. Organizational components, such as subunits or members, which display pooled interdependence are not constrained by mutual dependence to accomplish adequate performance. In brokerage offices and public health agencies the employees probably do not have to collaborate extensively to ensure optimum performance.

Perhaps all those organizations that have pooled interdependence are structurally invariant with respect to environmental and technological uncertainty. The structural-contingency model may hold for those work organizations that have a stronger degree of interdependence.

The interdependence may determine the extent to which external uncertainty may affect the various components or clusters of operations, therefore discriminatory measures of interdependence should be developed, especially if interdependence were found to be an important moderator variable.

Although the present study has dealt with environmental variables, the results are also relevant for technology-oriented authors who have used the structural-contingency model. Major proponents of the structural-contingency model have confused or combined technology with environment, as was apparent in their emphasis on uncertainty, which characterizes both environment and technology. It may be more fruitful to posit technology as a concept between environment and structure and to examine how the environmental variables determine the location of an organization on a number of technology dimensions. However, especially in the case of organizations that have a mediating function one could attribute predictive validity to environmental indices for their measuring technological variables. The salesmen of branch offices have somewhat boundary spanning roles in that they do not shield a core technology from external influences. The characteristics of their tasks probably relate directly to the market environment. Therefore, even though technology variables have not been measured, it seems that for organizations having such a mediating role, additional measurements on technology would not have enhanced the amount of variance explained. Again, this statement might not have been supported if the sample of organizations studied had been more heterogeneous.

This study has tried to determine factors that explain why organizations differ structurally and how they vary with respect to their effectiveness. It has not been successful in understanding variance in these parameters. Hopefully the model can be refined, as to improve an understanding of interorganizational structural differentiation.

Johannes M. Pennings is an assistant professor in the Graduate School of Industrial Administration, Carnegie-Mellon University.

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Woodward, Joan


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APPENDIX
The following descriptions describe the measures of environment, structure, and effectiveness. A five-point scale was used for all questionnaire items.

MEASURES OF ENVIRONMENTAL CHARACTERISTICS

Resourcefulness
1. Number of households of the office’s standard metropolitan area having an income exceeding 25,000 dollars.
2. The average balance of bank accounts in the standard metropolitan area.
3. The amount of donations to the local United Fund. This indicator was standardized with respect to size of the office.

Complexity
1. The objective measure was obtained by analysing the relative magnitude of seven classes of transactions.
2. The subjective measure was derived from a questionnaire item: “What proportion of your present and potential customers in your local business area put money each year into each of the following: A. Stocks. B. Bonds (municipals, treasury bills, etc.). C. Commodities. D. Insurance. E. Real Estate. F. Savings. G. Do not invest.”

It was assumed that if the seven classes of income or the aggregate seven percentages were rather equal in size, the complexity would be high. The greater the inequality of percentages, the less the complexity:

\[ C = \sum_{j=1}^{n} |p_j - \bar{p}| / n \]

where \( C \) stands for complexity, \( p_j \) for the \( j \)th percentage, \( \bar{p} \) the mean percentage, and \( n \) is number of categories. This score was multiplied by \(-1\) so that a high value implies high differentiation or complexity. This measure correlated rather strongly with the uncertainty measure in information theory \( H = -\sum p(x) \log p(x) \) where \( H \) stands for uncertainty, \( p(x) \) is the probability that \( x \) will be selected from the set \( X \) and the logarithm is taken to the base 2; the resulting numbers are referred to as bits. It was felt that the \( C \) measure was more intelligible.

Quality of Organizational Intelligence
How much do you learn about competitors in your local business area from each of the following sources: “A. Newspapers and financial magazines. B. Attending conferences and meetings in this area. C. Reading material put out by their research and planning staffs. D. Through friends working in these organizations. E. Informal gatherings and gossip. F. Customers coming to [focal organization] from other competitors in your local area. G. Other sources.”

Knowledge about Competition
“How informed do you feel about the competitors in your local business area with respect to their: A. Policies and strategies of selling. B. Electronic and mechanical aides used in selling. C. Special services and facilities to attract new customers. D. Activities of their research staff. E. Activities in their planning staff. F. Advertising and sales promotion.”

Environmental Uncertainty
“In order to operate successfully in a particular business area, any organization such as [focal organization] needs information about certain aspects of its business. Considering the amount of information which you now have about your local business area, how much additional information would you need to be almost certain in making estimates about the following: A. Sales potential with respect to individual customers. B. Sales potential with respect to institutional customers. C. Competitors in this area in terms of their growth and activities. D. Investment preferences of local customers. E. Lending practices of financial institutions in this area.”

Environmental Instability
This included the same aspects as those of the environmental uncertainty scale. The listing was preceded by the following question: “Quite often in any business area there occur changes which require an organization to modify its activities to adapt itself to the changing business conditions. To what extent would you say the following aspects of your local business area have changed in the last few years?”

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Feedback Specificity

“To what extent did your production come from the sources you had expected when you set your production goal?”

Demand Volatility

This was measured by the amount of change in the number of active customers during the period 1967–1969 standardized with respect to size:

\[ V = \sqrt{2} \left( |y_{12} - y_{11}| + |y_{11} + y_{12}| + |y_{13} - y_{12}| + |y_{12} + y_{13}| \right) \]

where \( V \) is volatility, \( y_{11}, y_{12}, \) and \( y_{13} \) the total number of active customers during the periods 1, 2, and 3 respectively.

MEASURES OF STRUCTURAL CHARACTERISTICS

Lateral and Vertical Communication

1. “Here is a list of persons and groups within this office. How often on the average do you have contact with them?”
2. “In your opinion how important for your work are your contacts with each of the following persons and groups within this office?”

For both questions, the list listed peers first and supervisors afterwards.

Participativeness:

1. How does your office manager usually go about making a decision when it is one that is of particular concern to you personally?”
2. “How does your office manager go about making decisions when it is one that concerns several or all of the brokers in the office?”
3. “To what extent do you feel that you, personally, can influence the activities and decisions of your office manager on matters that are of concern to you?”
4. “When something comes up that affects the brokers in general does your office manager let you know about it fully and promptly?”

Frequency of Meetings

“What kinds of things are done at the meetings in your office attended by office manager and brokers:
1. Someone discusses at length a topic on which he is better informed than others (lecture meetings).
2. Office manager and brokers exchange ideas and information on conditions in the market and special situations (market meetings).”

Power

Slope of the power distribution and total amount of power are indicators developed by Tannenbaum (1968): “How much say or influence does each of the following groups or people have on what goes on in this office? A. Office manager. B. Operations manager. C. Brokers.” The B version questionnaire also included “Operations personnel.”

Specialization or Skill Differentiation

“As a result of your training and experience, how confident do you feel as to your ability to handle well the following types of business?” This question was followed by 16 types, municipals, underwriting, big blocks, etc. The 16 ratings allowed for the construction of a profile for each employee in the sample. All profiles could be compared with each other. Each employee was represented as a point in a 16-dimensional space and the Euclidean distance was simply a number associated with a pair of individuals that reflected the degree of skill dissimilarity. The greater the distance between two brokers, the higher the dissimilarity between them. The mean distance between all employees within an office represented the degree of specialization.

Social Interdependence

1. “To what extent do you feel that you and the other brokers in your office belong to a team that works together?”
2. “To what extent do you feel that the brokers in your office are in direct competition with one another for the better accounts and other advantages, in such a way that each is trying to get ahead at the expense of others?”
3. “From what you know or have heard, how do the men in your office compare with those in other offices when it comes to sticking together and helping each other out?”
MEASURES OF ORGANIZATIONAL EFFECTIVENESS

Morale
How satisfied are you with A. Your pay, B. Your colleagues, C. Your supervisor, and D. The company. The scores were aggregated to obtain a measure of morale.

Anxiety
1. “To what extent do you feel jumpy and tense as a result of your job?”
2. “To what extent do you suffer from loss of sleep because of job pressures?”

Loss Due to Errors
This was the total number of dollars paid during 1969 as compensation for transactional errors.

Total Production
1. Total commission earned during 1969 from providing services to customers.
2. Number of new accounts.
3. Number of active accounts.

Decline in Production
This measure was based on the same information as total production. Change scores over the period 1967–1969 were computed. This measure as well as the two previous ones were standardized with respect to size.