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BREAKING THE SILOS: DISTRIBUTED KNOWLEDGE AND STRATEGIC RESPONSES TO VOLATILE EXCHANGE RATES

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A model of effective decision-making in a situation of distributed knowledge is developed, drawing on three perspectives: the sociocognitive perspective, which focuses on framing issues; the economic perspective, which focuses on the role played by incentives in the integration of knowledge and decision-making authority; and the process perspective, which stresses the role of integrating mechanisms and of processes that either hinder or foster risk awareness and flexibility. The model is tested on a sample of managers from different functional areas of Fortune *500 firms, using strategic responses to exchange-rate volatility as the context. The results show that all three perspectives—framing, incentives and process—are significant in explaining the effectiveness of strategic responses to volatile exchange rates. The findings suggest that simultaneously addressing managerial mindsets, incentives and process may be crucial to generating effective strategic responses across functions.*

INTRODUCTION

The problem of strategic decision-making in cases where knowledge is distributed across functions has seen a resurgence of interest (Prahalad and Doz, 1987; Bartlett and Ghoshal, 1989; Jensen and Meckling, 1990) although the problem itself can be traced back to some of the early thinkers on organization such as Parsons (1960), Cyert and March (1963) and Lawrence and Lorsch (1967). This problem is particularly relevant to managers as they attempt to get various functions to work together in real time on emerging strategic concerns. In strategy research, the issue of the expertise for strategic decision-making being spread across the firm is often assumed away by focusing exclusively on decision-making by the CEO or by the top management team. In reality, strategic decisions are often unstructured and emergent (Mintzberg, Raisinghani, and Theoret, 1976), evolving from complex interactions among individuals and groups in different divisions, functions and situations. They are often made in event time rather than in calendar time: in response to competitors' actions, to changes in the environment, or to internal innovations that cannot wait for the planning cycle.

With global competition, one set of environmental changes is particularly salient—frequent and largely unpredictable movements in exchange rates. These exchange rate changes significantly impact firms' competitive positions, and often call for pricing and sourcing reactions to such changes, as well as strategic choices regarding

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the degree of operational flexibility (Kogut, 1985) to be created to allow for such reactions. These decisions require expertise regarding customers, competitors, and suppliers that resides with line managers as well as functional specialists in marketing or sourcing, in addition to the knowledge about exchange rates, exposure, hedging, and accounting that characterize foreign currency experts in Treasury. None of the groups individually are likely to possess the full range of frameworks or all the current knowledge required to properly make these types of decisions.

Moreover, distributed knowledge within the firm may influence every stage of the strategic decision-making process. In strategic issue diagnosis (Dutton, Fahey, and Narayanan, 1983), for example, the early recognition of a new competitor might happen at the periphery (say, by a sales person in the field, or in a foreign subsidiary), while the knowledge required to recognize it as a strategic issue for the firm that might require a strategic response often lies elsewhere in the organization. The knowledge required for strategy formulation again could lie in multiple locations within the organization, some of which may not even be recognized as having anything to contribute to the decision. Similar problems often arise in strategy implementation. Some researchers (for instance, Shirley, 1982) would go so far as to say that distributed knowledge is a determining characteristic of *all* strategic decisions, which are defined by the fact of requiring inputs from and outputs to multiple functional areas.

While the process of strategic decision-making requires the integration of such distributed knowledge through interfunctional cooperation (Chakravarthy and Lorange, 1991), this integration may be difficult to achieve for a variety of reasons, from the lack of mechanisms (Allen, 1977) and incentives to foster cooperation across intraorganizational boundaries (Jensen and Meckling, 1990) to the existence of subcultures (Van Maanen and Barley, 1984) and of nonoverlapping 'thought-worlds' (Dougherty, 1987) within organizations where problems are framed in very different ways (Schwenk, 1988). Some of the extant research focused on the formulation and implementation of technology strategy, such as the work on new business venturing and product development (Burgelman, 1983; Brown and Eisenhardt, 1995), or on the absorptive capacity of organizations (Cohen and Levinthal, 1990), has recognized the problem created within organizations in areas such as innovation or learning by such 'distributed' expertise. Our work addresses these concerns by proposing and testing a general framework of the factors that influence the effectiveness of strategic decisions that could be applied in a variety of distributed knowledge contexts.

In this paper, we study the impact of factors drawn from multiple theoretical approaches on the quality of strategic decision-making in response to volatile exchange rates—a context where the knowledge required to make effective strategic decisions is distributed within the organization. We develop an integrative model of the effectiveness of strategic responses in a distributed-knowledge context drawing on three perspectives: the sociocognitive perspective in which the 'thought-worlds' (Dougherty, 1987) of the subcultures within the firm, especially of the knowledge-possessing expert function, can facilitate or hinder integration; the economic perspective (Jensen and Meckling, 1990) which emphasizes the role of incentive structures in the integration of knowledge and decision rights; and the process perspective (Chakravarthy and Lorange, 1991) which stresses the role of cross-functional integrating mechanisms in strategic decision-making and of processes that either hinder or foster risk awareness and flexibility. We then test the model through multiple-respondent surveys of 90 senior managers from the Finance and Operations areas of 21 of the 300 largest U.S. manufacturing firms.

The context in which we develop and test our model is one of strategic responses to volatile exchange rates. This is a context where the expertise is distributed across Treasury and operating units, and in which strategic decisions such as the decision to pursue market share at the expense of profitability or the decision to build operational flexibility (Kogut, 1985) may need to be made in event time. In the rest of the paper, the context is described in greater detail and then the model and hypotheses are developed. This is followed by a discussion of the methodology, the results and the implications for practice and further research.

The distributed knowledge context: Strategic responses to exchange-rate volatility

In this paper, we define 'strategic responses' as choices that require one or more of the following: (a) assessment of strategic interactions between

competing firms, (b) evaluation of partially or totally irreversible commitments, (c) assessment of current circumstances and their unfolding dynamics and (d) integration of expertise across functions. In the case of strategic responses to exchange rates, many if not all of these conditions typically prevail. Strategic decisions on pricing or sourcing taken in this context require an evaluation of competitors' cost structures and their likely reactions to moves made by the focal firm; decisions on investments or production, or for that matter on pricing or sourcing, can have long-term effects that are not easily reversible. By their very nature, decisions taken in anticipation of or in reaction to exchange-rate changes require an evaluation of the unfolding dynamics not only of the environment, but of its impact on competitors and their likely reactions over time. Further much knowledge and expertise regarding exchange-rate behavior, generic responses to exchange-rate volatility, and specialized financial risk management approaches lie in Treasury, while many of the strategic decisions that have to be taken in anticipation of volatility are integral to the firm's operations and require specific operational knowledge and, hence, must be made by divisional managers. As stated by David Fiedler (1995: 9), responsible for currency risk management at the Eastman Kodak company,

> Strategic exchange risk is an integral part of a business and inseparable from other strategic business issues. For example, decisions to change where raw materials are sourced, where to manufacture, markets to serve, and so on will all change the nature of the risk embedded in the business. In addition, there are times when the optimal solution to an exposure may be a non-financial hedge that is under the direct control of the operating unit.

Not all potential responses to exchange-rate volatility are strategic, nor do all require the integration of distributed expertise. Corporate responses to volatile exchange rates can range from the purely tactical as, for instance, in financial hedging of contractual or translation exposures (Lessard, 1986; Lessard and Lightstone, 1986) to the strategic: for example, longer-term investment and supply decisions to build operational flexibility in anticipation of volatility (Kogut, 1985; Dixit, 1989a), or building (conceding) market share versus increasing (decreasing) current margins decisions when faced with a cost (dis)advantage from (un)favorable exchange rates (Dixit, 1989b; von Ungern-Sternberg and von Weizsacker, 1990; Sundaram and Govindarajan, 1987).

In this paper, we focus exclusively on strategic responses to exchange rates, as it is in those decisions that the implications of distributed knowledge are most serious. For example, a strong yen creates a strategic window for American firms facing major Japanese competitors in the global market, giving the Americans a range of strategic options in terms of how they might improve their competitive positions, provided they can bring together the expertise on this matter that lies in Treasury, Marketing, Production and Purchasing. A failure to bring this distributed knowledge together at this critical time could lead to missed strategic opportunities with long-term competitive implications. By contrast, in decisions involving tactical responses, such as in financial hedging, treasury staff typically have both the information and authority to hedge such exposures; or the required actions may be fairly simple to coordinate across functions, as in the case of Treasury hedging a specific forward contract initiated by Purchasing, and the problem of distributed knowledge is less serious.[1]

The degree of integration required for strategic responses, i.e. those that require the effective management of competitive or operating exposures to exchange rates,[2] is greater since assessing competitive exposures and deciding how to respond to them requires the active involvement of Marketing, Production, and Purchasing, and the information is not reflected in the firm's accounts. Further, competitive exposures, and the corresponding requirements for cross-functional integration, will be greatest

[1] However, to the extent that the desired level of financial hedging itself is a function of strategic interactions among firms or of specific strategic circumstances as suggested by Froot, Scharfstein, and Stein (1993), such hedging may also include a 'strategic' dimension.

[2] For a definition of competitive or operating exposures, see Lessard (1986) or Lessard and Lightstone (1986). Their critical characteristics for our purposes are that (1) they cannot be estimated from firm's accounting information since they are not yet 'on the books,' rather they must be estimated from operational forecasts, (2) they are not recognized by U.S. accounting authorities (SEC and FASB) as exposures for which recognition of hedging gains and losses can be deferred until the revenues/costs are incurred, rather transactions to hedge these exposures must be marked to market on an ongoing basis, creating even greater earnings volatility.

in industries characterized by global competition (Porter, 1986), where prices that can be charged in different countries are interdependent because of competition and/or the threat of transshipment, and *where competitors typically have different geographical configurations* and, therefore, different operating cost exposures. Examples of such global competitors include computer and other manufacturers of high value to transport cost durables, with commercial aircraft representing perhaps an extreme case. This contrasts with so-called multidomestic industries, in which pricing and sourcing are largely domestically determined even though competitors include multinational firms. An example of a firm in a multidomestic industry would be McDonald's, whose product must be produced and consumed on the spot, and therefore faces little competitive exposure to exchange-rate changes. Packaged consumer goods, as well as durables where service requirements, control over channels of distribution, and nontariff barriers make cross-country segmentation possible, could also fall into this category. Auto manufacturers present an interesting case since their revenue exposures are quite multidomestic, but their cost exposures and the related scope for flexibility represent an extreme case of global competition. What is particularly interesting about the competitive dimension of operating exposure is that it applies even to the domestic operations of a firm facing global competiton.

DEVELOPMENT OF THE MODEL AND HYPOTHESES

Our basic model of the effectiveness of a firm's strategic responses in the distributed knowledge context of shifting exchange rates consists of the following three determinants: (a) the cognitive 'frames' or the 'thought-worlds' of the expert, (b) economic incentives, and (c) the processes for contingent and cooperative behavior within the firm. The choice of these particular perspectives for this model were drawn both from theory and from an analysis of a series of interviews[3] with treasury staff members responsible for foreign exchange risk management as well as planning staff and line operating managers in seven *Fortune* 500 firms, supplemented by student interviews, as part of structured masters' theses in another seven such firms; and from descriptions of practice in these and other firms in the literature.

In these initial interviews, we observed a wide range of styles in managing competitive exposure to exchange-rate changes. In general, these appeared to be influenced by the way the problem was framed as to the 'ownership' of the exposures. At one extreme, treasury units in a number of firms essentially ignored competitive exposures or even all operating exposures and the associated strategic responses. Reasons given included the fact that such exposures, which are associated with anticipated future costs and revenues, are not recognized as 'hedgeable' exposures from an accounting perspective, that they could only be measured inexactly, or simply that they didn't fit into the Treasury's financial definition of exposure. As a result, operating units were implicitly responsible for managing these exposures, with little or no Treasury support either in deciding how to respond to them or in taking into account their impact on performance. This is the opposite of what we define below as a service orientation in Treasury.

Some of the resulting pathologies included financial hedging/trading activities undertaken by operating units that were inefficient from a total organizational perspective, strategic choices that 'paid too much' to reduce competitive exposure, and an absence of organizational learning across business units. For example, in several cases, firms had hedged competitive exposures resulting from purchasing programs in Japan or Germany despite the fact that these were more than offset by opposite revenue exposures (i.e., having offsetting sales in Japan or Germany). Hedging in these cases by the operating units appeared to be driven by salient, discrete exposures, rather than by an assessment of the contribution of various exposures to overall corporate risk. In another case, an operating unit of a firm sacrificed significant cost advantages that would have resulted from backward integration in packaging because it would have increased exchange-rate exposure at the unit level, but would in fact have contributed to little or no change in exposure at the corporate level.

Several firms, while recognizing that competitive exposure 'belonged' primarily to the various

[3] For discussions of the interview results see Lessard and Nohria (1990).

business units, had a variety of processes in place to achieve the required cross-functional and corporate-wide integration. Some had treasury experts who acted as consultants to the business units. The consulting involved explaining and evaluating exposures at the unit level, assessing their contribution to corporate-wide exposures, discussing the range of possible exchange-rate changes over the relevant horizon, or evaluating the relative desirability of financial vs. operational responses to these exposures. One such firm is Kodak, whose practices are described by Fiedler (1995: 9–10):

> ... we have defined the ownership of strategic exposure as belonging to our operating units ... In that context, the Foreign Exchange Planning Department serves as a consultant to the operating units. The consulting role includes extensive education of operating units regarding the nature and intricacies of strategic exposure, performing analytic studies of exposure on behalf of operating units, proposing hedging strategies where appropriate, implementing the strategies when the hedge is a financial hedge.

More typical was a less explicit interaction of Treasury and operations regarding competitive exposures. These included involving treasury experts in occasional studies of sourcing, marketing, and contracting where exchange rate exposure was a key issue, discussions of exposure impacts within the annual planning cycle, and providing inputs regarding the 'planning rates' that would be used for budgeting and planning purposes. Further, treasury groups employed various methods to increase the salience of exchange rate volatility and with it, their own visibility. One Treasury that boasted a state-of-the-art foreign-exchange dealing room, for example, did this by inviting operating managers to 'stop by for a beer' at the end of the trading day to see what was happening in the markets. In some of these firms, there were explicit scenario analyses built into the planning and budgeting process to specifically evaluate the dynamic implications of exchange rates. Often though, interactions were limited or ineffective, and operating managers tended to see exchange rates in terms of the single-point planning rates imbedded in budgets and the after-the-fact adjustments for hedges that they did not often understand.

A few firms formally coordinated Treasury and operating roles through task forces focusing on issues such as sourcing and contracting, as well as through pricing and other market-related decisions that were undertaken by a top management-level group that spanned finance and operations. The firm that was most extreme in this direction was also the one where competitive effects of exchange rates were most salient—the industry was essentially a duopoly involving a U.S. firm with a largely dollar cost base and a foreign firm with a different cost base.

Another set of firms that coordinated the Treasury and operating divisions at top executive levels were those which had few directly recognizable competitive exposures, and therefore few responses that could be handled primarily by the operating units, but where the financial exposures from the international scope of the firms' operations still had significant strategic implications for the firms' long-term growth. Essentially, the ability of these firms to fund their growth options (such as funding research and development) did depend on the stability of the firms' cash flows, which were themselves exposed to currency changes due to the firms' widespread international presence. Although there was little that they could do strategically to alter their operating exposures, they recognized the long-term strategic implications of these exposures and took financial measures to offset them. As Lewent and Kearney (1990: 28) of Merck, one such firm that was included in our study, state:

> we have developed an appropriate financial hedging plan—one that provides management with what amounts to an insurance policy against the potentially damaging effect of currency volatility on the company's ability to carry out its strategic plan.

Issues of framing, therefore, include whether the overall problem to be managed is perceived by Treasury to be a primarily financial one of minimizing reported gains or losses from foreign exchange-rate changes, which might be reinforced both by a multidomestic 'administrative heritage' (Bartlett, 1986) and by accounting provisions that highlight translation exposures; whether the treasury unit views its role as to serve divisional general managers and act as an input to effective overall corporate responses; and further, whether Treasury takes a long-term or short-term view of the problem.

Many of these issues of framing are also likely

to be influenced by, and to influence, the structure of incentives in place. In particular, whether the treasury unit has a narrow functional focus, or whether it appropriately sees its role as assisting operating divisions is likely to be influenced by how its performance is measured and evaluated. If it is structured as a profit center with a primary emphasis on trading profits, it might be expected to have the narrower functional orientation. Whether it even gets involved in managing operating exposures, in contrast to financial exposures that clearly are part of Treasury responsibility, will also depend on incentives, but typically of a more subtle variety. One comment that we encountered several times in our exploratory interviews was that the Treasury shied away from any dealings with operating exposures since 'We don't get credit if things go well but we will be blamed if things go wrong.'

This problem is highlighted by the recent well-publicized case of Metallgesellschaft. While there is considerable controversy over whether the financial hedges employed were technically correct (Culp and Miller, 1994, 1995a, 1995b; Mello and Parsons, 1995), a key problem was that the losses on the financial hedge program were very visible as they had to be marked to market for accounting purposes, while the offsetting gains on future business transactions were not recognized. In effect, if the speculation inherent in the operating exposure associated with a given business strategy is not explicitly recognized, offsetting financial measures taken by Treasury will themselves be viewed as speculative rather than risk reducing.

Further, even in firms where Treasury had an explicit mandate to reduce overall corporate risk, the structure of its evaluation and incentives at times gave rise to Treasury actions that were driven by its desire to 'look good,' but were suboptimal from a corporate perspective. One Treasury, for example, followed a strategy of hedging a limited fraction of the firm's exposure with at or near the money options which are expensive but which are quite likely to be exercised at a profit to the Treasury. While this strategy provided less protection to the firm from extreme exchange movements than a strategy of hedging a larger proportion of the firm's exposure with lower-priced out-of-the-money options, the at-the-money strategy was preferred because it had a higher probability of showing profits directly attributable to Treasury after the fact.

The sponsorship of processes to disseminate information about exchange rates, to infuse the organization with a 'risk perspective' that recognizes exposures and the need to make both anticipatory and reactive decisions, and to share specific expertise relevant to particular decisions, in turn, is likely to depend both on framing and on incentives. Treasury managers who are in a position to take the lead in setting up these processes need to have the right mindsets and the right incentives to collaborate with the operating groups.

These observations from the field confirmed our initial view that for effective strategic responses to take place in a distributed knowledge context, having the right framing, incentives, and processes for cross-functional integration will be important. They also suggested a hierarchy of influence of framing, incentives, and process—with framing and incentives interacting and, in turn, influencing processes. The main thrust of our argument is that *all three aspects*—framing, process and incentives—are important in cross-functional integration for strategic responses (Figure 1), and it is possible that in different contexts the relative importance of each of these three elements might differ.

We test two versions of the model, one with framing first and the other with incentives first. We further control for both the salience of the problem to the firm, and for the extent to which strategic responses to exchange-rate volatility are used by the firm. Firms facing different degrees of global competition are likely to both perceive a need for strategic responses, and to execute

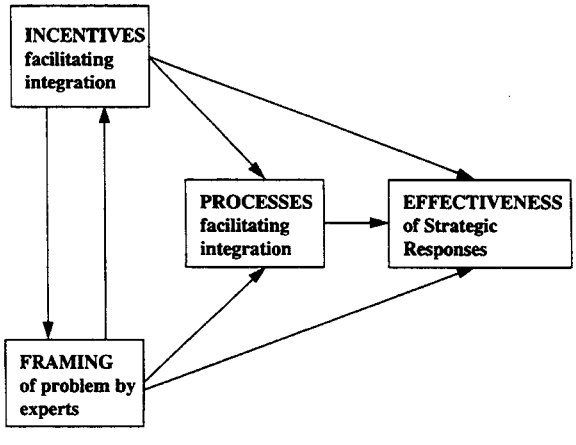

Figure 1. A model of the integration of distributed knowledge for effective strategic responses

such responses to different extents, which in turn could influence their perception of the effectiveness of these responses. Below, we discuss each of the factors in the model and the hypotheses in greater detail.

The sociocognitive perspective: Framing the problem

The way in which subunits 'frame' a particular strategic problem and see their own roles in relation to that problem will affect their responses to it or the extent to which they cooperate with other subunits in dealing with it, thus affecting the quality of the response.

The sociocognitive perspective (Schwenk, 1988; Schneider and De Meyer, 1991; Sims and Gioia, 1986) emphasizes the importance of managerial 'frames of reference' or 'thought-worlds' (Dougherty, 1987) on strategic decision-making. These frames of reference have been shown to influence many aspects of the strategic decision process from the identification of strategic issues (Dutton *et al.*, 1983) to the search for alternatives and to strategy formulation and implementation. These frames tend to be very context-specific and, as such, we had to first elicit what some of these frames might be in the particular distributed knowledge context we were studying and, further, develop hypotheses on how these frames might influence the effectiveness of strategic responses in a distributed context.

The specific orientations we used in our analyses emerged during the course of the exploratory open-ended interviews which we described earlier. We found that the staff experts (in this case, the treasury managers) tended to view their own roles within the corporation in different ways. Specifically, they differed in their perceptions of the importance of their role of providing service to operational divisions (their 'service' orientation) and their role as treasury specialists with the task of reducing foreign exchange risks to their firms' earnings, cash flows, or balance sheets (their 'functional' orientation). A third orientation, trading for profit, was also apparent, although it often appeared to go with a functional risk-reduction perspective.

These goals are not necessarily in conflict. A treasury group could have a strong commitment to overall risk reduction, assistance to operating units, and trading for profit on its own account. However, in a number of cases we observed what appeared to be pursuit of one goal at the expense of the others. One strongly functional-oriented unit was so tied up in accounting issues that it refused to acknowledge competitive exposures given their ambiguous status from an accounting perspective.

It seems reasonable to expect that the emphasis placed on organizational vs. professional or functional goals (Etzioni, 1969; Lansbury, 1978; Rotondi,1980),[4] and the decision time horizons of the experts would both have an impact on effective strategic responses where integration of distributed knowledge is required. In particular, we expect both a high service orientation and high functional orientation in Treasury to lead to more effective strategic responses in this distributed knowledge context. A high service orientation in Treasury, manifested as placing a great deal of emphasis on advice and assistance to the operating divisions, is likely to promote the integration of their expert knowledge into the division's strategic responses. A strong functional orientation in Treasury, by providing links to treasury professionals in other firms, could lead to a deeper knowledge base of the choices and implications of strategic responses when faced with volatile exchange rates, from knowing how other firms have dealt with the problem. As a result, we expect a strong functional orientation in the expert function to also facilitate knowledge transfer and use.

Treasurers further varied greatly on the time horizon over which they made decisions, ranging from those who only made commitments of less than 3 months to those who made decisions involving long-term commitments over several years. We expect more effective strategic responses in the situation where Treasury has a longer time horizon, given that strategic decisions typically cover longer time frames than tactical decisions. The time frame to some extent also proxies for general awareness or understanding of operating as opposed to financial exposures,

[4] We argue that the 'service' and 'functional' orientations we discerned in the treasury experts are similar to the organizational and professional orientations described in the literature on professionalism (Etzioni, 1969; Rotondi, 1980). The latter, of course are richer constructs, covering a wider range of attitudes and behaviors than captured by the 'service' and 'functional' orientations.

since few explicit financial exposures extend beyond 12 months.

This leads to the following hypotheses.

Hypothesis 1: A functional orientation in the Treasury should have a positive impact on the effectiveness of strategic responses in a distributed knowledge context, all else being equal.

Hypothesis 2: A service orientation in the Treasury should have a positive impact on the effectiveness of strategic responses in a distributed knowledge context, all else being equal.

Hypothesis 3: Firms whose Treasuries operate on longer time horizons will be more effective in their strategic responses, all else being equal.

The economic perspective: Incentives and disincentives for interfunctional cooperation

Whenever multiple actors or entities have to share information or effort, the structure of incentives faced by the actors tends to influence the effectiveness of the outcome. When knowledge has to be shared across different subunits for an effective strategic response, incentives promoting or hindering cooperation can be expected to have an impact on the strategic response. The literature in agency theory emphasizes the role played by incentives in bringing together knowledge that is distributed in the organization and decision-making authority (Jensen and Meckling, 1990). In general, wherever cross-functional cooperation is desired, incentives may be required to overcome the costs to individuals of reaching out across intraorganizational boundaries. At the very least, there should not be organizationally imposed disincentives to cross-functional cooperation.

As mentioned earlier, the existence of dysfunctional incentives acting against Treasury cooperation with operations or involvement in hedging competitive exposures was brought to our attention in several of the firms that participated in our first-phase interviews. A typical comment was that there was little incentive for Treasury to advise operating divisions on competitive exposures as it would not contribute to Treasury's direct profits. In some cases, a clear disincentive existed for Treasury to get involved in hedging competitive exposures as Treasury would be blamed for any losses that arose from strategic hedging without getting credit for the offsetting operating profits. Our sense from the exploratory research was that disincentives deterring cooperation between Treasury and operating divisions often prevailed, while explicit incentives to promote cooperation between them were rare or nonexistent. This led us to the following hypothesis.

Hypothesis 4: The lower the incentives for interfunctional cooperation, the lower the effectiveness of strategic responses in a distributed knowledge context, all else being equal.

The process perspective: Processes for cross-functional integration and flexibility

Mechanisms such as cross-functional teams or integrated data bases tend to bring together knowledge from different subunits within the firm, and from a process perspective we expect that firms that have institutionalized such processes will be more effective in their strategic responses. The process perspective emphasizes the importance of implementation processes in the effective execution of strategic decisions (Chakravarthy and Lorange, 1991).

In this distributed knowledge context, two aspects of process become particularly important. First, the existence of cross-functional integrating mechanisms, such as task forces or entrepreneurial 'boundary-spanners' (Allen, 1977) and information dissemination across functional boundaries is likely to have a significant impact on the effectiveness of strategic responses. Some of these mechanisms could be highly formal, for example, periodic circulation of exchange-rate forecasts or the setting up of cross-functional task forces to coordinate exchange-rate responses, both of which we observed. However, all cross-functional mechanisms need not be highly formal. Integration could be facilitated even by an individual from Treasury acting as an internal consultant to the operating divisions.

Second, in the course of our exploratory work, it became apparent that the systems of planning, budgeting and control in use in those firms differed significantly on the extent to which they emphasized exposures to exchange-rate volatility

and encouraged flexible and contingent behavior. A common procedure in budget setting and planning, for example, was for the economics subunit to issue an exchange-rate forecast which then would be used as the basis for budgeting and planning. Since the exchange-rate forecasting 'was done,' no further consideration was given to the potential range of exchange rates in the planning process. Only about half of the firms employed scenario analysis or other methods to explicitly recognize the uncertainty associated with exchange-rate forecasts. We expect firms whose systems allow for flexible and contingent behavior to be more effective in their strategic responses in this context as many of these strategic responses involve building a capacity for flexibility (Kogut, 1985; Lessard and Nohria, 1990). Also, process rigidity built into the budgeting and planning systems can force strategic responses to operate in calendar time, while in this particular context, effective strategic responses need to be made in real time. These observations led to the following hypotheses.

Hypothesis 5: Firms which use many cross-functional integrating mechanisms will be more effective in their strategic responses, all else being equal.

Hypothesis 6: Firms who plan for flexible and contingent behavior depending on exchange-rate movements will be more effective in their strategic responses to volatile exchange rates, all else being equal.

METHODOLOGY

Sample

Our first-phase interviews which led to the development of the model and the structured survey were conducted between 1987 and 1990, with Treasurers or Assistant Treasurers with FX responsibility, Chief Finance Officers, Planners and Divisonal Managers of 14 major *Fortune* 500 companies, numbering over 50 in all. The initial interviews were unstructured, but the later ones were more structured. Individual interviews were typically 1 hour in length and a visit to a particular firm typically lasted the whole day. At some sites, the interviews involved multiple visits to the same sites over several days. Some of the later interviews were conducted by MBA students as part of their Masters' thesis research. They were given specific instructions regarding the information they had to collect—in particular on Treasurers' attitudes towards the problem, on the processes in use for cross-functional integration, on incentives and on the range of corporate responses to the problem. Further, one of the principal researchers was typically present at the beginning and often at the ending of the interview process even where MBA students were involved. Five of these 14 firms were used to pretest the questionnaires, but none of them were included in the final sample used for testing the model.[5]

In testing the model, as it specifically related to distributed knowledge, we sought multiple respondents across functions within each firm, both to get more robust measures of the organizational-level variables (Phillips and Bagozzi, 1982), as well as to be able to tackle the problem of distributed knowledge. Six questionnaires, addressed to individuals responsible for Treasury and Planning (corporate staff), and for Marketing, Purchasing, Plant Siting and Capacity decisions (for a single major business unit), contained a common section to elicit *corporate-wide* views on the effectiveness of strategic responses, integrative processes and processes for flexibility, and to assess the variation among these responses across functions within firms. In addition, each questionnaire included questions specific to the subgroup to which it was addressed. In the case of the foreign exchange manager in Treasury, for example, these specific questions probed more deeply regarding the framing of the problem, both in terms of the goals of the Treasury and the time horizon over which the Treasury operated.

As strategic responses to volatile exchange rates are likely to pose greater difficulties in terms of distributed knowledge in large, complex organizations, we initially contacted the 300 largest industrial firms in the *Fortune* list to ask if they would agree to participate in our survey by distributing the questionnaire to six senior managers responsible for the six different types of strategic decisions involving exchange rates in

[5] Firms interviewed included two manufacturers of photographic equipment and supplies, an integrated oil firm, a chemical firm, three computer and electronics firms, an auto manufacturer, a pharmaceutical firm, a financial services firm, a telecommunications firm, a manufacturer of heavy equipment, and two diversified high-technology manufacturers.

each firm. Of the firms asked if they would participate, 25 declined on the grounds that exchange rates were not a problem for them, 26 declined as a matter of policy, and 48 firms agreed to distribute 207 questionnaires (some of them agreed to distribute fewer than six questionnaires). A total of 150 responses (out of the 207 questionnaires distributed) were received from all 48 firms that agreed to participate in the study. This level of participation in a multiple-respondent survey is as good as or better than other multiple-respondent surveys of firms (Khandwalla, 1976; Henke, 1986; Pearce and Zahra, 1991). As this paper deals specifically with cross-functional integration between Treasury and operating functions, firms with a single respondent and those with no response from Treasury were dropped, leaving us with 90 usable responses from 21 firms. The industries represented by these 21 firms include consumer and industrial products, high-technology firms and mature technology firms, and firms across industries that are typically 'globally integrated' and 'multidomestic'. The respondents were typically Vice Presidents, Senior Vice Presidents and Treasurers.

Operationalization of constructs

The constructs discussed were drawn both from theory and from our interviews, and the specific questions measuring each construct were pretested on a sample of 30 respondents from five firms, very similar to the final firms in the sample. The actual questions that went into each construct are given in Appendix 1.

The outcome measure: 'Effectiveness of strategic responses'

Each questionnaire had four questions on the perceived effectiveness of strategic responses in pricing, sourcing, siting and capacity utilization decisions. All respondents from each firm were asked to rate all of these areas for their firm. An index of the 'effectiveness of strategic responses' (EFFECTIVENESS) was constructed from the aggregated responses to the four questions on perceived effectiveness of pricing, sourcing, plant siting and international capacity loading responses (Cronbach's alpha = 0.93) for each firm. The effectiveness measures were thus not just one individual's perception, but the perception of a cross-functional group of senior managers about the effectiveness of each firm's strategic responses.

A formal test for convergent and discriminant validity of this construct was also done using structural equations modeling (LISREL), treating pricing and sourcing as a separate construct from siting and capacity utilization (using the individual responses rather than the firm-level aggregated construct described above in order to obtain a reasonable size of 137 complete responses for the measurement model). When compared to using all four variables as one construct, there was no difference in the chi-squared values (18.16, $p < 0.001$) and the adjusted goodness of fit was slightly lower (0.81 compared to 0.86) than when they were treated as a single construct. This analysis reinforced our decision to use the aggregated variables as one construct.

Framing

Treasury orientations. The interviews in the earlier phase of this study led us to expect variation among Treasury managers in terms of the three orientations: a service orientation, geared to assisting line units in their responses to changing exchange rates; a functional orientation, focused on financial exposure management; and a trading orientation geared to making a profit trading in the currency markets. In addition, we expected variation in the time-horizons over which the treasurers operated. Nine questions which we felt captured the first three orientations were extracted from the interviews and used in the treasurer's questionnaire and these variables were subjected to a factor analysis to see if our interview-based assumptions on mindsets held in the sample. The factor analysis produced a four-factor solution, two of the factors clearly reflecting the service orientation and the functional orientation we had found in the interviews, while the third factor was uninterpretable and a fourth factor reflecting the trading orientation consisted of a single variable and was therefore dropped. We could not use more precise measurement models or the split-sample method in developing these constructs due to the limitations imposed by the relatively small number of treasurers in our sample.

We decided therefore to focus only on the

service and functional orientations, which were operationalized from the variables in the treasurer's questionnaire. Two of the variables which had loaded together as expected (how important are the goals of 'assisting divisions in identifying exchange-rate impacts' and of 'assisting divisions in maximizing profits when faced with exchange-rate fluctuations') were combined into an index of SERVICE ORIENTATION (Cronbach's alpha = 0.91) in the Treasury manager. Two other variables—how important are the goals of 'minimizing the impact of FX on current year's profits relative to plan' and 'the goal of minimizing balance sheet translation exposure' which had also loaded together as expected—were combined into an index FUNCTIONAL ORIENTATION (Cronbach's alpha = 0.55) to operationalize the extent of functional orientation in the Treasury manager. Though the alpha value here is on the low side, it must be remembered that Cronbach's alpha is highly dependent on the number of variables in an index, and these two variables did load together in the factor analysis. These variables also substantively reflect two aspects of a corporate-finance orientation towards managing the impact of currency movements, one focused on profits and the other on balance sheets. As such, we felt that the index was a reasonable measure of a functional orientation.

Treasury time horizon. The other aspect of treasurer's mindsets that emerged in the course of the interviews, which we felt could be important in the extent to which it affected competitive *strategic* responses, was simply the time horizon with which Treasury operated. Some treasurers seemed to take a very short-term view of what they could and would do, while others took a long-term view which we felt was important for firms trying to build long-term strategic flexibility. The time horizon within which Treasury operates TIMEFRAME (Cronbach's alpha = 0.63) was operationalized as a variable measured in months, constructed from three questions: the extent of use of 'hedging with forwards up to 12 months' (HDGTO12), of 'hedging with forwards from 12 to 24 months' (HDGTO24) and of 'hedging with forwards beyond 24 months' (HDGGT24), as:

$$\text{TIMEFRAME} = \text{HDGTO12} \bullet 6 + \text{HDGTO24} \bullet 18 + \text{HDGGT24} \bullet 36$$

Incentives

The existence of disincentives to Treasury cooperation with operations or in getting involved in hedging competitive exposures came up in the interviews. An index of the existence of such disincentives (DISINCENTIVES) (Cronbach's alpha = 0.63) was created from three questions ('The accounting treatment of hedges against operating exposure makes them extremely unattractive', 'If operating hedges were to result in losses, Treasury would be blamed without taking into account offsetting operating gains' and 'Operating exposure is the responsibility of operating units, not Treasury') which captured the disincentives to cooperation most often mentioned. On a 7-point Likert-type scale, as the response 'Strongly agree' to these statements was coded as '1' and 'Strongly disagree' as '7', the scale was reversed so that high values indicated a high level of disincentives to cooperation.

Processes

Cross-functional integrative. A set of seven variables (see the Appendix for the actual questions used) captured the existence or otherwise of seven cross-functional integrating mechanisms which came up in some of the 'best practice' firms we had identified in our first-phase interviews. These ranged from the existence of cross-functional teams to entrepreneurial 'internal consultants' who acted as boundary-spanners (Allen, 1977) to systematic information dissemination on exchange rates through the companies' management information systems. These seven variables were added together and averaged across all respondents in each firm to give an indicator of the firms' commitment to cross-functional integration through multiple processes (INTEGRATIVE PROCESSES). This construct makes a simple assumption that more integrative processes can lead to better cross-functional integration.

Processes for flexibility. The flexibility or rigidity of the firm's budgeting and planning processes were captured by creating an index (CONTINGENT PLANNING) of four variables (Cronbach's alpha = 0.90) covering the extent to which alternative exchange-rate scenarios and

assessment of foreign-exchange exposures were used in the medium and long-term planning processes of the firm.

Control variables

Salience of exchange-rate volatility to the firm. The impact of exchange rates on multinational firms can be divided into two components: the impact on overseas competitiveness and performance, and the impact on domestic competitiveness and performance. The overseas impact includes both financial effects such as the translation of local currency profits overseas into dollars and the competitive effects of exchange-rate changes on these local currency profits. The domestic impact is limited to the competitive effect.[6]

As the focus of this paper is on the role of Treasury framing and firm-level processes on responses to *competitive exposure* where the problem of distributed knowledge and authority is most severe, we use the perceived impact on domestic competitiveness and performance aggregated across all respondents within the firm (COMPETITIVE IMPACT OF FX) as a control variable. This variable captures industry and firm-level characteristics that determine the salience of competitive foreign exchange impacts on the firm. This variable may also serve as a proxy for the difficulty or complexity of strategic foreign-exchange management.

Extent of use of strategic responses. To explain the perceived effectiveness of strategic responses, we would also need to control for the extent to which strategic responses are relevant in each firm. Firms with limited competitive exposure and/or limited sourcing flexibility face a much simpler set of issues than firms whose prices are interdependent across countries and that face many currency-related options in production. Firms with a limited set of strategic responses to exhange-rate volatility may perceive themselves to be quite effective in making such responses in contrast to firms facing more complex anticipatory and reactive strategic choices that are fraught with uncertainty and distributed knowledge. Since we cannot measure the relevance of strategic responses directly,[7] we control for the extent to which they are used. In so doing, we eliminate some of the possible explanatory power of framing, since we are not able to distinguish between firms that do not adjust prices or sourcing because they should not and firms that do not make such decisions because they are unaware of the competitive nature of their exposures and the associated strategic responses. Further, firms that rarely use strategic responses to exchange rates may be less aware of problems in their implementation, compared to firms that make frequent strategic responses. Some of these implementation problems were highlighted to us during the exploratory interviews. An index USE OF STRATEGIC RESPONSES (Cronbach's alpha = 0.75) was created by averaging the responses of all the raters within each firm of the extent of use of pricing, sourcing, plant siting and capacity loading mechanisms as strategic responses to exchange-rate volatility. Descriptive statistics and correlations of all the variables used in the model are provided in Table 1.

Regression analyses

The model we develop is a hierarchical mediation model (Cohen and Cohen, 1983; Pedhazur, 1982), in which we propose that framing, incentives and process all directly influence the effectiveness of strategic responses; that the structure of incentives and the way the problem is framed by the experts influence each other; and that framing and incentives together influence the existence of cross-functional mechanisms for integration and flexibility within the firm. Since we do not have strong priors regarding the relative hierarchical roles of incentives and framing, we present two alternative first-stage models: one including only framing and one including only incentives. In the model, we control for the salience of the problem to the firm and the extent to which the firm in fact uses strategic responses. Hierarchical reduced-form equations (Cohen and Cohen, 1983) were used to assess the change in R^2 and the significance of the change with the introduction of each new block of variables.

[6] For a discussion of competitive vs. translation effects, refer to Lessard (1986) or von Ungern-Sternberg and von Weizsacker (1990).

[7] To do so would require a complex analysis of market structure, barriers to transshipment, cost structures, costs of switching production, etc.

Table 1. Descriptive statistics and correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7	8
Effectiveness of strategic responses (EFFECTIVENESS)	14.1	5.9	1.000							
Salience of problem (COMPETITIVE IMPACT OF FX)	6.4	3.0	−0.4619*	1.000						
Use of strategic responses (USE OF STRATEGIC RESPONSES)	12.9	5.1	−0.3163	0.3600	1.000					
Economic disincentives (DISINCENTIVES)	−12.4	4.2	−0.0108	−0.3831	−0.2451	1.000				
Treasury time horizon (TIMEFRAME)	196.9	97.8	0.0516	0.3426	0.4724*	−0.1204	1.000			
Treasury service orientation (SERVICE ORIENTATION)	9.2	3.2	−0.0863	0.1096	0.1562	−0.3000	0.5032*	1.000		
Treasury functional orientation (FUNCTIONAL ORIENTATION)	7.3	2.5	−0.0015	0.1268	0.4638*	0.0620	0.0804	−0.0748	1.000	
Cross-functional integrative processes (INTEGRATIVE PROCESSES)	3.3	1.2	−0.3692	−0.2162	0.2651	−0.1388	0.0991	0.2503	−0.2520	1.000
Processes for flexibility (CONTINGENT PLANNING)	2.0	1.7	0.1371	0.1441	0.0136	−0.2292	−0.0226	0.1205	−0.4353*	0.1450

*$p < 0.05$

Stage 1A (framing[8] and control variables)

Effectiveness of strategic responses = F(Service orientation, Functional orientation, Treasury timeframe, Competitive impact of FX, Use of strategic responses)

Stage 1B (incentives and control variables)

Effectiveness of strategic responses = F(Disincentives, Competitive impact of FX, Use of strategic responses)

Stage 2 (framing, incentives and control variables)

Effectiveness of strategic responses = F(Service orientation, Functional orientation, Treasury timeframe, Disincentives, Competitive impact of FX, use of strategic responses)

Stage 3 (process, framing, incentives and control variables)

Effectiveness of strategic responses = F(Integrative processes, Contingent planning, Service orientation, Functional orientation, Treasury timeframe, Disincentives, Competitive impact of FX, Use of strategic responses)

Multicollinearity was not a problem, and estimation was by ordinary least squares. Table 2 presents the results of the regression analysis.

DISCUSSION AND IMPLICATIONS

All the major factors in the model—the incentives for integration, the framing of the problem and the processes facilitating flexibility and integration—contributed significantly to explaining the effectiveness of strategic responses in this distributed knowledge context, as shown by the significant changes in F values as blocks of variables capturing these three major factors were introduced into the model. The extent of explained variance (the adjusted R^2, which compensates for the number of variables in the model) goes up from 0.35 in the 'incentives only' case (Stage 1A) and 0.42 in the 'framing' only case (Stage 1B) to 0.61 (with framing and incentives) to 0.74 (with framing, incentives and process) with statistically significant changes in F as each new block of variables is introduced. The complementarity of economic incentives, social-psychological factors and managerial processes revealed in this study lends renewed urgency to the call for more interdisciplinary work in the area of strategy and organization.

For corporations too, these results have practical implications in that they highlight the difficulties inherent in bringing about cross-functional integration for effective strategic decisions. Framing or process may, on occasion, be able to compensate for poor incentives to cross-functional integration, and in another situation the best of processes and cultures might not work if the incentives are working strongly against them. It becomes imperative for management to pay attention to all of these factors simultaneously if they are to successfully integrate strategic activity across diverse divisions or functions.

The specific hypotheses that were tested under the three categories of incentives, process and framing are discussed below (see Table 3).

Incentives

In the context of volatile exchange rates, disincentives preventing collaboration between the locus of expertise (in this case, Treasury) and the locus of decision-making authority (the operating divisions) had a strong negative impact on the effectiveness of strategic responses, as predicted, especially when framing and process are controlled for. What is particularly interesting is that in Stage 1A, while the disincentives exert the expected negative effect on the effectiveness of strategic responses, the effect is not significant partly because it is masked by the positive effects of framing and process, which have not been controlled for at this stage. In Stages 2 and 3, as framing and process are introduced into the model, the negative impact of disincentives gets further strengthened and becomes significant. Similarly, in Stage 1B, while each aspect of framing is not statistically significant, once incentives are controlled for, the effect of two out of the three framing variables on the effectiveness of strategic responses becomes statistically significant.

[8] We also ran the model including the additional framing variable of 'trading' orientation (which had factored out as a single variable—'the importance of making a profit on currency trading'). However, including this variable made no difference to the other results, and this framing variable was itself unrelated to the effectiveness of strategic responses.

Table 2. Regression analyses: Effectiveness of strategic responses

Independent variables	*1A* β (Sig.-T)	*1B* β (Sig.-T)	*2* β (Sig.-T)	*3* β (Sig.-T)
Control Variables				
COMPETITIVE IMPACT OF FX	−0.57 (0.02)	−0.54 (0.01)	−0.71 (0.00)	−0.86 (0.00)
USE OF STRATEGIC RESPONSES	−0.31 (0.13)	−0.62 (0.02)	−0.76 (0.00)	−0.60 (0.03)
Incentives				
DISINCENTIVES	−0.30 (0.15)	–	−0.48 (0.01)	−0.46 (0.01)
Framing				
SERVICE ORIENTATION	–	−0.02 (0.92)	−0.18 (0.35)	−0.25 (0.12)
FUNCTIONAL ORIENTATION	–	+0.36 (0.10)	+0.45 (0.02)	+0.47 (0.04)
TREASURY TIME FRAME	–	+0.44 (0.08)	+0.58 (0.01)	+0.67 (0.00)
Processes				
INTEGRATIVE PROCESSES	–	–	–	−0.27 (0.20)
CONTINGENT PLANNING	–	–	–	+0.38 (0.02)
R^2	0.45	0.57	0.74	0.85
Adj. R^2	0.35	0.42	0.61	0.74
F	4.35	3.72	6.05	7.84
Sig. F	0.02	0.02	0.00	0.00
R^2 change			0.29 (A) 0.17 (B)	0.11
F change			4.72 (A) 8.17 (B)	4.22
Sig. F change			0.02 (A) 0.01 (B)	0.04

N = 21 firms (aggregated from 90 responses)

This result highlights the importance of having the right incentives, or at least the importance of not having the wrong incentives in place in situations where cross-functional collaborative effort is required. Process alone, or working on changing subcultures alone, may only partly compensate for a poor incentive structure. What was particularly interesting in this context was that executives referred more often to the presence of disincentives to cooperation that are not readily observable than to explicit incentives designed to *promote* cooperation.

Framing

Overall, we can say that framing does matter in the integration of distributed knowledge for effective strategic responses. However, while two aspects of the framing of the exchange-rate problem by the experts (Treasury) which came up in the course of the interviews—the length of their decision-making horizon and the extent of their functional orientation—were both significantly positively related to the effectiveness of strategic responses, the third dimension—their service orientation—was not significantly related to the effectiveness of strategic responses. It is possible that firms whose Treasuries have a greater service orientation are more aware of the complexities involved in strategic responses, and therefore rate their firms' performance lower in this regard. These Treasuries' service orientation may have increased because of problems these firms faced in the past in their strategic responses to

Table 3. Support for hypotheses

No.	Relationship tested	Expected sign	Actual sign	Statistical significance	Support for hypothesis
	Framing				
H1	Functional orientation of the expert function and effectiveness of strategic responses	+	+	**	Supported
H2	Service orientation of the expert function and effectiveness of strategic responses	+	−	n.s.	Not supported
H3	Decision time frame of the experts and effectiveness of strategic responses	+	+	***	Supported
	Incentives				
H4	Lower incentives for interfunctional cooperation and effectiveness of strategic responses	−	−	***	Supported
	Processes				
H5	Cross-functional integrative processes and effectiveness of strategic responses	+	−	n.s.	Not supported
H6	Processes for flexibility and effectiveness of strategic responses	+	+	**	Supported

***$p < 0.01$; **$p < 0.05$

exchange-rate changes, and this potential endogeneity is a problem that we recognize, but which can only be sorted out in a longitudinal study. We plan to continue working in this area with a fresh round of observations and interviews at these and other firms, which may help us better identify the dynamics of thse complex relationships.

A further caveat that relates to the generalizability of the conclusions regarding framing is that the specific cognitive mindsets that are critical in one context might not be the same in some other context. So the best that can be said is that framing matters to effective strategic responsiveness, but the extent to which it matters is likely to vary by the problem context and by the specific dimensions of managers' frames chosen for examination. Clearly, it would be useful to identify some stable underlying dimensions of the way individuals frame problems, if there exists such a set, to study the cross-situational impacts of framing.

Process

Again, overall we can say that process matters in the integration of distributed knowledge for effective strategic decision-making. However, of the two types of processes that were mentioned in the interviews, the flexibility and contingency orientation of the planning system had a clear positive impact on the effectiveness of strategic responses, while the number of cross-functional integrating mechanisms (which we took to imply a greater firm commitment to such processes following the logic of 'more of a good thing is better') was not significantly related to effectiveness.

These results highlight the difficulty of integrating process issues into a cross-sectional survey study. While it was evident in our depth interviews that the 'best-practice' firms were clearly committed to multiple mechanisms for cross-functional integration, through teams, or through entrepreneurial boundary-spanners or information systems, operationalizing these various processes as functionally equivalent and cumulative in our survey instrument was clearly not completely satisfactory. It is possible that a firm that has only one integrating mechanism (say, an entrepreneurial boundary-spanner) nevertheless has a very effective mechanism, compared to a firm that has many such processes, but does none of them well.

Some further caveats are in order in interpreting the results of this study. For one, the firms that agreed to participate in the study were already highly concerned about this particular strategic problem. However, a greater concern with the problem should, if anything, lessen the impact of organizational factors such as incen-

tives, process and framing on the cross-functional integration of distributed knowledge to take effective strategic action. Another issue arises from the fact that we had to use a perceptual measure of the effectiveness of strategic responses, albeit not just of one individual but of a group of senior managers from each firm. As we were interested in a narrowly defined area of strategic response, perceptual measures were the best we could do, as it would have been very difficult for responders to separate out the performance effects of these specific strategic responses to volatile exchange rates from the accounting information typically available within firms. Asking for that kind of effort from the companies involved would have also adversely affected their participation in our study. Again, we do not feel the use of a perceptual measure necessarily threatens our basic finding that incentives, process and framing all seem to matter in the integration of distributed knowledge for effective strategic decision-making. It would of couse strengthen our findings substantially if similar interdisciplinary studies looking at the impact of incentives, framing and process were conducted in different strategic contexts with different measures of effective integration.

CONCLUSION

In this paper we have examined a specific, complex management activity that cuts across well-defined functional lines—the management of strategic aspects of foreign-exchange rate exposure—in order to understand which factors determine firms' success in 'breaking the silos' and, thereby, moving beyond suboptimal local responses to optimal corporate-wide responses. The academic and trade literature is replete with normative perspectives on this activity, as well as with cases of error and failure. While strategic foreign-exchange risk management is technically complex, it is also organizationally complex. In fact, we believe that the observed failures can more often be traced to organizational considerations than flaws in technical understanding or methods. In this paper we demonstrate the role of these organizational considerations, and show that no single dimension of management dominates.

Much of the normative as well as descriptive strategy literature seeks to establish the dominance of a single dimension of management, e.g., leadership, framing, organizational processes, or structure, or of a single explanatory framework, in addressing complex organizational problems. By focusing on an activity that responds to a similar set of external circumstances across firms, we have been able to establish the joint relevance of three such dimensions: framing, incentives, and processes, in creating effective cross-functional strategic responses in real time.

The relationships between incentives, processes and framing provide a rich field for study using a variety of methods from experimental methods to thick descriptive fieldwork. The longitudinal implications of these relationships should provide fertile ground for research as the orientations, the processes and the incentives in firms are unlikely to be stable over time. One firm, for example, appeared to go from a trading-for-profit to a service-cum-functional orientation and back to a trading-for-profit orientation over the 6-years that we tracked its activities. Published reports show that Kodak, a pioneer in the service orientation, has dropped or substantially reduced the service/consulting emphasis with a change in treasurers (Smithson, Smith and Wilford, 1995: 39–40). Another firm, though its avowed orientation was towards service and corporate-wide risk reduction, gradually drifted into a trading-for-profit perspective at the expense of the effectiveness of its corporate-wide risk-reduction activity.

The specific strategic activity that we have examined—strategic responses to volatile exchange rates—is complex and clearly involves distributed knowledge across both line and staff functions, ranging from foreign-exchange traders whose world is a Reuters screen to manufacturing managers whose reality lies in the more concrete world of market shares, operating efficiencies and capacity utilization. Further, it is an activity whose salience has increased markedly only in the last few years in response to globalization of markets and high macroeconomic volatility, and as a result still tends to be centered in a few expert points rather than being diffused to the relevant line decision contexts.

However, the concepts discussed in this study are applicable in a variety of other areas where the knowledge required to make effective strategic responses is distributed across functions—in new product development or in total quality

management, for example. The research on product development, for instance, while explicitly concerned with integrated problem solving across functions (Clark, Chew, and Fujimoto, 1987), does not really address the incentives or the motivations for making this integration happen (Brown and Eisenhardt,1995). Examining and contrasting the role played by the three complementary mechanisms—incentives, framing and process—in a variety of such distributed knowledge contexts could lead to a better understanding of the process of strategic decision-making in such contexts and, perhaps, even lead to a redefinition of traditional functional roles from their orientation towards function-related tasks towards concepts such as knowledge creation and diffusion.

Our results have major practical implications in that they highlight the complementarity of economic incentives, social-psychological factors and managerial processes in the effective integration of distributed knowledge in organizations. Incentives, framing and processes all need to be aligned for effective cross-functional strategic decision-making, as each one could counteract the positive effects of the others. These results point to the perils inherent in strategy formulation and implementation in a distributed knowledge situation, if managements try to go for 'quick fixes' by, for instance, only working on process, or only on mindsets in their quest to 'break the silos' and achieve effective cross-functional integration.

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APPENDIX: Constructs, Questions and Reliability

Construct (VARIABLE)	Questions	Reliability (Cronbach's α)
Effectiveness of strategic responses (EFFECTIVENESS)	In your opinion, how effectively does your firm (the 'focal business') respond to rapid changes in exchange rates in terms of a. Pricing decisions b. Sourcing decisions c. Investment decisions d. Capacity utilization decisions (Responses on 7-point scale with 1 = 'Responds very effectively' to 7 = 'Responds poorly,' and an additional category for 'Don't know'—reverse coded so that high values = high effectiveness)	0.93
Salience of problem (COMPETITIVE IMPACT OF FX)	Firms experience exchange-rate impacts to differing extents and in different ways. To what extent do exchange rate movements have the following impacts on your focal business? *In the focal business, exchange rate movements affect* a. the profitability of U.S. operations b. the competitive position of US operations (Responses on 7 point scale with 1 = 'To little or no extent' to 7 = 'To a very great extent')	0.89
Use of strategic responses (USE OF STRATEGIC RESPONSES)	To what extent does your firm use the following mechanisms to deal with changes in exchange rates (in the 'focal business') a. Adjusts selling prices b. Changes sourcing locations c. Sites new plants at cheaper geographic locations d. Shifts capacity utilization from high-cost to low-cost areas (Responses on 7-point scale with 1 = 'Uses not at all' to 7 = 'Uses a lot,' and an additional category for 'Don't know')	0.75
Economic disincentives (DISINCENTIVES) Treasurer's questionnaire only	Several reasons have been suggested for why many firms hedge little or none of their operating exposure, i.e., the impact of exchange-rate movements on projected foreign and domestic operating income or cash flows. To what extent do you agree with these reasons in your firm's case? a. The accounting treatment of hedges against operating exposure makes them extremely unattractive b. If operating hedges were to result in losses. Treasury would be blamed without taking into account the offsetting operating gains c. Operating exposure is the responsibility of operating units, not Treasury (Responses on 7-point scale with 1 = 'Strongly agree' to 7 = 'Strongly disagree'—sign reversed so that high values = high disincentives)	0.63
Treasury time horizon (TIME FRAME) Treasurer's questionnaire only	TIMEFRAME = HDGTO12•6 + HDGTO24•18 + HDGGT24•36 In managing FX exposures, which techniques do you employ? a. Hedging with forwards up to 12 months (HDGTO12) b. Hedging with forwards—12 to 24 months (HDGTO24) c. Hedging with forwards—beyond 24 months (HDGGT24) (Responses on 7-point scale with 1 = 'Use not at all' to 7 = 'Use a lot')	0.67

Construct (VARIABLE)	Questions	Reliability (Cronbach's α)
Treasury service orientation (SERVICE ORIENTATION) Treasurer's questionnaire only	How important are the following goals for the Treasury function in your firm? a. Assisting divisions/subsidiaries in identifying exchange-rate impacts on their operations b. Assisting divisions/subsidiaries in maximizing profits when faced with exchange-rate fluctuations (Responses on 7-point scale with 1 = 'Not at all important' to 7 = 'Extremely important')	0.91
Treasury functional orientation (FUNCTIONAL ORIENTATION) Treasurer's questionnaire only	a. How important is the following goal for the Treasury function in your firm? —Minimizing the impact of FX on current profits relative to plan b. How important are balance sheet translation exposures to your firm in defining the FX exposure that you actually manage? (Responses on 7-point scale with 1 = 'Not at all important' to 7 = 'Extremely important')	0.55
Processes for flexibility (CONTINGENT PLANNING)	How often do you or managers involved in strategic planning for the 'focal business' do the following? a. Use alternative exchange-rate scenarios while developing long-term (over 5 years) strategic plans b. Use alternative exchange-rate scenarios while developing medium-term (2–5 years) strategic plans c. Assess foreign-exchange exposure for the firm as a whole while drawing up corporate strategic plans d. Assess foreign-exchange exposure for the focal business while drawing up its strategic plans (Responses on scale with 0 = 'Never', 1 = 'Seldom', 4 = 'Frequently', 7 = 'Always')	0.55
Cross-functional integrative processes (INTEGRATIVE PROCESSES)	Firms have different types of *internal management processes* to cope with volatile exchange rates. Here we would like you to think about any corporate services received by the focal business as well as processes in place within the focal business to call managers' attention to this problem (Respondents are asked to circle the appropriate answer from YES/NO/DON'T KNOW—integrative processes are just the average number of YES responses for each firm) a. The firm circulates corporate forecasts of exhange-rate movements to the business units b. The firm has set up a group drawn from different functions (e.g., a task force) to advise on strategies to deal with exchange rates c. The corporate Treasury or foreign-exchange group regularly provides guidance to the business units on how to deal with exchange rate changes d. Finance staff within individual business units regularly provide guidance to the focal business on how to deal with exchange-rate changes e. Particular individuals functioning as 'internal consultants' provide guidance to the business unit in dealing with exchange rate fluctuations f. Senior management of the focal business or of the corporation takes a direct interest in the impact of exchange-rate movements on the business g. Computerized corporate information systems provide to the divisions information on exchange rates	