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CHIEF EXECUTIVE SCANNING EMPHASES, ENVIRONMENTAL DYNAMISM, AND MANUFACTURING FIRM PERFORMANCE

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Chief executives must allocate their scarce time for scanning efforts among relevant domains of their firms' external environment and their firms' internal circumstances. We argue that high-performing CEOs vary their relative scanning emphases on different domains according to the level of dynamism they perceive in their external environments. The concepts of dominant logic and sector importance were used to develop predictions about which external domains and which internal domains should receive relatively more or less scanning emphasis in external environments that, overall, are more dynamic or more stable. A field survey of 105 single-business manufacturing firms evaluated CEOs' scanning emphases and firm performance. Results indicated that, for dynamic external environments, relatively more CEO attention to the task sectors of the external environment and to innovation-related internal functions was associated with high performance. In stable external environments, however, simultaneously increased scanning of the general sectors in the external environment and efficiency-related internal functions produced higher performance. These relationships were strongest between relative scanning emphases among domains and sales growth. We discuss the implications of these results for researchers and practitioners. Copyright © 2003 John Wiley & Sons, Ltd.

Chief executives must selectively allocate their attention: their time is scarce; myriad external and internal data are available to them; and these data typically represent complex, hard-to-interpret phenomena. CEOs must therefore focus on what they perceive to be key subsets of the available data, and by necessity exclude some other, potentially important data sources (Hambrick, 1981; Prahalad and Bettis, 1986). This 'scanning selection' task is made even more difficult because some inconsequential data sources may be readily available or even stridently seek attention, while other, more critical sources may be elusive, subtle, or hidden from view. In spite of these challenges, effective scanning emphasis remains a prerequisite to successful organizational adaptation. As Hambrick has noted, an 'organization's executives can only act on those phenomena to which their attention is drawn' (Hambrick, 1981: 299).

Effective scanning underlies the sound executive judgment and choices that are essential for strategic

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success (Child, 1972, 1997; Priem and Cycyota, 2001). Thus, scanning may represent a 'dynamic capability' for the firm (Eisenhardt and Martin, 2000). Moreover, executives are likely to have greater discretion over actions like scanning, which involve their own, individual activities, than they have over organization-wide activities like strategy implementation. Therefore, they are able to effect change in their scanning patterns when they believe it is warranted, as might be the case when they believe their environment has changed. Finally, executives must consciously select and accurately scan the appropriate environmental sectors before they can hope to initiate effective actions to align their organization with the demands of those sectors. This choice, of where to allocate limited time and attention, is the topic of our study.

Surprisingly, executive scanning emphasis has received less empirical attention from researchers than have some other areas—such as planning, analysis, strategy or decision making—for which scanning is an influential antecedent. Relatively little is known about whether a firm's context may influence the particular sectors of the external environment to which an executive's attention may be drawn, or about how scanning emphasis on particular sectors may be associated with firm performance. An additional factor that limits our knowledge of executive scanning has been the nearly exclusive emphasis of research to date on the external environment (e.g., Aguilar, 1967; Daft, Sormunen, and Parks, 1988; El Sawy, 1985). A firm's internal circumstances also produce important and changeable data that compete for executive time and attention, yet this aspect of executive scanning has been relatively ignored (Bluedorn *et al.*, 1994; Eisenhardt, 1989). The role of firms' internal capabilities in building sustainable advantage, given more balanced treatment in early theory (e.g., Andrews, 1980; Ansoff, 1965), has recently been reemphasized through the 'resource-based view' of strategy (Barney, 1991). If a firm's capabilities are indeed important to performance, executive scanning must produce astute comprehension of changes in *both* the external environment *and* the internal circumstances of a firm before effective adaptation can occur, and both must be considered in scanning research.

Given that: (1) CEOs must make trade-offs regarding which data to attend; (2) executive scanning is an influential antecedent to subsequent action; and (3) effective scanning involves attention to aspects of both the firm's external environment and its internal circumstances; it follows that executive scanning emphasis—that is, the relative scanning effort given to various external and internal domains—may warrant more attention in its own right as a contributor to successful firm adaptation. Our research follows this line of thinking by asking: Which sectors of the external environment, and which aspects of the internal circumstances, should receive relatively more or less scanning emphasis by CEOs of manufacturing firms facing different competitive environments?

LITERATURE REVIEW AND HYPOTHESES

Selective attention

Executives are 'sophisticated information seekers' (Boyd and Fulk, 1996: 2) who nevertheless are constrained by bounded rationality (Cyert and March, 1963). Because the magnitude of the scanning task is beyond any individual's information processing capability, top executives must set priorities in order to cope. Even with this selectivity, however, efforts to monitor solely the external environment can account for as much as one quarter of top executives' time (Hambrick, 1981).

Thus, CEOs' cognitive limits (Simon, 1957) force them to pay selective attention to key criteria in making strategic decisions. March and Simon (1958) further proposed that variables which are largely within the control of problem-solving individuals or organizational units are considered first. If a satisfactory program of activity is not discovered based on these variables, then attention will be shifted to variables not under direct control. Moreover, Thomas, Clark, and Gioia (1993) found that higher levels of information use during scanning lead to a heightened sense of controllability and positive gain regarding these areas, and Sutcliffe (1994) argued that more intense and frequent scanning enhances the recognition of environmental changes. Taken together, these findings imply that: (1) CEOs' cognitive limits mandate that they be selective in the scanning task; (2) higher information use increases the sense of controllability and accuracy regarding the environment; and (3) the focus of information use should be directed primarily to areas deemed important given the competitive environment in which the firm finds itself.

Scanning the external environment

Empirical results have supported the idea that selectivity in scanning contributes to firm performance (e.g., Boyd and Fulk, 1996; Daft *et al.*, 1988). CEOs must invest their 'scarce executive time' (Boyd and Fulk, 1996) in effective scanning activities that will 'pay off' (Fredrickson and Mitchell, 1984). Further, sectors of the external environment differ in importance and uncertainty (Daft *et al.*, 1988), and firms can benefit from emphasis on the 'right' sectors. An underlying theoretical explanation has yet to be advanced, however, specifying the combinations of sectors that should be emphasized in differing contexts. Questions remain concerning which sectors should be given most attention, when, and why. Concerning the external environment, Daft *et al.* (1988) noted that executives could overcome time and information-processing capacity limitations by focusing their scanning on specific sectors rather than scanning broadly. Following from the work of Bourgeois (1980) and Dill (1958), they theorized that the task environment (customer, competitor, and technological sectors) changes more rapidly and is therefore perceived as more important than the general environment (social, economic, and regulatory sectors).

Scanning the internal environment

The early normative literature on strategic planning placed as much emphasis on the *internal* circumstances of the firm as it did on the external environment (Learned *et al.*, 1965). 'The central tenet in strategic management is that a match between environmental conditions and organizational capabilities and resources is critical to performance, and that a strategist's job is to find or create this match' (Bourgeois, 1985: 548). Andrews similarly recognized that both opportunity and competence must be accurately identified for strategic success. In noting the challenges of internal scanning, he argued that: 'The insight required to identify the essential strength justifying new ventures does not come naturally. Its cultivation can probably be helped by recognition of the need for analysis' (Andrews, 1980: 67). More recently, Goodstein, Pfeiffer, and Nolan (1991) have also advocated monitoring the organization's internal circumstances as part of the strategic planning process.

The 'resource-based view' has reemphasized the importance of analyzing a firm's internal strengths and weaknesses during the strategy-making process (Barney, 1991; Wernerfelt, 1984). Work focusing on the less tangible, knowledge-based resources has suggested that the capabilities generated by such resources: are subtle and hard to understand; involve elusive talents that are difficult to link to results; can change quite rapidly; and are important to competitive advantage (e.g., Eisenhardt and Martin, 2000; Lippman and Rumelt, 1982; Miller and Shamsie, 1996). These factors imply, first, that an acute comprehension of firm capabilities is likely necessary for successful capabilities–environment matching, and second, that due to internal change executives must repeatedly scan internally to maintain their understanding of the capabilities of their firms for continued, effective adaptation. We therefore argue that scanning the internal domains is necessary, in conjunction with scanning the external environment, for effective organizational adaptation. An adaptive strategic fit requires relating the firm's strengths and weaknesses to specific opportunities and threats embedded in the external environment; thus, simultaneous scanning of the firm's external environment and internal circumstances is necessary. Most scanning research to date, however, has examined only the external scanning aspects of this theoretical equation, resulting in underspecified empirical models.

Environmental dynamism

Dynamism describes the rate and the unpredictability of change in a firm's external environment (Dess and Beard, 1984), and is particularly important because of its influence on relationships between a variety of firm-level constructs and firm performance. Examples include: organizational structure (e.g., Burns and Stalker, 1961), business-level strategy (e.g., Miller, 1988), and strategy-making processes (see Rajagopalan, Rasheed, and Datta, 1993, for a review, and Priem, Rasheed, and Kotulic, 1995, for an example). Milliken (1987) emphasized the need for expending greater scanning time and effort, overall, under dynamic environments. Daft *et al.* found that CEOs of high-performing firms 'tailor scanning more closely to perceived uncertainty. Scanning efforts are focused more directly on areas of strategic uncertainty and

information need' (Daft *et al.*, 1988: 134). Moreover, considerable empirical work has found positive relationships between the simple *level* of scanning efforts and performance among firms operating in variable environments (e.g., Daft *et al.*, 1988; Glick, Miller, and Huber, 1993; Priem *et al.*, 1995).

Our study addressed the relative scanning emphasis given to different sectors *within* the firm's internal capabilities and external environment, given a particular level of scanning effort, compared *across* firms. That is, does the relative emphasis among sectors affect performance even after considering the effects of the overall level of time and effort expended? In the next section, the concepts of dominant logic and sector importance are used to develop predictions about which internal sectors and which external sectors should receive relatively more or less CEO scanning emphasis in external environments that, overall, are more stable or more dynamic.

The scanning–environment match

The scarcity of executive time indicates that CEOs will focus their scanning efforts on a limited number of sectors. Given this propensity to focus scanning effort, however, the question remains: What determines the scanning emphases that should be pursued by CEOs? Research has shown environmental dynamism to be related to many important strategy variables. We argue in the following paragraphs: (1) that more dynamic environments require more innovation; (2) that innovation is associated with particular aspects of the external environment and particular internal functions of the firm; and (3) that CEOs whose dominant logic emphasizes innovation will find innovation-associated external aspects and internal functions particularly important to scan. We also make similarly structured arguments for stable external environments and efficiency. In each part, we tie relative scanning emphasis on particular external aspects and particular internal functions to performance for firms facing more dynamic or more stable external environments. The concept of dominant logic is crucial to our arguments in the next sections. 'Dominant logic' among a firm's top managers is defined as 'the way in which managers conceptualize the business and make critical resource allocation decisions' (Prahalad and Bettis, 1986: 490). We now compare effective scanning emphases for two different dominant logics: one stressing dynamism and innovation, and another stressing stability and efficiency.

The dominant logic: dynamism and innovation

Strategy research suggests that firms facing dynamic environments must innovate to succeed. Miles and Snow's (1978) case studies, for example, show that 'prospector' firms prosper by confronting uncertainty through product innovation. Firms that do not innovate in dynamic environments fall behind the frequent changes in products and practices common in such environments, and are likely to lose sales (Duncan, 1972; Miller, 1988). Miles and Snow's (1978) 'reactors,' for example, attempt to reduce uncertainty by ignoring their environments and neglecting innovation. These types of firms often perform poorly enough to face the danger of perishing, as one might expect from Bourgeois' argument that 'firms should only reduce uncertainty under stable environmental conditions and that *uncertainty may be functional in volatile environments*' (Bourgeois, 1985: 570, emphasis in original). Thus, firms that confront uncertainty where it exists, via innovation, typically outperform those that ignore its presence. Effective innovation, however, requires scanning focus on appropriate external and internal domains.

Innovation is typically associated with the task sectors of the external environment, since these sectors offer more immediate opportunities for goal attainment and are likely to change more rapidly than are general sectors (Bourgeois, 1980; Daft *et al.*, 1988; Dill, 1958). Product innovation frequently: is driven by changes in customer tastes; provokes reactions from competitors; and requires new technology for implementation (Hofer and Schendel, 1978; Miles and Snow, 1978; Miller and Friesen, 1984; Zaltman, Duncan, and Holbeck, 1973). Innovation helps firms to reap pioneering advantages in environments characterized by intense competition, exponential advances in technology, and frequently shifting customer requirements (Kessler and Chakrabarti, 1996).

The need for particular scanning emphases by CEOs pursuing innovation arises also for internal scanning, because just as external information is abundant, so is internal information. Further, just as scanning emphasis on particular sectors of the external environment is necessary for firms

facing dynamic environments, so may be scanning particular domains within the organization. When developing and maintaining organizational competencies in key technologies through innovation, for example, the market research, product R&D, and basic engineering internal functions may be seen as particularly important by CEOs. Eisenhardt's (1989) inductive study provides an anecdotal example of internal domains that draw CEOs' attention in dynamic environments: the first employee hired by the CEO of a firm facing a high-velocity environment was a manager whose job was to track new product development projects.

These arguments suggest that the dominant logic (Prahalad and Bettis, 1986) of effective CEOs whose firms are facing dynamic external environments will likely revolve around the external environment sectors and the internal capabilities most closely associated with successful innovation. Managers of successful firms in dynamic environments are thus likely to conceptualize their business as involving customer-, technology-, and/or competitor-driven innovation, and to consider internal capabilities in market research, product R&D, and basic engineering as critical to success.

Innovation-centric dominant logic will likely make task sectors of the external environment and innovation-related internal capabilities more salient to CEOs of firms facing dynamic environments. Ratneshwar *et al.* (1997) found that high salience is related to selective attention, with those benefits that are most salient receiving greatest attention. One might similarly expect that those sectors of the external and internal environments that are most closely associated with the dominant logic in a firm will have highest salience for the CEO and thus receive more attention than would less salient sectors.

In sum, these arguments suggest that, for dynamic environments requiring innovation, effective CEOs must draw frequently from their knowledge of the external task environment and internal innovation functions. Scanning emphasis on external task sectors is advantageous in dynamic environments because: (a) scanning the competitive environment helps executives keep track of, and react to or preempt, competitors' initiatives; (b) scanning the technological environment sensitizes them to available solutions that address internal weaknesses or external opportunities; and (c) scanning the customer sector helps in early identification of changes in customer tastes. In dynamic environments, Eisenhardt's medium-grained research suggests that executives: make use of real-time information, 'especially on a firm's competitive environment and operations' (Eisenhardt, 1989: 549); consider multiple alternatives simultaneously; and integrate decisions with one another and with tactical plans as means to arrive at comprehensive and speedy decisions that lead to higher performance. Only simultaneous scanning of external task and internal innovation domains provides the 'raw material' (i.e., the knowledge necessary for matching key environmental conditions with the right organizational capabilities) from which executives in dynamic environments can make sound decisions. Knowledge of the appropriate external environment domains without corresponding knowledge of the appropriate internal capabilities, or vice versa, will not allow effective organizational adaptation. Thus:

> *Hypothesis 1:As perceived environmental dynamism increases, and as scanning emphasis on the internal functions dealing with innovation increases, an increased CEO scanning emphasis on the external task environment is associated with higher firm performance.*

The dominant logic: stability and efficiency

Although crucial in dynamic environments, strong efforts toward product innovation may be superfluous and inefficient in more stable environments (Duncan, 1972; Miller, 1988). This is because: (a) when competitive pressures are not intense, innovation by a firm may usurp its established competitive advantages; (b) when technological changes are not rapid, fewer opportunities may be available to a firm to exploit; and, (c) when customer preferences do not change rapidly, product innovations by a firm may prematurely shorten the life cycles of its strong products (Kessler and Chakrabarti, 1996). Instead, spending time and effort scanning the more remote domains of the external general environment under stable conditions can open up possibilities for developing long-term, resource-enhancing opportunities, and for identifying major threatening events. Increased scanning emphasis on the general environment under stable conditions is unlikely to detract from performance, because scanning the task environment won't absorb as much executive

time when changes take place slowly. Boyd and Fulk (1996) reported anecdotal evidence supporting these notions. Further, Ansoff's (1965) 'awareness strategy' suggested that a firm can gain a strategic advantage during periods of stability by collecting information on vague, ill-defined (i.e., more macro) issues.

Similarly, scanning efficiency functions such as cost controls and operating efficiency may take on greater importance as the external environment becomes more stable. Organizations can analyze long-term, capability-building options for meeting slowly unfolding trends in the general environment. Capital investments that could reduce costs to a particular target level, for example, might open new avenues for achieving long-lasting competitive advantage. The joint exploration of slowly developing opportunities and hard-to-build competencies is possible only in more stable conditions.

These arguments suggest that the dominant logic of firms facing stable external environments will likely revolve around the general sectors of the external environment and efficiency-related internal capabilities. Following the logic outlined for Hypothesis 1: (a) the knowledge of stable-environment CEOs is most appropriate when they view the general sectors of the external environment and the efficiency-related internal capabilities as key to successful adaptation; (b) the importance of these external and internal domains will be higher for CEOs facing stable external environments than for CEOs of firms facing more dynamic environments; (c) CEOs with more appropriate knowledge will put relatively more scanning emphasis on the key domains; and (d) simultaneous scanning emphasis on the key external and internal domains is necessary for successful adaptation. Thus:

> *Hypothesis 2: As perceived environmental dynamism decreases, and as scanning emphasis on the internal functions dealing with efficiency increases, an increased CEO scanning emphasis on the external general environment is associated with higher firm performance.*

In summary, our discussion of the literature established that an organization must have the appropriate competencies in order to capitalize on external opportunities. We have further argued that CEO scanning efforts should emphasize the firm's key competencies and opportunities, and that the specific domains of scanning attention are contingent on the level of dynamism in the firm's external environment. In order for the organization to adapt well when facing a particular level of dynamism, the CEO must match the appropriate scanning emphases in external domains with the appropriate emphases in internal domains. Thus, appropriate scanning of the external environment alone, or of the firm's internal circumstances alone, would not lead to high performance. Finally, 'emphasis' does not imply that the absolute level of scanning for a particular domain is greater than for another; rather, emphasis requires that a firm pay more attention to that particular domain, relative to other sectors, when compared to other firms.

These arguments suggest that the 'scanning selection' task is a contingent one. A context-specific approach to scanning prioritization may be necessary for recognition of suitable opportunities to enhance firms' resources (Pfeffer and Salancik, 1978), build strategic advantage (Dutton and Freedman, 1984), and avoid potential threats (Ansoff, 1975).

METHOD

Sample and procedure

Strong tests of hypotheses involving triple interactions, such as ours, are generally very difficult to plan in field studies (McClelland and Judd, 1993). We maximized statistical power through our data analysis procedure (discussed later) and through our sampling plan. We followed Harrigan's (1983) suggestion that researchers select samples carefully to maximize the chances of detecting hypothesized effects statistically. We established three criteria, *a priori*, for identifying an appropriate population of firms from among those in a large southwestern metropolitan area that appeared in the *Directory of Manufacturers*.

First, to be included in the sample the firm must have been an independent business rather than a subsidiary, a division of another firm, or a unit of a conglomerate. This criterion ensured that the executive's scanning behavior was not influenced by a parent firm, and therefore controlled for firm autonomy (Child, 1972). Second, the firm must have been a single-business firm (Rumelt, 1974). This was determined through each firm's self-classification in the *Directory of Manufacturers* as

operating in only one 4-digit SIC code, or in two 4-digit SICs that could be considered in the same industry. This helped to ensure that the responses of the executives focused only on the environment of the primary business, rather than on the potential multiple environments associated with diversified firms. Finally, firms in the sample must have had from 50 to 99 employees. The minimum of 50 employees helped ensure that the business was a consequential entity. The maximum of 99 employees was established because we anticipated that the scanning emphasis of the CEO would likely have greater influence on performance for smaller than for larger firms (e.g., Miller and Toulouse, 1986). In larger firms the boundaries at which transactions with the external environment take place are far removed from the CEO, and the status of the internal environment may be less accurately perceived by the CEO, because of filtering by multiple layers of managers. Smaller-firm CEOs, on the other hand, may be more involved in both external transactions and internal implementation. Thus, their scanning would likely have greater influence on firm outcomes.

The 320 firms that were initially identified as meeting the three criteria formed the sample population. We anticipated a response rate of less than 30 percent because of two factors. First, because they are located in an area with many universities, some firms may have received numerous previous requests to participate in research studies. Second, the top executives of smaller firms frequently work at both strategic and operating levels, leaving them with little time to participate in academic research. Nevertheless, our goal was to have at least 100 firms in the final sample. After follow-up mailings and phone calls, 116 firms returned usable responses. Three of these firms employed 500 or more employees, and therefore were excluded as much too large. Thus, our overall response rate was 35 percent.

The mean size of the firms was 80 employees (S.D. = 37). They manufactured a variety of products. The average CEO was 50 years old (S.D. = 10.5) and had 21.6 years (S.D. = 12) of industry experience. Their average tenure with the firm was 16 years (S.D. = 11) and in the position of CEO was 11.6 years (S.D. = 10). The executives had varied functional backgrounds, although sales and manufacturing were somewhat better represented. A third of the CEOs had formal business education, mostly at the undergraduate level.

Data collection

The CEOs or presidents of the firms identified as meeting our criteria were sent a letter requesting participation in the study and a packet containing three questionnaires. The letter asked the CEO to complete a questionnaire, and to pass the other questionnaires to others in the firm who were involved in scanning and strategy making. Respondents were promised anonymity and a summary of the results that would indicate how their firm compared to other firms in the sample. The questionnaire was pilot tested using three firms that were not included in the study. This resulted in minor changes to the questionnaire to increase clarity.

Thirty-four of the responding firms returned more than one survey. Follow-up phone calls indicated that the additional respondents tended to be primarily responsible for one major function rather than organization-wide concerns. Moreover, over half of the CEOs of the single-response firms stated in follow-up calls that they were the *only* executives at their firm involved in environmental scanning and strategic decision making. We therefore adopted a key informant approach (see Kumar, Stern, and Anderson, 1993; Seidler, 1974), using data provided by the CEOs only. We conducted interrater reliability checks on organizational-level variables such as size, environmental dynamism, the overall level of scanning, and performance, however, for those firms where we did have multiple respondents. These reliabilities, ranging from 0.69 to 0.88, were satisfactory and validate the use of the key informant approach.

Operationalization of variables

Scanning emphases

We defined a CEO's scanning emphases as the relative importance the CEO places on information from differing domains of the external environment and internal circumstances of the firm. Thus, our first task in operationalizing scanning emphases was to identify relevant domains of firms' external environment and internal circumstances. Daft *et al.* (1988) had identified the 'task' and 'general' environments as relevant domains of the external environment. The empirical groupings they found for some subsectors, however, were not consistent with their expectations. Even less empirical guidance was available for classifying domains of the internal environment.

We began with six questionnaire items used to measure CEO-perceived importance of the external environment domains, one for each sector identified in Daft *et al.* (1988) and Aguilar (1967). These included the market environment, technological environment, competitive environment, political/legal environment, economic environment, and sociocultural environment. Likewise, six items were used to measure the importance of the internal environment domains, one for each activity in the value chain believed by Porter (1985) to be critical to competitive advantage. These included market research, product R&D, basic engineering, financial management, cost controls, and operational efficiency. Each item asked the CEO to rate the importance of the sector on a 7-point scale ranging from 1 (very important) to 7 (not at all important).

For parsimony to reduce the dimensionality of these CEO data, and because of the relative scarcity of empirical data on CEO-perceived external and internal domains, we performed exploratory common factor analyses using oblique rotation on the importance data obtained from the manufacturing firm CEOs. Oblique rotation was used because there was no theoretical basis for assuming that the domains would be fully orthogonal. The external environment domains were factor analyzed first, and then the internal domains. We kept the external and internal domains separated, in separate factor analyses, because the theory of strategic adaptation used in the hypothesis development section requires appropriate matching of the external environment's characteristics with the internal capabilities of the firm. This precludes external and internal areas from falling in the same factor.

Multidimensionality was demonstrated in both the analyses. Each exhibited convergence on a two-factor solution via complementary methods—such as different varieties of the eigenvalue criterion, the scree-plot, and interpretability—as advocated by Kim and Mueller (1978) and Loehlin (1992). In each case, a simpler structure was obtained for the two-factor rather than the single-factor or three-factor solutions. Factor loadings for the two-factor solutions for both the external and internal environment domains are shown in Tables 1 and 2, respectively.

For the external environment, the sociocultural, economic, and political/legal sectors loaded on the first factor (labeled 'scanning emphasis on the general environment'). Market, technological, and competitive sectors loaded on the second factor (named 'scanning emphasis on the task environment'). These loadings are consistent with the literature (e.g., Daft *et al.*, 1988) and permit us to test hypotheses involving differential effects of scanning emphases on task vs. general domains of the external environment.

Table 1. Factor loadings: external environment items

Item	Factor 1	Factor 2
Importance of sociocultural environment	0.81	0.11
Importance of economic environment	0.68	0.28
Importance of political/legal environment	0.54	0.32
Importance of market environment	0.17	0.70
Importance of technological environment	0.26	0.60
Importance of competitive environment	0.15	0.48

Table 2. Factor loadings: internal environment items

Item	Factor 1	Factor 2
Importance of cost controls	0.91	0.15
Importance of operational efficiency	0.87	0.16
Importance of product R&D	0.06	0.80
Importance of market research	0.30	0.63
Importance of financial management	0.51	0.61
Importance of basic engineering	−0.03	0.47

For the internal environment, cost control and operating efficiency loaded on the first factor. Product R&D, market research, and basic engineering loaded on the second factor. Financial management did not exhibit a simple structure, loading on both factors. Therefore, it was dropped from further analyses. We labeled the first factor 'scanning emphasis on efficiency' and the second factor 'scanning emphasis on innovation.' These loadings are consistent with Porter (1980): firms that pay more attention to functions such as cost control and operating efficiency typically tend to emphasize efficiency. On the other hand, sensitivity to trends and developments related to basic engineering, technology and markets, via scanning of internal functions such as product R&D,

market research, and basic engineering, permits firms to pursue innovation. The two internal environment factors, therefore, allow us to test for the differential effects of scanning emphasis on efficiency-oriented vs. innovation-oriented capabilities of the firm.

Environmental dynamism

We measured environmental dynamism using the multi-item scale of Miller and Droge (1986). This Likert-type scale has seen frequent use in the strategy literature (e.g., Miller, 1988; Priem *et al.*, 1995). Our interest was in the CEOs' perceptions of the level of dynamism, because executives act on their perceptions. Further, the study of strategy processes such as executive information search is likely to benefit most from the use of perceptual measures (Boyd, Dess, and Rasheed, 1993; Boyd and Fulk, 1996). The questions, measured on a 1–7 scale, are as follows: 'Our firm must rarely change its marketing practices to keep up with the market and competitors' vs. 'Our firm must change its marketing practices extremely frequently (e.g., semi-annually)'; 'The rate at which products/services are getting obsolete in the industry is very slow (e.g., basic metal like copper)' vs. 'The rate of obsolescence is very high as in some fashion goods'; and 'The production/service technology is not subject to very much change and is well established (e.g., in steel production)' vs. 'The modes of production/service change often and in a major way (e.g., advanced electronic components).'

Firm performance

We expected most of the small firms in the sample to be privately held. We therefore believed it unlikely, based on our past experience, that the CEOs would be willing to provide detailed accounting data on firm performance. Therefore, we used subjective, self-reported measures of performance. The CEOs were asked to report their best subjective estimates of performance compared to similar firms in their industry on a 5-point scale for each of the following: after tax return on total assets, after tax return on total sales, sales growth, and overall performance/success. Measures such as these have been found to be highly correlated with objective measures of firm performance (e.g., Dess and Robinson, 1984; Robinson and Pearce, 1988; Venkatraman and Ramanujam; 1987). Moreover, the literature suggests that subjective measures should be used when interest centers on capturing the perspective of organizational members (Duncan, 1972) and when studying managerial behavior and decision making (Boyd *et al.*, 1993). Five-year average estimates were elicited. This minimized the influence of short-term performance variations, but did in turn require that the CEOs had relatively long tenures as CEO. The explicit performance comparisons to similar firms provided a form of control for differences in performance due to industry (Dess, Ireland, and Hitt, 1990) and strategic group (Hatten, Schendel, and Cooper, 1978) effects. Lastly, the multiple measures were appropriate considering the multidimensionality of the performance constructs (Cameron, 1978; Chakravarthy, 1986). We found a high correlation (0.84) between after tax return on total assets and after tax return on total sales and, therefore, combined these two into an 'accounting return' measure of performance.

Control variables

Consistent with earlier research on smaller firms, we measured firm size using number of employees. The size variable was transformed using the natural logarithm to obtain a normal distribution, and the transformed variable was renamed 'logsize.' The analyses were controlled for logsize because size is a frequent correlate of firm performance. In addition, the analyses were controlled for the overall level of scanning, so CEOs' individual predilections toward scanning would not overwhelm the effects of the relative emphases of their scanning, which is the research interest in this study. Level of scanning was measured using Miller's (1987) four-item, 7-point Likert-type scale, which gathers information on the extent to which various scanning devices are used by the executive's firm.

Data analysis

Hierarchical regression was used to test the hypotheses. To reduce the potential problem of multicollinearity, we centered variables prior to forming multiplicative terms (Jaccard, Turrisi, and Wan, 1990). Because the interaction terms used to test moderation frequently are correlated with the terms from which they are constructed, 'it is necessary to partial the component parts of the product term

from the term itself when evaluating the presence of a moderated relationship. This is the essence of the hierarchical test' (Jaccard *et al.*, 1990: 24). Our hypotheses were for 'double moderation,' wherein the levels of two variables together influence the size of the effect (i.e., the slope) that a third variable has on the dependent performance variable. Thus, we tested our hypotheses with triple interaction terms, with all main effects and double interactions included in the hierarchical process. Only the control variables, the scanning domain variables, and environmental dynamism were entered in the first step of the regression model. Double interactions were added in the second step, and the appropriate triple interactions were added in the final step (Bobko, 1995; Darlington, 1990).

Our revised full regression model is:

$$\begin{aligned} Y = {} & a_1 \text{logsize} + a_2 \text{ scanning level} + b_1 X_1 \\ & + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_1 X_5 \\ & + b_7 X_2 X_5 + b_8 X_3 X_5 + b_9 X_4 X_5 + b_{10} X_1 X_3 \\ & + b_{11} X_1 X_4 + b_{12} X_2 X_3 + b_{13} X_2 X_4 + b_{14} X_1 X_3 X_5 \\ & + b_{15} X_1 X_4 X_5 + b_{16} X_2 X_3 X_5 + b_{17} X_2 X_4 X_5 \quad (1) \end{aligned}$$

where Y = firm performance, X_1 = scanning emphasis on task environment, X_2 = scanning emphasis on general environment, X_3 = scanning emphasis on innovation, X_4 = scanning emphasis on efficiency, X_5 = perceived environmental dynamism, and a_1, a_2, b_1 to b_{17} are regression coefficients.

In the above model, only the appropriate triple interactions, rather than all possible triple multiplicative terms, have been included. Our overarching theory argued that higher firm performance would result when one pre-identified scanning target from the external domain and one pre-identified scanning target from the internal domain receive higher scanning emphasis of CEOs facing either a more dynamic or a more stable environment. Thus, any multiplicative term that does not include one target from the external domain, one target from the internal domain, and perceived environmental dynamism would be considered inappropriate. After eliminating inadmissible combinations, we were left with four possible triple combinations. Although our hypotheses include only two of those four combinations, at this early stage of theory development and exploratory analysis we decided to include the remaining two combinations as implicit controls. By doing so, we are able to demonstrate the unique effects of our hypothesized interactions, over and above any possible effects of the triple interactions that are not hypothesized but that also meet the overarching criteria explained earlier in this paragraph.

Our multivariate, contingency Hypothesis 1 would be supported by a positive, significant triple interaction term for the influence of task scanning, innovation scanning, and dynamism together on the performance measures. Plus, when graphed the interaction would show that the effect of dynamism on performance is greatest at higher levels of task scanning and higher levels of innovation scanning. Hypothesis 2 would be supported by a negative, significant triple interaction term for the influence of general scanning, efficiency scanning, and dynamism together on the performance measures. Further, when graphed the interaction would show that the negative effect of dynamism on performance is greatest at higher levels of general scanning and higher levels of efficiency scanning.

The power to detect interactions is generally low in field studies, due to factors including more noise, less control over measurement errors, the nature of interactions (i.e., often ordinal), and the potential nonlinearity of bivariate relationships involving the dependent variable (McClelland and Judd, 1993). Given that: (1) our hypotheses involve triple interactions; (2) the theory leading up to our hypotheses is well entrenched in the strategy literature; (3) there is no prior evidence that the effect sizes will be large, because similar hypotheses have not yet been tested in the scanning research; and (4) our sample size is not overly large; it is appropriate to use a less conservative criterion for statistical significance (Sauley and Bedeian, 1989; Skipper, Guenther, and Nass, 1967). We therefore selected 0.1, *a priori*, as the appropriate level of significance for testing our hypotheses.

One additional element of our data analysis plan, however, helped further to increase the statistical power of the tests. We conducted the hierarchical regression procedure described above using all of the dependent variables at one time, in a 'repeated measures' regression. This technique has been advocated by several authors as particularly useful for increasing statistical power in research areas—such as leadership, group, and organization-level research—where attaining power through large sample sizes is problematic (e.g., Cohen and Cohen, 1983; Hollenbeck, Ilgen,

and Sego, 1994). The technique helps to increase power in at least two ways that are applicable for the current study. First, the use of the multiple performance measures (the repeated measures) in one regression provides the same benefits that a MANOVA does for a series of ANOVAs—the series of individual ANOVAs/regressions is 'protected' from chance-based Type I errors, and the dependent variables together may show a consistent pattern that produces statistical significance in the multivariate analysis when such significance may not be achieved in the individual analyses, thereby reducing Type II errors. The power advantage of repeated-measures regression relative to MANOVA, however, includes a gain from the use of continuous measures as independent variables (Hollenbeck *et al.*, 1994). Second, the repeated measures (i.e., within organizations) aspect of the multiple performance measures is used to increase the power to test the between-organization factors. This is accomplished by identifying the within variance and removing it from the total variance to determine the actual variance that *could* be explained by the between-organizations factors. This latter variance is used as the denominator of the F-test. 'Sensitivity is gained in this instance by removing the within-team variance that would otherwise have been treated as error variance in a typical between subject design (Cohen and Cohen, 1983)' (Hollenbeck *et al.*, 1994: 9). Thus, in testing for all of the performance measures at once the power of the test is increased substantially relative to a sequence of single-dependent-variable regressions.

RESULTS

Descriptive statistics and correlations are presented in Table 3. Cronbach's alpha scale reliabilities are also shown. To test our multivariate contingency hypotheses involving appropriate external and internal scanning emphases in environments of differential dynamism, we conducted the hierarchical regression procedure described above using all of the dependent variables at one time in a 'repeated-measures' regression. The results are shown in Tables 4 and 5 and are briefly described next.

The summary table (Table 4) shows that Step 1—containing only the control and main effect variables—explained a portion of the variance in the three performance measures together. Adding the double interaction terms in Step 2 did not increase explanatory power. The addition in Step 3 of the four specified triple interactions, however, greatly increased the ability to explain performance. Table 5 allows more detailed interpretations. For example, for a given level of scanning firms that paid more attention to the task environment were higher performers. There were no

Table 3. Descriptive statistics and correlations

Variable	α	Mean	S.D.	1	2	3	4	5	6	7	8	9
1. Logsize	NA	4.29	0.44									
2. Scanning level	0.81	3.64	1.40	0.12								
Scanning emphasis												
3. External: task environment	0.61	5.20	1.12	−0.03	0.20*							
4. External: general environment	0.71	3.83	1.38	00	0.16†	0.26**						
5. Internal: innovation	0.65	4.32	1.31	−0.04	0.20*	0.57***	0.34***					
6. Internal: efficiency	0.81	5.93	1.23	0.01	0.02	0.33***	0.14	0.07				
7. Environmental dynamism	0.79	3.49	1.44	0.00	0.18†	0.15	0.16†	0.29**	−0.18†			
Performance												
8. Accounting return	0.91	3.50	1.10	0.06	0.06	−0.03	−0.10	−0.07	0.00	−0.12		
9. Sales growth	NA	3.61	1.15	0.28**	0.09	0.34***	0.14	0.29**	0.03	0.07	0.46***	
10. Overall performance	NA	3.77	1.05	0.18†	0.13	0.09	−0.13	0.01	0.04	−0.16	0.72***	0.57***

Note: $n = 105$; α = Cronbach's alpha (except variables 6 and 8, where inter-item correlations are reported). †$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table 4. Summary table for between firm effects for sales growth, accounting return, and overall performance simultaneously (repeated measures regression)

	Step 1		Step 2		Step 3	
	Between	Error	Between	Error	Between	Error
SS	31.80	246.32	32.12	236.88	102.50	210.23
R^2 (adjusted R^2)	0.13 (0.07)		0.14 (−0.01)		0.49 (.37)	
F	2.2*		1.12		5.21**	
d.f. (numerator/denominator)	7/96		15/88		19/84	
Change in R^2	N.A.		0.01		0.35	
F for change in R^2	N.A.		0.13		14.41**	
d.f. (numerator/denominator)	N.A.		8/88		4/84	
G-G epsilon	0.89		0.89		0.90	

*$p < 0.05$; **$p < 0.001$

Table 5. Tests of hypotheses for between-firm effects for sales growth, accounting return, and overall performance simultaneously (repeated measures)

IV #	Variable	Step 1			Step 2			Step 3		
		SS	DF	F	SS	DF	F	SS	DF	F
1	Logsize	13.02	1	5.07*						
2	Scanning level	0.93	1	0.36						
3	Scanning emphasis on task environment (EXTTASK)	8.29	1	3.23†						
4	Scanning emphasis on general environment (EXTGEN)	2.44	1	0.95						
5	Scanning emphasis on innovation (INTINV)	0.96	1	0.38						
6	Scanning emphasis on efficiency (INTEFF)	2.19	1	0.85						
7	Perceived Environmental dynamism (ENVDYN)	3.97	1	1.55						
8	EXTTASK * ENVDYN				0.17	1	0.06			
9	EXTGEN * ENVDYN				0.12	1	0.05			
10	INTINV * ENVDYN				1.13	1	0.42			
11	INTEFF * ENVDYN				1.07	1	0.4			
12	EXTTASK * INTINV				0.48	1	0.18			
13	EXTTASK * INTEFF				0.54	1	0.2			
14	EXTGEN * INTINV				1.89	1	0.7			
15	EXTGEN * INTEFF				0.01	1	0.00			
16	EXTTASK * INTINV * ENVDYN							9.47	1	3.79†
17	EXTTASK * INTEFF * ENVDYN							21.67	1	8.66**
18	EXTGEN * INTINV * ENVDYN							10.51	1	4.2*
19	EXTGEN * INTEFF * ENVDYN							12.87	1	5.14*

†$p < 0.1$; *$p < 0.05$; **$p < 0.01$

significant effects on performance due to double interactions. But, each of the four triple interactions involving an internal scanning domain, an external scanning domain, and environmental dynamism was significantly related to the three performance measures together. This suggests that high performance requires the relative scanning emphases within internal *and* external domains *both* must be appropriate to the level of dynamism in the external environment.

We cannot, however, use the beta weights obtained from multiple performance measures in the repeated-measures regression to accurately specify the triple interaction relationships and compare

Table 6. Full model regression of sales growth

	Variable	Regression coefficient		S.E.
		Identification	Value	
1	Logsize	a_1	0.89	0.23
2	Scanning level	a_2	0.00	0.08
3	Scanning emphasis on task environment (EXTTASK = X_1)	b_1	0.33	0.13
4	Scanning emphasis on general environment (EXTGEN = X_2)	b_2	−0.03	0.09
5	Scanning emphasis on internal innovation (INTINV = X_3)	b_3	0.22	0.10
6	Scanning emphasis on internal efficiency (INTEFF = X_4)	b_4	−0.10	0.12
7	Environmental dynamism (ENVDYN = X_5)	b_5	−0.10	0.08
8	EXTTASK*ENVDYN	b_6	0.15	0.11
9	EXTGEN*ENVDYN	b_7	0.02	0.06
10	INTINV*ENVDYN	b_8	−0.03	0.08
11	INTEFF*ENVDYN	b_9	0.13	0.09
12	EXTTASK*INTINV	b_{10}	−0.20	0.09
13	EXTTASK*INTEFF	b_{11}	−0.13	0.08
14	EXTGEN*INTINV	b_{12}	−0.05	0.07
15	EXTGEN*INTEFF	b_{13}	0.05	0.06
16	EXTTASK*INTINV*ENVDYN	$\boldsymbol{b_{14}}$	**0.15***	0.07
17	EXTTASK*INTEFF*ENVDYN	$\boldsymbol{b_{15}}$	**0.25*****	0.06
18	EXTGEN*INTINV*ENVDYN	$\boldsymbol{b_{16}}$	**−0.13****	0.05
19	EXTGEN*INTEFF*ENVDYN	$\boldsymbol{b_{17}}$	**−0.21****	0.07

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$
Interpretable regression coefficients are in bold font.

them to those we hypothesized. To allow us to explain and graph the triple interactions of interest, Table 6 shows the full regression model for just one dependent performance variable: sales growth. We provide a detailed explanation of how the interaction found in our data compared to the assertions of Hypothesis 1. Then, we offer a similar but briefer explanation of the interaction associated with Hypothesis 2.

The interaction of task environment scanning emphasis, perceived environmental dynamism, and innovation scanning emphasis

The partial derivative of the full regression model over scanning emphasis on task environment (X_1) yields the following equation:

$$\Delta Y/\Delta X_1 = b_1 + b_6X_5 + b_{10}X_3 + b_{11}X_4 + b_{14}X_3X_5 + b_{15}X_4X_5 \quad (2a)$$

Or, in terms of the beta values obtained in our data (see Table 6):

$$\Delta Y/\Delta X_1 = 0.33 - 0.15X_5 - 0.20X_3 - 0.13X_4 + 0.15X_3X_5 + 0.25X_4X_5 \quad (3a)$$

The effect on sales growth (Y) of changing scanning emphasis on task environment (X_1) is a function of perceived environmental dynamism (X_5) and scanning emphasis on innovation (X_3). We examined the relationship by setting perceived environmental dynamism first at its highest value and then at its lowest value in our data. We held the value of scanning emphasis on efficiency constant at its mean.

For the highest perceived environmental dynamism, Equation 3a reduces to:

$$\Delta Y/\Delta X_1 = 0.75 + 0.23X_3 \quad (4a)$$

Equation 4 will yield zero when X_3 has a value of −3.23. Thus, the inflection point of the slope is −3.23. Because the inflection point of the

slope is within the range of values we observed in our data (−3.32 to 2.35), we concluded that scanning emphasis on task environment has a nonmonotonic effect on sales growth over the range of scanning emphasis on innovation when perceived environmental dynamism is the highest. When scanning emphasis on innovation is above −3.23, the equation will be positive but when scanning emphasis on innovation is below −3.23 the equation will be negative. The nonmonotonic relationship indicates that when perceived environmental dynamism is the highest, scanning emphasis on task environment has a positive effect on sales growth for all values of scanning emphasis on innovation above −3.23 and a negative effect on sales growth for all values of scanning emphasis on innovation below −3.23. We plotted this relationship in Figure 1. To plot the graph, we substituted the least and the highest values of scanning emphasis on innovation in our data in Equation 4a. The graph shows (see the square markers) that the inflection point is very close to the extreme low value of scanning emphasis on innovation. Therefore, the relationship is positive over practically the entire range of scanning emphasis on innovation in our data. But, because the slope is an increasingly positive one, we concluded that when perceived environmental dynamism is the highest, the positive impact of scanning emphasis on task environment on sales growth increases as scanning emphasis on innovation increases. This result supports our first hypothesis.

Schoonhoven (1981: 353) has pointed out that 'an assumption of symmetrical effects is hidden in the language of contingency theory' and has suggested investigating symmetrical effects when testing contingency hypotheses such as those at hand. In our case, a symmetrical effect would be demonstrated if at the lowest perceived environmental dynamism the slope of sales growth on scanning emphasis on task environment is decreasingly positive and/or increasingly negative. To examine if this is indeed the case in our data, we substituted the extreme low value of perceived environmental dynamism in our data in Equation 3a, which then reduces to:

$$\Delta Y/\Delta X_1 = -0.05 - 0.59X_3 \qquad (5a)$$

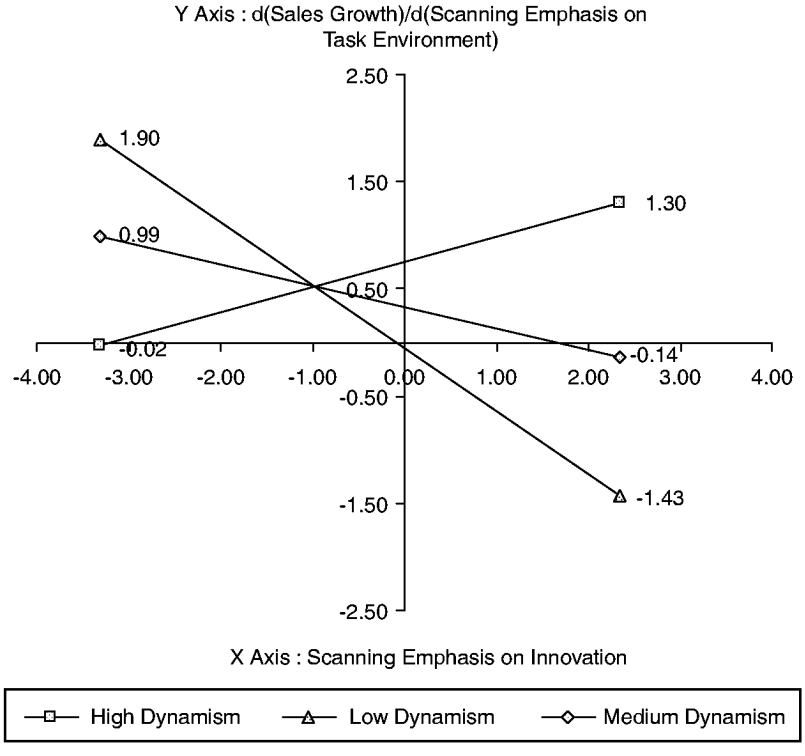

Figure 1. The effect of change in scanning emphasis on innovation and change in environmental dynamism on the relationship between sales growth and scanning emphasis on task environment

Equation 5a will yield zero when X_3 has a value of −0.09. Thus, the inflection point of the slope is −0.09. Because the inflection point of the slope is very close to the mean value (0, after centering) of scanning emphasis on innovation in our data, we concluded that at the lowest perceived environmental dynamism scanning emphasis on task environment has a nonmonotonic effect on sales growth over the range of scanning emphasis on innovation. When scanning emphasis on innovation is below −0.09, the equation will be positive; when scanning emphasis on innovation is above −0.09, the equation will be negative. The nonmonotonic relationship indicates that when perceived environmental dynamism is the lowest scanning emphasis on task environment has a positive effect on sales growth for all values of scanning emphasis on innovation below −0.09 and a negative effect on sales growth for all values of scanning emphasis on innovation above −0.09. Again, we plotted this relationship in Figure 1 (see the triangular markers). At all values of scanning emphasis on innovation below the inflection point, the slope is a decreasingly positive one. Further, at all values of scanning emphasis on innovation above the inflection point, the slope is an increasingly negative one. We concluded that when perceived environmental dynamism is the lowest, (a) the positive impact of scanning emphasis on task environment on sales growth decreases as scanning emphasis on innovation increases up to its inflection value, and (b) the negative impact of scanning emphasis on task environment on sales growth increases as scanning emphasis on innovation increases beyond its inflection value. This symmetrical result further supports our first contingency hypothesis.

By depicting the two graphs in the same figure, we have tried to clearly demonstrate the interaction proposed in Hypothesis 1. In order to further increase clarity, we additionally plotted the relationship at the mean value of perceived environmental dynamism (see the diamond markers). Although infinite graphs are possible (each in a different plane, although they may appear to intersect when presented in a two-dimensional space), just one additional graph would serve to establish the direction of rotation of the slope as perceived environmental dynamism changes as a continuous, rather than a dichotomous variable. Thus, we see that for any unit increase in scanning emphasis on innovation, the slope of sales growth on scanning emphasis on task environment is either decreasingly negative or increasingly positive as perceived environmental dynamism increases from its lowest to the mean to the highest value. This supports our first hypothesis. There is performance gain to increasing scanning emphasis on task environment when scanning emphasis on innovation and perceived environmental dynamism increase simultaneously.

The interaction of general environment scanning emphasis, perceived environmental dynamism, and efficiency scanning emphasis

Analogous to the analysis of Hypothesis 1, the partial derivative of the full regression model over scanning emphasis on general environment (X_2) yields the following equation:

$$\Delta Y/\Delta X_2 = b_2 + b_7X_5 + b_{12}X_3 + b_{13}X_4 + b_{16}X_3X_5 + b_{17}X_4X_5 \qquad (2b)$$

Or, in terms of the beta values obtained in our data (see Table 6):

$$\Delta Y/\Delta X_2 = -0.03 + 0.02X_5 - 0.05X_3 + 0.05X_4 - 0.13X_3X_5 - 0.21X_4X_5 \qquad (3b)$$

For the highest perceived environmental dynamism, Equation 3b reduces to:

$$\Delta Y/\Delta X_2 = 0.03 - 0.41X_4 \qquad (4b)$$

For the lowest perceived environmental dynamism, Equation 3b reduces to:

$$\Delta Y/\Delta X_2 = -0.08 + 0.28X_4 \qquad (5b)$$

Equations 4b and 5b have been graphed in Figure 2 (see the square and triangular markers, respectively), along with an additional graph for the relationship at the mean value of perceived environmental dynamism (see the diamond markers). Figure 2 depicts the following results:

- Scanning emphasis on the general environment has a nonmonotonic effect on sales growth over the range of scanning emphasis on efficiency at all values of perceived environmental dynamism in our data.

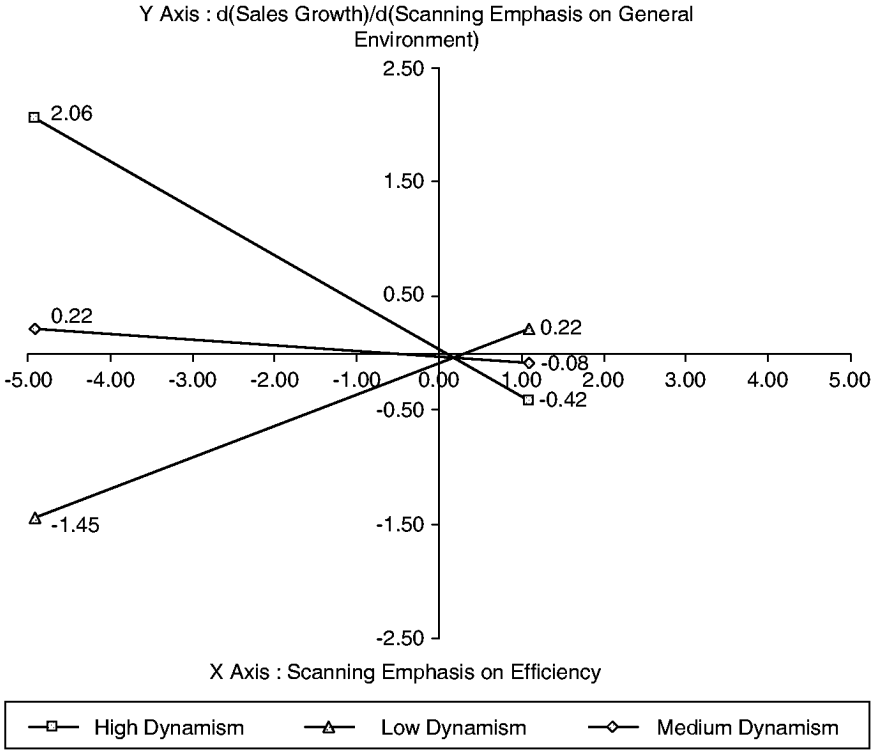

Figure 2. The effect of change in scanning emphasis on efficiency and change in environmental dynamism on the relationship between sales growth and scanning emphasis on general environment

- When perceived environmental dynamism is the lowest (see the triangular markers), the slope of sales growth on scanning emphasis on general environment is either decreasingly negative (below the inflection point of scanning emphasis on efficiency) or increasingly positive (above the inflection point of scanning emphasis on efficiency). We concluded that when perceived environmental dynamism is the lowest, then (a) the negative impact of scanning emphasis on general environment on sales growth decreases as scanning emphasis on efficiency increases up to its inflection value, and (b) the positive impact of scanning emphasis on general environment on sales growth increases as scanning emphasis on efficiency increases beyond its inflection value. This result supports our second hypothesis.
- When perceived environmental dynamism is the highest (see the square markers), the slope of sales growth on scanning emphasis on general environment is either decreasingly positive (below the inflection point of scanning emphasis on efficiency) or increasingly negative (above the inflection point of scanning emphasis on efficiency). We concluded that when perceived environmental dynamism is the highest, then (a) the positive impact of scanning emphasis on general environment on sales growth decreases as scanning emphasis on efficiency increases up to its inflection value, and (b) the negative impact of scanning emphasis on general environment on sales growth increases as scanning emphasis on efficiency increases beyond its inflection value. This symmetrical result provides further support to our second contingency hypothesis.
- Finally, we look at the change in perceived environmental dynamism. From the rotation of the three graphs, we observe that as perceived environmental dynamism decreases from its highest to the mean to the lowest value, the slope of sales growth on scanning emphasis on general environment is either decreasingly negative or increasingly positive when scanning emphasis on efficiency increases. This again supports our second hypothesis. There is performance gain to increasing scanning emphasis

on general environment when scanning emphasis on efficiency increases as perceived environmental dynamism simultaneously decreases.

DISCUSSION

We used the concepts of dominant logic and sector salience to develop predictions about which internal capabilities and which sectors of the external environment should receive relatively more or less CEO scanning emphasis in competitive environments that are overall more stable or more dynamic. We found that simultaneous scanning emphases on those internal capabilities and on those external environment sectors appropriate to the level of dynamism in the external environment produced higher performance. Higher sales growth, for example, resulted for the manufacturing firms in our sample when CEOs facing more *dynamic* competitive environments simultaneously increased their relative scanning emphases on the task sectors of the external environment and on innovation functions in the internal environment. Higher sales growth also occurred when CEOs facing more *stable* environments simultaneously increased their relative scanning emphases on the general sectors of the external environment and on efficiency functions in the internal environment. These results were not as strong, however, for return or overall performance. It may be that the benefits obtained from acute knowledge of the appropriate fit among key external and internal environment sectors pertain more to transactions across firm boundaries (i.e., the top line), and less to profitability (i.e., the bottom line).

Overall, the hypotheses received strong support. Both of the predicted triple interactions were significantly related to sales growth, profitability, and overall performance, together. And, the two triple interactions we graphed for sales growth alone were significant in the precise directions hypothesized. This level of support is far greater than that which would be expected merely by chance.

Our results have important implications for research. First, future studies should include *both* the external and internal environments of the firm when evaluating CEO scanning. Our study found that a simultaneous match among relative scanning emphasis on external sectors, relative scanning emphasis on internal sectors, and dynamism in the external environment was associated with firm performance. Research that emphasizes only one or two of these aspects, as has the earlier scanning work, risks obtaining incomplete or misleading findings. Second, these results on CEO scanning support multivariate contingency and configural theories of strategy (e.g., Miller and Mintzberg, 1984). Configurations may exert their influence from the earliest stages of the strategy-making process. Future studies likely should develop and test more complex contingency and configural theories of CEO scanning. Such theories might explain further and test why a simultaneous match among scanning emphasis on external sectors, scanning emphasis on internal sectors, and dynamism in the external environment may be more strongly associated with sales growth than profitability. Such research may profitably include variables affecting transactions within firm boundaries—e.g., decision-specific and managerial factors (Rajagopalan *et al.*, 1997), and structural factors (Ocasio, 1997; Wally and Baum, 1994)—when developing and testing new contingency theories of scanning and strategy-making processes.

This study also has implications for managers. First, the 'scanning selection' task is important to firm performance. Scanning emphasis on particular sectors of the environment is necessary for an effective strategy-making process. Second, the specific sectors on which to focus depend on the level of dynamism in the firm's competitive environment. Thus, top managers of firms facing dynamic environments should emphasize scanning the external task sectors and the internal sectors associated with innovation. Top managers of firms facing relatively stable environments, however, should emphasize scanning external general sectors and internal sectors associated with efficiency.

Our study has a number of limitations. Since our data were gathered from the CEO—a single respondent—in each organization, the likelihood of common response bias must be evaluated. Doty, Glick, and Huber have noted that 'Common methods variance creates a problem whenever the same informants (or method) provide data for both the independent and the dependent variables in a study *and* a pattern of responses on the independent variables obviously and logically implies a pattern of responses on the dependent variable' (Doty, Glick, and Huber, 1993: 1240, emphasis in original). They went on to

argue that, since the fit operationalizations and configural hypotheses in their study were quite complex, it seemed unlikely that the respondents 'could structure their responses' (Doty *et al.*, 1993: 1240) to produce the hypothesized results. Given the complexity of the variable operationalizations (see below) and the relationships hypothesized in our study—wherein the independent variables were formed from factor analyses of respondents' ratings, and the hypotheses involved relationships moderated by two other variables simultaneously—it appears similarly unlikely that methods bias could be the source of results supporting the hypotheses.

The sample was restricted to smaller manufacturing firms located in a major southwestern state. Although the threat to external validity arising from geographical restriction is likely quite low, our results may not be generalizable to either large manufacturers or to service firms. Also, sample size was limited due to the restricted research budget and the strict criteria for firm selection. This limitation may have relatively little influence on confidence in our results, however, when one considers that some recent scanning studies have had much smaller sample sizes, that we used the relatively powerful repeated measures regression technique (Cohen and Cohen, 1983; Hollenbeck *et al.*, 1994), and that it is generally quite difficult to detect moderating effects in field studies (McClelland and Judd, 1993). In addition, our data are cross-sectional, thereby making even strong causal arguments more tentative. Conservatively, the results could be interpreted to provide preliminary evidence for links between configural executive scanning behavior and firm performance.

Lastly, all the data we analyzed reflect the subjective estimates of manufacturing firm CEOs: first, because our interests centered on CEO perceptions and resulting outcomes; and second, because the strict controls for allowing firms into the sample population effectively eliminated diversified, publicly held firms with their published financial data. Common methods variance is always a potential threat to validity in such situations. The threat posed to our results due to possible common methods variance is limited, however, by the fact that the hypotheses involved triple interactions. In order to 'second-guess' the hypotheses, subjects would have been required to purposely match their responses to the environmental dynamism scale with the importance they devoted to particular external and internal environmental segments and to their responses to performance questions, without any cues as to the predicted 'appropriate' matches required for superior performance. Given the complexity of the hypotheses, it is unlikely that CEOs could have somehow 'structured' their responses to performance questions to reflect previous responses to the multiple items that measured the predictor variables (e.g., Doty *et al.*, 1993).

CONCLUSION

Top managers cannot take effective action to influence organizational processes and outcomes until they form appropriate judgments: (1) about the levels of key variables inside and outside their firm; and (2) about the causal relationships of these variables with one another and with firm performance (Priem and Harrison, 1994). In order to develop these judgments, managers first must prioritize those external and internal areas deserving their attention, and then gather and interpret the most critical data. Scanning is therefore the first step in the chain of activities leading to organizational adaptation (Hambrick, 1981).

Our study suggests that: (1) executive scanning of appropriate sectors in *both* the external *and* internal environments is important to firm performance; and (2) the pertinence of a particular sector depends in part upon the overall level of dynamism in the external environment facing the firm. Executives who do not scan both internally and externally, or who do not appropriately prioritize environmental sectors, will likely be hampered in forming effective judgments about their firm's competitive situation. Their subsequent actions could cause firm performance to suffer.

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