

**Managing the Future:  
CEO Attention and Innovation Outcomes**

**Manjit S. Yadav**

**Jaideep C. Prabhu**

**Rajesh K. Chandy**

Manjit S. Yadav is Associate Professor of Marketing & Mays Research Fellow at Mays Business School, Texas A&M University (email: yadav@tamu.edu). Jaideep Prabhu is Professor of Marketing at Tanaka Business School, Imperial College, London (email: j.prabhu@imperial.ac.uk). Rajesh Chandy is Carlson School Professor of Marketing at the Carlson School of Management, University of Minnesota (email: rchandy@csom.umn.edu). The authors thank seminar participants at the University of Minnesota, Imperial College, London Business School, Nijmegen University, Texas A&M University, and Warwick University, and Travis Certo, Venky Shankar, Jelena Spanjol, and Alina Sorescu for valuable comments on earlier versions of this paper. They gratefully acknowledge the assistance of Brigitte Hopstaken, Sunil Kishore, Mark Manglicmot, and Raghunath Rao in collecting the data. The authors would like to dedicate this paper to the memory of Raúl Rivadeneyra.

## **Managing the Future: CEO Attention and Innovation Outcomes**

### **Abstract**

The current literature presents a mixed view of top managers, often characterizing them as an impediment to innovation, irrelevant for innovation, or at best having an indirect effect on innovation. The authors argue, in contrast, that CEOs have a positive, direct, and long-term impact on innovation outcomes. They propose an attentional perspective to studying innovation, suggesting that CEOs' choice of what to focus on has significant implications for how firms detect, develop, and deploy new technologies over time. The authors test their arguments on longitudinal data from 176 public firms in the US retail banking industry, using a methodology that allows a separation between CEO attentional focus (1990-1995) and subsequent innovation outcomes (1996-2004). They show that CEO attention is a critical driver of innovation even: 1) when the target of attention is not innovation per se, but simply future events and external events in a generic sense, 2) when the innovation outcomes occur far in the future (sometimes several years in the future), 3) when the innovation outcomes are conceptually, empirically, and temporally distinct, and 4) in an empirical context—banking—that is not traditionally viewed as “high-tech”, and thus innovation-centric. These results, besides questioning many prevailing views on how CEOs affect innovation in their firms, also begin to address the issue of leadership that is widely recognized as one of the central problems in the management of innovation.

**Keywords:** Innovation; New product development; Managing technological change; CEOs and top management; Internet banking; Computer-aided text analysis

## **Managing the Future: CEO Attention and Innovation Outcomes**

To a lay observer, it may seem logical, even obvious, that the people who lead firms have an important role in driving innovation within them. CEOs such as Steve Jobs at Apple and Andy Grove at Intel are celebrated for their apparent success at promoting innovation in their firms. Innovation is central to the survival and success of firms, and the primary charge of CEOs is the survival and success of their firms. As such, it may seem reasonable to conclude that CEOs play leading roles in promoting innovation in their firms. However, the literature is, in fact, surprisingly mixed on this point.

Some authors argue that CEOs are frequently so steeped in the past, or in their day-to-day activities, that they fail to recognize that the technological environment has turned on them (see Finkelstein 2005; Khurana 2002; Leonard-Barton 1992; also see Tripsas and Gavetti 2000). As Hambrick, Finkelstein, and Mooney (2005a) note, top management positions are often accompanied by extremely intense job demands and stress. As such, “To the extent that creativity requires some amount of available time and cognitive resources, extremely high levels of job demands may squeeze out novelty and fresh thinking” (Hambrick, Finkelstein, and Mooney 2005b, p. 504). CEOs may also be so wedded to existing technologies that they resist or actively fight new ones. Finkelstein (2005, p. 20) quotes An Wang, then CEO of word processor maker Wang Labs as saying, “The PC is the stupidest thing I ever heard of.” Ken Olson, then CEO of minicomputer maker Digital Equipment Corporation, expressly forbade his employees from using the phrase “personal computer” while employed at his firm (Saxenian 1994; Rifkin and Harrar 1990, p. 195).

Perhaps a more charitable view of the impact of CEOs on innovation is that they are simply not very relevant in driving innovation in the firm. For example, some authors argue that the locus of innovation generally lies in the middle of the firm, in the actions taken and procedures used by its middle managers (e.g., Christensen 1997; Burgelman 1994). Even at Intel, led by such technology luminaries as Andy Grove and Gordon Moore, middle managers appear to have played the crucial role in driving technological change at important transition points. As Grove (1996, p. 95) describes the firm’s move to the microprocessor business:

“Over time, more and more of our production resources were directed to the emerging microprocessor business, not as a result of any specific strategic direction by senior management but as a result of daily decisions by middle managers...who sat around the table at endless production allocation meetings... While management was kept from responding by beliefs that were shaped by our earlier successes, our production planners and financial analysts dealt with allocations and numbers in an objective world. For us senior managers, it took the sight of unrelenting red ink before we could summon up the gumption needed to execute a dramatic departure from our past.”

Perhaps the most charitable view, common in the new product development literature, is that CEOs do have an effect on innovation, but that this effect is at the project level, via their support of individuals and teams working on individual projects (see Hegarty and Hoffman 1990; Montoya-Weiss and Calantone 1994; Rothwell et al. 1974).

But CEOs do more than just support individual projects. A primary role of CEOs is to set the general direction of the firm, and focus the attention of its members on particular areas of endeavor. Do CEOs impact innovation outcomes in the firm? If so, how?

We seek to examine these vital questions in this research. In doing so, we seek to make three contributions. First, we highlight the important, positive, and corporate-level impact of top managers on innovation outcomes in firms. Van de Ven (1998) observed a few years ago that issues pertaining to leadership represent one of the central problems in the management of innovation. His observations remain just as valid today. Corporate-level studies of top managers’ impact on innovation are rare. Those studies that do exist tend to ignore the processes by which top managers impact innovation, focusing instead on the demographic characteristics of CEOs and top management teams (Kitchell 1997; Young, Charns, and Shortell 2001; Tushman and Rosenkopf 1996). The dearth of research is partly due to methodological reasons. Top managers are notoriously hard to get to. In our empirical approach, we seek to sidestep, using archival data sources, the concerns that Chandy (2003, p. 353) notes:

“Filling out a six-page academic survey is rarely high on a CEO’s daily to-do list. Survey response rates can be poor. Longitudinal surveys are extraordinarily difficult to conduct. It is hard to make causal inferences from cross-sectional studies, especially in the absence of strong theory. Poor response rates also raise concerns about nonresponse bias . . .”

Second, we propose an *attentional* explanation for why some top managers have a greater impact on innovation than others. Following Ocasio (1997), attention in our conceptualization denotes “noticing,

interpreting, and focusing of time and effort” (p. 188). We examine CEOs’ attentional focus along two dimensions—temporal and spatial—and argue that CEOs’ choice of what to focus on reflects the discretion they exercise to allocate the scarce resource of attention. How this discretion is exercised, we reason, has long-term implications for how firms detect, develop, and deploy new technologies. This nexus between attentional emphases and specific aspects of firm-level innovation outcomes, while significant substantively and theoretically, remains empirically unexamined. To address this gap in the literature, our study investigates the link between CEOs’ attentional processes in 176 publicly traded firms from 1990-1995 and these firms’ innovation outcomes over an approximately eight-year period starting in 1996. We combine archival data from a variety of sources to maintain a temporal separation between attentional measures and subsequent firm-level innovation outcomes. We show that CEO attention is a critical driver of innovation:

- Even when the target of attention is not innovation per se, but simply future events and external events in a generic sense.
- Even when the innovation outcomes occur far in the future (sometimes several years in the future). The enduring nature of these effects suggests that it is partly through their information processing activities and emphases that CEOs leave a lasting mark on the organizations they lead.
- Even when the innovation outcomes are conceptually, empirically, and temporally distinct. The specificity of these effects underscores the theoretical significance of CEO attention in helping us understand how firms detect, develop, and deploy new technologies.
- Even in an empirical context – banking - that is not traditionally viewed as “high-tech”, and thus innovation-centric.

Third, in light of recent calls for increasing marketing's profile at higher levels of the firm (e.g., Webster, Malter, and Ganesan 2003, 2005), we present a novel approach for understanding the impact of CEOs on their firms. Our empirical approach, which involves a psycholinguistic analysis of communications by CEOs, provides a fairly unique window into their cognitive processes. While the psycholinguistic approach has been employed in other research on temporal discretion (see Pennebaker et al. 2003), this is the

first time it has been used to explore a substantive issue in marketing. This approach, we believe, can fruitfully be applied to other marketing contexts that involve CEOs. More generally, by introducing new conceptual and empirical approaches to the study of what leaders in organizations attend to, we hope to spur additional research to address "marketing's declining influence within the firm" (Kumar 2004, p. 3).

## **Theory**

### ***CEO Attention and the Firm***

CEOs are the heads of their firms in more ways than one. Within any organization, the “levers of power are uniquely concentrated in the hands of the CEO” (Nadler and Heilpern 1998, p. 9). CEOs, therefore, have the power, and arguably even the obligation, to set the direction of the firm (see Hambrick and Mason 1984). They influence what information others in the firm attend to, how they interpret this information, and utilize it for strategy formulation (e.g., Daft, Sormunen and Parks 1988; Lefebvre, Mason, and Lefebvre 1997; Simons 1991). Indeed, a key strategic role of the CEO is to focus the attention of employees among alternative operations (Gifford 1998), eventually driving them towards activities that are vital for the survival and growth of the firm. Thus, "to explain firm behavior is to explain how organizations . . . channel and distribute the attention of their decision makers" (Ocasio 1997, p. 203).

CEOs face competing claims on their attention (Hambrick and Abrahamson 1995; Hambrick and Mason 1984; also see Smith and Tushman 2005). Indeed, the scarce resource for many firms is no longer “information; it is processing capacity to *attend to* information. Attention is the chief bottleneck in organizational activity, and the bottleneck becomes narrower and narrower as we move to the tops of organizations” (Simon 1973, p. 270). How do individuals focus attention across competing objects? Extensive research argues that they do so via two processes: selection and expectation (LaBerge 1990; see also James 1890). First, they direct more cognitive resources at particular objects (see Hoffman and Ocasio 2001). Second, they engage in a heightened state of anticipation about focal objects (Posner and Cohen 1984).

The principles of selection and expectation, and the important role of the CEO in focusing the attention of the firm, suggest that greater attention by CEOs to certain issues and events can lead to greater

awareness, anticipation, and action in their firms with respect to these types of issues and events (Bashinski and Bacharach 1980; Bonnel, Possamar, and Schmitt 1987; Downing 1988; Tushman and Rosenkopf 1996). Building on these principles of selection and expectation, the following paragraphs examine in greater detail the implications of CEO attention on the innovation process in firms<sup>1</sup>.

### ***Attention and Innovation: A Process View***

Innovation is often studied as a discrete event. A creative individual conjures a solution to a vexing need. A firm patents an idea. Or a firm introduces a new product. Although viewing innovation as a discrete event provides for expositional simplicity and empirical convenience (see Damanpour 1991), a number of scholars have in recent years cautioned against doing so. They have noted that innovation is a process that unfolds over time (see Pettigrew, Woodman, and Cameron 2001; Van de Ven et al. 1999), and have criticized the use of “the ubiquitous single-snapshot technique” (Avittal 2000, p. 66) in theory building and testing in the area. Successful innovation requires firms to labor, like Hercules, through a series of tasks, each of which require attentional resources. Therefore, to fully and accurately capture the richness of innovation, these tasks should be studied explicitly when studying innovation. Three crucial tasks are the detection, development, and deployment of new technologies.<sup>2</sup>

To innovate over time, firms must first *detect* the arrival of a new technology (Kaplan, Murray, and Henderson 2003). Detection refers to the identification of a new technology, and the recognition of some future application for it. They must then *develop* an initial product based on the new technology. Development refers to the process of conversion of an idea for a new product to a product that is actually launched in the market. Finally, they must *deploy* the new technology further after launch. Deployment refers to the additions and improvements to existing features that occur to the product after the initial launch (see

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<sup>1</sup> Our unit of analysis is the firm. A potentially complicating factor in this regard is that the same firm can, over time, have more than one CEO, and successive CEOs can have different attention patterns. If CEOs change frequently, then it would be inappropriate to use CEO-level attention patterns to predict firm-level innovation outcomes without properly accounting for this turnover. In our conceptual arguments, we implicitly assume that CEO turnover is not frequent, and that there exists substantial continuity in the CEO suite. In the empirical section of this paper, we present extensive analyses to show that this assumption is reasonable in our context.

<sup>2</sup> The *detection* task is particularly relevant for ‘disruptive’ or ‘radical’ innovation contexts (Chandy and Tellis 1998) involving significantly new technologies. It must be recognized, however, that the scope of firms’ innovation activities also

Slotegraaf, Moorman, and Inman 2003; Tellis and Golder 2001). The distinction between detection, development, and deployment is useful in studying the process of innovation in a firm, and is in line with calls to study innovation as a process that evolves over time (e.g., Van de Ven et al. 1999). This evolutionary perspective is reflected in Srinivasan, Lilien, and Rangaswamy's (2002) sense-and-respond framework for understanding a firm's technological opportunism. The growing body of work on market orientation (Han, Kim, and Srivastava 1998; Jaworski and Kohli 1993) also asserts that the mechanisms firms employ to extract insights from the marketplace has significant implications for firms' innovation outcomes. However, the literature does not, to the best of our knowledge, make a distinction between detection, development, and deployment.

Detection, development, and deployment require the awareness of external opportunities and the anticipation of future events. CEO attention must, therefore, have a temporal and a spatial component that increases such awareness. Combining these insights, we argue that the discretion exercised by CEOs on *temporal attention* (e.g., emphasis on events that have yet to occur) and *spatial attention* (e.g., emphasis on events that have a locus outside the company) are predictive of firms' innovation outcomes. Specifically, our thesis is that in the context of innovation, greater attention to events in the future and to external objects leads to quicker detection of new technologies, quicker development of initial products based on these new technologies, and broader deployment of innovations based on these new technologies. In contrast, greater attention to internal objects leads to slower detection of new technologies, slower development of initial products based on these new technologies, and less extensive deployment of innovations based on these new technologies.

In the section below, we develop this thesis further and present hypotheses linking the focus of CEO attention (i.e., future, external, and internal focus) with a firm's innovation outcomes over time (i.e., detection, development, and deployment of new technology).

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involves continuous, incremental enhancements of existing technologies. The task of detection is less relevant in such innovation contexts.

## *Hypotheses*

*Future focus and innovation outcomes.* Given their scarce attentional resources, CEOs are forced to allocate time and effort with either less or more emphasis on the future. *Future focus* refers to the amount of attention devoted toward events that have yet to occur (see Chandy and Tellis 1998). Events, in this context, refer to actions to be taken by the firm or some other entity, anticipated outcomes of these actions, or other developments in general. In conceptualizing future focus in this way, we do not impose any *a priori* restrictions on the specific nature of future events that CEOs focus on. Our view of future focus is content-neutral; it simply addresses the temporal discretion exercised by the top management of a firm. While the issue of *what* specific information garners CEOs' attention may be of interest, it has the potential of creating tautological problems from the perspective of theory development and testing (e.g., thinking about innovation leads to more innovation). Therefore, in this study, we wish to first examine the effects (if any) of how CEOs exercise their temporal discretion.

Although the broad notion of the *future* features prominently in the business press (e.g., Hamel and Prahalad 1994; Handy 1990), there is little directly-applicable empirical research on the temporal dimension in managerial decision making (for an exception, see Mowen and Mowen 1991). Some research does show that managers often have divergent expectations about future technological developments and that these expectations shape their actions in the marketplace (see Chandy, Prabhu and Antia 2003). More generally, research in psychology suggests that individuals may exhibit varying levels of motivation to focus on the future (for a review see Karniol and Ross 1996). Norem and Illingworth (1993), for instance, show that while some individuals have a predisposition to develop detailed scenarios regarding future events and developments, others don't. If similar effects also apply to CEOs, there should be heterogeneity among them in terms of how much attention they devote to actions and other developments that have yet to occur.

We expect a greater attention to the future to have a favorable impact on the innovation outcomes of a firm. Increasing future focus decreases the likelihood that the firm is preoccupied exclusively with the concerns and issues of the past and present. Attending to the needs of today, while essential for maintaining the level of excellence a firm may have achieved, is less likely to serve as a basis for innovation (Chandy and

Tellis 1998). In fact, an exclusive focus on what makes a firm effective today may, ironically, also sow the seeds of failure in later time periods (Christensen 1997). A conscious effort to pull away from current needs and exigencies increases the firm's awareness of new technologies and technological opportunities, and its preparedness for the changes in the technological landscape.

More specifically, a greater focus on the future by a firm's CEO leads to greater awareness as well as greater anticipation within the firm of events in the future. This, in turn, leads to quicker detection by the firm of new technologies and technological opportunities. Further, the development and deployment of innovations involves considerable planning and preparation. A greater focus on the future also leads to greater preparedness for actions in the future, enabling quicker development and more extensive deployment of innovations. Thus, we hypothesize that:

H<sub>1</sub>: Firms with CEOs whose attentional patterns exhibit greater future focus are:

- (a) faster at *detecting* new technological opportunities,
- (b) faster at *developing* initial products based on these technological opportunities, and
- (c) superior at *deploying* these new products than firms with CEOs who exhibit lower future focus.

*External and internal focus and innovation outcomes.* *External focus* refers to the amount of attention devoted to objects whose primary locus is outside the firm. When the focus of attention is on objects within the firm, attention has an *internal focus*. It is important to note that external and internal foci represent independent attentional emphases in that one type of attentional focus does not necessarily determine the level of the other. Thus, over a period of time, CEOs with a high level of external focus (relative to others) may exhibit a high or low level of internal focus and vice versa.

This distinction between external and internal focus, consistent with a long-standing view in the literature (see Day 1994), implies that a firm's top management can exercise discretion in terms of how much they attend to objects whose primary locus is outside or inside the firm. The different posture of "prospectors" and "defenders", for example, is associated with (among other factors) differences related to attentional activities (see Miles and Snow 1978). Attentional differences between the internal and the external environment also feature implicitly in work on firms as interpretation systems (Daft and Weick 1984). These differences are important as they impact managerial and organizational cognitions which, in

turn, influence the formulation and implementation of strategic actions (see Walsh 1995). Empirical work based on these ideas provides evidence that the relative emphasis that managers place on the external or internal environment, and the nature of their resulting interpretations, eventually shape organizational actions and performance (Garg, Walters, and Priem 2003; Rust, Moorman, and Dickson 2002; Smith et al. 1991; Thomas and McDaniel 1990; Thomas, Clark, and Gioia 1993; White, Varadarajan, and Dacin 2002). For instance, Rust, Moorman, and Dickson (2002) find that an attentional emphasis on external constituents such as customers (which they refer to as ‘revenue emphasis’) leads to superior performance. In contrast, attentional emphasis on efficiency considerations of internal operations (which they refer to as ‘cost emphasis’) is associated with less favorable performance.

In the context of our study, we expect that an increased external focus will have a favorable impact on firms’ innovation outcomes. As potential new opportunities often emerge from outside the firm (see Chandy, Prabhu, and Antia 2003), attending to objects whose locus lie outside the firm increases the likelihood of managers becoming aware of such opportunities. This awareness, in turn, enables the firm to formulate a timely and effective response to such opportunities. In contrast, an attentional stance that reflects a heightened internal focus may facilitate innovation using existing options the firms has already mastered, but is unlikely to help in the realm of innovations that involve new opportunities with which the firm has limited or no prior experience (Tripsas and Gavetti 2000).

The above line of reasoning suggests that a greater focus on the external environment leads to a greater awareness and anticipation of new opportunities. This, in turn, leads to quicker detection of new technologies. Further, developing and deploying new products requires knowledge of new technology and anticipation of market opportunities (Gatignon and Xuereb 1997; Frambach, Prabhu, and Verhallen 2003). A greater focus on the external environment leads to a greater awareness of customer needs and a greater anticipation of market trends and competitive actions. Enhanced awareness and anticipation increases the likelihood of quicker development and more extensive deployment of innovations (Han, Kim and Srivastava 1998; Hurley and Hult 1998). Therefore, we hypothesize that:

H<sub>2</sub>: Firms with CEOs whose attentional patterns exhibit greater external focus are:

- (a) faster at *detecting* new technological opportunities,
- (b) faster at *developing* initial products based on these technological opportunities, and
- (c) superior at *deploying* these new products than firms with CEOs who exhibit lower external focus.

No firm can claim a monopoly over new ideas. Even when the impetus for a new technology emerges from within a firm, its development into a product relies on honing and polishing that is best accomplished through numerous interactions with customers, competitors, and other external entities (see Han, Kim and Srivastava 1998; Hurley and Hult 1998; Frambach, Prabhu, and Verhallen 2003). A greater focus on the internal environment reduces a firm's awareness of new technologies, and limits its actions with respect to such opportunities. Interactions with external entities often communicate a sense of urgency to the firm, either because they emphasize the prospect of competitive entry, or because they reinforce the customer need that is waiting to be filled (Athuene-Gima 1995, 1996; Narver, Slater and MacLachlan 2000). Internally focused managers insulate themselves against such communications, and their firms are therefore slower to respond to new technological opportunities. New technologies also cause disruption within a firm. For this reason, even when firms with internally focused managers do introduce innovations, they are worse at deploying them, since additions and changes to the innovations are likely to come at the expense of stability inside the firm (see Hambrick, Nadler, and Tushman 1998). Overall, therefore, we hypothesize the following effects of internal focus on the detection, development, and deployment phases of innovation.

H<sub>3</sub>: Firms with CEOs whose attentional patterns exhibit a greater internal focus are:

- (a) slower at *detecting* new technological opportunities,
- (b) slower at *developing* initial products based on these technological opportunities, and
- (c) inferior at *deploying* these new products than firms with CEOs who exhibit lower internal focus.

To summarize, we posit a link between CEOs' attentional stance and firms' innovation outcomes.

We argue that increased CEO attention to the future and the external environment results in superior innovation outcomes. In contrast, a heightened internal focus can impede firms' efforts to manage the innovation process. Academic work on the link between top managers' attentional patterns and firms' specific innovation outcomes is limited. In particular, from a process perspective, there is a need for empirical work that shows how CEO attention influences the innovation process in terms of detection, development and deployment of new technologies. We now turn to an empirical study that tests our

hypotheses and attempts to rectify some of the gaps in existing research.

## **Method**

### ***Empirical Context***

We use the US retail banking industry as the empirical context for this study. The arrival of Internet banking in the mid 1990s (see Figure 1) provides an ideal opportunity for a longitudinal study that focuses on the evolution of this innovation over several subsequent years (see Bank Technologies Group 2001; Schotema 2001). The presence of a number of public firms in the banking sector, coupled with the reporting mandated and maintained by regulatory agencies such as the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of Currency (OCC), and the U.S. Department of Commerce (DOC), gives us access to accurate data on individual firms over time. Further, Internet banking has been viewed as a strategically significant innovation that was implemented not only by large multi-city banks but also smaller, regional players (see Chandy, Prabhu, and Antia 2003). This broad participation allows us to study the behavior of a wide range of firms that differ in terms of size.

### ***Timeline and Sample***

The process of innovation in Internet banking evolved over several years. Retail banks first began to detect the new technological opportunity in early 1994, as indicated by the initial wave of domain name registrations for their planned websites. The first bank to register a domain name was Citibank in February 1991, but only 4 banks had registered a name by early 1994. The first incumbent bank to launch transactional banking via the internet was Wells Fargo in May 1995 (see Frei and Rodriguez-Farrar 2001). By 1996, a few additional incumbents had launched transactional banking services, which allowed customers to conduct a variety of financial transactions via the World Wide Web. Between 1995 and 2000, the number of banks with Internet-based transactional banking services grew rapidly. In our sample, this phenomenon peaked in 2000, though a fairly large number of banks continued to introduce Internet banking thereafter (see Figure 1).

Our data collection spans the years from 1990 to 2004. To understand the rationale behind the data collection approach, recall that our theory posits a link between CEOs' attention patterns and specific innovation outcomes. Therefore, to test this causal link, we ideally need data on attention patterns prior to the

time frame over which innovation outcomes are occurring and can be tracked. Based on data provided by the FDIC, the Online Banking Report, banks' websites and *Factiva*, we first determined that most banks registered a domain name and all banks went transactional after 1995 (as depicted in Figure 1). With the cut-off date of 1995 thus established, we used the six-year 1990-1995 time frame to assess CEOs' attention patterns for each bank in our data set (as detailed later, we did this using Letters to Shareholders featured in firms' annual reports). We then tracked innovation outcomes for each bank over the time frame 1996 to January 2004.

We selected banks for the study in two phases. We first selected all public US retail banks that offered transactional Internet banking before December 2000 and had at least three annual reports that we could access from the Compact D/SEC database during the period 1990-1995 ( $n = 89$ ). We then randomly selected 87 banks that went transactional after 2000. As in the case of the first set of banks, we included only those banks for which we could access at least three annual reports for the period 1990-1995. We used Dun and Bradstreet's Million Dollar Directory (commercial banking) to select this second set of banks. Collectively, this procedure yields a sample of 176 banks that exhibits substantial variation in terms of innovation outcomes and firm characteristics (see Table 1).

Two attractive features of this data collection approach are worth noting. First, by choosing the period 1990-1995 to assess CEOs' attentional patterns, we ensure that independent variables are based on a temporal window just prior to the onset of the focal innovation phenomenon we investigate (i.e., starting in January 1996). Thus, unlike cross-sectional, survey-based research efforts, our method allows for a stronger test of causality. Second, collecting data on the second set of banks ( $n=87$ ) allows us to correct for potential selection bias in the first set (see Shaver 1998). Specifically, in studying one of the innovation outcomes (the breadth of deployment), only including banks that introduced Internet banking by the end of 2000 introduces right censoring in our data. Moreover, the decision to offer Internet banking is endogenous and self-selected—the characteristics that lead banks to deploy well could also drive their choice to develop Internet banking in the first place. Discarding censored data can lead to biased, false-positive results, and not accounting for endogeneity and self-selection can lead to misspecification (Shaver 1998). Our two-phase

data collection approach, which obtains data on banks that did *not* have transactional Internet banking by the end of 2000 in addition to those that did, allows us to use regression with Heckman's (1979) correction to account for selection bias.

### ***Dependent Measures***

In this paper, we focus on three dependent measures of importance to the innovation process: speed of detection, speed of development, and breadth of deployment of technology pertaining to Internet banking (see Table 2). We measure *speed of detection* using the date on which a bank registered its primary domain name. This information is based on InterNIC's Whois registry. We measure *speed of development* using the month a bank went online with a transactional capability (only month-level data could be obtained for this variable). To obtain and verify the transaction month data, we rely on a number of sources: the Internet Archive's *Wayback Machine*, press releases from Internet banks' websites, press reports in the *Factiva* database, the Thomson Directory of Internet Banks, the Online Banking Directory, and phone calls to banking managers. Specifically, we first identify from the *Wayback Machine* the approximate date when the bank introduced transactional Internet banking. If the gap between the webpage that offered Internet banking and the webpage that did not is more than a month, we narrow the date down further by cross checking with press releases from the Internet bank's current website or, more often, by searching for press reports on the bank's Internet banking initiatives in *Factiva*. We also cross-check this data with data on Internet banking services available through the Thomson *Directory of Online Banking*. When all these methods failed, as was the case with a dozen or so banks, we telephoned the banks' Internet banking managers to identify the exact date.

We measure *breadth of deployment* based on an evaluation of the features that transactional Internet banks offered to consumers. Using input from industry experts, we identified the following specific features and services as being indicative of the breadth of deployment: the use of interactive Java applets, Internet brokerage, Internet tax filing, Internet business banking, and mobile banking (i.e., banking via a mobile device such as a PDA or cell phone). For each bank, the sum of these features serves as a summary measure of the breadth of deployment. Using the Internet Archive's *Wayback Machine*, we visited the past websites

of all Internet banks in our sample that were transactional by the end of December 2000 to determine the above-mentioned features that each of these banks offered by December 2001. Assessing deployment breadth in December 2001 allows sufficient time (at least a year) to pass between transactional entry and deployment, thus providing a stable measure of each bank's final innovation offering to its customers.

### ***Independent Measures***

We use banks' letters to shareholders to measure three independent variables related to the attentional foci of CEOs: future focus, external focus, and internal focus. Following guidelines in the text-analysis literature, we assess total attention directed at theoretically-relevant issues by using counts of specific types of sentences (for future focus) and words (for external and internal focus). Further, following the psycholinguistic literature (Pennebaker et al. 2003), which suggests that the number of sentences serve as a better proxy for number of thoughts than the number of words, we use the total number of sentences in the letter to control for the length of the document in all our models.

Historical records of letters to shareholders, written during the time period of interest, are consistently available over time and across a wide variety of firms. Moreover, letters to shareholders provide a unique glimpse into the cognitions of CEOs, in a manner that is impossible to obtain through other means. A large body of research shows that the letters to shareholders featured in firms' annual reports reflect CEOs' attentional foci and that these foci can be meaningfully assessed (see Abrahamson and Hambrick 1997; D'Aveni and MacMillan 1990; Kabanoff 1997). Further, CEOs take an active role in writing these letters (indeed, letters by some CEOs such as Warren Buffet have developed a keen following, and are closely dissected by the press and the wider investment community for insights into their thinking). While they are in practice often the output of a top management team that includes more than the CEO alone, CEOs nevertheless have primary fiduciary responsibility for the statements made in the letters.

One criticism of letters to shareholders is that they are the result of efforts aimed at impression management on the part of firms. Often, the argument goes, they are prepared with the active collaboration of public relations departments in firms. However, if these documents are solely tools designed to impress external audiences, with little correspondence to the actual decision making process in firms, then the use of

these letters as proxies for CEO cognition should yield null results. If the motive is purely impression management, then firms would all either behave very similarly (in a manner designed to create the most positive impressions), or in a random or idiosyncratic manner that is unique to the public relations operations of the firms. Metrics of cognition derived from letters to shareholders will not predict actual firm actions in the future. However, we (and many other researchers) show that the cognitions embodied in letters to shareholders have a systematic effect on firm actions, in a manner that is consistent with theoretical expectations (e.g., Barr 1998; D'Aveni and MacMillan 1990; Noble, Sinha, and Kumar 2002). Divinney and Kabanoff (1999) examine the link between the text of annual reports and firms' past and future investment patterns and conclude that "'words' and 'deeds' are related" (p. 61). Bowman (1978) reports a similar nexus between annual reports' text and firms' specific actions and emphases (e.g., social responsibility, international focus).

Further evidence of the appropriateness of letters to shareholders as sources of data on top management cognition in our context comes from Fiol (1995), who compares the cognitions expressed in letters to shareholders to those in internal planning documents written during the same period by the same firms. Based on this comparison, she concludes that while CEOs' attention cannot be observed directly, non-evaluative statements such as those on "internal/external orientation... and past/future orientation" are likely to be faithfully reported in letters to shareholders (Fiol 1995, p. 534; also see Barr 1998). Specifically, she found high correspondence between non-evaluative statements mentioned in letters to shareholders and internal company documents. Since these are the types of statements we examine in this research, we see letters to shareholders as reasonable and valid means of tapping CEO cognitions. We provide additional evidence of the validity of this approach in the Results section of this paper.

As detailed below, we use procedures recommended in the literature (see Weitzman 2000) to maximize the validity of our data sources and measures. Using the Compact D/SEC database, we collected all letters available for banks in our sample for the years 1990-1995. We selected this timeframe because it covers a sufficiently long time period immediately *prior* to the window over which we track innovation outcomes for banks in our sample. (We altered this timeframe for the few cases in our sample for which a

bank detected the new technology prior to 1995; doing so ensures a temporal separation between attentional patterns and innovations outcomes.) We were able to locate 3 letters each for 24 banks, 4 for 29, 5 for 59 and 6 letters for 64 banks in our complete sample of 176 banks. This data effort yields a total of 867 letters to shareholders.

*Future focus.* As noted earlier, *future focus* refers to attention directed at events that have yet to occur. We base our measure of *future focus* on psycholinguistic work (see Pennebaker, Mehl and Niederhoffer 2003 for a review) which argues that a writer's temporal attention can be deduced reliably from the type of words that the writer uses in a body of text. The psycholinguistic research shows that sentences containing the following words are indicative of attention directed at events that have yet to occur: will, may, might, shall, be, and tomorrow (and related contractions such as we'll, I'll, they'll, you'll, etc.). We performed a preliminary computerized search using DICTION 5.0 (Digitext Inc.) and N6 (QSR International Ltd.) of the letters to shareholders in our sample, and found that contractions and words such as may, might, shall, be, and tomorrow are rarely used. Based on this analysis, we tentatively concluded that sentences containing the word "will" are most indicative of attention being directed at events that have yet to occur.

To verify the validity of this conclusion, we randomly selected 10 banks and then assembled all letters for these banks over a six-year period (1990-1995). From these letters, we identified all sentences (n=246) containing the word "will". Two independent coders then coded these sentences as consistent or inconsistent with the working definition of a future-focused sentence (i.e., attention directed at events that have yet to occur; see Appendix 1). Eighty-three percent of these sentences were coded as future-focused, with an inter-coder agreement level of 90%. We concluded that Pennebaker et al.'s (2003) psycholinguistic approach was appropriate for initially identifying future-focused sentences in our specific empirical context (i.e., professional writing in firms' annual reports). Based on this preliminary analysis, we trained research assistants to 1) read all the sentences containing the word "will" in our letters to shareholders, 2) identify spurious sentences (i.e., sentences containing "will" but not consistent with our working definition of a future-focused sentence) and 3) remove these sentences from our data (see Appendix 1 for details). Using this method we identified (and deleted) 128 spurious sentences, leaving 4333 usable future-focused sentences

for further analysis.

*External focus and internal focus.* *External focus* refers to attention directed at objects whose primary locus is outside the firm, while *internal focus* refers to attention directed at objects whose primary locus is within the firm. We operationalize these concepts using word counts, following and adapting existing procedures (see Weitzman 2000) designed specifically to enable text-analysis software to systematically parse large bodies of textual information. Based on our reading of the letters to shareholders, and aided by a computerized examination of word usage by text-analysis software (N6 and DICTION 5.0), we developed a dictionary of words (see Appendix 2) that are consistent with our definitions of external and internal focus. We employed an iterative process, with words added or deleted at each stage of the process, until we judged the impact of any further addition or deletion to be minimal. Differences were resolved through discussion. Using this dictionary, we then operationalized external and internal focus using computer-aided word counts. Specifically, we measure external focus as the number of times words denoting attention to customers and competitors are mentioned in the letters of a given bank. Similarly, we measure internal focus as the number of times that words denoting attention to inward, organization-specific issues are mentioned in each set of letters.

### ***Control Variables***

We control for the effects of the following variables (see Table 2).

*Length of letters to shareholders.* The length of letters to shareholders can vary across firms. Therefore, we control for the length of each bank's letters to shareholders. We measure this using a count of the number of sentences in the letters for each bank in our sample. We also used the number of words in the letters as an alternate control variable. However, since prior research indicates that sentence counts serve as better proxies for number of thoughts than word counts, we present results that use sentence counts. Controlling for words in the models did not result in any model improvements.

*Bank size.* Larger firms have resources they can leverage to detect, develop and deploy innovation opportunities more successfully than smaller banks. We control for firm size by using the natural log of the number of employees in 1994 (i.e., the year just prior to the temporal window over which we track firms'

innovation outcomes). We obtain this data from FDIC. We also examine alternate measures of firm size such as assets and deposits held. These variables are highly correlated ( $\rho > .98$ ) with the employees-based measure we use in the paper.

*Bank specialization.* The FDIC classifies banks by their primary specialization. Banks with different specializations are likely to be face varying competition and have different types of customers; this in turn could have a differential effect on their detection, development and deployment of technological opportunities. Using data from FDIC, we control for these effects by creating a dummy variable that is 1 for banks that specialize in commercial and industrial loans and 0 for banks that specialize in consumer lending of various types (mortgage, credit-card, etc.).

*Bank rurality.* Banks also vary in terms of the extent to which they serve urban versus rural markets, which may affect their detection, development and deployment of technological opportunities. To control for this, we first identify the county in which each bank is headquartered. Based on this information, we use USDA's rural-urban classification (see [www.ers.usda.gov](http://www.ers.usda.gov)) to assess bank rurality on a 7-point scale (with 1 being "highly urban" and 7 being "highly rural").

*CEO turnover.* It is possible that change in CEOs could have an impact on innovation outcomes in firms. We control for this factor by including in each of our models a measure of CEO changes during the period of our sample ending with the year prior to the innovation outcome being predicted.

*Cumulative detection and development by other banks.* Institutional theory suggests that firms are embedded in networks and that the normative pressures to confirm/imitate within these networks drive important organizational actions such as innovation (see Scott 1990). This institutional influence might either supplant our attention-based theorizing or co-exist with it. To investigate this possibility, we create two measures that capture the cumulative number of other banks in the focal bank's network (specifically, banks in the bank's home state) that had detected and developed Internet banking by the time the focal bank detects and develops online banking, respectively (see Young, Charns and Shortell 2001 for a similar approach). We model these measures of imitation as time varying covariates.

*Complexity of website at initial launch.* Finally, banks differ in the complexity of their online offering when initially launched. As this initial level of complexity may influence the eventual sophistication of banks' Internet banking service (i.e., deployment breadth), we control for this variable in our test of the hypotheses concerning breadth of deployment. Initial complexity of banks' website at launch was coded on a 4-point scale ranging from 1 (information only) to 4 (fully transactional). A trained doctoral student with experience in the banking industry conducted the coding procedure.

### ***Models***

We now describe the models to formally test the hypothesized effects. For ease of exposition, we organize our discussion along the three innovation outcomes of interest: detection, development, and deployment.

*Speed of detection.* We measure speed of detection using the date on which a bank first reserves a domain name. Thus, we have the timing of a specific event (i.e., the registration of the bank's domain name) which we hypothesize to depend on the attentional patterns of that bank's CEO (specifically, the CEO's future, external, and internal focus) in prior time periods. We model this time-dependent binary event (whether registration occurs or does not occur at a given point in time) using survival analysis (Cox and Oakes 1984). This approach allows us to model not only the occurrence of the focal event, but also the timing of the event (Helsen and Schmittlein 1993). Further, hazard modeling can take into account right-censored data (i.e., observations for which the focal event has not occurred at the end of the study).

The hazard or probability of occurrence of an event (given that it has not occurred) can be expressed as  $h(t) = \lim_{\Delta t \rightarrow 0} P \{(event\ occurs\ in\ t+\Delta t)\} / \Delta t$ . We use a proportional hazard model with covariates (Cox and Oakes 1984) to test the hypothesized effect of a bank's future, external, and internal focus on detection. (We also use three alternative base hazard functions—Weibull, log-normal and log-logistic—to test our hypothesis. Our results are broadly robust to the use of these alternative specifications.) Specifically, we estimate:

$$h_i(t) = h_o(t) \exp(\alpha_1 Future_i + \alpha_2 External_i + \alpha_3 Internal_i + \sum \alpha_j Controls_i) \quad (1)$$

where  $h_i(t)$  = instantaneous probability of bank  $i$  registering a domain name at time  $t$ , given that it had not registered until time  $t$ ;  $h_0(t)$  = baseline hazard function;  $Future_i$  = future focus of bank  $i$ ;  $External_i$  = external focus of bank  $i$ ;  $Internal_i$  = internal focus of bank  $i$ ; and  $\Sigma Controls_i$  = is a set of control variables that includes 1) the number of text units (i.e., sentences) in letters to shareholders, 2) the natural log of the number of employees in 1994, 3) the specialization based on asset concentration, 4) the rurality of bank  $i$ , 5) CEO turnover, and 6) cumulative detection by other banks.

*Speed of development.* We measure speed of development using the month when a bank first offers transactional Internet banking to its customers. As in the case of detection, speed of development involves a specific event for each bank which we hypothesize to depend on the attentional patterns of that bank's CEO (specifically, the CEO's future, external, and internal focus) in prior time periods. We use the following proportional hazard model to test the effect of CEOs' attentional characteristics on development timing. (As with speed of detection, we also use the Weibull, log-normal and log-logistic hazard functions to test this hypothesis. Again, our results are broadly robust to the use of these alternative specifications.) Specifically, we use the following proportional hazard model:

$$h_i(t) = h_0(t) \exp(\beta_1 Future_i + \beta_2 External_i + \beta_3 Internal_i + \Sigma \beta_j Controls_j) \quad (2)$$

where  $h_i(t)$  = instantaneous probability of bank  $i$  offering transactional Internet banking at time  $t$ , given that it had not offered this service until time  $t$ . Other variables are as defined in equation 1, with two exceptions: we replace cumulative detection with cumulative development, and include time since detection as an additional control variable.

*Deployment breadth.* We measure deployment breadth using a count of the number of innovative features that a bank's transactional website offered at the end of 2001. We hypothesize that, while future focus and external focus positively influence deployment breadth, internal focus has a negative effect. Our data on deployment are, however, subject to right censoring. Specifically, 87 of the 176 banks in our sample did not offer Internet banking by the cut-off date. Moreover, the decision to offer Internet banking is endogenous and self-selected: the characteristics that lead banks to deploy well may also drive their choice to develop Internet banking in the first place. As discarding censored data can lead to biased, false-positive results, and not

accounting for endogeneity and self-selection can lead to misspecification (see Shaver 1998), we use regression with Heckman's (1979) correction to account for selection bias. Specifically, we include the censored data in the analysis and use the following substantive and selection equations respectively:

$$D_i = \gamma_0 + \gamma_1 Future_i + \gamma_2 External_i + \gamma_3 Internal_i + \sum \gamma_j Controls_i + e_i \quad (3)$$

$$S_i = \delta_0 + \delta_1 Future_i + \delta_2 External_i + \delta_3 Internal_i + \sum \delta_j Controls_i + u_i \quad (4)$$

where  $D_i$  = deployment breadth of bank  $i$ ;  $S_i$  = censored (=0) or uncensored (=1) status of bank  $i$ ;  $e_i$  and  $u_i$  are errors in the substantive and selection equations respectively, and other variables are as defined before. Other variables are as defined in equation 1, with two exceptions: we include 1) time since development as an additional control variable, and 2) an additional control variable that measures the complexity of the website at initial launch of bank  $i$ .

## Results

Table 3 presents descriptive statistics for the dependent and independent variables of interest. The table indicates that our empirical context provides adequate variation in these variables. Tables 4 and 5 present the results of estimating the proportional hazard models in equations 1 and 2, respectively. We use one-tailed tests to assess statistical significance for all directional hypotheses. The hazard ratios in Tables 4 and 5 reflect the impact on innovation outcomes of a unit increase in the specific type of attentional focus (i.e., future, external, or internal). Table 6 presents the results of the estimation of equations 3 and 4, namely the Heckman selection model. In all models, a likelihood ratio test rejects the hypothesis that all parameters equal zero.

Because detection, development and deployment are inherently sequential in nature, a natural question to pose is whether there are dependencies between the equations, specifically whether a) the speed of detection influences the speed of development and b) the speed of development influences the extent of deployment. However, the outcome variables of detection, development and deployment are separated in time and form a recursive system of equations. Moreover, an analysis of the correlation between the error terms of each of the equations indicates that these errors are uncorrelated. We therefore estimate equations 1-4 independently because recursive systems with uncorrelated errors do not require joint estimation of their

constituent equations, e.g., through seemingly unrelated regression (see Land 1973 for a formal proof). We do, however, control for the time since the focal bank established a domain name in estimating equation 2 (see Table 5), and for time since the focal bank has had transactional Internet banking in estimating equation 3 and 4 (see Table 6).

Finally, for the analyses in Tables 4 and 5 (which are based on the Cox proportional hazard model) we assess the validity of the assumption of proportionality as follows. First, we include our hypothesized independent variables as time varying covariates in each model, i.e., as interactions with time. In these interactions, we use both  $\log(\text{time})$  and analysis time. We find that none of these time varying covariates is significant in either model, thus providing one test against violation of the proportionality assumption. Second, we also test the proportional hazard assumption using Schoenfeld residuals and plots of the scaled Schoenfeld residuals. Again, we find no evidence that the proportionality assumption is violated. We now present specific tests of hypotheses H1a-H3c.

#### ***Future Focus and Innovation Outcomes***

Hypothesis H1 predicts that firms whose CEOs are higher in future focus are (a) faster at detecting new technological opportunities, (b) faster at developing initial products based on these technologies, and (c) superior at deploying these initial products than other firms. In support of H1a (see Table 4), future focus increases the hazard rate for detection (hazard ratio=1.016,  $p<.10$ ). Thus, a greater focus on the future facilitates banks' detection of new technological opportunities. In support of H1b (see Table 5), future focus increases the hazard rate for development (hazard ratio=1.018,  $p<.10$ ). Thus, a greater focus on the future facilitates the development of initial products based on new technologies. Finally, in support of H1c (see Table 6), future focus has a significant positive effect on the deployment breadth of innovations ( $\gamma = .03$ ,  $p<.01$ ). Thus, a greater focus on the future enhances banks' ability to deploy initial products based on new technologies.

#### ***External Focus and Innovation Outcomes***

Hypothesis H2 predicts that firms whose CEOs are higher in external focus are (a) faster at detecting new technological opportunities, (b) faster at developing initial products based on these technologies, and (c)

superior at deploying these initial products than other firms. In support of H2a (see Table 4), external focus increases the hazard rate for detection (hazard ratio=1.005,  $p<.10$ ). Thus, a greater focus on the external environment facilitates banks' detection of potentially new technologies. In support of H2b (see Table 5), external focus increases the hazard rate for development speed (hazard ratio=1.009,  $p<.05$ ). Thus, a greater focus on the external environment hastens firms' development of initial products based on new technologies. Finally, external focus has no effect on the deployment breadth of innovations (see Table 6). Thus, contrary to H2c, a greater focus on the external environment has no effect on the breadth of initial products based on new technologies that firms deploy.

### ***Internal Focus and Innovation Outcomes***

Hypothesis H3 predicts that firms whose CEOs are higher in internal focus are (a) slower at detecting technological opportunities, (b) slower at developing initial products based on these technologies, and (c) inferior at deploying these initial products than other firms. In support of H3a (see Table 4), internal focus decreases the hazard rate for detection (hazard ratio=.99,  $p<.05$ ). Thus, a greater focus on the internal environment reduces the speed with which firms detect new technologies. In contrast to H3b, however, internal focus increases the hazard rate for development (hazard ratio=1.01,  $p<.05$ ). Thus, a greater focus on the internal environment has a positive effect on the speed with which firms develop initial products based on new technologies. Finally, internal focus also has no effect on the deployment breadth of innovations (see Table 6). Thus, contrary to H3c, a greater focus on the internal environment is not predictive of how effectively a firm deploys initial products based on new technologies.

### ***Control Variables and Innovation Outcomes***

Among the control variables, only bank size has a somewhat consistent effect across all innovation outcomes. Specifically, bank size increases the hazard rate for detection (hazard rate=1.16,  $p<.01$ ). Thus, larger banks are able to leverage their more substantial organizational resources to detect innovation opportunities more quickly than smaller banks that are likely to have smaller resource base. Bank size also has a positive influence on the deployment breadth of innovations ( $\gamma =.47$ ,  $p<.01$ ). Thus, the greater resources of larger banks also enhance firms' ability to deploy initial products based on new technologies.

### ***Robustness Checks and Additional Analyses***

To check for the robustness of our results above, and to explore possible alternative explanations, we conducted additional analyses to examine the following issues.

*Do letters to shareholders actually reflect the topics that CEOs pay attention to?* In addition to the evidence (from the literature and from our banking data) that we noted in the Method section of the paper, we present additional evidence for the appropriateness of letters to shareholders in assessing how CEOs allocate their attention. Specifically, we compare the boardroom agendas of two Fortune 500 companies with their letters to shareholders. We first code the detailed agendas of the Board of Directors' meetings to estimate the percentage of time allocated to discussions consistent with our working definition of future focus. These agendas provided details about (a) specific topics scheduled for discussion and (b) time allocated for each topic. We find that each meeting lasted about four hours (firm 1: mean of 4.08 hours for 27 meetings; firm 2: mean of 4.44 hours for 13 meetings). As the agendas contained confidential and proprietary details, only one of the authors was allowed access to these agendas. If clarification was needed on a specific agenda item, this author could consult with a board member. Following our definition of future-focused attention, we first code each agenda item as future-focused if it pertained primarily to events that were yet to occur; we then measure the time allocated during that meeting to that agenda item. If a specific item was shown on the agenda as part of a broader topic (usually with bullet points), we assume that equal time was devoted to each sub-topic. Following this procedure, we compute the proportion of total meeting time allocated for future-focused discussions. We find that Firm 1 has a mean of 28.5% for 27 meetings from 2000-2005 while Firm 2 has a mean of 11.87% for 13 meetings from 2002-2005.

Next, we analyze the CEOs' letters to shareholders of both companies over the same time period and compute a measure of future focus using our text-based approach. We find that the extent of future focus measured based on the text analysis of the CEO's letters for Firm 1 (7.9%) is greater than that for Firm 2 (6.6%). We also find that the CEO's letters for Firm 1 use the word 'future' almost twice as frequently (5.2% of all sentences) as those for Firm 2 (2.6%).

Therefore, while acknowledging the subjectivity inherent in any text-based approach, we believe that the letters to shareholders data we use reliably reflects how senior managers in firms allocate their attention. *Does CEO turnover affect our results?* High turnover in CEOs would make it difficult to attribute the attention patterns of a particular CEO to innovation outcomes that occur under other CEOs. To address this issue, we collected data on all CEOs in all the firms in the sample during the study period, and conducted a number of additional analyses. We first examined the tenure of the longest serving CEO in each firm during 1990-2002. We find that the median tenure is 11 years (mean: 10.32 years), over this 13 year period, suggesting that a single CEO tends to dominate the period for most firms. Next, we examined the extent to which the same CEO supplied the information in the letters to shareholders in the first period (1990-1995). Specifically, we calculated the percentage of firms for which the letters to shareholders during this six year period were written by the same CEO. We find that in 77% of the firms, the same CEO wrote all the letters to shareholders in first period.

We then examined the extent to which the CEOs who wrote the letters to shareholders remained as CEOs of the firm in the second (implementation) period. For the 77% of firms in which the same CEO wrote all the letters to shareholders during 1990-1995, we find that these CEOs remained as CEOs in 92% of the years from 1996 until the year in which the banks implemented transactional Internet banking, and in 76% of all the years from 1996 until 2002. For the 23% of firms where the CEO changed at least once in the first period, we find that the CEOs who wrote the letter to shareholders in 1995 continued as CEOs in 94% of the years from 1996 until the year in which the banks implemented transactional Internet banking, and in 82% of the years from 1996 until 2002.

Overall, these results suggest that in most cases, the CEO supplying the information in the first period is indeed the CEO who implemented the programs in the second period. Contrary to descriptions in the popular press about the precarious nature of the CEO's position, we find that CEOs in our empirical context enjoy considerable longevity and thus have the opportunity to exert a long-lasting influence on the firm.

In addition to conducting these analyses, we also collected information on continuity in the top

management team in all cases in which there was a change in CEO. Specifically, in all cases of CEO change, we obtained information on a) whether the individuals who succeeded the CEO were insiders (i.e., members of the previous CEO's top management team) or outsiders to the firm, and b) whether the outgoing CEO continued on the top management team (generally as Chairman) after stepping down as CEO. Prior research indicates that both of these factors – selection of an insider as successor, and the continued presence by the prior CEO on the top management team – are indicators of the continued influence of the outgoing CEO on the actions of the firm (Shen and Canella 2002; Zhang and Rajagopalan 2004). Our analysis indicates that firms that did see changes in CEOs almost invariably chose insiders as successors. Specifically, we find that 92.5% of all new CEOs were insiders (i.e., current members of the top management team of the firm). Moreover, 75% of the departing CEOs continued on the top management team (generally as Chairman of the Board) even after they left the CEO position. These results provide additional evidence that the CEOs influence continues even after departure.

Finally, we conducted two additional analyses. First, we re-estimate equations 1-4 by also controlling for whether CEOs were insiders and whether the departing CEO continued as chairman. We find that our results are robust to this analysis and that these variables are not significantly different from zero in all our analyses. Second, we examined if the frequency of CEO changes is a significant predictor of the firm's attentional focus (i.e., its future, internal and external focus). We find that CEO changes are not significantly correlated with any of the measures of attentional focus ( $p > .40$  in all cases).

All of these results indicate that there exists substantial continuity between the CEO who supplied the information in the first period and the CEO who implemented the program in the second period, and that the CEO changes that do occur do not significantly impact the results from our analysis.

*Does firm performance provide an alternate explanation for our results?* A possible alternative explanation for our findings is that high-performing banks in the 1990-1995 period might be more likely, as a consequence of their good performance, to focus on issues in the future and external to the organization. As such, their scores on future and external focus may be high. Further, their good performance might also enable them to invest in new opportunities like Internet banking, enhancing their ability to detect and develop

Internet banking earlier and deploy it more extensively. The converse of the above explanation might apply to low-performing banks. To examine this alternative explanation, we present two analyses. First, we test if performance (ROA and ROE in years prior to 1995) is correlated with temporal and spatial attention of CEOs. We find no evidence of this. The correlation between ROA in 1994 and future, external and internal focus is  $-.04$  ( $p=.61$ ),  $0.03$  ( $p=.64$ ) and  $-.02$  ( $p=.78$ ), respectively. Similar results hold for ROA in 1992 and 1993 and for alternate measures of performance such as ROE in these years. Second, we re-estimate equations 1-4 with an additional control for banks' performance (ROA and ROE) in 1994 (we also do the analysis for 1993 and previous years). We find that our results remain robust in this additional analysis. ROA and ROE are mostly non-significant, while the direction and significance for our hypothesized variables is largely as in Tables 4, 5 and 6. Thus, it appears unlikely that firm performance offers an alternative explanation for our findings.

## **Discussion**

### ***Insights and Limitations***

In this paper, we argue that CEOs have a direct, positive and long-term impact on innovation outcomes in firms. Specifically, we show that the manner in which CEOs exercise their discretion to allocate scarce attentional resources has significant implications for the innovation outcomes of the firm over a long time period. Our view is different from much existing research, which often views CEOs as 1) impediments to innovation, 2) irrelevant for innovation, or 3) having at best an indirect effect on innovation. The attentional perspective we advocate in this paper also contrasts with existing literature that tends to view the effects of leadership through the lens of observable characteristics such as personality, demographics, or leadership style (e.g., Kitchell 1997). While the potentially significant role of managerial cognition on firms' innovation outcomes is frequently noted in the business press, little is actually known about the link between how leaders think and the specific innovation outcomes that occur in the marketplace. This research effort, with a focus on CEO cognition, represents a first step toward fully understanding the nature of this link.

Using longitudinal data from the US retail banking industry, we find support for the hypothesized link between CEOs' attentional focus and innovation outcomes. Specifically, we find that firms with CEOs

who attend to the future more are (a) faster at detecting new technological opportunities, (b) faster at developing initial products based on these technologies, and (c) superior at deploying these initial products. Our results are mixed for CEOs' attention to the external and internal environment. We find that firms whose CEOs attend more to the external environment are (a) faster at detecting new technological opportunities and (b) faster at developing initial products based on these technologies than are firms whose CEOs attend less to the external environment. However, we find no link between CEOs' external focus and breadth of deployment. Finally, we find that firms whose CEOs direct more attention to the internal environment are slower at detecting but faster at developing new technological opportunities than firms whose CEOs attend less to the internal environment. However, we find no link between CEOs' internal focus and breadth of deployment. Thus, overall, six of our nine attention-based hypotheses are supported. These findings are particularly noteworthy because, even with fairly coarse text-based measures of attention, we find a strong link between what CEOs attend to and what their firms achieve in specific innovation outcomes in subsequent time periods. Taken together, this underscores the importance of the primary substantive issue that motivated this research effort—that innovation research, in marketing and related disciplines, can make significant progress by looking more closely at CEOs' attentional foci.

Our findings must be viewed in light of the strengths and weaknesses of this study's empirical context and method. Regarding the empirical context, we track the evolution of Internet banking over many years and study the participation of a broad spectrum of banks. The presence of several regulatory entities also ensures the availability of reliable firm-level data over this period. Despite these obvious advantages, additional research in other empirical contexts is needed to establish the generalizability of our findings. Regarding our longitudinal data set and method, we establish a clear temporal separation between the measurement of our independent variables (i.e., attention patterns of a firm's CEO) and innovation outcomes (i.e., detection, development, and deployment of new technology related to Internet banking). Thus, our approach addresses the oft-mentioned criticism of cross-sectional survey-based research that investigates such issues (i.e., lack of temporal separation between measures). Further, our text-based method represents an innovative approach to assess attentional patterns of CEOs who are generally difficult to reach directly

through surveys.

Nevertheless, like other studies that use text-based methods, this study has some limitations too (see Kabanoff 1997). Our measures of attention patterns are based on letters to shareholders that may not exclusively reflect, in all cases, the thought processes of the CEO. Further, our measures of attention are based on word counts. Although we took several steps to ensure the internal validity of our measures, we must note the limitations that stem from the element of human judgment that enters text-based methods. A fruitful avenue for future research would be to further open the ‘black box’ of CEO attention by more directly assessing CEO attention, instead of relying as we do on indicants of CEO attention. Despite the strengths of our approach, finer-grained longitudinal data about individual firms will be needed to explore more fully the actual causal sequence of events leading to innovation outcomes. For instance, Mintzberg and Water’s (1985) view on *emergent* strategies (in contrast with *deliberate* strategies that we implicitly assume in our work) suggests the possibility that attentional emphases found in CEOs’ letters to shareholders may represent the crystallization of strategies that a firm has pursued in an improvisational or serendipitous manner. Detailed process-related data are needed to fully understand this interplay between deliberate and emergent strategies. Similarly, our data are not rich enough to identify the role of short-term future focus relative to long-term future focus.

More generally, this research examines a fairly simple set of drivers of innovation. While simplicity can be powerful and desirable, more complex explanations of innovation can yield additional insights. We list some such opportunities below. First, CEO attention could just be a starting point, and its effects on innovation could be mediated by the incentive structures that result from such attention (see Dutton and Ashford 1993). Second, it is possible to think of all three components of innovation (detection, development, and deployment) in terms of level and speed. Because we do not have reliable data on both these dimensions for all three components, we have not examined them here. Third, we do not distinguish between those innovations that were developed internally in a firm, relative to those that were developed by external entities. Fourth, more detailed information on general organizational culture and R&D expenditures can address whether these variables play a more important role in driving innovation than the attentional

variables we discuss in this research.

### ***Implications for Practice***

*The CEO as leader.* This paper argues and shows that CEOs are the heads of firms in more ways than one. They lead the firm and they think for it. They think for it in terms of focusing attention on the future and on opportunities and challenges in the environment. They lead the firm in terms of directing the attention of others in the organization towards those thoughts and actions that ensure the survival and growth of the firm. Those CEOs who don't, our paper suggests, do poorly at innovation, and might be doomed to sink and take their firms with them.

It may be tempting to think that the CEOs of most firms, recognizing the significance of the issues highlighted above, must already be making a concerted effort to emphasize looking ahead and outside. But do they? While detailed data on how CEOs actually allocate their attention are difficult to obtain due to the obvious reasons of confidentiality and lack of access, Hamel and Prahalad (1994) estimate that “senior management is devoting less than 3% ... of its energy to building a corporate perspective of the future” (p. 4). In our dataset of 867 letters to shareholders from 176 public firms, 9.21 % of all thoughts (sentences) were categorized as future focused. Additional studies can perhaps provide more detailed data about the allocation of attention by CEOs, but it appears that future-focused deliberations in firms are not as prevalent as one would expect.

*Letters to shareholders as an internal marketing tool.* Letters to shareholders are often seen as a means to communicate with external audiences such as regulators and shareholders (e.g., Abrahamson and Amir 1996); they are rarely seen as an *internal* marketing device. A key implication of this paper is that letters to shareholders have a crucial internal purpose too. They can be a powerful tool that can galvanize employees within firms into committing resources to activities vital to the firm's long-term survival and growth. As with advertising (see Gilly and Wolfinbarger 1998), letters to shareholders might serve to motivate employees by making them proud to belong to the organization. More importantly, they can help charge employees with a vision that aligns their goals with those of the firm and drives them to perform actions that benefit the firm. Firms may benefit from a better understanding and use of this important tool to motivate and manage

employees.

*Innovation is more than product development.* A final managerial implication of this paper stems from its emphasis on innovation as a process rather than as a discrete event. As we show, innovation is more than product development alone: firms must first detect technological opportunities; later they must refine and extend products to deploy them well. Firms and CEOs that understand this will succeed at the Herculean task of detecting, developing and deploying new technologies over a long period of time, and then repeating the cycle again at the next sign of change. A subtle point in this regard is that CEOs need not involve themselves with the nitty-gritty of actual detection, development and deployment. Their mere orientation toward the future and the external environment is sufficient to help steer others in the firm to perform these quotidian but nevertheless vital tasks.

### ***Implications for Research***

*Putting the head back on.* Despite calls to raise the profile of marketing in the upper echelons of the firm (Kumar 2004; Webster, Malter, and Ganesan 2003, 2005), the links between top management and marketing activities are still relatively unexplored in the marketing literature in general and the innovation literature in particular. Indeed, much work in marketing (on innovation) regards the firm as a sort of headless machine that goes about its work without any particular direction from the top. Outside marketing, the literature that does look at the role of the CEO in innovation often emphasizes its negative or indirect influence. We correct for these views by putting the head right back on the firm, and emphasizing the direct, positive role the CEO plays in innovation. Specifically, we show that CEO attention matters and that its effects on specific innovation outcomes persist and are evident over a long time frame. We also find that not all types of CEO attention are equal. A focus on the future appears to be more crucial, relative to a focus on the external environment. A focus on the internal environment can in some ways be a drawback. While past research has examined the influence of a firm's external and internal focus on innovation (Atuene-Gima 1996; Day 1994; Hurley and Hult 1998; Miles and Snow 1978; Jaworski and Kohli 1993), less research has emphasized the importance of a focus on the future. This paper suggests that future research pay more attention to CEO attention in general, and its temporal dimension in particular.

*The use of letters to shareholders and text analysis.* This research demonstrates the importance of a relatively under-used tool to research questions concerning CEO cognition and innovation, namely firms' letter to shareholders. Using these letters, and techniques that employ text analysis, allows us to get around many of the problems that surveys are notoriously subject to. Among the many benefits of letters to shareholders are that they enable us to study managerial cognition, they are public documents which require and involve some objectivity and accountability, and they are easily available with regularity over multiple time periods. This paper suggests that future research has much to gain from their use, along with the more general application of text analysis to other sources of textual data on managerial cognition such as press releases, archival material within firms and interviews with top managers. Indeed, finer-grained measures of attentional foci would allow stronger tests of our underlying conceptual arguments.

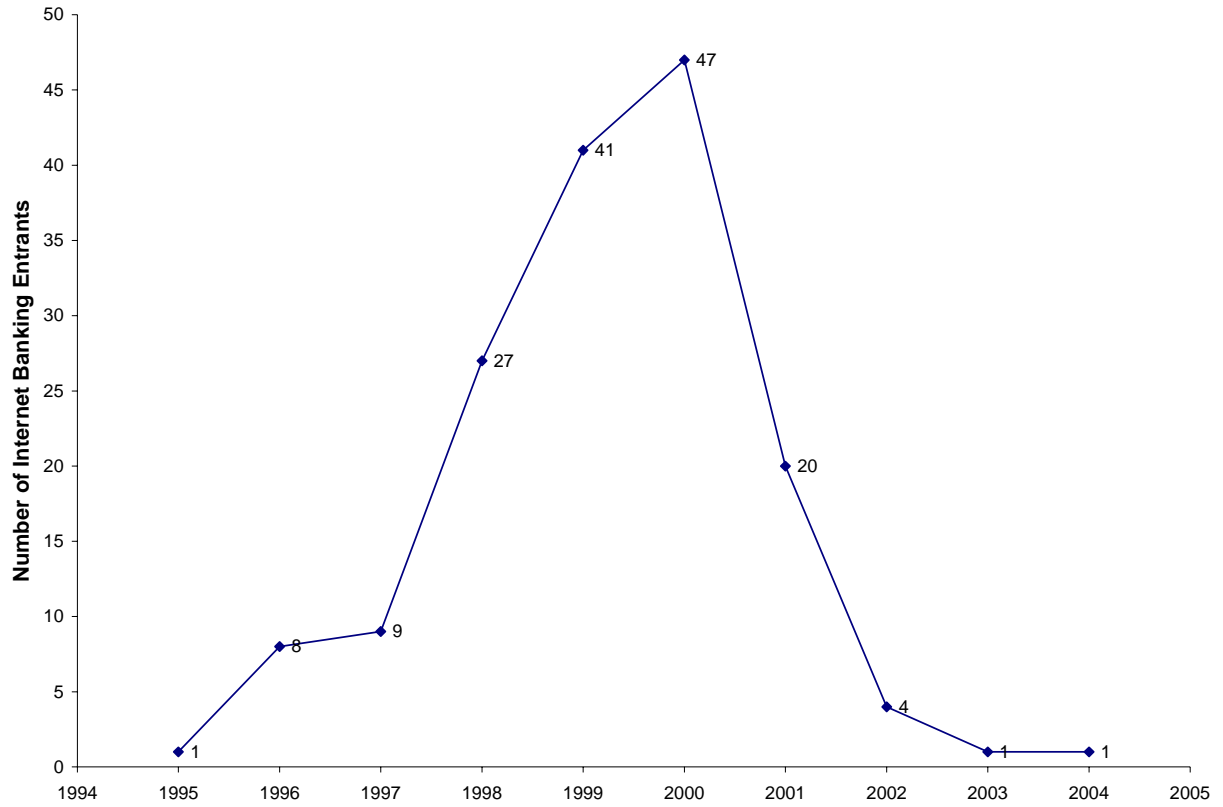
Further, while computer-aided text analysis is promising when dealing with large sets of textual data, it would be desirable to complement it with other methods such as in-depth interviews, internal company documents, and participant observation (for use of interviews, see Calori 1994). Apart from triangulation, one goal of using alternative data sources and methods would be to provide additional insights related to the *content* of CEOs' cognitions. These content-specific cognitions are significant as they may influence innovation-related decisions (e.g., resource allocation, organizational structure, etc.). Future research may benefit greatly from understanding this influence.

*Beyond product development alone.* This paper argues and shows that innovation is a process that unfolds over a long period of time. In contrast to much of the literature that views innovation as a discrete event, or at best a process that involves the development and launch of new products, we show that innovation also involves the prior stage of detection and the subsequent stage of deployment. Moreover, the impact of CEO attention on these three outcomes is not straightforward: its impact is strongest on detection, followed by development and then deployment. Thus, our research shows that a focus on any one aspect of innovation alone can mask the full effects of the drivers of innovation. This is in contrast to past research which, at most, acknowledges the impact of CEOs on product development, indirectly through their role in supporting product champions. The research is generally silent, however, on the role of the CEO on other aspects of

innovation. Future research can shed more light on these issues by studying how attentional patterns translate into specific actions pertaining to innovation. Such research can help enrich the attentional perspective we present, and begin to address the issue of leadership that Van de Ven (1998) identified as one of the central problems in the management of innovation.

**Figure 1**

**Internet Banking Entry by US Publicly Held Banks: 1995-2004**



**Table 1**  
**Characteristics of Banks in the Study**

<i>Bank Characteristic</i>	<i>N</i>	<i>%</i>
Employees		
0-100	32	18.2
101-200	42	24.9
201-600	41	23.3
601-1400	17	9.7
>1400	37	21.0
Assets (millions)		
0-500	82	46.6
501-1000	26	14.8
1001-5000	32	18.2
>5000	30	17.1
Banking Charter Class <sup>a</sup>		
1	79	44.9
2	21	11.9
3	59	33.5
4	3	1.7
5	8	4.5
Asset Concentration Hierarchy <sup>b</sup>		
1-4	95	53.4
5-9	75	48.3

Total N=176. Percentages may not add up 100 due to missing observations.

<sup>a</sup>A classification code assigned by the FDIC based on the institution's charter type (commercial bank or savings institution), charter agent (state or federal), Federal Reserve membership status (Fed member, Fed non-member) and its primary federal regulator (state chartered institutions are subject to both federal and state supervision). There were very few savings banks and savings associations in our data set (classification codes 4 and 5, respectively).

<sup>b</sup>A classification code assigned by the FDIC to indicate a bank's primary specialization on the basis of its assets.

**Table 2**  
**Summary of Measures and Sources**

<i>Conceptual Variable</i>	<i>Operationalization</i>	<i>Data Source</i>
Detection Speed	Date that domain name was registered (January 1996-January 2004)	FDIC InterNIC
Development Speed	Date that transactional Internet bank was launched (January 1996 – January 2004)	Internet Archive Bank Websites Factiva Thomson Directory of Internet Banks Online Banking Directory Phone Calls to Bank Managers
Deployment Breadth	Number of incremental innovations introduced over time (measured December 2001): Java applets, Internet Business Banking, Internet Tax Filing, Internet Brokerage, and Mobile Banking	Internet Archive Bank Websites Online Banking Report
Future Focus	Frequency of the word “will” in annual letters to shareholders, following guidelines in psycholinguistics research (1990-1995)	Compact D/SEC Lexis Nexis
External Focus	Frequency of words (see Appendix 2) denoting outward attention to customer and competitors in annual letters to shareholders (1990-1995)	Compact D/SEC Lexis Nexis
Internal Focus	Frequency of words (see Appendix 2) denoting inward attention to organization-specific issues and developments in annual letters to shareholders (1990-1995)	Compact D/SEC Lexis Nexis
Control Variables	Total number of text units (sentences) in letters to shareholders	Compact D/SEC Lexis Nexis
	Bank size: Number of employees, Assets and Deposits	FDIC
	Bank demographics: Bank specialization and Rurality of HQ location	FDIC
	Complexity of Internet bank at initial launch	Internet Archive Online Banking Report
	Bank performance: ROA and ROE	FDIC
	Changes in CEO	<i>Corporate Affiliations</i> , Factiva

**Table 3**  
**Descriptive Statistics**

	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Speed of Detection <sup>a</sup>	2214.75	709.32	0	4937
Speed of Development <sup>b</sup>	52.17	17.69	0	115
Deployment Breadth <sup>c</sup>	3.26	1.78	0	5
Future Focus	24.76	18.55	0	120
External Focus	70.80	54.05	3	279
Internal Focus	71.52	50.89	3	328
Total Text Units	267.13	153.54	31	328
Ln(Employees)	5.88	1.70	1.38	11.03
Bank Specialization	.50	.50	0	1
Bank Rurality	2.38	1.58	1	7

<sup>a</sup>Lag in days for the focal bank (after the first bank registered a domain name).

<sup>b</sup>Lag in months for the focal bank (after the first bank offered online banking).

<sup>c</sup>Number of innovations deployed by the focal bank.

**Table 4**  
**Effect of Attentional Focus on Speed of Detection**

<i>Independent Variable</i>	<i>Hazard Ratio (Standard Error)</i>
Future Focus	1.016* (0.01)
External Focus	1.005* (.4 X 10 <sup>-2</sup> )
Internal Focus	.99** (.2 X 10 <sup>-2</sup> )
Total Text Units	.99 (.1 X 10 <sup>-2</sup> )
Ln(Employees)	1.16*** (.07)
Bank Specialization	.94 (.15)
Bank Rurality	1.04 (.06)
CEO Changes Until Detection	.79 (.14)
Cumulative Detection	1.01*** (.2 X 10 <sup>-2</sup> )
Log Likelihood	-607.61
LR Chi <sup>2</sup>	55.46***
AIC	1233.21

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

**Table 5**  
**Effect of Attentional Focus on Speed of Development**

<i>Independent Variable</i>	<i>Hazard Ratio (Standard Error)</i>
Future Focus	1.018* (.01)
External Focus	1.009** (.4 X 10 <sup>-2</sup> )
Internal Focus	1.01** (.5 X 10 <sup>-2</sup> )
Total Text Units	.992*** (.2 X 10 <sup>-2</sup> )
Ln(Employees)	1.09 (0.09)
Bank Specialization	1.05 (0.27)
Bank Rurality	1.03 (0.08)
CEO Changes Until Development	1.18 (.31)
Cumulative Development	1.00 (.9 X 10 <sup>-3</sup> )
Time Since Detection	.99*** (.3 X 10 <sup>-3</sup> )
Log Likelihood	-274.53
LR Chi <sup>2</sup>	16.99**
AIC	569.06

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

**Table 6**  
**Effect of Attentional Focus on Deployment Breadth**

<i>Independent Variable</i>	<i>Substantive Model Coefficient (Standard Error)</i>	<i>Selection Model Coefficient (Standard Error)</i>
Future Focus	.03 <sup>***</sup> (.01)	-2.49 X 10 <sup>-3</sup> (1.3 X 10 <sup>-2</sup> )
External Focus	-4.55 X 10 <sup>-3</sup> (5.05 X 10 <sup>-3</sup> )	5.3 X 10 <sup>-3</sup> (5.09 X 10 <sup>-3</sup> )
Internal Focus	-6.02 X 10 <sup>-3</sup> (4.95 X 10 <sup>-3</sup> )	-5.30 X 10 <sup>-3</sup> (4.52 X 10 <sup>-3</sup> )
Total Text Units	7.24 X 10 <sup>-4</sup> (2.25 X 10 <sup>-3</sup> )	1.16 X 10 <sup>-3</sup> (2.34 X 10 <sup>-3</sup> )
Ln(Employees)	.47 <sup>***</sup> (.08)	.15 <sup>**</sup> (.08)
Bank Specialization	-.64 <sup>***</sup> (.27)	-.25 (.24)
Bank Rurality	.04 (.10)	-.01 (.08)
CEO changes until deployment	.87 <sup>**</sup> (.28)	.09 (.25)
Complexity at Launch	-.27 (.22)	
Time Since Development	.01 (.01)	-.04 <sup>***</sup> (8.63 X 10 <sup>-3</sup> )
Intercept	-.01 (1.10)	1.03 <sup>*</sup> (0.77)
N: total	144	
N: uncensored	75	
Log Likelihood	-192.52	
Wald Chi <sup>2</sup>	83.39 <sup>***</sup>	
AIC	418.83	

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

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## **Appendix 1**

### **Manual Coding Instructions for Future Focus**

The purpose of this coding exercise is to identify the main issue(s) being referred to in each sentence in the enclosed set. These sentences (all of which have the word "will") have been selected from banks' annual reports. Please read each sentence carefully and then complete the coding sheet using the following guidelines. If you encounter an incomplete sentence, or would like more information about the context of a sentence, please write the sentence number on the coding sheet, leave the code blank, and mark the sentence for future coding.

**Coding question:** Is the sentence "future focused"?

**Guidelines:** A "future focused" sentence is a statement that reflects attention being directed at events **that have yet to occur**. "Events" in this context refer to actions to be taken by the firm or some other entity, anticipated outcomes of these actions, or other developments in general.

Examples of "future focused" sentences:

- We will continue our aggressive pursuit of expense management.
- In 1995 and years ahead, we will realize increased benefits from these investments.
- Westwater will retire as Director Emeritus this April.

Examples of sentences that are NOT "future focused":

- This section will cover some of the highlights of our 1991 accomplishments.
- The past year will remain as one of frustration at the events directed at our industry.
- You will find the excitement and glitz of Las Vegas-home to ten of the world's eleven largest hotels.

**Appendix 2**  
**Dictionaries for Automated Coding**

<b>External Focus</b>		<b>Internal Focus</b>	
Customers	Competitors	Organizational	
Customer	Competitive	Organization	CEO
Customers	Competitiveness	Organizational	President
Consumer	Competitor	Reorganization	Vice-President
Consumers	Competitors	Management	Vice-presidents
Buyer	Compete	Retire	Director
Buyers	Competition	Retired	Directors
Market	Peer	Retirement	Officer
Markets	Peers	Employee	Officers
Market-place	Companies	Employees	Subsidiary
Marketplace	Banks	Staff	Subsidiaries
Communities	Firms	Stakeholder	Diversification
	Position	Stakeholders	Diversify
	Positioning	Board	Diversified
	Positioned	Manager	
		Managers	