To Explore or Exploit: A Test of Organizational Learning at the Corporate and Business Unit Level

by

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August 14, 2001

Acknowledgements: We would like to gratefully acknowledge the support of Ron Bendersky at the University of Michigan and their executive education program for funding this research.

Abstract

This research of 399 business segments in 120 Fortune 500 firms is one of few large scale studies of organizational learning and performance. Using behavioral theories of organizational learning and dynamic capabilities, we test for corporate and business level learning effects on performance. Controlling for contextual factors, such as industry, strategy, and structure, we find that business segment performance is explained by organizational learning at both the business segment and corporate levels. We also find that these two levels interact to explain segment performance. Our research suggests that combining behavioral theories of organizational learning with dynamic capabilities is useful, but additional theories are needed to tease out levels of analysis and their interactions.

Key words: Organizational learning, resources, dynamic capabilities, core competencies, firm performance.

I. Introduction

Researchers have argued that organizational learning is an important source of competitive advantage, but few empirical studies test it in a strategic context. Most of what is written about it is theoretical (Fiol & Lyles, 1985; Huber, 1991; March, 1991; Crossan, Lane & White, 1999). With a noted exception for studies by Simonin (1997) and Garbi (1994), there is almost no empirical work with large samples or with organizational learning effects on performance. Most studies are either based on case analysis, single industries, or small sample sizes. While theories of organizational learning reflect a broad and intuitive understanding, scholars have argued for more empirical analysis (Fiol, 1994; Miller & Shamsie, 1996; Simonin, 1997; Crossan et al., 1999). To address this problem, this study links behavioral views of organizational learning with the resource-based view. Resource-based view scholars have aargued that behavioral components, such as organizational learning, should be studied within a competitive context to determine their strategic importance (Barney, 1992; Mahoney & Pandian, 1990). This study responds to these challenges by testing the performance implications of organizational learning types at the business unit and corporate level in large complex organizations within a competitive context.

In this paper, we show that organizational learning is a source of sustainable competitive advantage. De Geus (1988) argues that learning may be the only source of sustainable competitive advantage. Moreover, we argue that it can be managed at the corporate and business unit level to a certain extent. First, while learning may have unintended consequences, managers can monitor and alter learning routines. Second, organizational learning is different at business unit and corporate levels. Business units manage learning routines that lead to new knowledge or exploit existing capabilities (March, 1991; Nonaka & Takeuchi, 1995). However,

corporate offices must manage the transfer of knowledge and learning across the organization (Prahalad & Hamel, 1990). Third, scholars have argued that organizational learning is a source of superior firm performance (Fiol & Lyles, 1985; DeGeus, 1988; Strata, 1989; Rumelt, 1991). Firms that learn faster than their competitors, that exploit organizational learning capabilities quicker, and that innovate more rapidly gain a sustainable competitive advantage.

In this paper, we argue that in order for learning to be sustainable, types of organizational learning must be both understood and managed. We analyze learning at the business unit and corporate levels to determine if different types of organizational learning are more effective than others. We also isolate the competitive environment and other corporate effects to eliminate the possibility that learning routines are masking other organizational components. In this cross sectional study of 399 business units in 120 large complex corporations, we are able to examine these learning effects within a large sample of the population, the Fortune 500. We extend the literature by showing that some types of organizational learning at both the business unit and corporate levels enhance firm performance while others do not. Learning that is based on new ideas and concrete integrating mechanisms across business units is linked to firm performance whereas more efficient exploitation and abstract integration are not.

II. Literature

The resource-based view has lead to a renewed emphasis on elements within the firm to explain differences in firm performance, including a focus on organizational capabilities such as learning. Some scholars argue that learning and knowledge are central to the resource-based view of competitive advantage (Kogut & Zander, 1992). A firm's ability to create knowledge, recombine assets in new ways, exploit existing capabilities, and transfer learning are primary sources of competitive advantage.

This study uses a broad definition of the resource-based view (RBV) that includes resources, dynamic capabilities, information processes and core competencies (Prahalad & Hamel, 1990; Barney, 1991; 2001; Teece, Pisano & Shuen, 1997; Makadok, 2001), including organizational learning. Within the literature on organizational learning, some scholars focus on resources (Barney, 1991, 1992), capabilities (Kogut & Zander, 1992; Chandler, 1992) or competencies (Selznick, 1957; Prahalad & Hamel, 1990; Reed & DeFillipi, 1990), others focus on adaptation and development over time (Cohen & Levinthal, 1990; Lant & Montgomery, 1987; Lant & Mezia, 1992). We follow Barney's convention (1992, 2001) of broadly defining resources to include competencies and capabilities; thus, organizational learning is a resource.

In spite of defining resources to include capabilities and competencies, a useful practical distinction should be made. Makadok (2001) helps to distinguish resources from capabilities, using a resource picking versus capability building framework. Resources are purchased a priori in the market. Managers with superior resource picking skills enhance firm performance. For example, Nucor's purchase of thin slab casting machines reflects a superior resource picking skill. Capabilities refer to a firm's capacity to deploy resources. For example, Nucor's ability to build thin slab casting plants relies on their metallurgy and start-up capabilities. Thus, firms can outperform their rivals by having superior capability building skills. Capabilities "are information-based, tangible and intangible processes that are firm-specific and developed over time through complex interactions among the firm's resources," (Amit & Schoemaker, 1993). Organizational learning fits the definition of a capability within the broader category of resources that are socially complex, firm-specific, and developed over time (Barney 1991, 2001; Dierickx and Cool, 1989).

The literature has defined organizational learning as cognitive, information processing-based, evolutionary, and/or behavioral. It can be based on cognitive schemas in which individual learning is transferred to communities of practice (Lave, 1991; Fiol, 1994; Walsh, 1995, Brown & Duguid, 2001), Knowledge and learning are socially constructed at the organizational level (Daft & Weick, 1984; Weick, 1991). It may also be based on a firm's ability to manage

information (Huber, 1991). It may also be evolutionary, dynamic and adaptive (Lant & Mezias, 1992). Organizations change their learning routines to respond to environmental challenges. They may learn new skills by recombining their existing capabilities (Kogut & Zander, 1992). Finally it may also be behaviorally based in which learning is a change in routines that are path dependent and goal directed (Levitt & March, 1988; Pisano, Bohmer, & Edmondson, 2001). Groups learn by changing routines when targets are not met. Managers can affect routines by altering goals and giving feedback, but the process is noisy. This view of learning is routed in behavioral decision-making (Amit & Schoemaker, 1993; Levinthal, 1994), in which managers are boundedly rational (Simon, 1976, 1991) and environments are ambiguous (Cyert & March, 1964, March & Olsen, 1976). Organizational learning is found in organizational routines (Nelson & Winter, 1982), in core competencies (Prahalad & Hamel, 1990; Hamel & Prahalad, 1994), and in organizational capabilities (Nelson, 1991; Chandler, 1992; Teece et al., 1997).

While the view that organizational learning is a routine is somewhat static, other scholars argue that it is dynamic (Van de Ven & Polley, 1992; Garud & Nayyar, 1994; Cohen & Levinthal, 1990; Teece et al., 1997). Teece and Pisano (1994) argue that dynamic capabilities reflect an organization's ability to learn and adapt. Organizational learning is reflected in the recombination of productive resources (Penrose, 1959; Kogut & Zander, 1992), and the accumulation of stocks of knowledge stocks over time (Dierickx & Cool, 1989). Van de Ven and Polley (1992) study trial and error learning and technological innovation over time. They develop a two-stage model in which intervention is likely to occur when innovation is threatened. Garud and Nayyar (1994) argue that transformative capability, the ability to develop a stock of internally developed technology is essential for learning over time. Cohen and Levinthal (1990) argue that absorptive capacity, a firm's ability to assimilate new information and apply it is essential to its innovative capability. This capacity is associated with its prior related knowledge.

In addition to the literature on antecedents of learning, organizational learning is an important source of competitive advantage (Nelson & Winter, 1982; Rumelt 1984, 1987; Nelson, 1991; Chandler 1992; Levinthal & March, 1993; Teece et al., 1997). Organizational learning is a particular capability in which firms can build the capacity to outperform their rivals (Fiol & Lyles, 1985; DeGeus, 1988; Strata, 1989; Huber, 1991; March, 1991). Barney notes that it may be a source of sustainable competitive advantage because it is non-immitable, non-substitutable, valuable and rare (Barney, 1986, 1992). Firms achieve superior resource and product market positions through organizational learning (Rumelt, Schendel and Teece, 1991; Chandler, 1992). Organizational learning may account for why in equilibrium[1] some firms maintain a competitive advantage over their rivals (Rumelt et al., 1991). Lippman and Rumelt (1982) show how learning allows firms to sustain above normal profitability in equilibrium.

While some theories attempt to distinguish individual from group level learning (Argyris & Schon, 1978, 1996; Crossan et al, 1999), with the exception of RBV, most are unclear as to distinctions between corporate and business unit levels of analysis. RBV, broadly defined, distinguishes between business units and corporate levels of learning. At the business unit level, business-specific skills, such as learning, can contribute to stable differences among business unit returns (Rumelt, 1991: 173). At the corporate level, the corporate general office adds value to business units by transferring knowledge and learning from one business unit to another (Henderson & Clark, 1990; Prahalad & Hamel, 1990; Hamel & Prahalad, 1994; Teece & Pisano, 1994). RBV combined with behavioral theories of organizational learning provides a rich framework for testing learning at the corporate and business unit level.

Corporate. The RBV emphasizes the role of the corporate general office as one of adapting firm-specific resources -- business unit capabilities and top management skills -- to meet

[1] Rumelt, et al., (1991) define equilibrium as the level at which firms have exploited all opportunities in their industry. Rumelt, et al., (1991) suggest that some firms are more profitable than others even in equilibrium because of favorable resource positions and isolating mechanisms that protect profits (Lippman and Rumelt, 1982). This view differs from the classical view of equilibrium in purely competitive industries in which all profits are competed away.

the changing needs of the market. Corporate focuses on transferring knowledge across functional areas, integrating learning activities, and establishing a shared vision -- image or broadly defined goal -- for the future (Prahalad & Hamel, 1990; Ulrich, Jick & Von Glinow, 1993). Finally, corporate managers are a valuable resource that may enhance organizational learning (Barney, 1991; Castanias & Helfat, 1991). Castanias and Helfat (1991) argue that superior performance is tied to managerial skill, experience, and learning processes. Corporate managers create value in large diversified firms by developing organizational capabilities, such as knowledge transfer and organizational learning (Prahalad & Hamel, 1990; Rumelt et al., 1991; Chandler, 1992; Hamel & Prahalad, 1994).

In addition to learning by corporate managers and transferring knowledge across firm boundaries, corporations also establish integrating mechanisms that enhance learning and performance. These mechanisms are determined through structures, systems, strategies and processes (Fiol & Lyles, 1985: Ulrich et al., 1993). Argyris and Schon (1978, 1996) show how managerial intervention can lead to double loop learning and improve single loop learning. Senge (1990) applies system theories to establish processes that improve continuous learning in organizations. These processes lead to shared visions, mental maps, and personal mastery. Prahalad & Hamel (1990) demonstrate that transferring technological know-how across the organization can breakdown barriers within single business units and improve organizational learning. They define core competencies as the collective learning across the organization. Cohen and Levinthal (1990) show how firms that conduct their own R&D learn new technologies faster than those that do not. Adler (1993) suggests that formal systems and clearly defined tasks increased organizational learning at the NUMMI plant, although this study is difficult to generalize. While there is learning at the corporate level, corporate learning capabilities that affect performance are defined more by the integrating mechanisms used to transfer knowledge

and learning across organizational boundaries or enhance business unit learning than by corporate learning of new processes or capabilities.[2]

Business unit. The resource-based view argues that organizational capabilities at the business unit level are important sources of competitive advantage because they adapt to environments that are often changing and ambiguous. Researchers in this area suggest that sources of competitive advantage are dynamic, building on the work that emphasizes change as destructive (Schumpeter, 1934; Kirzner, 1973) and evolutionary (Penrose, 1959; Nelson & Winter, 1982). These sources are often tacit or difficult to articulate (Itami, 1987), such as organizational capabilities.

Organizational capabilities are reflected in organizational routines that include both "blueprints" (Nelson & Winter, 1982) and tacit know-how (Polanyi, 1962; Teece, 1982), such as organizational learning (Nelson & Winter, 1982; Chandler, 1992). Organizational learning is embedded in the behavior of collectives of individuals within the firm (Levitt & March, 1988; Kogut & Zander, 1992). It may be reflected in the collective activities, processes, systems, strategies, and structures of the organization (March 1991; Chandler, 1992; Levinthal & March, 1993)

III. Hypotheses

Business Unit Learning

At the business unit level, business-specific skills, such as learning, can create a sustainable competitive advantage (Rumelt, 1991). This is exemplified by De Geus's highly

[2] At the heart of the resource-based view is the notion that firm heterogeneity leads to differences in firm performance (Wernerfelt, 1984; Rumelt, 1984, 1987). Barney (1991, 19967) extends this notion to the firm as a bundle of resources that are rare, valuable, non-imitable, and non-substitutable. These resources are created largely at the business unit level. Studies of business unit effects, which are foundational to RBV, also note that the largest portion of firm performance is explained by variances in business unit effects and not corporate effects (Rumelt, 1991; Bowman & Helfat, 2000).

cited quote “the only competitive advantage the company of the future will have is its ability to learn faster than its competitors” (De Geus 1988, 6; Senge 1990). Business units manage learning routines that assimilate new knowledge and exploit existing capabilities (March, 1991; Nayyar & Garud, 1994; Cohen & Levinthal, 1990). Levitt and March (1988) argue that learning must improve the efficiency of the firm while maintaining a constant level of innovation.

March divides organizational learning into two types, *exploration* and *exploitation* (March, 1991; Levinthal & March, 1993). First, exploration emphasizes learning about new markets and studying the environment for new opportunities (March, 1991). This type of learning is largely consistent with the resource-based view and absorptive capacity (Cohen & Levinthal, 1990) in which a firm's current learning capability influences its ability to learn from its environment, recombine resources, and gain competitive advantage (Levinthal & March, 1993). Second, exploitative learning focuses on enhancing firm learning capabilities by improving and refining current routines (March, 1991; Levinthal & March, 1993). This view is largely consistent with the resource-based view and notions of transformative capacity in which firms transfer learning capabilities over time through path dependent processes (Garud & Nayyar, 1994).

Studies of organizational learning and knowledge support the view that it leads to superior firm performance. Henderson and Clark (1990), and Henderson and Cockburn (1993, 1994) find that the behavioral components of organizations are more significant predictors of competitive advantage than industry effects. Henderson and Clark (1990) in the photolithography industry and Henderson and Cockburn (1993) in the pharmaceutical industry suggest that organizational knowledge is an important source of competitive advantage. Nonaka (1994) defines *organizational knowledge* as the organization and use of information anchored by the commitment and beliefs of the firm. This view of knowledge creation is reflected in exploration learning routines. Henderson and Cockburn (1994) show that core competencies, the collective learning across organizational boundaries (Prahalad & Hamel, 1990; Hamel &

Prahalad, 1994), are more significant sources of firm performance than industry effects in the pharmaceutical industry. Garbi (1994) shows that exploitative and explorative learning are contingent on competitive strategies of low cost and differentiation. When controlling for competitive strategies, exploration and exploitation learning enhance firm performance (Garbi, 1994).

Given that these concepts are rooted in RBV, organizational learning capabilities in this study are expected to have similar results to these studies of organizational climate, knowledge, and learning.

> Hypothesis 1a: Business unit organizational capabilities of exploitation learning are positively associated with firm performance.
> Hypothesis 1b: Business unit organizational capabilities of exploration learning are positively associated with firm performance.

Corporate Learning

Corporate managers creates value through the development of dynamic capabilities, including organizational learning (Teece, 1980, 1982; Castanias & Helfat, 1991; Chandler, 1991, 1992). They can develop learning through a variety of processes and systems, including incentives, resource allocation processes, and information processing (Argyris & Schon, 1978, 1996; Huber, 1991; Chandler, 1991, 1992). In addition to developing learning through incentives, structures and systems, corporate management plays a particular role in enhancing learning throughout the organization. According to the core competence view, this role is maximize the collective learning across business units. Thus, corporate management focuses on integrating mechanisms that develop learning capabilities across the organization.

In developing learning capabilities, corporate management may also influence organizational learning through incentives and rewards (Williamson, 1975, 1991, 1996). By offering financial and other resources to organizations that learn, management can influence

organizational behavior. They can also help to establish the targets that are used for goal-directed behavior and learning routines (March, 1991). McKinsey established career paths and financial rewards for employees to encourage the development of in depth industry and functional specialists. They established special practice Olympics to bring together the new knowledge generated from these specialists and to reward their novel contribution to the firm.

Development of learning capabilities is also influenced by strategy, structure and systems. Corporate management may include learning as a part of its business strategy, provide communication and information systems that enhance learning or allocate resources across business units to enable learning (Barney, 1992; Chandler, 1992; Levinthal & March, 1993; Argyris & Schon, 1978, 1996). The corporate general office can also influence organizational learning through structure, reward systems, and new strategic initiatives (Fiol, 1985; Castanias & Helfat, 1991). Kogut and Zander (1992) suggest that firms create dynamic capabilities by building social networks and focusing on how knowledge is organized. Building of teams, information systems, and decision making processes around a core competencies can enhance organizational learning.

Chandler (1990, 1992) argues that the resource allocation process is aimed at enhancing existing and developing new organizational capabilities. Resource allocations might provide the means to alter an information systems or transferring personnel with specific know-how across business units. The allocation of resources might be financial, human or technological.

In order to add value to the firm, the corporate general office manages the collective learning across the organization (Henderson & Clark, 1990; Prahalad & Hamel, 1990; Hamel & Prahalad, 1994). Scholars argue that managing *core competencies*, the collective learning across organizational boundaries, can lead to superior firm performance (Prahalad & Hamel, 1990; Hamel & Prahalad, 1994; Henderson & Cockburn, 1994). Teece's work emphasizes dynamic

capabilities that affect learning within and across business units. Teece and Pisano (1994) define dynamic capabilities as an organization's ability to learn, adapt, change, and renew over time.

This study uses the notion of *dynamic learning capabilities* to describe how the corporate office affects organizational learning. Dynamic learning capabilities are -- the corporate general office's mechanisms to facilitate organizational learning over time. *Integrative learning* reflects the corporate general office mechanisms to transfer organizational learning across business units, whereas *business learning* reflects the corporate general office mechanisms that enhance organizational learning within business units (Henderson & Clark, 1990). Integrative learning may be divided between strategic and operational integrating mechanisms. Strategic integrating mechanisms reflect use of strategy, visions, and mission to enhance learning across business units. Operational integrating mechanisms refer to the use of financial rewards, budgeting, technology, incentives, and resources to increase learning across business units. According to the core competence view and RBV, when learning is diffused across the business units, these dynamic learning capabilities may be a source of superior firm performance because they are valuable, rare, non-immitable, and non-substitutable (Barney, 1986, 1992; Prahalad & Hamel, 1990).

Few empirical studies have tested how the corporate general office enables dynamic learning capabilities that affect performance. Henderson and Cockburn (1994) argue that core competence, collective learning across organizational boundaries is a significant source of performance, although their study is limited to a small sample of pharmaceutical firms. Other studies of organizational learning show that learning is positively related to business unit performance, but do not clearly distinguish between corporate level learning across business units and business level learning within the unit (Garbi, 1994; Yeung, Nason, Ulrich & Von Glinow, 1994). Henderson and Cockburn (1994) show that collective learning across organizational boundaries is a source of superior firm performance. Pisano et al. (2001) show that organizational learning is enhanced by integrating mechanisms, including training,

communication, and debriefing activities. However, there study is limited to learning curves in hospitals engaged in cardiac surgery.

> Hypothesis 2. Corporate dynamic learning capabilities that focus on strategic and operational integrative learning across business units will outperform those that focus on learning within business units.

Corporate and business unit learning

While learning can occur at the level of corporate or business units, the relationship between the two is unclear. Some scholars view the two as complementary and others view them as substitutes. First, we further examine the types of learning that occur at both of these levels as noted in the literature. Second, we distinguish corporate learning as a matter of managerial choice (Porter, 1991; Chandler, 1992) and business unit learning as a less deterministic process of organizational behavior (Levitt & March, 1988; March, 1991).

Learning can occur within functions, such as production, distribution, and marketing, at the business unit level, and at the corporate level of managerial choice as firms adjust to changing economic, social, and political environments (Chandler, 1992). Learning at the broader contextual level, can affect learning at the operational level. In this case, we distinguish managerial learning based on managerial choice of integrating mechanisms, shared information, and cross-functional training, etc. from that of organizational learning based on behavior and decision-making at the business unit level.

Managerial learning is closely associated with double loop learning and organizational learning is similar to single loop learning in the broader corporate view. Argyris and Schon (1978, 1996) note that learning can occur at the level of the task, single loop, or at a broader level of understanding a range of related tasks, double loop learning. The role of managers is to intervene at the level of double loop learning to improve performance at the single loop level. Crossan et al. (1999) describe a process of learning from individual to organizational. According

to their model, individual learning is based on intuition and interpretive, group learning flows from integrating shared understandings, and organizational learning focuses on institutionalizing routines, rules and procedures. This view tends to be more cognitively based than routine based but it does show how the different levels of analysis are connected through feedforward and feedback processes as organizations engage in learning.

Managerial learning at the corporate level may be connected to organizational learning at the business unit level. Managers focus on the creation of bundles of tangible and intangible resources and capabilities whose economic returns can be appropriated by the firm (Amit & Shoemaker, 1993, 37). Managers must not only select resources, but they must build capabilities (Chandler, 1992; Amit & Shoemaker, 1993). Building capabilities requires strategic vision, development time, and sustained investment. It requires that managers learn by building heuristics solutions that help them to address the many cognitive and behavioral biases of learning. Managers set targets that influence organizational learning routines.

It is not clear that managerial learning always complements organizational learning; some scholars argue that the two are substitutes. Levinthal and March (1993) note that organizational learning has become a replacement for managerial choice, but both may be connected through the cognitive and inferential limitations of individuals in organizations. Levitt and March (1988) note that theories of organizational learning are distinct from theories of managerial choice, although the mechanisms of learning are intertwined with choice. They define learning as a routine that is dependent on history and oriented towards goals; generic routines are:

> "forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate. It also includes the structure of beliefs, frameworks, paradigms, codes, cultures, and knowledge that buttress, elaborate, and contradict the formal routines" (Levitt & March, 1988; 320).

Crossan et al., (1999) show how different levels of learning can drive out other forms of organizational learning. For example, institutionalization of learning can drive out intuitive learning. If learning becomes too institutionalized, it may create inertia and require

Schumpeterian (1934) forces of creative destruction to enact variations that allow for intuitive insights (Crossan et al., 1999). Using RBV, Conner and Prahalad (1996) extend this argument to knowledge resources. They note that managers may substitute their knowledge and learning for those of their subordinates in an efficient and non-opportunistic way.

Thus, organizational learning is intricately woven with managerial learning in such as way that it may be a substitute or it may be complementary. If the two effects are complementary, then managerial learning and organizational learning should jointly produce a positive affect on performance. If they are substitutes for each other, then they will have a jointly negative affect on performance. Given the contradictory predictions between core competence (Prahalad & Hamel, 1990) and RBV (Conner & Prahalad, 1996), we hypothesize the following:

Hypotheses:
3a: The complementary effects of managerial learning and operational learning will lead to superior firm performance.
3b: The substitution effects of managerial learning and operational learning will lead to superior firm performance.

IV. Methods

This study uses a variety of data and methods, including multiple regression, factor analysis, and variance analysis to determine the effects of organizational learning on firm performance. The data, independent, dependent, and control variables, and model employed in the study are described below.

A. Description of the Data and Sample

This study uses survey and COMPUSTAT data aggregated to the business segment level. The sample represents 360 business segments in the US from a population of approximately 1440 business segments of Fortune 500 corporations. Surveys were issued to executives, managers and directors in business segments of Fortune 500 corporations. Of the 1440 business segments of the Fortune 500, responses were received from 430 of them. Each business unit is then matched to the business segment file of COMPUSTAT using the 4 digit SIC code. COMPUSTAT provides from two to three levels of SIC codes per business segment, with the primary code reflecting industry that most represents the business segment. In some cases, it was not possible to determine the business segment, resulting in a remaining sample of 360 business segments. The average number of business segments for the population is 2.6 versus 2.5 for the sample ($p. < .20$).

B. Representativeness

1. Representativeness by Firm. The sample also represents the population in terms of assets and return on assets with no significant differences in the T-tests. The populations' average assets per COMPUSTAT of $2.6 billion are slightly larger than the samples average assets of $2.2 billion, ($p < .11$). Return on assets per COMPUSTAT is also larger for the population at 10.2% versus 9.3% for the sample, ($p < .12$). This study includes 120 Fortune 500 corporations, 20% of the population, as listed in COMPUSTAT's annual data file. All firms are

legally incorporated in the United States. The sample covers 44 industries of the 50 in the population, at the 2 digit SIC code level, including aircraft, automobile, electronic, and computer, chemical and pharmaceutical, petroleum, utilities, banking, and services**.** Corporations reflect high and low performers in each industry.

2. Representativeness by Segment. Based on COMPUSTAT's industry segment file, business segment data is also representative of the 120 corporations in the sample. Within each corporation, business segments combined total over 75% of sales. Also, the largest business segment in each corporation is included in the sample. Each of business segments reflects large divisions with multiple single business units.

3. Representativeness by Business Unit. The 360 business segments reflect large divisions from approximately 1440 single business units (SBUs) for a response rate of 25.0%. While the number of business segments is based on COMPUSTAT, the number of SBUs is derived from the surveys and information provided by the corporations on the business units for each individual. Most respondents included information on the survey, such as their 4 digit SIC code, number of employees, and regional location. When this information was not provided, the study used the address file of the respondent or information gathered from telephone interviews with the sponsors.

4. Representativeness of surveys. The final level of analysis occurs at the survey level. This process is based on combining 3,229 surveys into 430 business segments. Out of 3700 surveys distributed, respondents returned 3,229 for a response rate of 87.3%.

In addition to the COMPUSTAT data previously noted, this study also uses survey data. We received over 3, 000 surveys , using a 360^{o} instrument in respondents evaluate the business segment and the corporation. Surveys were initially sent to business segment and corporate managers in 1996, who were directed to distribute the surveys to a superior, subordinate and at least two line managers. Respondents were selected on the basis of their ability to make an informed decision about the business segment (Campbell, 1955; Phillips & Bagozzi, 1986; Seidler, 1974). The relationship of the associates to the participant included supervisors (10%),

peers (46%), subordinates (11%),and clients (33%). On average, we have approximately 8 respondents per business segment and 30 per corporation.

The respondents represent a mixture of demographic characteristics, functional areas, and managerial levels (Campbell, 1955; Seidler, 1974; Phillips and Bagozzi, 1986). Thus, the respondents reflect a variety of levels and functions in the organization. The functional breakdown includes human resources (23%), general management (20%), manufacturing (16%), marketing/sales (10%), finance/accounting (10%), and planning, R&D, and other (21%). The breakdown by level includes individual contributors (29%), managers (34%), directors (30%), and general managers (7%).

Business segments with fewer than three respondents to the survey, including participants and associates, are excluded from the study, as recommended by Seidler (1974), following the multiple informants' literature. Also, early versus late surveys indicate a slight bias in assets, but not profitability, based on COMPUSTAT data of average assets and return on assets. Splitting the surveys based on the first half of responses received, T-tests show that late surveys averaged assets of $2 billion versus $1.5 billion for early surveys ($p<.06$). This size bias suggests that larger firms take longer to respond to the survey.

C. Description of the Model

The basic model uses ANOVA to test business segment effects. Schmalensee (1985) established the basic empirical model used in this paper and used by researchers in varying forms (Hansen & Wernerfelt, 1989; Rumelt, 1991; Roquebert et al., 1996

Similarly, this study is as follows:

. $r_{ij} = \mu + \alpha_i + \varphi_i + \beta_j + E_{ij} + F_{ij} + \varepsilon_{ij}$

The model is consistent with other firm effect studies:

$r_{ij} = \mu + \alpha_i + \beta_j + C_{ij} + D_{ij} + \varepsilon_{ij}$

where r_{ij} firm (business segment) performance for its *i's* operations in industry *j*; the $\alpha's$ are corporate learning; the $\beta's$ are business level learning; C_{ij} interactive effects; D_{ij} are control variables, μ is a constant; and ε's are disturbances.

D. Description of Variables

1. Dependent Variable. Firm performance is defined theoretically as the attainment of a business division's market position that leads to superior financial performance relative to its rivals (Porter, 1991). This definition is consistent with business policy theory, but empirical definitions of firm performance vary widely in the literature. They range from financial indicators, such as profit, return on investment or market share (Venkatraman & Ramanujam, 1987) to organizational effectiveness measures, such as resource acquisition, legitimacy and goal achievement (Cameron & Whetten, 1981, 1983). In this paper, firm performance is defined as the business segment's three year average return on assets from 1997-2000. Consistent with other studies of firm effects, it is measured by average business segment return on assets (Roquebert et al., 1996; McGahan & Porter, 1997, 1996; Brush & Bromiley, 1997).

2. Independent Variables

This study uses organizational components of competitive strategy and organizational learning as independent variables for business segment. Hansen and Wernerfelt (1989) measure organizational climate with a survey of organizations developed by Likert. Some researchers measure organizational knowledge and core competencies with patents (Cockburn & Henderson, 1993; Henderson & Cockburn, 1994). Similar to Hansen and Wernerfelt (1989), this study measures competitive strategies and organizational learning with survey responses.

E. Descriptive Statistics

Table 1 provides the descriptive statistics and the correlation matrix for all of the variables used in this study. Survey variables reflect composite scores based on factor analysis. All variables conform to multivariate assumptions.

The correlation matrix in Table 1 indicates that the relationship between the variables is as expected, and none is highly correlated. For example, exploitation and lowcost, and exploration and differentiation are positively correlated.

2. Independent Variables

Organizational learning types used in this study are divided by corporate, business unit, and interactive.

Corporate Learning - The study uses survey questions related to the degree to which the corporate general office uses mechanisms to integrate learning across or within business units. These questions include mechanisms related to technology transfer, information systems, transferring knowledge across business units, and the type of learning used in business strategies. Corporate level organizational learning is based on core competence (Prahalad & Hamel, 1990; Hamel & Prahalad, 1994; Henderson, 1994). Core competence reflects a corporation's ability to use integrating mechanisms to maximize the collective learning across business units. Factor analysis of integrating mechanisms shows that one method is based on integration of strategies, and vision – strategic learning, and the other is based on integration of resources, budgets and financial information – operational learning. These two types of learning are developed using a factor analysis with Varimax rotation of 15 survey questions regarding types of integrating mechanisms used. Factor 1, strategic learning, accounts for 35% of the variance; the other factor, operational learning, accounts for 21% of the variance. The reliability estimates of Cronbach for strategic learning are .85 and for operational learning are .89.

Business Unit Organizational Learning. Organizational learning types used in this study are based on March's (1991) distinction of two types of organizational learning: learning that focuses on the *exploration* of new products and markets, and learning that emphasizes the *exploitation* of firm capabilities. These learning types are developed using factor analysis with Varimax rotation of 16 survey questions. Respondents used a 6-point Likert scale from "Don't know/not applicable" to "To a very large extent," to respond to the questions such as "we often learn new ideas outside our business..., we work to be masters at what we do,…learning from within 'your business' is a key part of our strategy...", etc.. These two learning types are developed using factor analysis with Varimax rotation of 28 survey questions about learning routines for new and existing products and capabilities. Factor 1, exploration, accounts for 23% of the variance; the other factor, exploitation, accounts for an additional 6%. The reliability estimates of Cronbach α's for exploration are .75 and for exploitation are .85.

Interactive learning variables are based on combining corporate with business unit level learning. Complementary relationships are expected to be positive and substitution effects are expected to be negative. Exploration and strategic learning are combined to form strategic exploration. Exploration is also combined with operational learning to form operational exploration. Exploitation is combined with strategic learning as strategic exploitation and with operational learning as operational exploitation.

3. Control Variables

Firm size. Research suggests that firm size may affect firm performance (Hall & Weiss, 1967; Child, 1972; Lenz 1981). The log of the number of employees is included in the model because the log fits the linearity assumptions of multiple regression analysis better than absolute values of firm size.

Age. Research also suggests that the age of the firm may impact profitability. Older firms may suffer from inertia that limits their ability to adapt and learn. This study includes the year the firm was established based on survey results.

Fiol and Lyles (1985) note that four additional factors influence organizational learning. These factors are the environment, organizational culture, structure, and strategies of the firm.

Environment. Industry dummies are used to control for the competitive environment. This is consistent with other studies of industry effects (Schmalensee, 1985; Rumelt, 1991; McGahan & Porter, 1996, 1997).

Structure. Structure variables are based on survey questions about the level of centralization and decentralization (Ouchi, 1977, 1979; Hoskisson, Hill & Kim, 1993). Factor analysis is used to determine the level of centralization and decentralization based on 30 survey questions. Cronbach alphas for centralization are .90 and for decentralization are .87.

Culture. Culture is defined as a set of key values, beliefs, understanding, and norms shared by the firm (Schein, 1992; Brown & Starkey, 1994). It is based on survey responses to questions about the type of culture and whether or not the culture is "strong," the degree to which this it is shared throughout the corporation.

Strategy. Diversification strategies are based on survey responses and verified using Palepu's (1986) measure of relatedness. Studies generally show that related diversification strategies outperform unrelated ones (Rumelt, 1982; Ramanujam & Varadarajan, 1989). Respondents are asked whether or not their firm is engaged in the following: related acquisition, unrelated acquisition, related divestitures, or unrelated divestitures. Dummy coding is used to measure strategy.

The correlation table and descriptive statistics are presented in Table 1. None of the variables is highly correlated, with the exception of the interactive learning variables. The relationship among the variables is as expected. Regression analysis is presented in Table 2.

V. Results

The results in Table 2 support the corporate, business unit, and interactive models of organizational learning as predictors of business segment performance.

The business unit's model fits the data, with an F-ratio of 2.20 that is significant at the .001 level and an adjusted r-square of 16.8. (Business level learning adds an additional 1% explanation in variance over the control model. The control model has an adjusted r-square of 15.8%.) Hypothesis 1 is partially supported. Exploration learning is significant at the .05 level, but exploitation learning is not significant. In addition, some of the control variables are significant and robust in all models. Related divestures is negative and significant at the .01 level. Decentralization is positive, but significant only in the control and business unit models.

The corporate model's overall fit is significant at the .001 level with an F-ratio of 2.54 and an adjusted r^2 of 22.5%. It partially supports the second hypothesis that corporate organizational learning is positively associated with business unit performance. Operational learning is positive and significant at the .001 level, but strategic learning is not.

The interactive model also fits the data with an F-ratio of 2.55 that is significant at the .001 level. Operational learning x exploration learning is positive and significant at the .05 level, supporting the hypothesis 3a, in which corporate learning and business unit learning are complementary. Hypothesis 3b is not supported. Although some combinations of corporate learning and business unit learning are negative, suggesting a substitution effect for corporate operational learning and business unit exploitation learning and for corporate strategic learning and business unit exploration learning, they are not significant.

VI. Conclusions

The results support models of organizational learning from behavioral to the resource-based view broadly defined. Including dynamic capabilities and core competencies at the corporate level, the models provide strong support for RBV's view of corporate integrating mechanisms focused on operational and financial information and processes. They provide support for integrating this information with learning new ideas and exploring new capabilities, suggesting that core competencies or collective learning is a significant predictor of firm performance. It is somewhat surprising that operational learning performed better than strategic learning. It appears that firms are more successful at transferring learning when the integrating mechanisms are more concrete and less abstract. Concrete mechanisms include transferring product and process information and best practices as well as transferring financial and budget information. More abstract mechanisms, including strategic planning and shared visions are not significant.

This study suggests that to an extent corporations can manage learning. Managerial learning activities can have a positive effect on performance, but not always. By using concrete integrating mechanisms, corporate managers can influence organizational learning, but care is needed for more abstract integrating mechanisms. While these abstract mechanisms may have direct and positive effects on firm performance, when used as a mechanism for learning, they may have unintended consequences or no effect on firm performance.

The study also provides support for behavioral models of learning at the business unit level. While only partial support is given for March's (1991) model of exploration and exploitation learning, in this study, exploration learning is an important and robust explanation of firm performance. This gives partial support to studies that suggest that knowledge-creation and innovation are more significant sources of sustained competitive advantage than building more

efficient capabilities. Capability exploitation may be more imitable than building new capabilities through exploration. This supports Teece and Pisano's (1994) notion of dynamic capabilities that are based on adaptation and new information and Nonaka and Takeuchi's (1995) view of knowledge creation.

Both the corporate and business unit levels of learning are more complex than suggested by the current theories of behavioral and dynamic capabilities suggest. The interaction of corporate operational learning and business unit exploration learning suggests that corporations must actively pursue new innovation and transfer this knowledge across business units to have a sustainable competitive advantage. It may suggest that integrating mechanisms that are not only concrete, but more incentive based pull knowledge across the organization as units see the results of successful business units. Abstract transformational learning may reflect a push strategy that is harder to translate into exploiting existing capabilities and exploring new ones.

While this study is one of few large-scale analyses of learning and performance, particularly at the corporate and business unit levels, it clearly is limited by the use of cross sectional, survey and accounting data. Ideally studies of organizational learning and competitive advantage should use longitudinal data. While it is difficult to obtain rich longitudinal data for large-scale samples, this would be a logical next step in furthering research on dynamic learning capabilities and sustainable competitive advantage as well as for exploring the relationship between corporate and business unit learning over time. Second, survey data, while useful, is also limiting. In spite of significant efforts to minimize biases, survey data is inherently about perception. Studies, which tie perceived learning to actual learning, would aid in developing more empirical work in this area. Finally, this study is limited by the accounting data used to compute business unit returns. Accounting data provides rich data at the business segment level,

the level of analysis, but it is subject to accounting conventions that limit its ability to measure economic rents and firm performance. Other market-based returns are not available at the business segment level, making it difficult to use market-based measures. Measures of innovation or market share may be useful substitutes in future analysis.

In spite of the empirical limitations of the study, the most significant needs are theory based. While combining behavioral theories of organizational learning with RBV is useful in helping to determine the performance implications of organizational learning at different levels of analysis, it does not provide a clear picture of antecedents, levels, and dependent variables. In spite of the plethora of theories on organizational learning, clearer and more focused theories are needed to guide empirical studies. Areas for theory building include: 1) how organizational learning at the corporate and business unit level affects performance; 2) what corporate and business unit mechanisms enhance learning; 3) what are the interactions of corporate and business unit level learning; 4) what forms of organizational learning are distinct form knowledge-creation; 5) whether or not efficiency based learning, i.e. exploitative learning is a source of sustained competitive advantage; and 6) how do contextual variables, such as industry, strategy and structure affect learning. The latter question is a natural extension of work by Fiol and Lyles (1985), Chandler (1992) and Argyris and Schon (1996) that begin to tease out contextual variables and levels of analysis.

This study suggests that a dynamic capabilities-based theory of organizational learning is needed to explain how organizational learning creates sustained competitive advantage at the corporate and business unit levels as well as the interaction between the two. It suggests that firms that focus on new exploratory learning routines will build capabilities that are non-imitable and lead to a sustainable competitive advantage. It indicates that both business units and

corporate managers play an important role in the development of dynamic learning routines, but that these roles are not always clear cut. Some combinations of corporate and business unit learning have no effect on performance and others are complementary. This study provides support for learning new capabilities at the business unit level and transferring knowledge across business units in concrete ways.

Table 1

Descriptive Statistics and Correlation Analysis

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Exploration	42.2	4.3	1.00								
2. Exploitation	7.8	1.5	-.21	1.00							
3. Oper. learning	10.3	2.3	.06	.25	1.00						
4. Strategic learning	33.0	3.9	.54	-.22	.12	1.00					
5. Strategic exploration	14.1	2.7	.78	-.25	.11	.81	1.00				
6. Oper. exploration	4.4	1.1	.47	.13	.80	.38	.47	1.00			
7. Strategic exploitation	25.7	5.1	.17	.71	.31	.38	.30	.35	1.00		
8. Oper. exploitation	8.2	2.6	-.10	.75	.71	-.05	-.08	.67	.68	1.00	
9. Related acquisitions	.5	.5	.10	-.10	.04	.06	.09	.08	-.05	-.05	1.00
10. Related divestitures	.2	.3	.06	.09	.04	.04	.06	.06	.11	.06	.19
11. Unrelated acquisitions	.1	.2	.04	-.01	.00	-.01	.01	.01	.00	.00	.17
12. Unrelated divestitures	.1	.2	-.04	.04	.02	.01	.00	.01	.04	.02	.18
13. Culture	41.7	6.4	.32	.08	.26	.42	.42	.36	.30	.22	.01
14. Centralization	.0	.2	.04	.10	.18	.06	-.07	.06	-.04	.05	.02
15. Decentralization	.1	.3	.38	.27	.43	.34	.10	.19	.11	.06	.08
16. Age	1962	40.9	-.05	-.03	-.04	.07	-.04	.05	-.05	.02	.08
17. Firm size (log)	3.4	.7	.03	-.01	.05	.02	.03	.06	.00	.05	-.04

	10	11	12	13	14	15	16	17
11. Unrelated acquisitions	.12	1.00						
12. Unrelated divestitures	.17	.11	1.00					
13. Culture	.06	.06	-.01	1.00				
14. Centralization	.00	-.05	.07	.02	1.00			
15. Decentralization	-.03	.02	.05	.32	.02	1.00		
16. Age	.02	-.06	-.01	.07	.03	-.01	1.00	
17. Firm size (log)	.09	-.01	.02	-.05	.03	-.01	.03	1.00

Table 2
Business segment performance as predicted by organizational learning
at the business unit, corporate and joint levels
and integrated models. (standard errors-values in parentheses.)

	Control Model	Business Unit Model	Corporate Model	Main Effects Model	Interactive Model
Exploration		.03*		.13*	
		(.01)		(.01)	
Exploitation		.02		.00	
		(.04)		(.00)	
Operational learning			.10***	.11***	
			(.03)	(.03)	
Transformative learning			.02*	.02	
			(.01)	(.01)	
Transformative x exploration					-.05
					(.05)
Operational x exploration					.03*
					(.02)
Transformative x exploitation					.03
					(.03)
Operational x exploitation					-.02
					(.01)
Related acquisitions	.13	.11	.16	.14	.13
	(.12)	(.11)	(.11)	(.11)	(.12)
Related divestitures	-.41**	-.42**	-.42**	-.41**	-.42**
	(.15)	(.15)	(.15)	(.15)	(.15)
Unrelated acquisitions	.00	-.11	-.11	-.14	-.13
	(.24)	(.24)	(.23)	(.23)	(.23)
Unrelated divestitures	-.24	-.20	-.29	-.16	-.16
	(.23)	(.23)	(.23)	(.22)	(.23)
Culture	.00	.00	.00	.00	.00
	(.00)	(.01)	(.01)	(.00)	(.00)
Centralization	-.02	-.01	-.01	-.01	-.01
	(.02)	(.01)	(.01)	(.01)	(.01)
Decentralization	.01*	.01*	.00	.00	.00
	(.00)	(.00)	(.01)	(.00)	(.00)
Age	-.01	-.01	-.01	.00	.00
	(.00)	(.01)	(.01)	(.00)	(.00)
Firm size (log)	.08	.08	.07	.08	.08
	(.08)	(.08)	(.07)	(.08)	(.08)
Industry dummies	xxx	xxx	xxx	xxx	xxx
Constant	3.04	2.88	1.15	1.38	2.53
N	399	399	399	399	399
F-stat	2.16***	2.20***	2.54***	2.53***	2.55***
R^2	29.5	30.9	34.0	34.9	35.1
Adj. r^2	15.8	16.8	20.8	21.1	21.3

***Significant at the .001 level. **Significant at the .01 level. *Significant at the .05 level. xxx Several industry dummy variables are significant.

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