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Adaptive Latitude: Environment, Organization, and Individual Influences

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This study examines a hierarchy of adaptive latitude and the influence of environmental, organizational and managerial characteristics on firm adaptation across three industries (aerospace, electronic components, and paper products). Results show that environmental characteristics had the greatest impact on adaptive latitude, followed by organizational characteristics. J BUSN RES 2000. 50.259–272. *© 2000 Elsevier Science Inc. All rights reserved.*

A thesis central to the strategic change and adaptation literature is that managers cope with changes in their environments by choosing a variety of adaptive responses. However, while strategic and structural adaptive responses have received empirical attention (Ginsberg and Venkatraman, 1995; Jennings and Seaman, 1994; Wiersema and Bantel, 1993), relatively little information is available on other types of adaptation (Ginsberg and Buchholtz, 1990) or whether there is a hierarchy among options or responses. Moreover, while scholars agree that policy makers are constrained and enabled by individual and organizational characteristics, as well as by influences from the external environment, most research has investigated one or two of these influences in isolation from the others.

One purpose of this study was to investigate whether organizational policy makers faced with a changing environment choose a variety of adaptive responses that vary in breadth and cost (referred to here as adaptive latitude) and employ them in a progressive hierarchy. A second purpose was to investigate the extent to which environmental and organizational factors, along with personal characteristics of managers, limit or favor efforts of policy makers to adapt. Although strategic choice theorists and population ecologists differ about which is the most important or powerful set, researchers generally agree that each set may be employed to account for adaptive responses (Hambrick and Finkelstein, 1987; Hrebiniak and Joyce, 1985). Few empirical studies, however, jointly examine the environmental and organizational factors that account for variations in adaptive responses (cf. Boeker and Goodstein, 1991; Jennings and Seaman, 1994; Wiersema and Bantel, 1993; Zajac and Kraatz, 1993).

Specifically, this study investigated the extent to which different types of adaptive responses, ranging from procedural to strategic, are explained by perceptions of the external environment (uncertainty, heterogeneity, and market competitiveness), by characteristics of the organization (age and size of the firm, structure, and strategy), and by characteristics of management (tenure and age of the chief executive). To provide greater latitude in testing and interpreting the effects of these factors on adaptive responses, we examined firms across three different industries—aerospace, electronic components, and paper products.

Theory of Adaptation and Adaptive Latitude

Adaptation is a general term for the process of accommodation between an organization and its environment whereby policy makers modify an organization's structure and processes or its alignment with the environment in order to maintain and improve performance (Lawrence and Dyer, 1983; Ungson,

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Journal of Business Research 50, 259–272 (2000)

655 Avenue of the Americas, New York, NY 10010
ISSN 0148-2963/00/$–see front matter
PII S0148-2963(99)00020-X

James, and Spicer, 1985). The theory of adaptation has as its primary focus the critical task of coalignment with the environment and holds that policy makers select organizational forms on the basis of fit with environmental characteristics.

Tushman and Romanelli (1985), along with other researchers, distinguish broadly between two types of organizational adaptations: incremental and radical. Incremental adaptations are those changes that encourage the status quo and that operate through "processes of convergence," whereas radical adaptations are characterized by "processes of reorientation wherein patterns of consistency are fundamentally reordered" (Tushman and Romanelli, 1985, p. 174). Organizational adaptation, as described by Gersick (1991) and Meyer, Brooks, and Goes (1990), consists of relatively long periods of stability or first-order change that involves continuous, rather than small or incremental changes (i.e., equilibrium), punctuated by relatively short or revolutionary periods of second-order change that involves transformations during which the fundamental properties of a system are substantially altered.

Adaptation thus encompasses multiple changes, ranging from changes in an organization's control systems, allocation of resources, technology, and structure to changes in a firm's strategy, rather than a single type of change (Tushman and Romanelli, 1985; Tushman, Newman, and Romanelli, 1986). Most previous empirical studies, however, have focused on only structural and strategic responses to environmental change. For example, using data from American liberal arts colleges, Zajac and Kraatz (1993) examined restructuring as a strategic response to changing environmental conditions. Smart and Vertinsky (1984) described the strategies U.S. and Canadian firms made to cope with crises; Zajac and Shortell (1989) studied the strategic changes hospitals made in response to an environmental shift; and Smith and Curtis (1987) investigated whether 27 railroads changed their strategies prior to and after deregulation.

A purpose of this study was to capture the range of possible adaptive responses suggested by adaptation theorists (Gersick, 1991; Meyer et al., 1990; Miller and Friesen, 1980; Tushman and Romanelli, 1985) by investigating the following six broad categories of changes: procedural (alterations in standardization of rules and procedures); personnel-related (modifications to recruiting, selection, and training practices); process (changes in resources, control systems, and technology); structural (changes in the firm's core structure and facilities); network (changes in suppliers of products or services); and strategic (changes in the firm's products or markets offered, mergers, acquisitions, divestments, and so forth).

Theories of adaptation presume that policy makers vary in how much latitude of action they have in making use of different adaptive responses to environmental change. Hambrick and Finkelstein (1987) proposed in their model of managerial discretion or latitude of action that managers have "many discretionary domains and substantial discretionary range within those domains" (Hambrick and Finkelstein, 1987, p. 396). They regard discretion as involving "actions" rather than merely "choices" as the latter often are merely "cognitive endeavors, some of which realistically can never get converted into actions" (Hambrick and Finkelstein, 1987, p. 373). For example, whereas some courses of action are necessary, others can be avoided (Ungson et al., 1985). Some organizational attributes are easily and quickly changed, such as work procedures and schedules, while other changes such as reorganizations, major modifications to equipment and facilities, or changes in firm strategy are not as easily or quickly accomplished.

While executives have discretion within many domains, "discretion is not an absolute," but is bounded and simultaneously influenced by the interrelated but separate dimensions of characteristics of the organization, conditions of the environment, and the chief-executive's own attributes (Hambrick and Finkelstein, 1987, p. 387). Executive discretion operates within an organizational structure that sets some constraints on decisions and actions, and develops within an environment to which the organization must relate and which, according to ecological theorists and others, significantly influences its adaptive behavior. Moreover, according to upper echelons theory originally proposed essentially as an alternative to an ecological perspective (Hambrick and Mason, 1984), executive discretion and choice cannot be understood without taking into account the different experiences, backgrounds, and cognitive processes of the policy makers themselves. A firm's latitude of action would be high, for example, when the market is growing, the firm has abundant resources, and the executive's power base is high. On the other hand, latitude of action would be low when the industry is structured as an oligopoly, the firm is large, and executives lack commitment within the organization (Hambrick and Finkelstein, 1987; Finkelstein and Hambrick, 1990).

Research Hypotheses

Although adaptation takes many forms, theorists suggest that adaptation responses follow a hierarchical (as opposed to haphazard) order or pattern, depending upon the policy maker's analysis of the cost of different options given the demands created by environmental change (Carter, 1990). Tushman and Romanelli (1985) described a hierarchy of adaptive responses, corresponding to how pervasively the action affects an organization's premises or decisions. In his model of adjustments to environmental demands, Miles (1975) also described a hierarchy of adjustments, including procedural, process, structure, and supra or strategic, corresponding to how demanding or costly the adjustment. In support of the notion of a hierarchy of responses, Ginsberg and Venkatraman (1992, 1995) studied tax-return preparation firms confronted with a major technological change—the introduction of electronic filing of income-tax returns—and found that intra-organizational strategies were considered before interorganizational

strategies. According to the notion of logical incrementalism (Quinn, 1980) and the principle of minimum intervention, policy makers who are intendedly rational will attempt to employ courses of action that solve their problems with minimal financial and human cost to their organizations. "To confront a strategic problem by restructuring the entire organization when, in fact, it is possible to achieve acceptable results with a less far-reaching and pervasive approach (e.g., changes in incentives or controls) makes little sense" (Hrebiniak and Joyce, 1984, p. 9). "By adjusting incrementally to changing environmental conditions, an organization can delay or even avoid more costly alternatives while it is in the process of accommodating variation" (Ginsberg and Venkatraman, 1995, p. 428). While multiple courses of action and simultaneous changes during periods of adaptation are possible, we predict that policy makers will tend to make adaptational changes in ascending order of cost and scope:

H1: There is a hierarchy of adaptive changes that can be arranged in ascending order of scope and cost—procedural, personnel, process, structural, business-network, and strategic—such that the less costly and narrowest in scope will occur with significantly greater frequency than will the more costly and broader in scope.

Relating Characteristics of the Environment to Adaptive Latitude

The adaptation hypothesis that structural and other forms of adaptation are determined by the state of the environment presumes the presence of decision makers who will be correct in their perception and analysis of the environment and make requisite adaptive moves. Starbuck and Mezias (1996) note that managerial perceptions often lack consensus and may be unrealistic or inaccurate. Notwithstanding the intractable problem of determining the accuracy of managerial perceptions and the causal indeterminacy of knowing whether environmental perceptions are a consequence rather than cause of organizational attributes and changes, the present study is in keeping with an interpretative approach to organizational environments, an approach which holds that cognitions and perceptions are useful for predicting choices among adaptation responses, even though they may be insufficient for predicting the effectiveness of those responses (Dutton, 1993; Dutton and Jackson, 1987; Huber and Daft, 1987).

In research on adaptation, perceived uncertainty and heterogeneity are considered important environmental variables leading to externally induced changes within organizations (Carter, 1990; Wiersema and Bantel, 1993). Policy makers who perceive that their environments lack turbulence (unpredictability or rapidity of change), tend to pursue strategies characterized by rather small, incremental change (Tushman and Romanelli, 1985), because learning requirements are minimal and policy makers can manage by routines and employ relatively minor responses such as procedural adjustments (Miles, 1975). By contrast, an environment that is perceived as increasingly uncertain may serve to reduce structural rigidity or inertia, thereby enabling policy makers to choose among a range of options. Policy makers who view their environment as heterogeneous (the dissimilarity of different environmental sectors) may perceive a variety of choices with regard to markets, suppliers, customers, and so forth, thereby increasing their adaptive latitude (Hambrick and Finkelstein, 1987). In a study of a group of highly diversified Canadian firms, Miller and Friesen (1982) found that when the environment is viewed as dynamic and heterogeneous, successful firms choose to employ a variety or number of different innovative changes (which indicates greater latitude of action), including changes in the introduction of products or services, changes in the methods of production or the rendering of services, and changes in risk taking associated with growth opportunities.

The competitive nature of an industry further affects policy makers' efforts to adapt to changes in their environments. Birnbaum (1984) studied medical diagnosis and medical therapy firms and found that competitive uncertainty played a larger role in the choice of adaptation strategies than did regulatory and customer uncertainty. Hambrick and Finkelstein (1987) believe that firms within industries that lack latitude in pricing (such as commodity goods), offer policy makers fewer discretionary domains than firms that have latitude in pricing. As Pfeffer and Leblebici (1973) note, "competition constrains the organization's behavior, tending to reduce its profits and to limit the range of discretionary behavior" (Pfeffer and Leblebici, 1973, p. 270). Accordingly, we propose the following (see Table 1 for a summary of the research hypotheses in this study):

H2a: The greater the environmental uncertainty perceived by organizational decision makers, the greater the organization's adaptive latitude.

H2b: The greater the environmental heterogeneity perceived by organizational decision makers, the greater the organization's adaptive latitude.

Table 1. Summary of Study Hypotheses: Relationships with Adaptive Latitude

Environmental variables	
Uncertainty	Positive
Heterogeneity	Positive
Competition	Negative
Organizational variables	
Age of firm	Negative
Size of firm	Negative
Centralization	Positive
Differentiation	Positive
Cost leadership	Negative
Managerial variables	
CEO tenure in position	Negative
CEO Age	Negative

H2c: Adaptive latitude will be negatively associated with market competitiveness.

Relating Characteristics of the Organization to Adaptive Latitude

Adaptive organizational behavior is not only affected by environmental factors, but is facilitated or inhibited by factors in the organization, including the age and size of the firm, its hierarchical structure, and competitive business strategy. As Hambrick and Finkelstein (1987) explain, policy makers exercise a greater level of discretion and latitude of action when there are fewer constraints imposed by an organization's context. As firms age and become larger, structural rigidity and inertial forces increase, potentially constraining the ability of the firm to undertake adaptive changes. Older organizations are less able to change because they have had time to formalize relationships and standardize routines (Kelly and Amburgey, 1991). Hambrick and Finkelstein (1987) proposed that the inertial effects of size outweigh their liberating effects, even though larger organizations may be better able to undertake more and riskier strategic alternatives than smaller firms because of greater organizational slack and a greater margin of error.

An organization's hierarchical structure or hierarchy of authority can impinge on policy makers' freedom or latitude of action in responding to external changes. Because of increased political power, centralized authority gives policy makers greater control over resources (Miller, 1987) and thereby greater control and influence over adaptational changes. Miller and Friesen's (1982) study of 52 Canadian firms described earlier and Miller's (1987) study of 97 small and medium-size firms both found centralization to be related to a greater number of different innovative strategies and courses of action.

The choice of competitive business strategy also affects a policy maker's latitude of action in responding to changes in the environment. Porter (1980) distinguishes among three generic strategies: cost leadership, differentiation, and focus. Cost leadership strategies strive for the lowest costs in an industry while producing a product or service. A differentiation strategy seeks to attain competitive advantage by creating a product or service that is seen by customers to be superior. Focus or niche strategies select a narrow competitive scope within an industry or market and follow either a cost leadership or differentiation strategy within the selected industry or market niche. Because firms pursuing a cost leadership strategy typically have strict internal controls, detailed reporting procedures, highly structured responsibilities, and quantitatively based incentive systems which require relative stability and low change, they tend to do little experimentation with products or organizational processes (Porter, 1980). In contrast, firms pursuing a differentiation strategy allow (and perhaps require) greater adaptive latitude by policy makers because such firms rely heavily on entrepreneurial and innovative behaviors, including creative workers, subjective incentive systems, and frequent changes based on market conditions. Accordingly, we expect that:

H3a: The greater the age of the firm, the lower the organization's adaptive latitude.
H3b: The greater the size of the firm, the lower the organization's adaptive latitude.
H3c: The greater the centralization of authority, the greater the organization's adaptive latitude.
H3d: Adaptive latitude will have a positive association with differentiation strategies and a negative association with cost leadership strategies.

Relating Managerial Characteristics to Adaptive Latitude

Adaptive organizational behavior may depend as much on the characteristics of management as on the characteristics of the environment and the organization. By virtue of their personal characteristics, chief executives will vary in the degree to which they generate and consider multiple courses of action (Hambrick and Finkelstein, 1987). Upper echelon research holds that cognitive biases, values, and perceptions measured by such proxies as tenure and age influence what choices executives make. Research shows, for example, that long tenure of an executive is associated with performance conformity and strategic persistence (Finkelstein and Hambrick, 1990), while short tenure which may be a means by which an organization overcomes inertia is associated with strategic change (Tushman and Romanelli, 1985; Wiersema and Bantel, 1992). As for the age of the CEO, "it is expected that in high-discretion situations, chief executives will tend to be relatively young" (Hambrick and Finkelstein, 1987, p. 396). CEO age has been linked to risky strategies and to firm growth since younger managers typically have less commitment to the status quo and have more favorable attitudes toward risk taking (Bantel and Jackson, 1989; Stevens, Byer, and Trice, 1978). While team analysis is generally superior to an analysis of CEOs, we predict that:

H4a: The shorter the tenure of the chief executive in the position, the greater the organization's adaptive latitude.
H4b: The lower the age of the chief executive, the greater the organization's adaptive latitude.

Methods

Organizations and Executives

The sample frame for this study was selected from *Ward's Business Directory of U.S. Private and Public Companies* (Edgar, 1994). The Ward's directory was used because it contains a complete list of public companies and is also a leading source of information about companies that are not publicly traded

or are subsidiaries of larger companies. The directory includes more than 140,000 companies (90% of which are private) and lists CEO names, addresses, sales information, employee figures, and four-digit Standard Industry Classification (SIC) codes.

A two-step approach was used to select the sample from the Ward's directory. First in accordance with Jennings and Seaman's (1994) recommendation that researchers use a multi-industry approach when examining the relationships among strategy, structure, and adaptation, and because adjustment patterns may differ among industries (Ungson et al., 1985), we selected three industry strata, representing, respectively, declining, growing, and stable or mature industries. The three industry strata were: (1) aerospace (SIC 372 and 376); (2) electronic components and superconductors (SIC 367); and (3) paper and allied products (SIC 26). Random samples of 350, 350, and 350 were drawn from the three strata, respectively, for a total of 1050 firms. The firms that were randomly sampled had the same general distribution of characteristics in terms of SIC code and size and age of the firms as the firms in the sample frame.

Since 1991 there have been extensive changes in the environments of aerospace firms. Declining sales of planes, jets, missiles, and other space vehicles, coupled with restraints on federal military expenditures and the dissolution of the Soviet Union, have led to downsizing and consolidation in this industry (*Fortune*, 1994). The aerospace industry saw a shipments decline of −0.5% in 1992 and −11.1% in 1993, and was predicted to be one of the weakest industries in 1994 (Menes, 1994). Edgar (1994) predicted a decrease of approximately 11% in shipments in 1994, while Standard and Poor's (1994) predicted a 6% decline.

The electronic components industry is the fundamental building block for the electronic components industry and has benefited from a growing demand for autos, computer equipment, and telecommunications. This industry saw shipments growth of more than 13% in 1992 and more than 11% in 1993, and was predicted to be one of the two fastest-growing industries in 1994 (Menes, 1994), with sales predicted to increase as much as 26% (Standard and Poor's Register of Corporations, Directors, and Executives, 1994).

The paper and allied products industry covers 17 manufacturing sectors that process wood, wastepaper, other cellulose fiber, and plastic film into thousands of end products. This industry constitutes a "high quality, high-volume, low-cost producer that benefits from a large consumer base, a modern technical infrastructure, adequate raw materials, and a highly skilled labor force" (Edgar, 1994, p. 10-1). This industry saw a shipments growth of 1.0% in 1992 and 0.5% in 1993, and had a predicted growth of 2% annually through 1998 (Edgar, 1994). The contrasting features and growth scenarios of these industries provide the motivation to test the research hypotheses in each industry.

On the premise that top administrators can provide reliable information about basic environmental and organizational characteristics of their organizations (cf. Hrebiniak and Snow, 1980), and in accordance with the Total Design Method (TDM) described by Dillman (1978), we mailed questionnaires, accompanied by postpaid return envelopes and cover letters, to the chief executive officers (chairman, CEO, and president) of the 1050 firms in the sample. The cover letter served to identify the sponsor of the study and explain its purpose and why it is important that executives fill out the questionnaire, assuring them of confidentiality. A reminder letter with a replacement survey questionnaire was mailed three weeks after the initial mailing. The second mailing increased the response rate by approximately 10%. Approximately 70 surveys were undeliverable and excluded in calculating the response rate.

Although the limitations of using a single informant to provide information about an organization have been discussed in previous studies, our approach of collecting data using only one informant per organization has been upheld by Huber and Power (1985) and Jennings and Lumpkin (1992). Follow-up semi-structured interviews on the telephone or face-to-face were also conducted approximately one month after administering the questionnaire with four to five executives from a representative sub-sample of firms within each industry in an attempt to confirm questionnaire responses. Although many interview questions specifically related to the research hypotheses, the executives were encouraged to describe whatever environmental and organizational events seemed significant to them.

The response rates of 31.1%, 34.8%, and 36.3%, respectively, for the aerospace electronic components, and paper products industries are typical for research using CEOs as respondents (Milliken, 1990). Although nonresponse bias is always a concern when response is voluntary, nonresponding firms did not differ significantly from responding firms in annual sales ($t = 2.09$, $df = 52$, $p = 0.34$), and a chi-square analysis indicated that nonresponding firms did not differ significantly from responding firms by industry strata ($\chi^2 = 1.39$, $df = 2$, $p = 0.50$).

The executives included 342 males and 14 females, a mean age of 41 to 50 years, a mean time in present position of 6 to 10 years or more, and a mean time with the company of 11 to 15 years or more. A large number of respondents held a college (161) or advanced degree (139); the others held an associate degree (25) or had a high school education (27).

Over half the responding firms employed fewer than 500 workers and only 15% employed over 700 workers. The mean age of the companies was 42.93, 42.75, and 55.78 years for the aerospace, electronic components, and paper products firms, respectively. Approximately 50% of the aerospace firms reported a declining change in sales in 1993. By contrast, a majority of the paper products firms (approximately 77.2%) reported a growth rate equal to or less than 20% annually,

and 34.4% of the electronic components firms reported an average annual growth rate of 20% or greater.

Measures

Our questionnaire covered all the dependent variables (adaptations) and all the independent variables except size and age of the firm, which were determined from a standard industry listing. The scales we employed had been standardized and validated by other researchers (e.g., Duncan, 1972; Miller and Friesen, 1982; Negandhi and Reimann, 1972; Ungson et al., 1985) and were pilot tested using industry experts. We also attempted to confirm questionnaire responses in post hoc interviews.

ENVIRONMENT. Milliken (1990) and Yasai-Ardekani (1986) both believe that environmental uncertainty should be considered a perceptual phenomenon inasmuch as organizations can only respond to what they perceive; we therefore employed perceptual measures of environment. Environmental uncertainty refers to the extent to which organizational decision makers perceive unpredictable change in the external environment. We used a 10-item measure developed by Duncan (1972) (alpha coefficient = 0.71). The items (reverse scored) require executives to rate the frequency of change (5 = rare, infrequent change to 1 = rapid, intense change) in their firm's external task environment sectors, including distributors; suppliers of equipment, materials, and parts; competitors for customers; government regulators; and developers of new or improved production methods. Environmental heterogeneity signifies the diversity in the firm's suppliers, customers, competitors, and markets. It was measured through a 4-item scale (alpha coefficient of 0.80) developed by Miller and Friesen (1982). Executives describe the diversity of the products/services they offer with regard to customers' buying habits, competition, and the market, using a 5-point Likert scale.

We measured competition using a scale (reverse scored) developed by Negandhi and Reimann (1972). Their scale assesses the extent of market competition faced by a given firm based on the degree of price competition among manufacturers of similar products, the degree of delay in securing a product, and the number of alternatives available to the consumer. Executives indicated which one description best characterized their firm at the time that the survey was completed: (1) severe price competition from other manufacturers of similar products, no delays in securing the product, 5–20 alternatives to customers (a highly competitive market); (2) little price competition, no delays, 2–4 substitutable products available in the same market (a moderately competitive market); and (3) no price competition, 6–24 months waiting time to secure products, no real alternatives (seller's market).

STRATEGY. To measure strategic positioning, we used a scale developed by Powell (1992). This scale was based on the attributes of strategy identified by Porter (1980) and was validated by Powell in an empirical study of firms in the furniture and women's apparel industries. Using a 5-point Likert scale ranging from 1 = not important to 5 = very important, executives were told that each of four strategies (cost leadership, differentiation, focus, and market breadth) is neither better nor worse than another, and were asked to indicate the one that best described their firm's strategy: (1) competition based primarily on overall cost leadership within the industry (a cost leadership strategy); (2) competition based primarily on something other than lowest cost, that is, on product, service, or quality (a differentiation strategy); (3) competition based primarily upon concentration on a rather narrow buyer group, product line, or geographic market (a focus strategy); and (4) competition based primarily upon the breadth of the product line (a market breadth strategy).

CENTRALIZATION. To measure centralization or concentration of authority, we used seven 5-point Likert items adapted by Miller and Friesen (1982) from the work of Hage and Aiken (1969), whose original measure of perceived centralization is among the most commonly identified dimensions of organizational structure. Executives indicate which level of management (from middle to topmost) is responsible for making several different types of decisions, including capital budgeting, acquisition of firms, new product introduction, entry into major new markets, pricing of major product lines, and hiring and firing of senior personnel. The alpha coefficient was 0.74.

SIZE AND AGE OF FIRM. To measure firm size we used the logarithm of the total number of employees for each firm. (A logarithmic transformation provides the most generally useful procedure for effecting linearity [Cohen and Cohen, 1983, p. 257].) Although some researchers have used different measures, such as volume of sales or income, the number of employees has been used as a measure of organization size in many empirical studies (cf. Miller, 1987). Secondary data on the number of employees for each firm was obtained using *Wards Industry 1994 Data*. Consistent with research by Powell (1992), the age of each participating firm was determined by the firm's founding date.

ORGANIZATIONAL ADJUSTMENTS. The frequency of organizational adjustments (adaptive latitude) was measured through a scale developed by Ungson et al. (1985) and adapted by Koberg (1987). This instrument was based on Miles' (1975) theory of adjustments to the environment. Executives are told that organizational adjustments refer to a broad range of changes in organizational procedures, processes, structure, etc., that are undertaken by an organization to maintain and improve its relationship with its environment. Executives indicated how often within the last three years their firm had made a particular adjustment as a direct response to actions by environmental groups such as suppliers, competitors, customers, government regulatory agencies, and so forth. The six categories of adjustments or responses are: procedural (changes in work rules, procedures, and schedules); person-

nel-related (changes in selection, training, and hiring and firing of personnel); process (changes in resources, planning and control systems, and technology); structural (changes in hierarchy and facilities); business network (changes in subcontracting, replacement of suppliers, and vertical disaggregation [Miles and Snow, 1986]); and strategic (changes in product/service offered, mergers, joint ventures, acquisitions, divestments, etc.). The responses for each adjustment variable ranged from "never" to "more than ten times" and were assigned weights from 1 to 5. We computed a single composite overall measure of frequency of organizational adjustments (alpha coefficient of 0.73) by averaging the unweighted score on each of the six adjustment variables. Overall the alpha coefficients reported here are generally at an acceptable level, which is conservatively considered around 0.60 (Nunnally, 1967), and are generally consistent with guidelines set up by Van de Ven and Ferry (1980) for measuring organizational attributes.

Determining a period for analysis is always more or less arbitrary (Miller and Friesen, 1980). This study used a three-year period because conditions in the recent past affect current organizational performance, and because organizational decision makers consider the recent past, as opposed to earlier periods, when formulating strategic and other adjustments (Zammuto, 1983). The three-year time period is similar to that used by Boeker and Goodstein (1991) and by Ungson et al. (1985).

We acknowledge that field studies using self-report, cross-sectional data are particularly susceptible to errors resulting from consistency, priming, and problems associated with common method variance (Podsakoff and Organ, 1986). Factual data of which the respondent possesses direct knowledge pose less serious problems, since such data are in principle verifiable. Some of the data collected in the present study (such as level of management responsible for approving decisions and year in which firm was founded) were of this type. Also, Spector (1987) proposed that method variance might well be more of a problem with single items or poorly designed scales and less of a problem with multi-item and well-designed scales. Last, because items on the questionnaire were arranged so that measures of the dependent variables followed the measures of the independent variables (Carter, 1990), and archival data (size and age of the firm) were used, problems of common method variance should be somewhat attenuated.

An indication of the portion of variance attributable to functional relationships and the portion attributable to the use of common methods is nevertheless desirable in survey research. Podsakoff and Organ (1986) suggested a number of statistical procedures whereby common method variance can be checked. Among these procedures is Harman's single-factor test. This test assumes that the first unrotated factor provides a good approximation of common method variance. The higher the amount of variance accounted for by the first factor, the higher would be the common method variance. Factor analysis of the study research variables revealed first unrotated factors that accounted for 17.1%, 18.2%, and 18.8% of the variances, for the aerospace, electronic components, and paper products firms, respectively. These results indicate statistically that the probability of common method variance is somewhat limited.

Analysis and Results

Tables 2, 3, and 4 present the means, standard deviations, and zero-order correlations among the research variables by industry. Predictably, the six adjustment variables were positively related to each other, findings that are consistent with arguments that firms often undertake multiple adjustments (Koberg, 1987; Miles, 1975; Ungson et al., 1985). In addition, other correlations were generally consistent with theory and research.

Results: Research Hypotheses

As H1 predicted, a correlated (paired sample) *t*-test ($p = 0.05$) shows that the frequency of procedural adjustments was significantly greater than the frequency reported for the other five types of adjustments. Process adjustments were employed significantly more often than structural, network, and strategic adjustments, and network and structural adjustments were employed more often than strategic adjustments. Only four comparisons were not significant: personnel adjustments did not differ from process, structural, and network adjustments, and structural adjustments were employed as often as network adjustments.

Hierarchical regression, an efficient analysis alternative that allows blocking on variables, was used to test the research hypotheses that characteristics of the environment, organization, and management would be related to adaptive latitude. As explained by Cohen and Cohen (1983, p. 137), hierarchical regression analyses allows sets of independent variables rather than single independent variables to be entered cumulatively in a hierarchical order, and upon the addition of each new set, an R^2 is determined (see Table 5). Although the range of the research variables is smaller for some variables (for example, centralization) than for others (for example, environmental heterogeneity) (see Tables 2, 3, and 4), regression coefficients are not affected by range restriction when assumptions of linearity and homoscedasticity are met (Cohen and Cohen, 1983). Examination of scattergrams for size showed no gross violation of these assumptions in any of the three industries.

Hypotheses 2a, 2b, and 2c related characteristics of the environment (uncertainty, heterogeneity, and market competitiveness) to adaptive latitude. Table 5 shows that perceived environmental uncertainty accounted for variations in adaptive latitude (that is, the overall frequency of organizational adjustments) in all three industries. Perceived environmental heterogeneity was not a predictor of adaptive latitude, and

Table 2. Aerospace Industry (n = 122). Means, Standard Deviations and Zero-order Correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Competition	2.63	0.57	1																	
2. Uncertainty	2.67	0.55	0.24*	1																
3. Heterogeneity	2.78	1.13	−0.01	0.24*	1															
4. Cost leadership	4.41	1.05	0.26**	0.05	−0.17	1														
5. Differentiation	4.30	0.84	0.01	0.17	0.17	0.10	1													
6. Focus	3.17	1.40	−0.04	−0.18	−0.04	−0.07	−0.07	1												
7. Breadth	2.67	1.35	0.18	0.12	0.27**	−0.04	−0.02	0.14	1											
8. Centralization	4.31	0.44	−0.03	−0.23*	−0.08	0.15	−0.02	−0.01	−0.16	1										
9. Age of firm	1.55	0.31	0.14	0.03	−0.12	0.34**	−0.18	0.01	0.07	−0.02	1									
10. Size of firm	2.27	0.97	0.07	0.14	0.01	0.27**	0.02	−0.12	−0.18	0.03	0.33**	1								
11. Tenure of position	4.07	1.61	0.09	−0.11	−0.06	−0.08	0.10	0.07	0.05	0.02	−0.18	0.38**	1							
12. Age of CEO	3.49	0.69	0.06	0.09	0.04	0.12	0.32**	−0.01	−0.08	0.04	−0.03	0.04	0.32**	1						
13. Procedural adjustments	3.24	1.00	0.26**	0.27**	−0.03	−0.03	0.01	0.13	−0.16	−0.14	0.03	−0.12	0.07	0.15	1					
14. Personnel	3.14	1.08	0.19	0.19	−0.05	0.09	−0.25**	0.10	0.13	−0.06	0.18	0.09	−0.17	0.02	0.27**	1				
15. Process adjustments	3.20	1.02	0.12	0.27**	0.01	0.19	−0.05	0.01	0.06	−0.17	0.11	0.08	−0.11	0.12	0.31**	0.44**	1			
16. Structural adjustments	2.95	0.98	−0.04	0.14	−0.03	0.07	0.01	0.09	−0.03	−0.01	−0.03	0.13	−0.23*	−0.05	0.13	0.33**	0.40**	1		
17. Network adjustments	3.06	0.97	0.33**	0.33**	0.12	0.17	−0.13	0.14	0.11	−0.16	0.05	−0.01	−0.16	0.19*	0.47**	0.46**	0.46**	0.14	1	
18. Strategic adjustments	2.55	0.94	0.12	0.39**	0.34**	−0.14	0.02	0.06	0.21*	−0.34**	−0.03	−0.07	0.01	0.05	0.14	0.28**	0.36**	0.11	0.24*	1

*$p < 0.05$, **$p < 0.01$.

Table 3. Electronic Components Industry (n = 127). Means, Standard Deviations and Zero-order Correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Competition	2.57	0.58	1																	
2. Uncertainty	2.81	0.48	0.20*	1																
3. Heterogeneity	2.97	1.06	0.06	0.11	1															
4. Cost Leadership	3.59	1.13	0.34**	0.05	0.07	1														
5. Differentiation	4.32	1.07	−0.08	0.09	0.22*	0.23*	1													
6. Focus	3.00	1.20	−0.05	0.01	−0.14	−0.23	−0.11	1												
7. Breadth	3.06	1.14	0.11	0.09	0.09	−0.15	0.08	0.06	1											
8. Centralization	4.29	0.52	0.01	−0.10	−0.09	−0.17	0.04	0.14	−0.04	1										
9. Age of firm	1.32	0.32	0.06	−0.03	0.01	0.01	−0.01	0.09	0.03	0.07	1									
10. Size of firm	1.98	0.69	0.20*	0.13	0.18	0.11	0.09	0.04	0.23*	−0.03	0.48**	1								
11. Tenure of position	4.29	1.61	0.07	−0.01	−0.17	−0.17	−0.15	−0.11	−0.02	0.08	0.08	−0.09	1							
12. Age of CEO	3.40	0.75	0.10	0.19*	−0.09	−0.11	−0.14	0.11	−0.07	−0.04	0.03	−0.06	0.48**	1						
13. Procedural adjustments	3.05	0.91	0.14	0.06	0.21*	0.05	0.01	0.16	−0.01	0.08	0.05	0.05	−0.16	−0.07	1					
14. Personnel adjustments	2.87	0.92	0.14	0.14	0.16	−0.03	−0.08	0.16	0.01	−0.01	0.27**	0.26**	−0.22*	−0.05	0.38**	1				
15. Process adjustments	2.97	1.03	0.27**	0.23*	−0.04	0.02	0.17	0.08	0.02	−0.10	0.01	0.17	−0.03	0.06	0.33**	0.39**	1			
16. Structural adjustments	2.85	0.96	0.21*	0.33**	0.05	0.05	0.15	−0.02	−0.02	−0.06	0.16	0.27**	0.03	0.06	0.15	0.22*	0.50**	1		
17. Network adjustments	2.86	0.88	0.23*	0.18	0.22*	0.17	−0.01	0.11	0.11	−0.18	−0.04	0.07	−0.14	0.01	0.41**	0.32**	0.35**	0.22*	1	
18. Strategic adjustments	2.50	0.96	0.27**	0.32**	0.14	0.04	0.15	−0.07	−0.05	−0.10	−0.07	0.09	0.19*	0.12	0.12	0.09	0.38**	0.47**	0.22*	1

*$p < 0.05$, **$p < 0.01$.

Table 4. Paper Products Industry (n = 109). Means, Standard Deviations and Zero-order Correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Competition	2.87	0.34	1																	
2. Uncertainty	2.57	0.51	−0.07	1																
3. Heterogeneity	2.73	1.02	−0.10	0.09*	1															
4. Cost leadership	3.88	1.11	0.25**	−0.01	−0.13	1														
5. Differentiation	4.49	0.82	−0.02	−0.07	0.03	0.18*	1													
6. Focus	2.99	1.35	−0.23**	−0.01	0.08	−0.11	−0.04	1												
7. Breadth	2.93	1.12	0.08	−0.01	0.24**	0.10	0.09	0.29**	1											
8. Centralization	4.30	0.55	0.11	−0.12	−0.12	0.17	0.22*	−0.09	−0.06	1										
9. Age of firm	1.65	0.32	−0.09	−0.13	0.04	−0.09	−0.13	0.15	0.05	0.02	1									
10. Size of firm	2.09	0.63	−0.06	0.09	0.03	0.11	−0.03	−0.15	0.04	−0.23*	0.22*	1								
11. Tenure of position	4.38	1.79	0.01	−0.16	0.17	0.01	0.20*	0.10	0.26**	0.11	0.04	−0.24**	1							
12. Age of CEO	3.49	0.72	−0.02	−0.17	−0.01	0.10	0.10	0.20*	0.19*	0.01	0.34**	0.01	0.45**	1						
13. Procedural adjustments	2.91	0.88	0.15	0.21*	−0.03	0.09	0.03	−0.15	−0.05	−0.10	0.01	0.16	−0.14	−0.16	1					
14. Personnel adjustments	2.77	0.89	−0.08	0.24**	0.26**	−0.03	0.02	−0.13	0.11	−0.16	0.04	0.24**	−0.21*	−0.13	0.40**	1				
15. Process adjustments	2.70	1.03	0.09	0.25**	0.23*	0.11	−0.03	−0.12	−0.13	−0.09	−0.13	0.34**	−0.27**	−0.14	0.24**	0.32**	1			
16. Structural adjustments	2.68	0.99	0.01	0.17*	−0.05	0.13	−0.16	−0.04	−0.06	−0.08	−0.02	0.35**	−0.23*	−0.12	0.27**	0.21*	0.50**	1		
17. Business adjustments	2.55	0.82	0.07	0.19*	0.07	0.08	0.03	−0.12	0.09	−0.06	0.13	0.33**	−0.15	−0.07	0.34**	0.31**	0.25**	0.29**	1	
18. Strategic adjustments	2.48	0.97	−0.04	0.02	0.22*	0.12	0.03	0.06	−0.09	−0.01	0.02	0.10	−0.17	0.03	0.14	0.19*	0.48**	0.25**	0.22*	1

* $p < 0.05$, ** $p < 0.01$.

Table 5. Hierarchical Regression Results

Industry	Change in Adj. R^2	Beta[a]
Aerospace		
Uncertainty		0.344**
Heterogeneity		0.058
Competition		0.144
Tenure in position		−0.167
Age of CEO		0.193
	0.036	
Age of firm		0.035
Size of firm		−0.043
Centralization		−0.194
Differentiation		−0.315**
Cost leadership		0.026
Breadth		−0.085
Focus		0.161
	0.143*	
$F = 3.08$ $df = 12, 75$ $p < 0.01$		
Electronic components		
Uncertainty		0.215*
Heterogeneity		0.060
Competition		0.378**
Tenure in position		−0.069
Age of CEO		−0.066
	0.012	
Age of firm		−0.039
Size of firm		0.056
Centralization		−0.175
Differentiation		0.213**
Cost leadership		−0.286*
Breadth		−0.256*
Focus		0.115
	0.127*	
$F = 2.59$ $df = 12, 86$ $p < 0.01$		
Paper products		
Uncertainty		0.176*
Heterogeneity		0.166
Competition		0.023
Tenure in position		−0.193
Age of CEO		−0.022
	0.033	
Age of firm		0.003
Size of firm		0.299**
Centralization		−0.013
Differentiation		0.016
Cost leadership		0.141
Breadth		−0.059
Focus		−0.022
$F = 3.49$ $df = 12, 105$ $p < 0.01$	0.146**	

*$p < 0.05$, **$p < 0.01$.
[a]Beta values are for full equation.

market competitiveness was a positive predictor, but only in the electronic components industry. In summary, there is support for H2a, no support for H2b; and some support for H2c.

Hypotheses 3a, 3b, 3c, and 3d related the age and size of the firm, hierarchy of authority, and competitive strategy to adaptive latitude. Age of the firm was not related to adaptive latitude. In the paper products industry, size of the firm correlated significantly with adaptive latitude, but in an unexpected positive direction. A centralized hierarchy of authority was not a predictor of adaptive latitude in any of the three industries. A differentiation strategy predicted adaptive latitude in the electronic components industry but negatively predicted adaptive latitude in the aerospace industry. As predicted, cost leadership strategy was a negative predictor of adaptive latitude but only in the electronic components industry. Therefore, there is no support for H3a, H3b, and H3c and some support for H3d.

The last set of hypotheses related age and tenure in position of the CEO to adaptive latitude. The beta coefficients shown in Table 5 reveal that neither tenure in the position nor age of the CEO was a significant predictor of adaptive latitude. Thus, there is no support for H4a and H4b.

To determine the unique contribution of the environmental, organizational, and managerial characteristics of management to adaptive latitude, we examined the change in the adjusted R^2 (Cohen, 1988). Table 5 reveals that in all three industries, environmental and organizational variables were a significant predictor of adaptive latitude.

The statistical power of the tests was checked to determine the possible effect of sample sizes on the findings. On the basis of a conventional medium-sized effect, as indicated by a population r of 0.30 (Cohen and Cohen, 1983; Cohen, 1988), we determined the odds that a test would be significant to be 0.86, 0.92, and 0.92 for the aerospace, electronic components, and paper products firms, respectively. This value exceeds the acceptable significance value of 0.80 indicated by Cohen and Cohen (1983), and suggests that the size of the study's samples did not significantly bias the findings.

Discussion and Conclusions

Our findings from a group of aerospace, electronic components, and paper products firms suggest that policy makers have adaptive latitude, choose a variety of adaptive responses to environmental change, and employ them in a progressive hierarchy according to scope and cost. Over a three-year period, adjustments that were least costly and narrowest in scope (i.e., procedural) were reported by executives most frequently, and the more costly and broader adjustments (process, structural, network, and strategic) were reported least frequently.

Among the different adaptive responses to environmental challenges described by aerospace executives we surveyed in follow-up interviews were the use of just-in-time (JIT) inventory programs, a procedural adjustment, workforce reductions, a personnel adjustment, cuts in military procurement budgets, and the replacement of 3, 5, and 10 planning-year increments with 1 and 3 year increments, process adjustments, and facilities reductions, a structural adjustment. These executives further expected the industry to see an increased use of

outsourcing (network adjustments), and mergers and acquisitions (for example, Lockheed and Martin Marietta), joint ventures, and expansion into emerging technologies such as remote sensing, solar observatories, and spacecraft systems (strategic adjustments). Executives from the electronic components industry reported adjusting to environmental change by making use of flexible work schedules and part-time workers (procedural and personnel adjustments), by implementing decentralized decision making and allowing employees to exercise more discretion (structural adjustments), by installing new supply and subcontracting systems (network adjustments), and by expanding into foreign markets, refocusing on the core competencies of the firm (strategic adjustments). And executives in paper products firms reported changing the technology of production (for example, the purchase of new machinery or large paper machines), which was a process adjustment, and changing the product mix of the firm (for example, the divestiture of weak business lines such as packaging businesses), which was a strategic adjustment.

All three industries showed a hierarchy of adaptation, although factors in the environment and in the organization and characteristics of management appeared to limit or favor policy makers' efforts to adapt, as proposed by Hambrick and Finkelstein (1987). Our results imply that changing environments are significantly related to adaptation. Among the environmental changes described by executives in the aerospace industry were an increase in industry mergers, see-saw funding, cutbacks in defense and NASA spending, and technological and customer uncertainty. For the electronic components industry, shrinking technology cycles (for example, the introduction of a new technology every 17–30 months) and price-sensitive and cutthroat competition created substantial uncertainties. While one executive commented that "dynamic" is not an adjective some people would use to describe the paper products industry, he noted several uncertainties and changes in the industry, including price swings, increased lumber prices, a gravitation toward large paper machines, expansion of the market for recycled material, and environmental imperatives. Our results also suggest that a highly competitive market environment is related to adaptive latitude in the electronic components industry, a finding that runs counter to the argument that firms in threatening environments respond with rigidity responses (Staw, Sandlelands, and Dutton, 1981). Perhaps the rapidity with which technology was changing in the industry in the early 1990s, as one executive reported in a follow-up interview, dominated price competition, strongly influencing the number of adjustments undertaken by firms in efforts to adapt.

Contrary to our expectations, organizational size was significantly related to adaptive latitude in the electronic components industry. This unexpected positive relationship may be associated with the vigorous steps larger firms in that industry have taken to give workers more responsibility and freedom regarding their duties. In our interviews with executives, they reported that Total Quality Management programs and other quality related or "employee empowerment" initiatives had resulted in greater organizational flexibility and responsiveness.

The effects of competitive strategy for adaptive latitude appear to depend upon the growth rate of the industry in which the firm operated. Whereas strategy had no significant impact on adaptive latitude in the paper and allied products industry, which is relatively stable, in the electronic components industry, a differentiation strategy favored adaptive latitude. In the rapidly growing electronic components industry, a differentiation strategy allows the firm to differentiate itself along several dimensions (Porter, 1985), possibly enabling policy makers to more effectively respond and adapt to the frequent market and technological changes typical of this industry (Porter, 1980). By contrast, a differentiation strategy constrained adaptive latitude in the aerospace industry. Porter (1980) explains that a differentiation strategy often results in a trade-off with a cost position. Therefore, a differentiation strategy may hinder firms in their efforts to achieve alignment in an industry characterized by dramatic restraints on federal military expenditures, and declining sales of planes, jets, missiles, and other space vehicles.

Whether environmental or organizational variables most strongly affected adaptive responses seemed to depend on whether variations in adaptation could be attributed to environmental determinism and strategic choice (Hrebiniak and Joyce, 1985). For example, in a commodity industry such as paper and allied products, the price at which product is offered is partly determined by the price responsiveness of the market, and thus to stay competitive and thrive, a firm must keep abreast of technological advances and market forces. Thus environmental forces outside the firm's control (determinism) had more influence on adaptive responses (as indicated by a significant change in R^2) than organizational factors inside the firm (choice). By contrast, executives in the aerospace and the electronic components industry were faced with technological developments that largely dictated the pace and direction of market change in the industry (determinism), and yet, despite these outside influences, organizational factors such as strategy also influenced adaptive changes (choice). In these high technology industries, strategy can influence such factors as time to market, strategic partnerships, or degrees of innovation, all of which impact adaptive change.

Our findings are limited by the inherent limitations of cross-sectional research, which is of little use in examining proactive or anticipatory adaptation. Also, although we quantified the degree to which organizations undertake adaptive responses to environmental change, we failed to measure the intervening variable of choice and we did not examine the relationship between adaptive latitude and firm performance. Despite its importance to scholars and practitioners alike, performance was difficult to measure because the majority of the firms in our sample are not publicly traded and reliable

performance data are difficult or impossible to obtain. Future research is needed to investigate other kinds of adjustments such as interorganizational linkages and other antecedents of adaptive latitude such as organizational history (Kelly and Amburgey, 1991). Also, future research is needed to determine whether different responses to the same environment are equally effective.

Although the three industries studied are somewhat dissimilar in their growth rate and level of technical development, our results suggests that while firms adopt a variety of adaptive strategies, they still adapted in a hierarchical pattern. This study also suggests that some CEOs had greater adaptive latitude than others and may be better able to achieve coalignment with the environment, depending on the state of the environment and the firm's strategy. For example, by choosing a competitive strategy, policy makers may effectively constrain or enhance their firm's future adaptive latitude. Future research is suggested to investigate the specific contexts, or the sets of environmental, organizational and managerial characteristics which enhance a firm's adaptive latitude. Finally, this study investigated the adaptive capabilities of individual organizations. Future research is indicated to investigate adaptation strategies operating at a different level of analysis, involving the collective adaptation of a set or population of organizations.

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