Innovation Streams and Ambidextrous Organizational Designs: On Building Dynamic Capabilities

Michael Tushman
Wendy Smith
Robert Wood
George Westerman
Charles O’Reilly

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Abstract

This paper explores the roots of dynamic organizational capabilities. We suggest that streams of innovation are central to a firm’s dynamic capabilities. We argue that organizational design is an important determinant of innovation streams and that these streams can be effectively executed within organizations through ambidextrous organizational designs. Based on in-depth data on 15 business units and 36 innovation episodes we explore the consequences of organization design choices on innovation outcomes. We explore the phenomena of ambidextrous organizational designs - what they are, how they operate, and their association with innovation outcomes. We also explore their boundary conditions as well as how these complex organizational forms evolve. Functional designs, cross-functional teams, and unsupported teams are significantly less effective in hosting innovation streams than ambidextrous designs. Ambidextrous organizational designs are effective for all types of non-incremental innovations except for product substitution events. Further, the use of ambidextrous designs was associated with the sustained performance of existing products. While not all ambidextrous designs were successful, firms that did not employ ambidextrous designs were unable to implement streams of innovations. Two business units initiated spinouts but only after the non-incremental innovations were initiated within an ambidextrous design. These exploratory results suggest that organizational design and senior leadership behaviors are powerful levers in driving streams of innovation and that ambidextrous organizational designs permit a business unit to simultaneously explore and exploit. We discuss the implications of these results for the ongoing debate on the nature of dynamic capabilities and organizational evolution.
Understanding the determinants of dynamic capabilities, the ability of a business unit to thrive over time, is a topic of fundamental interest to strategy and organizational scholars (eg Teece, Pisano and Scheun, 1997; Wiggins and Ruefli, 2002). Prior research has focused on making choices between strategic alternatives like flexibility or efficiency (Thompson, 1967; Burns and Stalker, 1961; Ghemawat and Costa, 1993), specialist or generalist (Hannan and Freeman, 1977) and differentiation or low cost (Porter, 1996). However as competitive rivalry increases and environmental conditions shift both more rapidly and unpredictably, more recent work suggests that organizations need to be able to simultaneously explore and exploit (March, 1991; Sutton, 2002), operate in multiple time-frames (Gavetti and Levinthal, 2000), as well as be capable of operating both flexibly as well as efficiently (Tushman and O’Reilly, 1997; Volberda, 1996; Brown and Eisenhardt, 1998).

Yet the organizational mechanisms for operating in multiple selection environments and the associated nature of organizational evolution are unresolved and hotly debated topics (Pettigrew, Woodman, and Cameron, 2001; Burgelman, 2002a; Weick and Quinn, 1999; Rivkin and Siggelkow, 2001; Adler,Goldoftas, and Levine, 1999). While the topics of organizational designs for dynamic capabilities and the nature of organizational evolution are interrelated, this paper focuses empirically only on the linkages between organization design and streams of innovation. Further, we focus on dynamic capabilities at the business unit level of analysis1.

We empirically explore the phenomena of ambidextrous organizational designs, how they work, and their boundary conditions. Based on a sample of 15 business units attempting to execute innovation streams, we find that ambidextrous organizational designs are significantly more effective in hosting innovation streams than all other

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1 There is much literature on building dynamic capabilities through internal corporate venturing, alliances,acquisition, and joint ventures at the corporate level of analysis (eg Burgelman, 2002b;Van de Ven et al, 1999; Leifer et al, 2000). We focus on general managers building dynamic capabilities within business units.
organizational forms employed. Those business units with low performing innovations that switched to an ambidextrous design significantly enhanced their innovation outcomes. Further, the use of ambidextrous designs to execute non-incremental innovation was associated with significantly enhanced performance of the existing products. Two highly effective organizations initiated product substitutions without ambidextrous designs. In our sample, there were no examples of managing innovation streams through spinouts, venture capital, or through sequential attention to innovation. Those most successful organizations were able to evolve through continued exploitation of a given product as well as through exploring across a range of innovation types. Given these results, we discuss linkages between complex organizational designs and business unit/organizational evolution.

Innovation Streams and Dynamic Capabilities

To compete over time, firms must create portfolios of innovation that extend their existing technical trajectory and/or move into different markets (Abernathy and Clark, 1985; Eisenhardt and Tabrizi, 1995; Teece and Pisano, 1994; Tushman and O’Reilley, 1997). For example in the newspaper business, incumbent newspaper organizations have been challenged by the rapid emergence of instantaneous news delivered over the web. Incumbent newspapers must compete through incremental product and process innovation, architectural innovation (e.g., adding or eliminating sections), as well as through discontinuous innovation (e.g., editing and delivering the news via the web). These architectural and discontinuous innovations may well be introduced to fundamentally new markets than the incumbent currently serves (e.g., USA Today’s international edition). Dynamic capabilities requires that incumbents build on and exploit current capabilities as well as create fundamentally new products/services to potentially new customers.

Innovation streams are unique to a firm and its history. For a particular firm, innovations differ from one another based on their technical departure from existing products and/or departure from existing markets (Abernathy and Clark, 1985; Henderson and Clark, 1990; Christensen, 1997; Tushman and Smith, 2002). Streams of innovation involve extending the existing product as well as developing one or more non-incremental innovations that may be marketed to new customers. For example at Ciba
Vision, Glen Bradley created the conditions where his firm was simultaneously able to
develop lower cost conventional lenses and associated solutions even as they developed
daily disposables, extended wear lenses, and a pharmaceutical based product that would
correct a common eye pathology. These innovations had the potential to cannibalize the
business of the conventional lens/solutions business.

More generally, innovation streams refer to a portfolio of innovations that differ
along technological and/or market dimensions. Incremental technical change refines and
extends the existing product’s price/performance ratio through the continued exploitation
and local search of an existing technological trajectory (Dosi, 1982; Rosenkopf and
Nerkar, 2001). For example, IBM’s Network Technology organization under Chris Kelly
developed transport and network technology even as her organization drove costs down
in their existing Asic business. Architectural innovations add or subtract product
subsystems or change the linkages between subsystems (Henderson and Clark, 1990;
Baldwin and Clark, 2000). For example at Ciba Vision, the addition of a color substrate
to the existing conventional lens was an architectural innovation. While architectural
innovation may be technologically minor, they are difficult for incumbents to execute
(Henderson and Clark, 1990). Discontinuous innovations involve fundamental technical
change in a product’s core subsystem (Dosi, 1982; Tushman and Smith, 2002). These
innovations trigger cascading effects throughout the product (Tushman and Murmann,
1998). In the tire and photography industries, for example, radial tires and digital cameras
were competence-destroying shifts from bias ply tires and analog cameras. Radial treads
had cascading effects on all other tire subsystems just as digital image capture affected all
other camera subsystems (Sull, 1999; Tripsas and Gavetti, 2000).

Innovations also differ in their target market or customer. Market or customer
differences are based on their distance from the focal firm’s existing customers (Leonard-
Barton, 1995). The least challenging market innovation involves selling to the firm’s
existing customer base. These innovations may be incremental line extensions or
discontinuous, but as they are focused on existing customers, they represent a limited
marketing/customer challenge to the incumbent (eg Von Hipple, 1988, Christensen,
1997). Well-defined new customer segments are more challenging to incumbents. For
example, HP’s Scanner Division’s move into portable scanners represented a shift to a
new customer segment for this Division. While this Division could not rely on customer information channels from their existing professional users, the consumer market was a well-defined and well-known customer segment. Emerging markets, markets where there is no reliable information on customers or their preferences are the most different from a firm’s existing customers (Leonard-Barton, 1995). These segments are the most strategically uncertain for incumbents. For example, Ciba Visions’ ophthalmic pharmaceutical product was targeted to ophthalmologists. Ciba Vision could not leverage its market competencies rooted in optometrists to this potentially emerging ophthalmologist market.

These technology and market dimensions define an innovation space whose origin is the focal firm’s existing product/market choices (see Figure 1). Where incremental innovation is associated with extending the existing technological trajectory to existing customers, non-incremental innovations are at points away from the origin. For example, HP’s Scanner Division, a leader in the flatbed scanning industry in the late 1990’s, developed two different hand held portable scanners even as it continued to innovate in flatbed scanners. Their initial hand- held scanners were architectural innovations (ie smaller versions of existing flat-bed technology) targeted to mobile professionals. Later, based on a discontinuous technological change in image capture and manipulation, this division implemented a much smaller scanner targeted to the emerging consumer market (see Figure 1).

Dynamic capabilities, reflected in sustained performance in a particular product franchise, are anchored in a firm’s ability to exploit through incremental innovation and explore through non-incremental innovation (March, 1991; McGrath, 1999). Dynamic capabilities are rooted in playing at multiple points in a firm’s innovation space-- in continual incremental innovation at the origin as well as non-incremental innovation at one or more cells in a firm’s innovation space. Yet each cell in a firm’s innovation space is associated with different task and environmental contingencies, and as such, requires its own set of structures, incentives, culture and competencies (Sutcliffe, Sitkin, and Browning 2000; Bradach, 1997; Nadler and Tushman, 1997). Those organizational characteristics required for an effective exploitative innovation are fundamentally different than those characteristics required for an effective exploratory innovation.
Where the former requires tight controls, structures, culture, and disciplined processes, the latter require looser controls, structures, and more flexible processes (Quinn and Cameron, 1988; Burgelman, 1991; Leonard-Barton, 1992).

Innovation Streams and Organizational Architectures

There are fundamentally contrasting views on how to configure organizations so that they can both explore as well as exploit. One view argues that because of senior team and organizational inertia, liabilities of change, and existing customer preferences, incumbents can only exploit current technologies or customers (Carroll and Teo, 1996; Christensen and Bower, 1996; Audia, Locke, and Smith, 2000; Foster and Kaplan, 2001). Christensen’s (1997) research in the disk drive industry indicates that because of customer preferences and existing resource allocation processes, dynamic capabilities are rooted in the creation of independent spinouts. Leifer et al (2000) found that the creation of radical innovation hubs and corporate venture units helped corporations escape the inertia of existing business units. Similarly, Foster and Kaplan (2001) found that, because of limited mental models in the senior team and because of cultural lock in, incumbents could initiated creative destruction through alliances, joint ventures, or through partnering with venture capitalists.

Contingency literature argues that organizational form should fit strategic imperatives (Donaldson, 1998; Nadler and Tushman, 1997). Firms must have strategies that are contingent on environmental conditions and organizational architectures that, in turn, fit their strategies (Lawrence and Lorsch, 1967, Hannan and Freeman, 1989; Gresov, 1989; Chandler, 1990). But, internal organizational consistency drives short-term effectiveness as well as long-term organizational inertia (Sorensen, 2002; Tushman and Romanelli, 1985). When environmental conditions shift, highly congruent firms either are either selected out of the environment or evolve through punctuated change (Miller, 1994; Romanelli and Tushman, 1994; Rosenbloom, 2000; Siggelkow, 2001). Senior teams may, however, be able to simultaneously host incremental innovation as well as product innovation through heavyweight teams coupled with system-wide change (Wheelwright and Clark , 1992). This contingency based literature puts a premium on
executive leadership, organizational design, and punctuated change as routes to dynamic capabilities (Miller 1990; Mintzberg and Westley, 1992).

Building on Weick’s (1979) notions of positive and negative feedback loops and Nelson and Winter’s (1982) ideas on routines and switching routines, a third approach to dynamic capabilities is routed in switching organizational designs over time. Duncan (1976) has argued that organizations can innovate by switching between organic structures during early phases of an innovation to mechanistic structures for the execution phase of the innovation. Duncan’s (1976) notion of design is anchored in the rhythmic switching of organizational designs within a business unit paced to the rate of innovation. The senior team’s role is to institutionalize these dual architectures and build senior team processes to deal with the conflicts and costs associated with switching designs. More recently, Brown and Eisenhardt’s (1997) research in the global computer industry finds that business units can operate in multiple time frames and develop streams of innovation by designing organizations that are both tightly and loosely coupled and through time paced innovations that are sequentially executed. Brown and Eisenhardt (1998) and Eisenhardt and Tabrizi (1995) suggest that semi structures and sequential attention to innovations permit organizations to continuously change rather than evolve through punctuated change. The role of the senior team in these switching models is to set the basic set of rules to permit the rhythmic switching between compression and experiential innovation modes.

**Innovation Streams and Ambidextrous Organizational Forms**

A fourth organizational design approach to building dynamic capabilities is a plural or ambidextrous organizational design. Like contingency ideas, ambidextrous designs are rooted in building organizational forms that match the complexities of the firm’s environment (Quinn and Cameron, 1988; McDonough and Leifer, 1983). But rather than integrated architectures or switching between designs, ambidextrous organizational forms are composed of multiple integrated architectures that are themselves inconsistent with each other (Bradach, 1997; Sutcliffe, Sitkin, and Browning, 2000; Tushman and O’Reilly, 1997). Exploitative subunits are organized to be efficient, while exploratory subunits are organized to experiment and improvise. These highly
differentiated subunits have only targeted tactical linkages. Ambidextrous designs achieve strategic linkage through the senior team (Tushman and O’Reilly, 1997). Quite different than autonomous strategic action initiated by internal entrepreneurs or skunkwork teams hidden from the rest of the organization (eg Burgelman, 2002b; Leifer et al, 2000), in ambidextrous designs the general manager and the senior team drive both induced and autonomous strategic action. Ambidextrous designs permit senior teams to simultaneously explore through experimentation as well exploit through rigorous processes.

Ambidextrous organizational forms do not switch between exploration and exploitation—they do both simultaneously. Nor do they rely on spinouts, internal venture groups, or venture capital to generate innovation options—they develop options internally. Further, these organizational designs are not semi structures that are both loose and tightly designed, but rather are composed of fundamentally different subunits some of which are tightly structures while others are loosely structured. These sources of variation do not emerge through autonomous actions of skunkwork teams but rather through the strategic actions of the senior team. These internally inconsistent architectures are physically, culturally, and structurally distinct from each other.

Where basic contingency ideas argue for both high differentiation and high integration in complex contexts (Lawrence and Lorsch, 1967; Donaldson, 1998; Rivkin and Siggelkow, 2001), ambidextrous designs are defined by high differentiation and limited tactical integration. Integration is achieved in ambidextrous organizations at the senior team level of analysis (Tushman and O’Reilly, 1997; Bradach, 1998).

Ambidextrous organizational architectures build dynamic capabilities through variation generated in exploratory units and through consistency and control managed in exploitative units. Such designs provide firms the capabilities to evolve both through sustained incremental change as well as through proactive punctuated change. For example, Adler, Goldofitas, and Levine (1999), Nonaka (1988), Nobelius’ (2002), and Bradach (1998) provide evidence of dynamic capabilities in the automotive, wireless, and restaurant franchise businesses through ambidextrous organizational designs.

To both protect the benefits of historically rooted learning as well as escape from this learning regime, ambidextrous business unit designs create multiple internally
inconsistent organizational architectures simultaneously (Tushman and O’Reilly, 1997; Adler et al, 1999). Such highly differentiated (or modular) organizational forms do not unlearn exploitative competencies, but rather they create fundamentally different learning contexts (Sutcliffe et al, 2000; Rivkin and Siggelkow, 2001). These ambidextrous organizational architectures escape the legacy of history and path dependence through the combination of high levels of differentiation and low levels of tactical integration.

But how can these internally contradictory architectures be integrated to leverage technological and/or market competencies? In the absence of strong formal linking mechanisms, ambidextrous organizations achieve leverage through senior team integration. Senior teams achieve strategic integration through an overarching product class strategy and vision, a limited set of common core values, as well as building senior teams with the demographic heterogeneity to deal with inconsistent architectures (e.g. Tushman and O’Reilly, 1997; Rotemberg and Saloner, 2000). Further, the senior team can build processes capable of dealing with the conflicts and tradeoffs associated with operating in multiple time frames (Tripsas and Gavetti, 2000; Gavetti and Levinthal, 2000; Sutton, 2002). Ambidextrous organizational forms take advantage of technological and/or market competencies not by switching back and forth between organizational forms or through sequentially initiating innovation streams. Rather ambidextrous organizations simultaneously operate in multiple time frames as they exploit and explore at the same time (see also Baghai, Coley and White, 1999). Spinouts make economic sense only when the firm has nothing to leverage- when the innovation is based on a discontinuous technology and is targeted to a fundamentally different market.

We define an ambidextrous organization as business units with: (a) high levels of differentiation reflected in distinct exploratory unit(s), each with dedicated innovation manager(s) and dedicated staff. These units are physically separate from the incumbent unit and the innovation manager(s) reports to either the general manager or a member of the senior team, (b) low levels of tactical integration between the incumbent unit and the exploratory unit(s) reflected in targeted cross unit formal linking mechanisms, and (c) strong senior team integration reflected in the general manager’s strong substantive and symbolic support for both the incremental and non-incremental units and the senior team with common fate incentives (see Figure 2).
These four design approaches lead to fundamentally different managerial actions to build dynamic capabilities. For example, in the early 1990’s, low cost, disposable conventional lenses (lenses that did not require solutions) threatened Ciba Vision’s conventional soft lens and solutions business. Glen Gradley, general manager of Ciba Vision, had to choose an organization form that would build and extend his organization’s franchise in the eye care industry. Bradley and his executive team had to decide whether to create streams of innovation through spin-outs, cross functional teams, skunkwork teams, switching Ciba’s organizational design between efficiency and innovation, or through creating an organizational design where he and his senior team managed distinct units that were simultaneously efficient as well as exploratory. The existing literature is silent on the differential effectiveness of these four approaches to driving streams of innovation.

This research focuses on ambidextrous organizational forms and their effectiveness in driving innovation streams. Based on a sample of business units that were explicitly attempting to manage streams of innovation, we explore the existence of ambidextrous organizational forms, their characteristics, their association with innovation outcomes, and their boundary conditions. Further, we assess the extent to which these firms used spinouts, ventures, and/or switching between exploitation and exploration in service of driving innovation streams. We also compare the relative performance of ambidextrous organizational forms to other organizations designs employed in hosting innovation streams.

METHODS

We chose a grounded theory building approach because of the lack of knowledge on the existence, nature, and characteristics of ambidextrous organizational forms at the business unit level of analysis. Such grounded theory building involves inducing empirical regularities from field based case data. Our research design is a multi-case design where a series of cases are treated as a set of independent observations that are
used to induce mid-range theory (eg. Van de Ven et al, 1999; Burgelman, 2002a; Brown and Eisenhardt, 1997; Yin, 1984). We employed these qualitative techniques along with analytical coding to induce ideas on ambidextrous organizational forms as well as explore the linkages between this organizational form and innovation outcomes. We used the business unit as our unit of analysis because this is the level within a single product or multi divisional firm where the senior team has to deal with the challenges of developing innovation streams (see also Adler et al, 1999; Brown and Eisenhardt, 1997).

Because our objective was to explore the relations between organization design and innovation streams, we sought out general managers who had managed or were attempting to manage innovation streams- both incremental as well as non-incremental innovations. We gathered in-depth data on 36 cases of non-incremental innovations attempted within 15 existing business units. For each case we assessed innovation type by comparing the target market and technology of the innovation with the firm’s existing product. Based on the existing work on ambidextrous organizations at the business unit level of analysis (eg Tushman and O’Reilly, 1997; Bradach, 1998), we also explored a set of organizational and senior team variables. Our sample is constrained to business units attempting to manage streams of innovation. We use these data to explore organizational designs employed to execute these innovations and the differential consequences of alternative designs. With this limited sample, however, we cannot speak to other modes of creating dynamic capabilities.

Sample

Our sample involves business units (or single product firms) simultaneously managing an established product and at least one non-incremental innovation. We defined a business unit as the lowest level in a multi divisional corporation where the general manager had full financial responsibility and decision-making authority over both the established products as well as the non-incremental innovation (eg Bradley at Ciba Vision). Non-incremental innovations involved either a departure from the technology employed in the existing product (eg daily disposables at Ciba Vision), a different target market from the established product (eg consumer markets at HP’s Scanner Division), or both (pharmaceutical product to ophthalmologists at Ciba Vision). We gathered data from
a diverse set of industries. Our 36 innovation episodes were gathered from 15 business units in 9 distinct industries and cover 5 of the 6 non-incremental innovation spaces in Figure 1 (see Table 1).

Each innovation episode is an effort by a business unit to develop and commercialize one non-incremental innovation. We were able to gather data on 2 or more non-incremental innovations in 7 of the business units. Eleven innovations were observed across more than one innovation episode. In each of these 11 cases, the business unit introduced or attempted to introduce the innovation in an initial innovation episode. The business unit then initiated a strategic reorientation, simultaneously shifting structure, processes, culture, and competencies, and attempted to execute the non-incremental innovation with a completely different organizational architecture. For example we collected data on three distinct innovation episodes in HP’s Scanner Division. Episode 1 was a five-year period where multiple non-incremental innovation attempts each failed. After a new general manager was appointed and initiated an organization wide transformation, episode 2 tracks the period of dramatic success in both incremental and non-incremental innovation. Episode 3 tracked the performance of the non-incremental innovation after the innovation manager switched his reporting relationship from a general manager to a sector executive (see Table 1). Including multiple innovation episodes for a given business unit helps us to induce the impact of different organizational forms on innovation outcomes while holding the larger organizational context fixed.

Data Collection

We collected data through semi-structured interviews supported by archival data. For 29 of the innovation episodes, we interviewed 7 to 12 informants in the business unit, including the business unit’s general manager and the innovation manager (if a distinct individual had responsibility for the innovation). For 7 innovation episodes, the introduction of the radial tire at BF Goodrich, Goodyear and Firestone, and digital cameras and medical imaging film at Polaroid, we relied principally on detailed written material prepared by other researchers (Sull, 1999; Tripsas & Gavetti, 2000). For these innovation episodes we conducted in-depth interviews with the researchers involved in
the primary data collection. We supplemented these data with four interviews with principals at Goodyear and Polaroid. In total, we conducted 102 interviews with primary sources and 2 interviews with secondary sources (see Table 1).

We supplemented our open-ended interviews with more targeted questions to get at organizational variables associated with ambidextrous organizational designs (Tushman and O’Reilly, 1997). We gathered data on whether the non-incremental innovation was located in a distinct unit, the physical location of the unit, and explored the extent to which the non-innovating unit had a distinct culture, rewards, and competencies. We also gathered data on the role of the innovation manager, his/her relationship with the general manager, and whether he/she was on the senior team (see Appendix 1). In addition we also gathered data on the extent to which the organization was able to learn about the new technology, learn about new markets/customers, as well as overall commercial success (see Appendix 1).

To ensure that we accurately captured the data, we typed our notes after the interviews and wrote a mini-case for each innovation episode. We shared our analyses with key informants at the research site to confirm and/or adjust our understanding of the phenomena. In addition, each coder described the non-incremental innovation in terms of technological and customer differences from the organization’s existing product. Where there were discrepancies, the coders discussed the placement with key informants to determine an innovation’s location on the innovation map. Figure 1 lists the 15 existing products at the origin and locates each non-incremental innovation episode in this innovation space.

Five researchers coded innovation episodes for each of the organization and innovation outcome variables. We also coded the relative performance of the business unit’s existing product over the period studied. We assessed whether the existing product improved, held steady, or declined over the period studied. Each case was coded by at least three coders, one of whom was new to the case. Interrater reliability for all of our variables were above .71 indicating substantial convergence among coders. We also used intraclass correlations (ICC) to explore consistency across coders for each case. Each variable demonstrates intraclass correlations between .63 and .92, indicating that the
coders were internally consistent (see Table 2). Because of the high reliability across coders, we created scales by averaging across coders.

A principle component factor analysis of the eight organizational variables indicates that these variables factor into two factors (eigenvalue=1, cutoff >.7). The first factor, which we labeled structural differentiation, includes distinct unit, separate physical location, distinct culture, distinct rewards system, and human resource capabilities (Chronbach $\alpha = .87$). The second factor, which we labeled senior team integration, includes ambidextrous manager’s support of the non-incremental innovation and the ambidextrous manager-innovation manager relationship (Chronbach $\alpha = .92$). We created two composite variables from these factors and their associated items. The innovation manager’s position does not load on either factor and was excluded from subsequent analyses (see Table 2).

Market success, market learning and technology learning are each highly correlated (.74<r> .96). As such we created a five point overall performance scale using all three outcome scales (reliability $\alpha = .90$).\(^2\) We use this measure of performance to classify each innovation episode as high performers (greater than 4), moderate performers (greater than 2 and 4 or less), or low performers (2 or lower). Our 36 innovation episodes include 7 low performers, 13 moderate performers, and 16 high performers. Over the course of our research, the existing product’s performance improved in 3 cases, held steady in 5 cases, and in 7 cases the existing product’s performance declined. In 3 performance decline cases, however, the declines were an explicit aspect of the business units’ strategies (eg. Pilod’s strategy at Goodyear was to rapidly substitute for the existing bias- ply businesses with radial tires). Table 2 reports our descriptive statistics.

RESULTS

On Innovation Streams

Innovation streams are composed of incremental innovation in an existing product as well as at least one non-incremental innovation. Innovation streams are anchored by

\(^2\) Market success is included only in the cases where the product was already commercialized. Three of the innovation attempts had not introduced a product to the market.
the business unit’s existing product. Each of our 15 business units had a general manager
who was responsible for the sustained performance in a particular product class (see
lower left cell in Figure 1). For example, Glen Bradley was responsible for the eye care
business of Novartis, Phil Faraci was responsible for HP’s scanner business, and Tom
Curley was responsible for Gannett’s national news franchise. Each of our general
managers had an ongoing business with its own set of competitive challenges for the
existing product line. For example, HP’s Scanner division was under great competitive
pressure to bring costs down and raise quality in the existing flatbed scanners.

Beyond innovating in the existing product, each of the 15 business units also
initiated at least one non-incremental innovation. Eight of the 15 business units initiated a
single non-incremental innovation during the course of our research. For example,
Medical Product Division continued to innovate in its black and white ultrasound product
even as it developed a low cost color ultrasound device. The other 7 business units
initiated multiple non-incremental innovations. Five business units initiated 2 non-
incremental innovations, while Software Co. and Ciba Vision each initiated 3 non-
incremental innovations. For example, between 1992 and 2000, Ciba Vision initiated
daily disposables, extended wear lenses, and a radical pharmaceutical product to halt the
progress of a debilitating eye condition (ARMD) even as it continued to incrementally
innovate in its conventional lens product.

Are their performance consequences of executing multiple non-incremental
innovations and does executing streams of innovation impact the performance of the
existing product? There are no significant differences in the performance of non-
incremental innovations between those organizations that focused on a single non-
incremental innovation versus those that initiated multiple non-incremental innovations
(t= .21, NS; Table 3). Multiple non-incremental innovations did not diminish innovation
outcomes even as focusing on a single non-incremental innovation did not positively
affect innovation outcomes. Further, there is no significant difference between the
number of non-incremental innovations in those business units whose existing product
improved or held steady during the period studied versus those business units where the
existing product declined (t= .42, NS). There is no evidence that initiating streams of
innovation, by themselves, either hinder or support the continued performance of the existing product.

The 36 non-incremental innovation episodes are spread throughout the innovation space in Figure 1. Our sample includes 24 discontinuous innovation episodes (eg. radial versus bias ply tires) as well as 12 architectural innovation episodes (eg. the development of a color ultrasound product in Medical Imaging Division). Discontinuous innovations are not more or less successful than the architectural innovations (t=. 87, NS). Further, 9 non-incremental innovations were targeted to existing customers, 9 to new customers in defined markets, and 18 to more uncertain emerging markets. There are no statistically significant differences between non-incremental innovations targeted to existing customers versus those targeted to new customers/markets (F = 2.14, p = .13).

Innovation streams exist, there are non-incremental innovations throughout the innovation space, there are no overall performance consequences of the type of non-incremental innovation, and initiating innovation streams is not associated with significant performance consequences in the existing products. We now explore the consequences of organization design choices on innovation outcomes of non-incremental innovations. We explore the existence of ambidextrous organizational designs, alternative designs to manage innovation streams, and the relations between design choice and innovation outcomes. Seven of the 15 business units made several attempts to execute a particular non-incremental innovation. These business units permit us understand how organizational architectures evolve in service of innovation streams.

**Ambidextrous Designs and Their Characteristics**

We defined an ambidextrous organizational form as a business unit with high structural differentiation, low levels of structural integration, and strong senior team integration [see Figure 2]. We analyzed our data both qualitatively as well as quantitatively. For our qualitative analyses we created tables with quotes reflecting these ambidextrous design concepts (see Appendix 2). We induced our observations from comparing within and across innovation episodes (eg Brown and Eisenhardt, 1997; Adler et al, 1999). We also coded each case to capture levels of structural differentiation and senior team integration. We used these quantitative data to organize our 36 innovation
episodes and to sharpen and add insight to our qualitative data. Based on median splits, we organized the innovation episodes into cells based on high/low structural differentiation and high/low senior team integration (see Table 4).

Of the 36 innovation episodes, 15 had ambidextrous organizational forms—high levels of structural differentiation, targeted structural integration, as well as high levels of senior team integration. While there were differences among these 15 ambidextrous cases, USA Today under Tom Curley illustrates the phenomenon of ambidextrous organizational designs. Curley had been President and Publisher of USA Today since 1991. Created in 1983, USA Today had been profitable and a high performing unit of the Gannett corporation since 1993. By 1995, under pressure from newsprint costs and national competition as well as emerging competition from alternative, web-based news sources, Curley articulated a network strategy that was based on leveraging his new gathering/editorial capabilities through multiple media. This network strategy built on USA Today’s core values of fairness, accuracy and trust.

In 1995, Curley promoted Lorraine Cichowski from the USA Today’s Money section to run an independent on-line news product. As general manager of USA Today.com, Cichowski was made a member of Curley’s top team. While she had Curley’s support, she did not have the support of other members of the senior team. Cichowski built a distinct organization for her on-line business. She hired staff from outside USA Today, and built a fundamentally different set of structures, roles, incentive and culture all dedicated to instantaneous news that might or might not come from the newspaper. On-Line was housed on its own floor, physically separate from the newspaper. By 2000, even though USA Today.com was profitable, it was losing staff because of funding constraints. The newspaper continued to drain resources from the emerging on-line franchise. Cichowski pushed to be spun out from the newspaper and from Curley’s emphasis on profitable growth. We coded this innovation episode as one of high structural differentiation but low senior team integration (see Table 4 and Appendix 3).

Because Curley wanted to leverage his editorial group through the web and because he felt the on-line market was similar to the newspaper, in February 2000 Curley replaced Cichowski with Jeff Webber, then the VP of circulation. At this juncture Curley
also replaced 40 percent of his senior team, including his editorial director. This revised senior team fully supported Curley’s network strategy and Webber’s role in that strategy. Webber built a new senior team in USA Today.com even as he kept his organization distinct from the newspaper. However where there was no integration under Cichowski, under Webber there were editorial linkages at the senior team level and weekly lower level editorial linkages. Further, Curley shifted the senior team incentives so that they all had common bonus incentives based on cross platform growth. Under Webber, USA Today.com’s performance against sales, profit, and reader retention all significantly increased through June 2001. In June 2000, Curley employed the same ambidextrous design in launching its television unit, USA Today Direct. Curley hired Dick Moore from outside Gannett and gave him the freedom to create a unit within USA Today with the competencies, structure, and culture to operate a successful television production unit. As with Webber, Moore reported directly to Tom and was made a member of Curley’s senior team. The USA Today.com (B) and USA Today Direct (B) were both coded as ambidextrous organizational designs (see Table 4, and Appendix 2).

More generally, the 15 ambidextrous business units have a set of common characteristics (see Table 5). All 15 ambidextrous organizational forms look similar to USA Today.com (B) and Ciba Vision described above. We had 9 ambidextrous managers (the 15 ambidextrous designs were found in 9 business units). In 8 of the 9 cases the ambidextrous manager was the senior person in the business unit or corporation (either general manager, president, or CEO). At Ciba Vision, the general manager and his head of R&D shared this ambidextrous role together. In 5 cases, the ambidextrous manager came from within the business unit (eg. Chris King at IBM Microelectronics), while in 4 cases he/she was recruited from outside the business unit (eg Phil Faraci at HP Scanner Division (B)). These ambidextrous managers all articulated a strategy that encompassed both incremental as well as non-incremental innovation. In 7 of 9 business units the ambidextrous manager articulated an overarching vision that encompassed both exploration as well as exploitation. For example at Ciba Vision, Glen Bradley’s “Healthy Eyes for Life” was an aspiration that could encompass the conventional lens business as well as daily disposables and their pharmaceutical product.
These ambidextrous managers, in all 15 cases, built distinct, physically separate, non-incremental innovation units led by a full-time innovation manager. In 8 cases, the innovation manager came from inside the business unit, while in 7 cases he/she came from outside the business unit. Each of the 15 ambidextrous designs had innovation units that developed their own distinct cultures and human resources. For example at CitySearch at Regional News, 32 of its 35 employees came from outside the company. This highly differentiated unit built its own entrepreneurial culture as well as an incentive system matched the strategic demands of growth and market share. Even as each innovation manager had their own dedicated resources and staff to commercialize the non-incremental innovation, in every case the innovating unit had to leverage resources outside of the innovating unit. For example in IBM Software, several of John Swainson’s software programmers reported to a corporate R&D facility even as they were fully dedicated to Swainson’s Websphere project.

In each of 9 ambidextrous designs, the ambidextrous manager provided strong substantive and symbolic support for the non-incremental innovation. For example, in HP’s Scanner Division, Phil Faraci was clear with his senior team that both the flat bed as well as the portable scanners had to be successful. A common fate reward system was employed such that if either product did not succeed, no one on his team would get a bonus. Seven of the eight ambidextrous designs employed common fate reward systems for their senior teams. In 12 of the 15 ambidextrous designs, the innovation managers reported to the general manager and he/she was on the senior team. In the other 3 cases, the innovation manager reported to a member of the senior team. In every case the general manager met frequently with the innovation manager. For example, in IBM’s software group, the Websphere manager did not report to the general manager. However, Swainson had this innovation manager meet frequently with his senior team and she had direct access to him.

Finally, in every case where the ambidextrous manager was a general manager in a multidivisional firm, the manager to whom the general manager reported had a crucial role in this structure. This meta-manager created the context within which the ambidextrous manager could legitimately both explore and exploit. These meta-managers provided the resources, coaching, and political support with the larger corporate context.
and with the ambidextrous manager’s peers. For example, Chris King at IBM Network Technologies could not have been successful had not John Kelly, the Group Executive of Technology, provided visibility for King at corporate and support for King with her skeptical peers. In contrast, once HP/Handheld Scanner (B) was spun out from its host division, it lost its corporate sponsor. Without senior support, the product could not acquire the resources need to do a full product launch.

Does the locus of the non-incremental innovation affect the choice of ambidextrous form and how stable are these organizational architectures? Ambidextrous designs are found at the edges of the innovation space (see Figure 1). 14 of the 15 ambidextrous designs are found either in the emerging markets row or the discontinuous technology column. Only one case of ambidextrous design was found where the non-incremental innovation was close to the business unit’s existing product. In IBM’s middleware unit an architectural innovation targeted to existing customers was organized in an ambidextrous fashion. In every other case where ambidextrous organizations were employed, the non-incremental innovation was targeted to either emerging markets or involved a discontinuous technological change, or both (see Figure 1). It appears that the use of this complex organizational form may be contingent on the nature of the innovation stream.

Ambidextrous organizational designs seem to be relatively stable organizational forms. In 7 of our 15 cases, ambidextrous designs were chosen at the initiation of the innovation stream. In 6 of these 7 cases, the ambidextrous design remained stable over the course of our research (between 1 and 10 years, an average of 4.17 years). For example, between 1992 and 1997, Glen Bradley and his team at Ciba Vision built an ambidextrous business unit that hosted 3 non-incremental innovations. In 8 cases, ambidextrous designs emerged after innovation performance shortfalls triggered system-wide changes. These ambidextrous designs remained stable in 7 of these 8 cases.

In 3 cases, ambidextrous designs were initiated and then abandoned. At the Regional News, its News .com innovation was initially initiated with an ambidextrous organization. After 4 years, however, News.com was reintegrated back into the newspaper organization at Regional News. In contrast in both HP’s Scanner division and at Ciba Vision, successful discontinuous innovations targeted to emerging markets, the
Handheld Scanner (C) and pharmaceutical eye product target to ophthalmologists (Visudyne (B)), were both spun out of their incumbent business units (see Table 6). We explore the performance consequences of these design shifts below.

**Other Organization Designs Employed**

As a set, these descriptive results suggest that ambidextrous organizational forms exist, they are relatively stable, and they are most frequently found for innovations that are distant from the business unit’s existing product/market positioning. We also found other organizational designs in service of innovation streams. Indeed, where 15 innovation episodes were initiated through ambidextrous designs, 20 were executed with other organizational designs (see Table 4). Nine innovation episodes were initiated through cross-functional teams embedded in an existing functional organization (low differentiation and low senior team integration). For example at Software Co., e-learning, advanced collaboration, and knowledge management products were developed through dedicated cross functional teams.

Four innovation episodes were executed in highly differentiated structures without strong senior team integration-- we labeled this category unsupported innovation teams (see Table 4). These unsupported senior teams were of two types. One is where the innovation manager had little or ambivalent senior team support (USAToday .com (A) and Polaroid’s digital camera), the other type is where the innovation manager reported to a level so high in the corporation that he/she received little substantive support (USAToday Direct (A) and HP Handheld Scanner (C)). For example, Polaroid created a highly differentiated unit with a dedicated innovation manager, team, and significant resources to commercialize digital cameras. This unit was physically separate from the analog camera unit and was able to develop its unique structure and culture to execute this non-incremental innovation. Despite heavy financial investments in digital photography, the innovation manager faced on-going resistance and skepticism from the CEO and the senior team. In contrast, USAToday Direct(A) was initiated in 1990 by Gannett’s chairman Allen Neuharth. He created a distinct, physically separate organization and hired an external team to launch USAToday’s television product. Because of the range of issues on Neuharth’s corporate-wide agenda, USAToday Direct
was left alone, unintegrated both within USAToday as well within the larger Gannett corporation.

Finally, 7 innovation episodes were executed with no change in the business unit’s functional design (low differentiation and high senior team integration). In the cases of Goodyear’s radial tires and in IBM’s network and transport chips, for example, the existing senior team took responsibility for the development of non-incremental innovations. These innovations were executed in the existing organization, without developing a distinct unit to focus on the non-incremental innovation. At IBM’s Network Technology group, for example, the general manager and her team took full responsibility for commercializing the more mature Asic chips as well as the Network and Transport chips-- architectural innovations targeted to emerging markets.

In no case did these 15 business units employ internal venturing, acquisition, or spinouts to initiate non-incremental innovations. In two cases, Ciba Vision/Visudyne (B) and HP Handheld Scanner (C), discontinuous innovations targeted to emerging markets were spun out after they had been successfully launched in the incumbent business unit. It may be that ambidextrous designs are fertile contexts in the creation of discontinuous innovations to emerging markets that are then candidates for spinouts.

**Design Choices and Innovation Outcomes**

The number of non-incremental innovations initiated within a business unit does not affect innovation outcomes. To what extent are design choices associated with the performance of non-incremental innovations? We compared the overall innovation outcomes of ambidextrous designs with each other design choice (see Table 4). Ambidextrous designs are significantly more effective in hosting non-incremental innovations than all other designs employed except for functional designs. Ambidextrous designs significantly outperform both the cross-functional design (p<. 001) as well as unsupported innovation teams (p<. 001). In contrast, simple functional designs with strong senior team integration are as successful in initiating non-incremental innovation as are ambidextrous designs.

We conducted an analysis of variance to explore the impacts of structural differentiation and senior team integration on innovation outcomes (see Table 4). Senior
team integration is a strong and significant predictor of innovation outcomes (F= 19.59, p< .001). The greater the senior team integration, the greater the non-incremental innovation performance. Structural differentiation is a weakly significant predictor of innovation outcomes (F= 2.18, p< .08, one tailed test). The greater the structural differentiation, the greater the non-incremental innovation performance. The interaction of differentiation and integration is not significant (F= .58). While these overall results indicate that organization design choices impact innovation outcomes, we now explore mechanisms through which these outcomes occur.

Ambidextrous designs significantly outperform both cross-functional teams as well as unsupported innovation teams. These patterns are most clearly seen when a business unit tried multiple organizational designs to execute a single non-incremental innovation. For example in HP’s Scanner division, an initial set of architectural innovations targeted to new markets (handheld scanners) was executed through heavyweight teams. Despite substantial technical and market potential, this heavyweight team could get neither senior management support nor support from the rest of the scanner organization. Indeed when a corporate sponsor provided 10 million dollars for the handheld project, these resources were appropriated by the existing flat bed business.

After five years of no progress in handheld scanners with this design approach, a new general manager was recruited into the business unit. This general manager made both handheld and flat bed priorities for the division, created a distinct unit for the handheld product and put a strong manager in charge of this unit who was a member of the senior team. This innovation manager, in turn, moved his portables unit away from the flatbed organization and created a culture, structure, and a set of processes that were consistent with the highly uncertain portables business and were fundamentally different from the cost oriented flatbed unit. Phil Faraci, the new general manager, changed the incentives on his senior team such that they could only achieve their bonus targets if the succeeded in both the flatbed as well as the handheld business. This shift to an ambidextrous design was associated with the rapid progress in HP’s handheld product as well as increased performance in the flatbed business.

Those innovation episodes that remained either cross-functional teams or unsupported innovation teams were consistently less successful than those that became or
were initiated as ambidextrous organizations (see Table 4). For example, Firestone attempted to initiate radial tires in the same organization that also continued to make bias-ply tires. This cross-functional team approach to implement a discontinuous technical change led to strong cultural, political and community resistance to change and ultimately to failure. Similarly, Software Co.’s attempt to initiate both e-learning and knowledge management in its traditional functional organization led to sustained underperformance. Finally, there was one innovation episode where an ambidextrous design was shifted to a heavy weight team design. Regional News .com became less successful after its distinctive and separate unit was integrated into the newspaper organization (average performance of 3.42 vs. 2.33).

Of the four unsupported innovation teams, two transitioned to ambidextrous designs (USAToday .com (A) and Direct (A)). In both cases, performance increased in the transition to an ambidextrous design. In contrast, in both cases (Polaroid digital cameras (B) and HP Handheld Scanner (C)) where the innovation episode remained as an unsupported innovation, the innovation was terminated. As seen in USAToday Direct (A), if an innovation manager reports to an ambidextrous manager at the corporate level the results can be devastating. In HP Handheld Scanner (C), after the innovation manager achieved sustained success with Faraci as the ambidextrous manager, the innovation manager was spun out as an independent business unit reporting to the sector head. As with USAToday Live under Neuharth, this small division could not capture sufficient time or resources from the sector executive. During a period of corporate-wide cost pressure, one of the first units cut was the Handheld Scanner unit. Faraci reported that had he not been promoted he could have sheltered this unit until it reached a critical mass to support itself.

Where senior team integration is clearly an important determinant of non-incremental innovation outcomes, how important is structural differentiation? While functional organizational designs are as successful in promoting non-incremental innovation as are ambidextrous designs, this overall result masks differences that help clarify the boundaries of ambidextrous designs. Three innovation episodes started as functional designs but shifted to ambidextrous designs within two years (see Table 6). In IBM’s Network Technology Division, for example, as the network and transport chips
flourished under Chris King’s simple functional organization design and entrepreneurial senior team, its more mature Asic business suffered. Under pressure from her boss John Kelly to drive short and long term innovation, King shifted her own style, her senior team, and organization structure. King recruited a new, more process oriented, manager to run the Asic business even as she kept the network and transport businesses separate. She changed her focus from simply entrepreneurial performance to both entrepreneurial as well as disciplined performance. She changed her senior team’s bonus to focus on growth in the overall network technology market across multiple product/market spaces. This switch to an ambidextrous form was associated with sustained performance in the non-incremental innovations as well as increases in performance in King’s Asic business. The switch to an ambidextrous design did not, however, help the struggling Polaroid Helios (B) project. While technically successful, this medical imaging product came to the market too costly and with the wrong form factor.

Of the three non-incremental innovations that employed functional designs, two performed above the median non-incremental innovation performance. The type of non-incremental innovation seems to affect the conditions under which more simple functional designs are effective. In both Medical Imaging Division and at Goodyear Tire the non-incremental innovations (color ultrasound machines and radial tires) were product substitutes (black and white machine and bias-ply tires). In both of these innovation episodes, the general managers took full responsibility for substituting the existing product with its replacement. For example at Goodyear a new President, Charles Pilliod, created a “crusade” to transform Goodyear from a bias-ply company to a radial company. Pilliod took personal responsibility in quickly converting Goodyear’s senior team, manufacturing capacity and research capabilities to focus on radials. A similar, general manager driven, transformation took place in Medical Imaging Division as color ultrasound immediately substituted for the back and white machine. In both cases, these substitutions were driven from the business units’ existing functional structure--no distinct units were formed. It may be that product substitution events are well executed through simple functional organizational forms. In contrast, when the non-incremental innovations are part of an innovation stream, when both exploitation and exploration are
important (for example in Medical Product Group), ambidextrous designs seems to dominate.

Over time there was a net migration from non-ambidextrous designs to ambidextrous designs (see Figure 6). In a total of 12 organization design transitions, 8 were from under performing, non-ambidextrous designs to ambidextrous designs. In 7 of these 8 cases the performance of the non-incremental innovations increased after the design shift. In these 8 transitions, innovation performance significantly increased after ambidextrous designs were employed ($t= 5.67, p<. 03$). In contrast, in both cases (HP Handheld (C) and Regional News.com (B)) where an ambidextrous design was abandoned for another organizational design, innovation performance decreased. In one case, for Ciba Vision’s Visudyne (B), a successful discontinuous innovation to fundamentally different customers was successfully spun out to Novartis’ pharmaceutical division. After being successfully hosted in Ciba Vision for 5 years, Visudyne was large enough to successfully leverage Novatis’ pharmaceutical research and sales competencies.

Is there a relationship between ambidextrous designs and the locus of non-incremental innovation? While in our sample most of the ambidextrous designs are found at the edges of the innovation space, one ambidextrous design was close to the innovation space’s origin (IBM’s Middleware division’s attempt to develop Websphere in the context of Cobol). This ambidextrous design was successful from the start. In contrast, Medical Product Group floundered in its attempt to execute an Integrated Healthcare System with its existing functional organizational design. It may be that innovation episodes close to the existing product’s technology and markets may be effectively executed with ambidextrous designs. Thus while our data are limited, ambidextrous designs seem to cluster at the edges of an innovation space even as they seem to be effective across innovation types.

Finally, what is the impact of employing ambidextrous designs on the performance of the existing product? It may be that the adoption of this complex organizational form may hurt the performance of the existing product. Table 7 categorizes the performance of the existing product over the periods studied by type of organization design employed to execute non-incremental innovations (see Table 7).
Those existing products that either held steady or increased in performance employed ambidextrous designs in 7 of 8 cases. In contrast, those business units whose existing products declined in the context of innovation streams used ambidextrous designs in only 1 of 4 cases. It appears that in the context of innovation streams, ambidextrous designs are significantly associated with the continued enhancement of existing products (Chi Square = xxx, p = yy). In contrast, the use of simple functional designs or cross-functional teams seems to impede a business unit’s ability to both exploit as well as to explore.

**DISCUSSION**

Dynamic capabilities are rooted in the ability of a business unit to both explore and exploit (March, 1991). We operationalized exploration and exploitation in terms in terms of innovation streams—portfolios of innovations that both incrementally build on the existing product as well as extend the business unit’s franchise through non-incremental innovations. These non-incremental innovations involve either architectural and/or discontinuous technical change, and may be targeted to different customers. These innovation streams present substantial organizational challenges since the structure, incentives, culture, processes, and competencies required to further exploit existing products actively stunt a firm’s ability to explore into new product/markets. Worse, the potential cannibalization of the existing products by the exploratory innovations drives active resistance to exploration. This research explored how a set of business units dealt with the contradictory requirements of exploration and exploitation.

We selected our sample of 15 business units based on their explicit attempts to manage innovation streams. These organizations managed between 1 and 3 non-incremental innovations even as they continued to exploit their existing products. The 36 innovation episodes were distributed throughout the innovation space, though 33 were either targeted to emerging markets and/or involved discontinuous innovations. These innovation streams are consistent with the work of Adler, Goldoftas, and Levine (1999), Leifer et al (2000) and Brown and Eisenhardt (1997) on the importance of multiple product innovations as a source of competitive advantage. There were no innovation
outcome differences in business units that managed only 1 non-incremental innovation compared to those who managed multiple non-incremental innovations. Contrary to Barnett and Freeman (2001), we did not find that firms suffered performance losses when they attempted to initiate multiple product introductions. Further, the performance of the existing products were unaffected by the number of non-incremental innovations attempted.

If innovation streams are crucial for dynamic capabilities, how do firms pace exploitation and exploration and where is the locus of energy for these contradictory processes? The innovation/product development literatures are unresolved on these organizational issues. We argued that streams of innovation would be most effectively executed by exploiting and exploring simultaneously in ambidextrous organizational architectures. These designs build into the business unit the internal contradictions associated with innovation streams. These designs are composed of highly differentiated units that are weakly structurally integrated. The energy to drive these innovation streams and the force for strategic linkage in these complex architectures is through the senior team. Finally we argued that because inertial forces are so strong, these ambidextrous forms would be found independent of the type of non-incremental innovation.

Our key findings were that for these 15 business units and for these 36 innovation episodes, ambidextrous design did indeed exist and were relatively stable. These complex organizational forms were significantly more effective than all other organizational design choices in hosting innovation streams, they can be learned over time, and were found for non-incremental innovations throughout the innovation space. The costs of ambidextrous designs were not, however, necessary for product substitution events. When non-incremental innovations immediately substituted for an existing product, committed senior teams and functional organization designs were successful.

The organization design employed to manage innovation streams had significant impacts on the performance of both existing products as well as the non-incremental innovations. For driving innovation streams, ambidextrous designs dominated all other organizational forms. Except for product substitutions, those business units that employed ambidextrous designs were significantly more effective in driving non-incremental innovations. Further ambidextrous designs were also associated with either holding
steady or enhanced performance of the existing products. In contrast, for those firms initiating innovation streams, employing functional or cross functional designs were associated with both decreased performance in the existing products as well as significantly less effective non-incremental innovation outcomes. Even as not all ambidextrous designs were successful or stable, this complex design outperformed all other organizational forms employed when business units attempted both incremental as well as non-incremental innovations.

Contrary to the spinout, alliance, and venturing literatures (e.g., Christensen, 1997; Leifer et al., 2000), we found that these business units built dynamic capabilities internally. Further, contrary to driving innovation streams through semistructures and time-paced transitions (e.g., Brown and Eisenhardt, 1997), ambidextrous designs drive innovation streams through designing contradictory architectures within business units that reflect the contrasting requirements of exploration and exploitation. These highly differentiated designs had weak but targeted integration and strong senior team integration. Both substitution events as well as innovation streams were driven through strong senior team direction and integration—not through the autonomous behaviors of champions at lower levels of the business unit (e.g., Leifer et al., 2000). Such designs put a premium on senior teams that can handle the contradictions associated with these multiple learning modes. These ambidextrous designs are loosely coupled, modular organizational forms that do not learn and unlearn, but rather build in multiple learning contexts from which the senior team can make strategic bets to shape the business unit’s fate (Burgelman, 2002b; McGrath, 2001).

But what are ambidextrous organizational designs and how do they work? The 15 ambidextrous designs demonstrated clear patterns. These complex designs were composed of highly differentiated units, each with their own innovation manager and their own structures, incentives, competencies, and cultures. Ambidextrous designs achieved linkage through a set of interrelated roles and incentives. In every case, the innovation manager reported to an ambidextrous manager and/or to the senior team. These ambidextrous managers provided the support and energy for both exploitation as well as experimentation. Innovation and ambidextrous managers came equally from within the business unit as well as from outside the business unit. Meta-managers,
managers to whom the ambidextrous manager reported, were crucial in setting the context within which ambidextrous and innovation managers could succeed. As ambidextrous designs were controversial in the larger corporation, meta-managers provided the political, social, and financial support to the ambidextrous manager (eg Kelly at IBM Network Technologies). Beyond these three roles, these differentiated units had weak linkages among themselves and with the exploitative unit, but in every case had targeted linkages to specific domains in the existing organization.

The role of the ambidextrous manager was particularly crucial. Ambidextrous managers must be able to be consistently inconsistent--supporting both variance increasing as well as variance decreasing behaviors in their organizations. When the ambidextrous manager emphasized exploitation at the expense of exploration (eg HP Scanner (A)) or the reverse (eg. IBM Microelectronics (A)), the ability to drive innovation streams suffered. In 7 of our 9 business units, this ability to be consistently inconsistent was facilitated by the ability of the ambidextrous manager to articulate and behaviorally support an overarching vision within which exploitation and exploration made sense. Finally, our results suggest that not only are roles and team processes important in ambidextrous senior teams, but so too are senior team incentives. It appears that common fate incentive structures are crucial. In 7 of 8 business units where we had data, the general manager built a common fate incentive system. For example, not until Curley and Faraci initiated common senior team rewards did the senior team actually behave in a way that supported innovation streams. In contrast at Polaroid, the absence of either a shared vision as well as a common fate reward system for the senior team may have stunted its ability to succeed in either its existing product or in its non incremental innovations.

It appears that both differentiation as well as senior team integration are important in executing innovation streams. If there is not sufficient differentiation (eg IBM’s Network Technology (A)), if the innovation manager is either not on the team or not respected in the senior team (eg. USA Today .com (A) or Regional News .com (B)), if the locus of integration is too high (eg USA Today Direct (A) or too low (HP Handheld Scanner Division (A)), or if the senior team can not develop their own processes to handle multiple learning modes (eg Polaroid, Digital Camera (B)), then inertial processes
operate to hold the organization hostage to its past. In contrast when the multiple roles, differentiated structures, and senior team integration are aligned, business units can drive multiple non-incremental innovations over several years (eg Ciba Vision). Finally it appears that ambidextrous designs can be learned over time. In 7 of 8 innovation episodes where low performing business units shifted to ambidextrous designs their performance significantly increased (eg IBM Network Technology (B) or HP Handheld Scanner (B)). Each of these cases involved changes in either the general manager or the innovation manager.

We found, then, that ambidextrous designs exist and that they are composed of an interrelated set of roles, structures and senior team processes. The combination of high differentiation, targeted tactical integration, and senior team strategic integration all affect innovation outcomes. While we did not test ambidextrous designs against spinouts, internal ventures, or semistructures linked in time, we did not find these modes of driving streams of innovation in our sample. We did have two spinouts after the non-incremental innovations were initiated in the business unit. The pharmaceutical product at Ciba Vision (Visudyne) was spun out to Novartis’ pharmaceutical division. As this unit was able to leverage the corporation’s pharmaceutical R&D as well as a more targeted physician oriented sales force, this non-incremental product was able to grow substantially. In contrast, HP’s Handheld Scanner (B) was spun out such that it achieved no corporate leverage or senior support. This innovation was cancelled within 6 months of its spinout. It may be that ambidextrous designs host well the development of non-incremental innovations. Where these innovations have no technology or market leverage within the host business unit they are candidates to be spun out. If, in contrast, there is the ability to leverage either customers or technology within the business unit, then ambidextrous designs appear to be more effective than other organizational designs in hosting non-incremental innovations.

What do these results suggest for the debates on the nature of organizational evolution and change (eg Carroll and Barnett, 1995; Weick and Quinn, 1999; Pettigrew et al, 2001)? The selectionist approach argues that inertial forces are so strong that incumbent organizations either get selected out of the environment or evolve through spinouts or through corporate venturing (eg Christensen, 1997; Barnett and Freeman,
The incremental approach to evolution argues that firms are not caught by inertial forces and can evolve through paced, continuous, incremental change (eg Brown and Eisenhardt, 1997), while the punctuated equilibrium approach argues that organizations evolve through periods of incremental change punctuated by discontinuous change (Romanelli and Tushman, 1994). Ambidextrous designs, where highly differentiated units both explore and exploit, may permit building dynamic capabilities through both incremental as well as proactive punctuated change.

It may be that ambidextrous designs create the space for multiple selection environments as well as multiple change modes. Thus exploitation is driven by a regime of incremental, continuous change anchored on a given technical/customer trajectory. In contrast, exploration is a learning mode driven by variability from which senior team makes strategic bets on their business unit’s future. If such bets are made, such as extended wear lens at Ciba Vision, these bets may be coupled with punctuated change in units uncoupled from the exploitative unit. Thus at USAToday, if Curley and his team make a bet on instantaneous news, this bet will be associated with discontinuous changes in their .com unit even as it is uncoupled from the newspaper. It may be that dynamic capabilities within business units are rooted in these complex organizational forms that host multiple learning environments and multiple change modes. If so, senior teams not only must be able to manage ambidextrous forms but also manage the different change dynamics associated with exploitation as well as exploration.

Our focus has been on the roots of dynamic capabilities. While our results are strong, several caveats are important to observe. Our premise was that at the business unit level of analysis, dynamic capabilities are rooted in innovation streams. We, in turn, selected our sample based on these streams and demonstrate that ambidextrous designs are an effective design to execute innovation streams. It may well be that innovation streams are not crucial to long term business unit fate and that ambidextrous designs are less effective than other more simple strategies/organizational forms in shaping dynamic capabilities. Further, our results only apply to business units initiating innovation streams. It may be that at the corporate level of analysis, acquisitions, joint ventures, and/or spinouts are powerful determinants of dynamic capabilities. Future research could gather more comprehensive, industry anchored longitudinal sample to explore alternative routes.
to dynamic capabilities. Finally, it may be that beyond the meta-manager, characteristics of the larger corporations help or hinder ambidexterity. We have no data on how the corporate contexts in our five multidivisional corporations affected the ambidextrous managers and their teams. Future research could explore the role of corporate contexts in shaping dynamic capabilities within their business units (eg Galunic and Eisenhardt, 2001).

CONCLUSION

Our paper has explored how organizations shape dynamic capabilities through innovation streams. We find that business units that employed ambidextrous architectures could indeed explore and exploit simultaneously. In contrast, those business units that employed other organizational designs experienced difficulties in both exploiting their existing products as well as in exploring into non-incremental products. These results highlight the role of senior teams, organizational architectures, and building into business units the internal contradictions necessary in order to simultaneously explore and exploit. Ambidextrous organizations exist and are stable organizational forms. These highly differentiated organizational forms have tactical integration coupled with strong senior team integration. These complex organizational forms outperformed other designs used to manage innovation streams. Ambidextrous designs were found throughout an innovation space except for product substitutions where functional designs dominated. It may be that except for substitution events, organizations evolve through continuous, incremental change in exploitative units as well as through punctuated change in those differentiated exploratory units. We suggest that the energy and impetus for innovation streams is driven not through autonomous action at lower levels, but through the active involvement of the senior team in driving exploratory as well as exploitative actions in their business units.

We find that organizations can exploit and explore simultaneously through ambidextrous organizational forms. These dynamic capabilities are not at the edge of chaos, not semistructures linked in time, and are not driven through autonomous entrepreneurial behavior. Rather, dynamic capabilities are built through complex
organizational forms and senior teams that can handle the contradictory strategic, senior team, and organizational design issues involved in simultaneously exploiting and exploring. Future research could more fully explore the characteristics of ambidextrous designs and the characteristics of senior teams that can manage these complex forms.
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Tushman M. and W. Smith

Van De Ven, A.H., D. Polley, R. Garud, and S. Venkataraman

Volberda, H. W.

von Hippel, E.

Weick, K. and R. Quinn

Weick, K.

Wheelwright, S., and K. Clark
Wiggins, R and T. Ruefli

Yin, R. K.
Independent Variables.

Distinct Unit. A distinct unit is a subunit developed for the innovation that has an identified leader and full-time staff. We coded distinct unit as a dichotomous variable.

Separate Physical Location. A separate location means that the majority of the employees working on the innovation are located in a defined physical area, distinct from employees working on other products. Not all employees working on the innovation needed to be in the same physical location for the innovation to have a separate physical location. We coded separate physical location as a dichotomous variable.

Distinct Culture. Organization culture can be described as socially created standards, norms for appropriate behavior, and informal social control systems to enforce these norms (O’Reilly, 1989). We coded distinct culture on a 1-5 scale, where one means that there is little distinction in the culture of the existing business unit and the innovation subunit, and five means that there is substantial distinction in culture.

Distinct Reward Systems. Distinct reward systems includes the formal rewards (eg. compensation, bonuses, criteria for promotion.) for the employees working on the innovation that differ from those used for employees working on the established product. We coded distinct rewards systems on a 1-5 scale, where one means that none of the reward systems are distinct and five means that all of the reward systems are distinct.

Human Resources. We assessed human resources by describing the selection practices of the innovating unit. We coded human resource capabilities on a 1-5 scale, where one means that none of innovating staff is hired from inside of the business unit and five means that all of the innovating staff is hired from outside the business unit.

Ambidextrous Manager Support. The ambidextrous manager is the lowest level manager who has financial responsibility and decision-making authority over both the core product and the innovation. In each of our cases, this is the general manager of the business unit. Ambidextrous manager support is the
extent to which the ambidextrous manager is invested in the innovation, as demonstrated by the manager’s commitment of personal time and financial resources to the innovation. We coded ambidextrous manager’s support on a 1-5 scale, where one means low commitment of personal time and financial resources and five means high commitment of time and financial resources.

Innovation Manager’s Position. The innovation manager is the manager directly responsible for the non-incremental innovation. Innovation manager position is defined as the formal inclusion of the innovation manager as a member of the business unit’s senior team. We coded the innovation manager’s position as a dichotomous variable.

Ambidextrous Manager-Innovation Manager Relationship. The AM-IM relationship is defined as the informal relationship built between the ambidextrous manager and the innovation manager, as indicated by the innovation manager’s ability to communicate with the ambidextrous manager, to ask questions and advice, and to seek help with problems. We coded the AM-IM relationship on a 1-5 scale, where one means a weak relationship such that the innovation manager does not feel comfortable communicating with the ambidextrous manager and five means a strong relationship such that the innovation manager feels comfortable communicating with the ambidextrous manager.

Dependent Variables – Performance of the non-incremental innovation. We assessed the performance of non-incremental innovations by evaluating the extent to which the business unit was able to learn about the new technology and/or market as well as the innovation’s commercial performance against plans (Levitt and March, 1988). We considered three aspects of performance: market success, technology learning, and market learning.

Market success. The market success of the innovation applies only to the innovations already in the marketplace at the completion of data-gathering. We define market success based upon the metrics used by our informants, and triangulated this measure of success using qualitative data in the interviews with various informants in each company. We coded market success on a 1-5 scale, where one means a highly unsuccessful product and five means a highly successful product.

Technology learning. We define learning as both the acquisition of the skills and knowledge and the action based on this knowledge (Garvin, 2000; Edmondson, 1999). Technology learning is defined as acquiring competence to make informed decisions and to practice behaviors based on appropriate
knowledge with regard to the design, manufacture, and delivery of the product. We coded technology learning on a 1-5 scale, where one means a low level of learning and five means a high level of learning.

Market learning. The challenges for understanding a target market can be quite different from understanding the product technology (Christensen, 1997). Therefore, in measuring learning, we distinguish between market learning and technology learning. Market learning is defined as acquiring competence to make informed decisions to act based on appropriate knowledge with regard to the selection of the target market, the tailoring of the product to that market, and the pricing, distributing, and promoting of the product in that market. We code market learning on a 1-5 scale (similar to technology learning).
<table>
<thead>
<tr>
<th>Company/Existing Product</th>
<th>Innovation Episode</th>
<th># of Non-Incremental Innovations</th>
<th>Performance</th>
<th>Existing Product Performance</th>
<th>Industry</th>
<th>Dates</th>
<th>Number of Interviews</th>
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<td>HP Scanners</td>
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<td>Electronics</td>
<td>Jan 91 - Mar 96</td>
<td>7</td>
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<td></td>
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<td>Steady</td>
<td>Media</td>
<td>1999 - 2000</td>
<td>11</td>
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<td>News.com(B)</td>
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<td>Micro Display Chip (A)</td>
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<td>1.63</td>
<td>From Losing Money to Improving</td>
<td>Semiconductor</td>
<td>1997 - 1999</td>
<td>7</td>
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<td>Imaging Chip (A)</td>
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<td>Imaging Chip (B)</td>
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<td>Ciba Vision</td>
<td>Conventional Lens</td>
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<td></td>
<td>Daily Disposable</td>
<td>3</td>
<td>5.00</td>
<td>Managed Decline</td>
<td>Eye Care</td>
<td>1992 - 1997</td>
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<td>5.00</td>
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<td>Vysudyne (A)</td>
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<td></td>
<td>USAT.com (A)</td>
<td>2</td>
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<td>Under Attack to Held Steady</td>
<td>Media</td>
<td>1994 - 2000</td>
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<td></td>
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<td>Direct (B)</td>
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<td>4.25</td>
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<td></td>
<td>On-Site Power Plants</td>
<td>1</td>
<td>4.56</td>
<td>Held Steady</td>
<td>Energy</td>
<td>1986 - 1995</td>
<td>11</td>
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<td>Medical Imaging Co.</td>
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<td></td>
<td>B&amp;W Ultra-Sound</td>
<td>1</td>
<td>4.78</td>
<td>Managed Decline</td>
<td>Health Care</td>
<td>1986 - 1990</td>
<td>10</td>
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<tr>
<td></td>
<td>Color Ultra-Sound</td>
<td></td>
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Continued on next page
<table>
<thead>
<tr>
<th>Company/Existing Product</th>
<th>Innovation Episode</th>
<th># of Non-Incremental Innovations</th>
<th>Performance (^1)</th>
<th>Existing Product Performance</th>
<th>Industry</th>
<th>Dates</th>
<th>Number of Interviews</th>
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<td>Medical Products Co.</td>
<td>Medical Devices</td>
<td>Integrated Healthcare System</td>
<td>1</td>
<td>2.50</td>
<td>Steady</td>
<td>Health Care</td>
<td>1994 - 1999</td>
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<tr>
<td>IBM Network Technology</td>
<td>ASIC</td>
<td>Transport Chip (A)</td>
<td>4.56</td>
<td></td>
<td>Mar 99 - Mar 00</td>
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<td></td>
<td></td>
<td>Transport Chip (B)</td>
<td>2</td>
<td>4.56</td>
<td>Growing Rapidly</td>
<td>Mar 00 - Sep 00</td>
<td>10</td>
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<td>Network Chip (A)</td>
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<td>4.56</td>
<td>Semiconductor</td>
<td>Mar 99 - Mar 00</td>
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<td>Network Chip (B)</td>
<td></td>
<td>4.56</td>
<td>Mar 00 - Sep 00</td>
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<td>COBOL</td>
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<td>Held Steady</td>
<td>Software</td>
<td>1996 - 2000</td>
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<td>IBM Middleware</td>
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<td>Software Co</td>
<td>Integrated Collaboration</td>
<td>Advanced Collaboration</td>
<td>2.67</td>
<td></td>
<td>Declining</td>
<td>Software</td>
<td>Jun 00 - Dec 01</td>
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<tr>
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<td>Knowledge Management</td>
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<td>3.17</td>
<td>Declining</td>
<td>Software</td>
<td>Jun 00 - Dec 01</td>
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<td></td>
<td></td>
<td>E-Learning</td>
<td></td>
<td>2.00</td>
<td>Declining</td>
<td>Software</td>
<td>Jun 00 - Dec 01</td>
</tr>
<tr>
<td>Secondary Sources</td>
<td>BF Goodrich(^2)</td>
<td>Bias Ply Tires</td>
<td>1</td>
<td>1.44</td>
<td>Declining</td>
<td>Tires</td>
<td>1970 - 1976</td>
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<tr>
<td></td>
<td>Radial Tires</td>
<td></td>
<td></td>
<td></td>
<td>Declining</td>
<td>Tires</td>
<td>1970 - 1976</td>
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<tr>
<td></td>
<td>Radial Tires</td>
<td></td>
<td></td>
<td></td>
<td>Declining</td>
<td>Tires</td>
<td>1970 - 1976</td>
</tr>
<tr>
<td></td>
<td>Analog Camera</td>
<td>Helios (A) (High Resolution Medical Imaging Film)</td>
<td>2.00</td>
<td>Steady</td>
<td>Photography</td>
<td>1986 - 1988</td>
<td>4</td>
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<td></td>
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<td>Helios (B)</td>
<td>2</td>
<td>1.67</td>
<td>Steady to Declining</td>
<td>1988 - 1996</td>
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<td></td>
<td></td>
<td>Digital Camera (A)</td>
<td></td>
<td>2.00</td>
<td>Declining</td>
<td>1980 - 1989</td>
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<td></td>
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<td>Digital Camera (B)</td>
<td></td>
<td>2.33</td>
<td></td>
<td>1990 - 1996</td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS:** 15 36 9 102

---

1 A composite scale (1 - 5) based on Technology Learning; Market Learning; and Commercial Success.

2 Data for Goodyear, Firestone and Goodrich innovations are principally from Sull (1999).

3 Data for Polaroid innovations are principally from Tripsas and Gavetti (2000).
## Table 2
Reliability for Items and Factor Correlations

<table>
<thead>
<tr>
<th>Item/Factor</th>
<th>Item Reliability</th>
<th>Descriptive Statistics</th>
<th>Correlations</th>
</tr>
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<tbody>
<tr>
<td>Distinct Unit</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Separate Physical Location</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Distinct Culture</td>
<td>.83</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Distinct Reward System</td>
<td>.82</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>Human Resource Capabilities</td>
<td>.91</td>
<td>.90</td>
<td></td>
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<tr>
<td>Structural Differentiation</td>
<td></td>
<td></td>
<td>0.87</td>
</tr>
<tr>
<td>Ambidextrous Manager Support</td>
<td>.75</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>AM-IM Relationship</td>
<td>.79</td>
<td>.94</td>
<td></td>
</tr>
<tr>
<td>Senior Team Integration</td>
<td></td>
<td></td>
<td>0.92</td>
</tr>
<tr>
<td>Market Learning</td>
<td>.81</td>
<td>.86</td>
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<tr>
<td>Technology Learning</td>
<td>.77</td>
<td>.82</td>
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</tr>
<tr>
<td>Market Success</td>
<td>.91</td>
<td>.85</td>
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</tr>
<tr>
<td>Performance</td>
<td>0.90</td>
<td>35</td>
<td>3.4</td>
</tr>
</tbody>
</table>

\(^1\) Structural Differentiation and Strategic Integration are both standardized with mean = 0, SD = 1.

*p < .05, ***p < .001
Table 3: Innovation Performance by Number of Non-Incremental Innovations

Comparison of Performance by number of innovations:
One vs. Multiple
\( t = .21 \) (n.s.)
## Table 4

### Structural Differentiation

<table>
<thead>
<tr>
<th>Senior Team Integration</th>
<th>Cross-Functional TEAMS</th>
<th>Unsupported Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOW</strong></td>
<td><strong>HIGH</strong></td>
<td></td>
</tr>
<tr>
<td><strong>N=9</strong></td>
<td><strong>N=4</strong></td>
<td><strong>N=15</strong></td>
</tr>
<tr>
<td>Average Performance</td>
<td><strong>2.27</strong></td>
<td><strong>2.52</strong></td>
</tr>
<tr>
<td></td>
<td><strong>3.51</strong></td>
<td><strong>4.27</strong></td>
</tr>
</tbody>
</table>

**Structural Differentiation**

- Low Structural Differentiation
  - HP Scanners: Handheld Scanner A
  - Regional News: News.com B
  - Turner Technologies: Micro Display A
  - Turner Technologies: Imaging A
  - Firestone: Radial Tires
  - BF Goodrich: Radial Tires
  - Software Co: E-Learning
  - Software Co: Knowledge Management
  - Software Co: Advanced Collaboration

- High Structural Differentiation
  - HP Scanners: Handheld Scanner C
  - USA Today: USAT.com A
  - Polaroid: Digital Cameras B
  - USA Today: Direct A
  - HP Scanners: Handheld Scanner C

**Main Effect of Senior Team Integration**

- F = 19.59
- p < .0001

**Main Effect of Differentiation**

- F = 2.18; p < .08 (one-tailed)

**Interaction Effect**

- Not significant (F = .58)
Table 5: Characteristics of Ambidexterity

<table>
<thead>
<tr>
<th>Ambidextrous Manager / Locus</th>
<th>Vision</th>
<th>Distinct Unit</th>
<th>IM</th>
<th>Targeted Integration</th>
<th>Senior Team Incentives</th>
<th>IM on Sr. Team</th>
<th>Meta Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP Zorro (B)</td>
<td>GM / Outside</td>
<td>NONE</td>
<td>Yes</td>
<td>Inside</td>
<td>MIS/HR/Finance</td>
<td>Joint Bonus</td>
<td>Yes</td>
</tr>
<tr>
<td>USA Today .Com (B)</td>
<td>GM / Inside</td>
<td>&quot;Network Vision&quot; best...</td>
<td>Yes</td>
<td>Inside Outside</td>
<td>Editorial</td>
<td>Joint Bonus / Common Fate</td>
<td>Yes</td>
</tr>
<tr>
<td>IBM Network Tech Transport (B)</td>
<td>GM / Inside</td>
<td>#1 supplier of Network Tech by 2000</td>
<td>Yes</td>
<td>Inside Inside</td>
<td>Sales / B. Dev.</td>
<td>Joint Common Fate</td>
<td>Yes</td>
</tr>
<tr>
<td>IBM Middleware Websphere</td>
<td>GM / Outside</td>
<td>Leader in software for emerging web based computing</td>
<td>Yes</td>
<td>Inside</td>
<td>Software</td>
<td>Joint Bonuses for initial stage of innovation</td>
<td>No</td>
</tr>
<tr>
<td>Utility Co. On-Site Power Plant</td>
<td>GM / Outside</td>
<td>A value creating, respected public utility</td>
<td>Yes</td>
<td>Outside</td>
<td>Marketing</td>
<td>Stock Options</td>
<td>Yes</td>
</tr>
<tr>
<td>Ciba Vision Extended Wear Daily Disposable Visudyne (A)</td>
<td>GM &amp; Head of R&amp;D / Inside</td>
<td>Healthy Eyes for Life</td>
<td>Yes</td>
<td>Inside Inside Inside</td>
<td>R&amp;D / Mkt.</td>
<td>Joint / Common Fate</td>
<td>Yes</td>
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### Table 6
Designs over Time

#### Structural Differentiation

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<thead>
<tr>
<th>Cross-Functional TEAMS</th>
<th>Unsupported Teams</th>
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<tr>
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<tr>
<td>HP Scanners: Handheld Scanner A</td>
<td>USA Today: USAT.com A</td>
</tr>
<tr>
<td>Regional News: News.com B</td>
<td>Polaroid: Digital Cameras B</td>
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<td>USA Today: Direct A</td>
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<tr>
<td>Turner Technologies: Imaging A</td>
<td>HP Scanners: Handheld Scanner C</td>
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<td>Firestone: Radial Tires</td>
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<td>BF Goodrich: Radial Tires</td>
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<tr>
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<td>Software Co: Knowledge Management</td>
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<td>Software Co: Advanced Collaboration</td>
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<td><strong>HIGH</strong></td>
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<td>USA Today: Direct B</td>
</tr>
<tr>
<td>Utility Co: Power Plants</td>
<td>Regional News: City Search.com</td>
</tr>
<tr>
<td>IBM Network Tech: Network Chip A</td>
<td>Regional News: News.com A</td>
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<tr>
<td>IBM Network Tech: Transport Chip A</td>
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<tr>
<td>Medical Imaging: Color Ultrasound</td>
<td></td>
</tr>
<tr>
<td>Goodyear: Radial Tires</td>
<td></td>
</tr>
<tr>
<td>IBM Network Tech: Network Chip B</td>
<td></td>
</tr>
<tr>
<td>IBM Network Tech: Transport Chip B</td>
<td></td>
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<tr>
<td>Medical Products: Integrated Health Care System</td>
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</tr>
<tr>
<td>Polaroid: Helios A</td>
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</tr>
<tr>
<td>Polaroid: Digital Cameras A</td>
<td>SPIN OUT</td>
</tr>
<tr>
<td><strong>NEW</strong></td>
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<td>CIBA PHARM</td>
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<td>IBM Network Tech: Transport Chip B</td>
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<td>Visudyne B</td>
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<td>CIBA Vision: Daily Disposable</td>
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<td>Polaroid: Helios B</td>
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<td>POLAROID: Helios B</td>
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<td>Number of Innovation Episodes</td>
<td>Decline</td>
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<td>Non-Ambidextrous Design</td>
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<tr>
<td>Ambidextrous Design</td>
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$X^2 = 7.87$

$p = .01$
### Figure 1: Innovation Map

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<thead>
<tr>
<th>Incremental Non-Incremental Technological Change</th>
<th>Ambidextrous Designs</th>
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</thead>
<tbody>
<tr>
<td><strong>Current Customers</strong></td>
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</tr>
<tr>
<td>Polaroid: Analog Camera</td>
<td>IBM Middleware: Websphere</td>
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<td>Software Co: ICE</td>
<td>Medical Imaging: Color Ultrasound</td>
</tr>
<tr>
<td>IBM Software: COBOL</td>
<td>Medical Products: Integrated Healthcare System</td>
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<td>Med. Imaging: B&amp;W Ultrasound</td>
<td>Firestone: Radial Tires</td>
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<tr>
<td>UtilityCo: Power Plants</td>
<td>Goodyear: Radial Tires</td>
</tr>
<tr>
<td>Ciba Vision: Conventional Lens</td>
<td>BF Goodrich: Radial Tires</td>
</tr>
<tr>
<td>IBM Network Tech: ASIC</td>
<td>UtilityCo: On Site Power Plants</td>
</tr>
<tr>
<td>Turner Tech: ASIC</td>
<td>Ciba Vision: Extended Wear</td>
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<tr>
<td>Goodyear: Bias Ply Tires</td>
<td>Ciba Vision: Daily Disposable</td>
</tr>
<tr>
<td>BF Goodrich: Bias Ply Tires</td>
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<tr>
<td>Regional News: Newspaper</td>
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<tr>
<td>HP Scanners: Flatbed Scanners</td>
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<tr>
<td>USA Today: Newspaper</td>
<td></td>
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<tr>
<td>Med. Product: Medical Devices</td>
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<tr>
<td><strong>New Customers/Defined Markets</strong></td>
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<tr>
<td>USA Today: Direct</td>
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<td>USA Today: USAT.com</td>
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<tr>
<td>Polaroid: Helios</td>
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<tr>
<td>Polaroid: Digital Camera</td>
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<tr>
<td><strong>Emerging Market</strong></td>
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<td>HP Scanner: Handheld Scanner A</td>
<td>Software Co: E-Learning</td>
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<td>Turner Technologies:</td>
<td>Regional News: City Search.com</td>
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<td>Imaging Chip A, B</td>
<td>HP Scanner: Handheld Scanner B, C</td>
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<tr>
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<td>Transport Chip A, B</td>
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<tr>
<td><strong>Target Market Change</strong></td>
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<td>Changing Market</td>
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<td>Current Customers</td>
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<td>New Customers/Defined Markets</td>
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<td>Emerging Market</td>
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<tr>
<td>Ambidextrous Designs</td>
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</tr>
</tbody>
</table>
Figure 2: Ambidextrous Design at IBM Microelectronics

J. Kelley
(Meta Manager)
Group Executive

Chris King
(Ambidextrous Manager)
Network Technologies

Senior Team

Tactical Integration

Wireless Manufacturing

ASIC (Exploitation)

Network (Innovation Manager)

Transport (Innovation Manager)

Exploration

Storage