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THE INFLUENCE OF EXPERIENCE ON ORGANIZATIONAL SEARCH, KNOWLEDGE CREATION, AND PERFORMANCE

By

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ABSTRACT

THE INFLUENCE OF EXPERIENCE ON ORGANIZATIONAL SEARCH, KNOWLEDGE CREATION, AND PERFORMANCE

By

Michael J. Mannor II

In this dissertation I examine the overall question of how organizations can learn from different types of experience to create new knowledge and achieve superior performance. I take a three essay approach to examining these issues. I begin by developing a new theoretical approach to looking at organizational experience by drawing on theory from micro-level research to explore how quantitative depth and qualitative breadth in experience can differentially influence search and innovation in firms. In the next essay, I move on to apply these ideas to knowledge creation in the pharmaceutical industry. These ideas are examined empirically in 20 years of U.S. patent data. The final essay then concludes by investigating the influence of these different types of experience on firm performance among production companies in the U.S. film industry.

DEDICATION

I dedicate this work to the memory of my father and brother, both of whom enriched my life tremendously and continue to be missed deeply.

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I owe a great deal of thanks to my beautiful wife Katie, my kids, my mom, and the inspiring community of scholars at MSU. I would like to particularly thank the members of my committee, Kent Miller, Gerry McNamara, Jamal Shamsie, and Don Colon. Also, thanks to Sue Polhamus for all of her help throughout my doctoral program and with the final preparation of this document. The management department at Michigan State is a great group of friends and colleagues, and I could imagine no better place to go to work everyday for the last five years.

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INTRODUCTION

The idea that organizations learn from experience has been well accepted in the study of organizations for at least 80 years (Rohrback, 1927; Wright, 1936; Yelle, 1979). In the course of this study the benefits of experiential learning have been shown to be important for the study of economic advantages in airplane manufacture (Alchian, 1962), nuclear power plant construction (Zimmerman, 1982), truck production (Epple, Argote, & Devadas, 1996), pizza-making (Darr, Argote, & Epple, 1995) and many other industries. In recent years this line of research has branched out to study the strategic advantages of experiential learning for the management of alliances (Hoang & Rothaermel, 2005), the success of new entries (King & Tucci, 2002), the performance of acquisitions (Zollo & Singh, 2004), and research and development investments (Nerkar & Roberts, 2004). This rich history has launched books (Argyris & Schon, 1978), corporate initiatives (McGregor, 2008), and the careers of many consultants.

However, in this dissertation it is argued that the conceptualization of experience in this research tradition has been, collectively, rather narrow. Although the industry settings have broadened, new methods have been applied, and new strategic outcomes have been considered, a consistent theme throughout the literature has been the conceptualization of experience as a quantitative assessment of cumulative experience collected by an organization over time. Whether this is measured with the number of years of exposure or the cumulative number of units produced (Argote, 1999), the number of airplanes produced (Asher, 1961) or the number of pizzas made (Darr, et. al, 1995), research has consistently failed to recognize a wider perspective of the different types or challenges presented by a firm's history of experiences. By developing new

theory to better capture the influence of different types of experience, it may be possible to re-examine existing findings, question established truths, and uncover new avenues for research. Interestingly, this significant oversight has occurred despite the encouragement of various literature reviewers through the years to explore these broader experiential perspectives (Levitt & March, 1988; Huber, 1991; Bapuji & Crossan, 2004).

Responding to this shortcoming, this dissertation begins with the development and application of a new and more complex model of organizational experience. Building on advances in the micro-level study of work experience and job performance (Quinnones, Ford, & Teachout, 1995; Tesluk & Jacobs, 1998), this dissertation integrates these ideas into a new model of organizational experience and then explores how this new model can help to inform the study of search and innovation in organizations. In subsequent chapters, this new approach to organizational experience is further extended by investigating the influence of different types of experience on knowledge creation and performance. Further, in applying these new perspectives of experience, there is a consistent focus throughout the dissertation on the influences of different types of experience on creating 'breakthroughs'. This focus on breakthroughs is motivated in part due to the fact that radical innovations have the potential to help organizations to achieve first-mover advantages (Lieberman & Montgomery, 1987), create barriers to entry (Porter, 1980), better meet consumer demands (Adner & Levinthal, 2001), and generally push the envelope of competitive pressure on their rivals (Utterback & Suarez, 1993). Further, radical innovations have been shown to be responsible for between 48-93% of the financial payoffs from the patenting activities of firms (Scherer & Haroff, 2000). Despite these substantial potential benefits, academic research has been slow to explore

empirically the processes of radical innovation (Garcia & Calantone, 2002; Fleming, 2002), and organizations vary significantly in their ability to create breakthrough innovations (Ettlie, Bridges, & O'Keefe, 1984; Ahuja & Lampert, 2001). By applying this new model of experience to the study of how organizations learn to create such innovations, this work has the potential to open new doors and push into new understanding of this important phenomenon.

In fact, despite the struggles of many firms, some organizations appear to have the "winning formula" for consistently churning out great industry-changing products. In the past luminaries such as Sony, IBM, GE, 3M, Apple, and Pfizer have served as models to their peers and have been rewarded by investors for consistently churning out revolutionary products. Although these models have been studied by competitors, few have been able to create innovative environments as successful as these firms. Further, many of these successful organizations have had difficulty themselves sustaining their own successful innovation. Causal ambiguity and social complexity often make the successful "formula" difficult to understand, even from the inside (Fleming, 2002). Perhaps due to these difficulties, several of these luminary model organizations have stumbled in recent years.

Thus, with the goal of developing a more complete perspective of experience in organizations and then applying these new experiential ideas to the study of search, knowledge creation, and performance, the structure of this dissertation is simple. First, Chapter 1 begins by reviewing the rich history of research on experiential learning and then offering a formal critique of how this research has been held back by narrow conceptualizations of experience. Chapter 1 then introduces more complex ideas of

experience from the work experience and job performance literature and develops a new model of the qualitative-diversity as well as the quantitative-intensity of experiences at both individual and organizational levels of analysis. Chapter 1 continues by connecting these new ideas of experience to the mechanisms of learning in organizations (organizational norms and routines) to explore how these mechanisms are influenced by these different types and levels of experiences. Chapter 1 concludes with an analysis of how specific norms and routines influenced by these experiences contribute to the development of radical innovations in organizations.

Chapters 2 and 3 build from this conceptual base to examine these ideas empirically in two data settings – the pharmaceutical industry and Hollywood. Chapter 2 explores the influence of different types of organizational experience on knowledge creation in the pharmaceutical industry. In this chapter I explore how different types of organizational experience (experiential depth, breadth, and diversity) influence the rate and impact of knowledge creation in the pharmaceutical industry. In chapter 3 the ideas from chapter 1 are extended to the study of firm performance in Hollywood. Specifically, the relation between different types of organizational experience and performance is investigated. Building on experiential learning theory, two perspectives are advanced. First, a universalistic approach is developed from the traditional learning literature, building on the logic that all experience is good experience. Second, a more contingency-based approach is hypothesized, in which the influence of different types of experience on performance can vary significantly, and even be negative in some cases.

In sum, these three chapters advance new perspectives of organizational experience theoretically and empirically to advance experiential learning theory. Each

chapter is designed to be both integrated into the core themes of the dissertation, but also with a clear modularly for future publication in a more traditional journal format.

CHAPTER 1

CREATING BREAKTHROUGHS: EXAMINING THE EXPERIENTIAL ROOTS OF SEARCH AND KNOWLEDGE CREATION

OVERVIEW

This chapter extends theory on the experiential roots of organizational learning by examining the different types and levels of such learning. This is achieved in two parts. First, research from inside and outside organizational learning are brought together to inform a new multi-level framework of organizational experience. Second, these new ideas are used to examine the experiential roots of norms and routines in organizations, focusing on the context of search and knowledge creation in organizations.

The idea that organizations learn from experience has been well accepted in the study of organizations for at least 80 years (Rohrback, 1927; Wright, 1936; Yelle, 1979). In the course of this research the benefits of experiential learning have been shown to be important for the study of economic advantages in airplane manufacture (Alchian, 1962), nuclear power plant construction (Zimmerman, 1982), truck production (Epple, Argote, & Devadas, 1996), pizza-making (Darr, Argote, & Epple, 1995) and many other industries. In recent years this research has branched out to study the strategic advantages of experiential learning for the management of alliances (Hoang & Rothaermel, 2005), the success of new entries (King & Tucci, 2002), the performance of acquisitions (Haleblian & Finkelstein, 1999; Haleblian, Kim, & Rajagopalan, 2006; Zollo & Singh, 2004), and research and development investments (Sampson, 2005, Nerkar & Roberts, 2004). This rich history has launched books (Argyris & Schon, 1978), corporate initiatives (Jana, 2007), and the careers of many consultants.

However, in this study I argue that the conceptualization of experience in this research tradition has been, collectively, rather narrow. Although the industry settings have broadened, new methods have been applied, and new strategic outcomes have been considered, a consistent theme throughout the literature has been the conceptualization of experience as a quantitative assessment of cumulative experience collected by an organization over time. Whether this is measured with the number of years of exposure or the cumulative number of widgets produced (Argote, 1999), the number of airplanes produced (Asher, 1961) or the number of pizzas made (Darr, et. al, 1995), researchers have consistently failed to recognize a wider perspective of the different types or challenges presented by a firm's history of experiences. By developing new theory to

better capture the influence of experience diversity, in addition to experience intensity, it may be possible to re-examine existing findings, question established truths, and uncover new avenues for research. Interestingly, this significant oversight has occurred despite the encouragement of literature reviewers through the years to explore these broader experiential perspectives (Levitt & March, 1988; Huber, 1991; Bapuji & Crossan, 2004).

Despite these cautions, a critical question that the current study seeks to answer is why a historically limited theoretical conceptualization of organizational experience is inadequate. In fact, I argue that several shortcomings leave existing models of experiential organizational learning simplistic and insufficient for advancing our understanding of how organizations learn and create knowledge. First, simplistic models of experiences are inadequate for understanding how diverse organizational norms and routines are developed in organizations. Focusing on only the intensity of experiences significantly biases any models of norms and routines to focus toward efficiency, missing the entire domain of developing broad learning organizations. This is particularly important, as norms and routines act to both protect and sustain business advantages from competitors over time (Nelson & Winter, 1982), and are significantly influenced both by organizational and individual experiences (Bettenhausen & Murnighan, 1985; Levitt & March, 1988). Second, as existing models of experiential organizational learning have both simplified the treatment of experience and consistently failed to recognize a multi-level perspective (Huber, 1991; Bapuji & Crossan, 2004), understanding the processes through which different types of experience interact across levels of analysis is impossible. In fact, a wealth of research has been done at the individual level of analysis that is almost completely missing from macro treatments of experience. This is evident,

in particular, in the fact that significant advances have been made in the study of experience in industrial-organizational psychology (e.g. Quinnones, Ford, & Teachout, 1995; Tesluk & Jacobs, 1998), but macro-level research has yet to embrace or integrate such advances into organizational level models. This instance of research myopia is unfortunate, as insights at the individual level have important implications at the organizational level as well. Further, keeping our conceptualization of organizational experience simple in terms of level and type has sheltered macro-level research from the interesting but complicated issues of fit and misfit between individual and organizational experiences. Although these issues are complex, such situations are likely to have an important influence on organizational processes, influences that are not able to be captured by simple existing models of organizational experience.

Taking these ideas together, the bottom line is that it is virtually impossible to theoretically disentangle the nature of experiential organizational learning with our current conceptualizations of experience. To impact actual practice, we need new theory that moves away from traditional assumptions and myopias to better encompass the complex reality of the phenomenon, in which experiences are not all equal, and have very different influences on the development of norms and routines.

Directly responding to these shortcomings, this study focuses on the development and application of a new and more complex model of organizational experience. Toward this end, this study begins with a critique of the traditional treatment of experience in the organizational learning literature, and how several recent advances both inside and outside the organizational learning literature can inform the development of a new model of organizational experience. In particular, I specifically build on advances in the micro-

level study of work experience and job performance (Quinnones, Ford, & Teachout, 1995; Tesluk & Jacobs, 1998) to first integrate these ideas into a new multi-level model of organizational experience. With this new experience model, I then move on to apply the new model to understand how this more complex approach can help to inform the study of norms and routines in organizations, and ultimately how organizations create radical new knowledge. I conclude with a discussion of the implications of this research for theory and practice, and directions for future research.

CONCEPTUAL DEVELOPMENT

The Rich History of the Experiential Learning Tradition

The first step toward reaching the goal of understanding the influence of experience on the development of radical innovations in organizations is to review the long history of experiential learning research through the years. Few literatures in the study of organizations have such an extensive and inter-disciplinary history as that of the organizational learning from experience literature. Early work in this tradition introduced the notion of learning from experience primarily in the manufacture of airplanes in the 1920's and 1930's (Rohrbach, 1927; Wright, 1936). Variously called "learning curves", "progress functions", or "experience curves" all of this research was directed at the general proposition that cost and labor savings accrue with increasing levels of experience. This research continued through World War II and beyond with governmental assistance and aided by the support of the RAND corporation (Asher, 1961; Alchian, 1963; Garg & Milliman, 1961) focusing on the nature of this relation between experience and savings in airplane manufacture. Building on this research, others began examining this new learning-by-doing perspective in the manufacture of

radar equipment (Preston & Keachie, 1964), rayon fiber (Hollander, 1965), production systems (Baloff, 1966; 1971), and various other manufacturing contexts (Conway & Shultz, 1959; Nadler & Smith, 1963; Hirsch, 1952). In a very interesting narrative review of this research, Dutton, Thomas, and Butler (1984) explain that postwar empirical studies continued to incorporate the progress function concept into economic theory by studying the learning relationships in a wide variety of processes. The results of this research clearly established that significant improvements were associated with experience but that there was considerable variation between processes, products, firms, and facilities (Yelle, 1979; Dutton, et. al, 1984).

Continuing this tradition, research carried on in great abundance in the 1980's and 1990's to build on this foundation but began to expand to a broader focus in terms of the contexts of learning and the use of some new methods to assess learning from experience. Still, the focus of this research remained the economic benefits of learning for cost functions and reducing labor expense. Highlighting some of this research, strong learning from experience effects were found in the construction of nuclear power plants (Zimmerman, 1982), shipbuilding (Argote, Beckman, & Epple, 1990), semi-conductors (Dick, 1991), biomedical devices (Ven de Ven & Polley, 1992), truck manufacturing (Epple, Argote, & Devadas, 1996), and pizza-making (Darr, Argote, Epple, 1995). New research methodologies employed in this research also began to bring insights from simulation models to bear on experiential learning with interesting research from Muth (1986), Hatch and Mowry (1998), and Gavetti and Levinthal (2000).

In addition to a broader contextual focus, in recent years research has also begun to further expand the boundaries to explore how learning can impact strategic in addition

to economic outcomes. The question has turned from whether or not learning occurs to what exactly organizations learn to do better. Clearly, organizations learn to reduce unit and labor costs, but they also learn from their experiences to better understand relations with more specific strategic consequences. Research in this tradition has examined the effects of experience on strategic change (Amburgey, Kelly, Barnett, 1993), joint venture success (Barkema, Shenkar, Vermeulen, & Bell, 1997), hotel survival (Baum & Ingram, 1998), new product introductions (Martin & Mitchell, 1998), the timing of new entry (Martin, Saminathan, & Mitchell, 1998), the decision of where to locate a new business (Baum, Li, & Usher, 2000), the success of new entries (King & Tucci, 2002), R&D performance (Hoang & Rothaermel, 2005), acquisition performance (Haleblian & Finkelstein, 1999), and innovation (Nerkar & Roberts, 2004).

Shortcomings in the Historical Research on Experiential Learning

Despite the strong history and tremendous breadth of the experiential learning literature, it is the thesis of this study that this research has, collectively, taken a rather narrow view of experience. Further, I argue that by taking a broader approach to the study of experiential learning, the elimination of this historical restriction can lead to powerful new insights. In making this claim it is first important to understand the nature of this historically narrow focus.

From its inception as a field of study, the learning-by-doing literature has focused most attention on just one type of experience – a simple quantitative assessment of the time or amount of exposure an individual, organization, or population has had in relation to a specific stimulus. For example, in the aircraft manufacture tradition, it was exposure over time to an increasing number of aircraft building projects (Wright, 1936). In other

cases it was the number of nuclear plants constructed (Zimmerman, 1982), the number of angioplasty surgeries a surgeon has completed (Kelsey, et. al, 1984), or the number of pizzas a franchisee had produced (Darr, et. al, 1995). In this view, it is the ability of such individuals, organizations, and populations to observe this stimulus repeatedly over time, reflect, make generalizations, and then adjust their behavior that is called 'learning' (Kolb, 1984). It is through this type of quantitatively-intense learning that the benefits of cost savings have been found to occur (Yelle, 1979). In more recent research new strategic outcomes and methodologies have been employed, but the one variable that has remained relatively consistent throughout the years is that experience has been conceptualized using this narrow quantitative assessment of exposure to a stimulus.

Interestingly, the idea that narrow conceptions of experience need to be expanded has emerged several times through the years in reviews of the organizational learning literature. For example, in Levitt and March's (1988) review, the authors point out that in addition to the direct effects of cumulative experience totals, the complexity of the experience may also be an important consideration. In another example, Huber (1991) goes out of his way to make clear that "it is important to challenge narrow concepts of organizational learning." In regard to a more complex view of experience, he goes on to suggest that the variety, not just the quantity, of experiences is important for organizational learning, and specifically outlines methods through which organizations can gain a wider set of experiences (Huber, 1991). In the most recent review, Bapuji and Crossan make the point very succinctly, arguing "there is a need to know what type of previous experience is useful for which situations" (2004: 403).

Advances toward a Broader Conceptualization of Experience

Responding to the need for research that broadens our conceptualization of experience-based learning, two streams of research have emerged – one inside the field of organizational learning and one outside in the discipline of industrial-organizational psychology.

From *inside* organizational learning research a small but growing stream of work has begun to embrace a broader conceptualization of experience, though somewhat inconsistently. For example, after noting that "many organizational learning studies have an implicit assumption that the learning rate is maximized through specialization," Schilling, Vidal, Ployhart, and Marangoni (2003) look at how people can improve their learning rates by doing 'something else.' Although the center of their research was still focused on the rate of learning, the typical learning curve outcome, their lab study sparks an interesting question – how is experience doing something 'different' unlike experience doing more of the same? This line of reasoning builds on March's (1991) characterization of exploration versus exploitation motivations in organizational learning. March argued that firms must make tough decisions in allocating scarce resources to manage the tension between these two different paths, one of which leads to narrow experience and learning (exploitation) and the other leads to broad experience and learning (exploration). Building on these theoretical ideas, several recent empirical findings provide further support for the argument that a more complex view of experience is needed in the organizational learning literature. For example, in their study of the disk drive industry, King and Tucci (2002) argue that at least two types of experience exist – 'static' and 'transformational' experience. Static experience is argued to be experience in existing

markets, but transformational experience is argued to be experience with 'major changes.' Building on this distinction, their results suggest that these different categories of experience have different effects on the strategic decisions of firms to enter new markets. In another example, Nerkar and Roberts (2004) argue that important differences exist between 'proximal,' 'distal,' and 'general' experiences. In their study of the pharmaceutical industry, proximal experiences are those that are in the same technical area as current research endeavors, distal experiences are experiences in other therapeutic areas, and general experiences are those outside of therapeutic technologies but still in the pharmaceutical domain. Their results again support the idea that differences in experience lead to differences in strategic outcomes. In several additional empirical examples, Haleblian and Finkelstein (1999), Haleblian, et al. (2006), and Hoang and Rothaermel (2005) all find that different types of acquisition and alliance experience have different effects on future performance. In all of these examples we see different but connected logics that come to the same conclusion – not all experiences are the same. Building on this simple but powerful realization, each suggests that a new theoretical foundation is needed to push forward the experiential learning literature.

However, in addition to the few but growing number of promising new ideas inside the organizational learning literature, even more significant advances have been made *outside* the study of organizational learning. The common theme in this outside work is that a more complex conceptualization of experience can bring new insight to previously well-understood relationships. Specifically, in the field of industrial-organizational psychology, research on the determinants of job performance in organizations has begun to theoretically break apart experience into a much broader and

more complex set of related constructs. Two theoretical advances, one by Quinnones, Ford, and Teachout (1995) and another by Tesluk and Jacobs (1998) have suggested that we look at experience not only in quantitative terms, but in a much wider sense where experience can be viewed as qualitatively diverse as well as quantitatively intense. Arguing, similar to the claims made here, that the historical measurement of experience in the job performance and compensation domains has been too simple and too narrow, these authors make a compelling case for the more complex view of experience that they develop (Tesluk & Jacobs, 1998). Building on these arguments, these authors propose a new model of experience and suggest powerful new avenues for research that build from this new model to re-analyze and extend the findings on experience and job performance developed through the years.

Thus, the goal of the current research is to bridge the gap between the work being done inside the organizational learning literature and the very promising work being done in industrial-organizational psychology to provide a single integrated foundation for moving forward the study of experience-based organizational learning. Although the work in each domain has made important strides, it is by bringing these streams together that we can work together toward a unified and conceptually enriched platform for future research on experience-based organizational learning. This is the motivation for the next section of this paper.

EXTENDING TRADITIONAL MODELS OF ORGANIZATIONAL EXPERIENCE

Extending Traditional Models of Experience Type

Building on these ideas, the first distinction between experiences is the proposed delineation between quantitatively-intense and qualitatively-diverse experiences in

organizations (Quinnones, Ford, & Teachout, 1995; Tesluk & Jacobs, 1998). This approach is designed to overcome the narrow definitions from previous models of experiential learning and focus on a more complete set of organizational experiences. As outlined above, these distinctions build on recent advances in the micro-level study of work experience and job performance, and have the potential to yield significant progress in our understanding of the dimensionality of experience.

Table 1 – Different Types of Organizational Experience

Experience Type	*Definition*	*Illustrations*	*Examples*
Quantitative Intensity of Experience	measurements of the time or amount of exposure to specific situations or environments encountered over time	# of airplanes produced # of surgeries completed	Wright, 1936 Argote, et. al. 1990 Baum & Ingram, 1998
Qualitative Diversity of Experience	measurements of the variety, challenge, or complexity of the situations or environments encountered over time	# of different past alliance partners Complexity of drugs manufactured	Nerkar & Roberts, 2004 Hoang & Rothaermel, 2005 King & Tucci, 2002

First, it is important to be clear about definitions. To this end Table 1 is provided to help clarify the nature of the proposed experience dimensions. According to Tesluk and Jacobs (1998), experience can be described as consisting of quantitative and qualitative components that exist at different levels of specification and accrue over time. Quantitative experience is defined as a measurement of the time or amount of exposure to specific situations or environments encountered over time. Examples of quantitative

experience at the organizational level include number of years an organization has been producing a certain product, number of years an organization has been part of a certain alliance, the number of interactions the firm has had with a specific technology, the number of patents it has applied for or any other additive representations of exposure over time. These types of measures are reflective of the traditional measures of work experience in the job performance literature (McDaniel, Schmidt, & Hunter, 1988), and by translation, mirror the types of measures historically employed in the organizational learning literature. In contrast, qualitative measures of experience include measurements of the variety, challenge, or complexity of the situations or environments experienced by individuals or organizations over time. Examples of qualitatively diverse organizational experiences include the number of different partners that a firm has had alliances with, the number of different types of technology a firm has worked with, the number of different time-demand situations the firm has experienced, the difficulty of the firm's past experiences, or the complexity involved in an organization's past experiences. Important to note is that an organization's experience overcoming different types of challenges, in different technological life-cycles, or with different consumer applications of technologies are all qualitatively different experience sets that would not be identified with traditional purely quantitative measures of organizational experience.

A key for the current research in examining these differences between various types of experience is identifying how these experiences can lead to different learning and ultimately to different innovation outcomes. In building their new model of the different dimensions of experience, Tesluk and Jacobs (1998) also propose that the different types of experience have different influence on learning from such experiences.

For example, individuals who perform the same task repetitively over long periods of time gain extensive knowledge of the task and potentially develop short-cuts for task completion (Tesluk & Jacobs, 1998). This allows the individual to become more efficient over time and potentially more successful in their task environment. In contrast, Nemeth (1986) suggests that the exposure to qualitatively different technologies over time has the effect of expanding an inventor's cognitive models and can help them to make novel connections that they may not have otherwise recognized. This is supported by findings in the creativity literature that in many cases creative breakthroughs are associated with the wide experiences of individuals with extensive social networks (Kelly & Caplan, 1997) who can draw on the ideas of diverse colleagues to make creative advances.

The important point here is that one type of experience (repetitive, quantitatively extensive experience) can potentially lead to one learning outcome (efficiency) where a different type of experience (diverse, qualitatively varied experience) can potentially lead to a very different learning outcome (creative breakthroughs).

Extending Traditional Models of Experience Level

In addition to these different types of experience, major criticisms of research on organizational learning through the years have focused on the confusion of multiple levels of learning. In their influential work, Argyris and Schon (1978) suggest that the dilemma of learning in organizations versus learning by organizations is the "paradox of organizational learning." They go on to argue:

> It is clear that organizational learning is not the same thing as individual learning, even when the individuals are members of the organization. There are too many cases in which organizations know less than their members. There are even cases in which the organization cannot seem to learn what every member knows (1978).

Further, this point has been echoed in every review of the organizational learning literature since 1985 (Fiol and Lyles, 1985; Levitt & March, 1988; Huber, 1991; Dodgson, 1993; Crossan, Lane, White, & Djurfeldt, 1995; Miller, 1996; Easterby-Smith, 1997; Bapuji & Crossan, 2004). Although exact agreements about the differences between individual and organizational levels of learning are not well established (Cook and Yannow 1993; Popper & Lipshitz, 1998), the one thing that is clear is that the relations between individual and organizational levels of learning are complex. However, there is growing evidence that these levels are both independently and jointly important for firm-level learning and performance. For example, Hoang and Rothaermel (2005) found that organizational-level learning from previous alliances influences the success of future alliances. In this case, as might be expected, organizational-level experiences influence organizational learning and organizational outcomes. On the other side, in a recent theoretical piece Vera and Crossan (2004) propose a model where the individuals in an organization (the CEO and top managers) play an important role in facilitating learning at both individual and organizational levels of analysis. In this case it is the individuals that are proposed to influence organizational-level learning and outcomes.

Thus, the notable conclusion from these findings is that organizational learning involves a complex interaction of individual and organizational factors, and that new models must address these factors. Further, of primary importance for future research is the identification of learning mechanisms that bridge the gaps between individual and organizational levels (Cook & Yannow, 1993; Popper & Lipshitz, 1998) toward a more complete model of organizational learning. Toward this end, the next stage of this research will be to explore how the diverse types and levels of experience outlined here

influence the mechanisms for learning in the organization to guide organizational action, innovation, and performance.

Table 2 – A New Framework of Organizational Experience

Nature of the Experience

Level of the Experience		**Quantitative Intensity**	**Qualitative Diversity**
	Individual	Individual Quantitatively Intensive Experience *e.g. # of years of experience in semiconductor R&D jobs*	Individual Qualitatively Diverse Experience *e.g. # of different semiconductor technologies exposed to in past jobs*
	Organizational	Organizational Quantitatively Intensive Experience *e.g. # of years designing and producing semiconductors*	Organizational Qualitatively Diverse Experience *e.g. # of different electronics technologies used in R&D divisions*

A New Multi-Level Model of Organizational Experience

Bringing the ideas from the previous two sections together, I build on these foundations to propose a new integrative model of organizational and individual experience. Although the differences between diverse types of experience at multiple levels combine to potentially highlight many different paths for research, the core of these distinctions can be integrated into a 2 x 2 matrix of key experience constructs for the learning and innovation of organizations. A graphical representation of this new model is provided in Table 2. By synthesizing the ideas from these many different experience perspectives the result is a more complex view of experience and learning

than that of the simplistic quantitative models of traditional literature[1], and a more nuanced set of constructs for exploring firm processes and outcomes. Further, this new view of experience helps to inform the next section of this research, an exploration of the organizational learning mechanisms influenced by these different experiences.

APPLYING THIS NEW MODEL OF EXPERIENCE TO SEARCH AND LEARNING

The Mechanisms of Organizational Learning

Thus, with this new theoretical model of organizational experience, the next step for this research is to apply this new experiential model to how organizations actually learn. To do this I will investigate the mechanisms for learning through which these experiences are embedded into the organization, repeatedly transformed into organizational action, and potentially result in radical innovation. How do organizations integrate new knowledge from experiences? Although models describing the mechanisms of organizational learning have been slow to develop in the literature, several theoretical advances inform this process.

Notably among these is Kolb's 1984 book on experiential learning by individuals. In this research Kolb draws on a long history of research in psychology to present a well-researched model through which experiences are translated into action. Although debate continues as to whether or not to directly adopt this model for organizational-level experiential learning (Popper & Lipshitz, 1998), at the very least it provides important

[1] One point to note here is that technically, both qualitative diversity and quantitative intensity assessments of experience are likely to be quantitatively assessed in measures of these different types of experience. In this sense, the use of the term 'qualitative' in describing the diversity of experiences does not mean that the assessments of such diversity would necessarily be assessed qualitatively, just that the measurement of experiences could assess the amount of quantitative intensity (repeated similar encounters) in experience or assess the amount of qualitative diversity (exposure to different types of encounters) reflected in previous experiences, even if both measures are actually measured quantitatively.

insights into the process. In his model, Kolb (1984) suggested that individuals experience events, reflect and make generalizations about these experiences, and then experiment and make changes to the structure and nature of their behavior in light of the new knowledge they have acquired. Once these insights from experience have been embedded into the individual's routines and behaviors then this provides a new foundation from which new experiences can again change and re-shape the framework (Kolb, 1984). This general process is echoed in recent theoretical advances from Crossan, Lane, and White (1999) where organizational learning is conceptualized as involving stages of intuiting and interpreting by individuals, integrating by groups, and institutionalizing by organizations. In both of these models we see evidence of a general process that involves experience, reflection, and then change. In particular, two key contributions from Crossan, et. al. (1999) add specific insight into the process. First, organizational processes occur at multiple levels and each of these levels contributes to changes in the structure and processes of the organization. Second is the idea that organizations also have an institutional level of norms, a level not as clearly present in individuals. This institutional level is particularly important as it is both influenced by experiences and endures over time to act as a lens through which future experiences are evaluated by the organization (Crossan, et. al., 1999; Daft & Weick, 1984). In a sense, this institutional level informs not just what individuals in organizations do but also why they do it.

Further supporting this idea that experiences are preserved and influence future interpretation are notable findings from several authors. In this stream it is argued that organizations, unlike individuals, develop and maintain learning systems that not only influence their immediate members, but are then transmitted to others over time by way

of organizational histories and norms (Lawrence & Dyer, 1983; Levitt & March, 1988; Popper and Lipshitz, 1998). Hedberg (1991) notes, "members come and go, and leadership changes, but organizational memories preserve certain behaviors, mental maps, norms, and values over time." The most prominent contribution to these ideas of organizational memory comes from Walsh and colleagues. Walsh (1995) argues that in addition to guiding behavior and organizational action, learning mechanisms act as memory devices, through which the accumulated knowledge of the organization is used to repeatedly enact processes over time. Walsh and Ungson (1991) argue that experiences are interpreted and then stored throughout the organization, in individuals, culture, transmissions, structure, and ecology (physical layout). In line with these ideas, Levitt and March (1988) suggest that organizations can be seen as learning by encoding inferences from history into two primary mechanisms, routines that guide typical behavior and norms that govern "the way things are done around here." However, these authors also note that relatively little is known about the details through which experience is accumulated into such structures (Levitt & March, 1988).

Building on and integrating these ideas, the current research focuses on the influence of experiences on the selection, usage, and adaptation of *norms* and *routines* in the organization. Building on the work of Nelson and Winter (1982) and others, routines are defined as repetitive and recognizable patterns of interdependent actions that govern the typical enactment of a specific task or set of tasks in an organization over time (Feldman & Pentland, 2003; Pentland & Rueter, 1995). In contrast to routines, organizational norms are defined at a higher, more institutional level as the common beliefs about appropriate and required behavior for organizational members as members

of the organization (Katz & Kahn, 1978), a definition that builds on earlier foundations from Sherif (1936), Davis (1950) and others. Where routines directly influence organizational members by directing their activity in the context of task completion, organizational norms indirectly impact individuals by biasing them toward certain types of organizationally-accepted decisions and ways of working (Selznick, 1957).

In this sense, experiences are viewed as influencing both the organization as a whole and individuals within the organization, and the learning that occurs as a result of these experiences is encoded into the norms and routines of the organization. These norms and routines then store and preserve knowledge over time. As the ultimate outcome of interest in the current research is new knowledge creation, this focus on norms and routines helps to answer the question of how some organizations can sustain success over long periods of time. As knowledge creation occurs within a normative context (Knorr-Cetina, 1981; Dougherty & Heller, 1994), replicating the success of past innovation requires learning and repeating, which is facilitated by establishing norms and routines. To this end, organizational norms and routines are two facets of the organization that endure and continue to guide the organization through product cycles, CEO's, and technological advances. Although star performers and great inventors can fade away, lose their edge, or be hired away by competitors, organizational norms and routines carry on through generations of employees (Harrison & Carroll, 2006).

The Critical Role of Search Routines in the Pursuit of Radical Innovation

Building on these ideas, a key question remaining is that of which norms and which routines contribute to the development of radical innovations. Although the norm and routine literatures suggest links between experience and these processes, to

understand how these processes influence radical innovation we must identify the specific norms and specific routines that influence radical innovation. To this end, several recent advances provide guidance.

Specifically, a growing literature has built up over the last ten years to suggest that the routines organizations use to *search for information* in their research and development projects greatly influences the nature of the innovation (Stuart & Podolny, 1996; Ahuja, & Lampert, 2001; Fleming, 2001; Rosenkopf & Almeida, 2003). This search research builds on the theoretical tradition of the Carnegie school and the behavioral theory of the firm, which suggests that search processes are important determinants of organizational outcomes, particularly innovation (Cyert & March, 1963; March & Simon, 1958). Further, there is considerable agreement in the literature that at the organizational level, local search is often produced through the smooth functioning of organizational routines (Stuart & Podolny, 1996; Nelson & Winter, 1982; Cyert & March, 1963). Recent empirical and simulation research has continued this tradition by examining how organizations build on their own experience sets (Baum, Li, & Usher, 2000) to search for information and adapt to rugged landscapes in efforts to improve fitness (Gavetti & Levinthal, 2000; Levinthal, 1997). These search routines can involve investigating narrow or broad sources of information (Rosenkopf & Almeida, 2003), information primarily from a firm's own previous innovations (Katila & Ahuja, 2002), old or new knowledge (Nerkar, 2003; Katila, 2002), or information only from proximal and familiar sources (Ahuja & Lampert, 2001). In this line, of critical interest is how organizations can overcome local search biases through the use of different search routines (Rosenkopf & Nerkar, 2001) or knowledge strategies (Bierly & Chakrabarti,

1996) to achieve radical innovation. However, despite these significant advances in the modeling and understanding of search routines, little is understood about how different types and levels of organizational experiences influence the selection, usage, or development of search routines. There is evidence that experience influences search (Ahuja & Lampert, 2001; Nerkar & Roberts, 2004), but which experiences and how remain unclear.

Supporting and Conflicting Norms

Although such search routines are argued to have direct influences on the creation of radical innovations in organizations, like most institutional pressures, the influence of organizational norms is likely to be more indirect. Rather than directly contributing to the creative effort of producing innovation, norms support or constrain which experiences occur and are drawn upon to select and develop routines. Research on institutional theory suggests that individuals interpret their experiences through the filter of the institutional environment in which they work (Scott, 1995). This implies that although individual experience may dictate one type of information search behavior, the institutional pressures they face may advise an alternative choice. For example, so-called "cultures of efficiency" such as those advocated by TQM and six-sigma programs (Westphal, Gulati, & Shortell, 1997) support economic goals in organizations by focusing organizational members attention on the fast and efficient completion of tasks (Camerer & Vepsalainen, 1988). In this type of an efficiency-driven normative environment, the conversion of individual experiences into action is likely to be biased toward more efficient search routines. If individuals who enter this environment have wide and diverse experiences that lead them to engage in extensive search and consider a broad set of information

sources in their innovative efforts, a conflict emerges. On the other hand, other organizational cultures are focused on supporting creative thinking and potentially non-task-related social networking to stimulate novel ideas. Examples of such creativity-focused organizations include the well-documented imaginative environments of Apple Computers, Pixar Animation Studios, IKEA, or MTV Networks (McGregor, 2008). In these creativity-based normative environments the conversion of individual experiences into action will be biased toward more creative and diverse information search routines. Individuals who have historical experiences more focused on efficiency or narrow domains will again find themselves in a search conflict.

Thus a variety of questions emerge. Organizations have experiences that, over time, directly contribute to the development of institutional norms and organizational structures to support these norms (Meyer, Scott, & Deal, 1981; Scott, 1995). Individuals inside organizations have experiences that are both unique from and shared with those of the organization, and may have experiences that lead them to engage in routines that are out of alignment with the pressures of the normative environment. Given the importance of search for the creation of radical innovation (Ahuja & Lampert, 2001), how these divergent experience sets influence the selection, usage, and development of search routines is likely to significantly influence the long-term success of organizational innovation efforts.

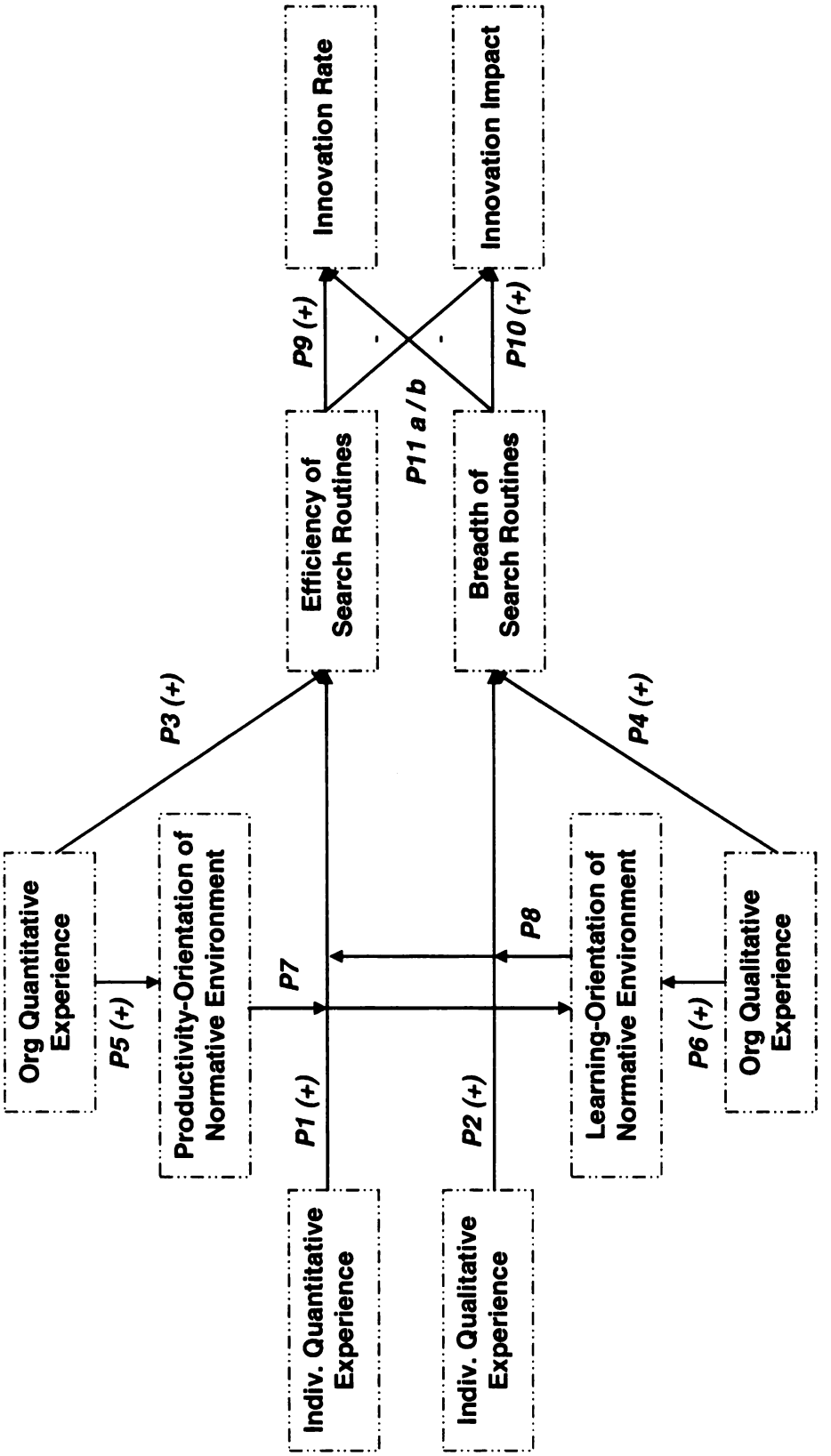
THEORY AND PROPOSITIONS

A New Model of Experience, Search, and Knowledge Creation

Figure 1 presents the full proposed conceptual model of experience, search, and new knowledge creation. In building propositions to support this model, I will begin by

examining how different types of individual level experience influence the choice of search routines. From this foundation, I will move on to examine how the different search routines modeled relate to each other. Next I will bring in the organizational level of experience, where different types of organizational experience are posited to influence both the norms and routines of the organization. Building on these ideas I move to the moderating influence of organizational norms on the relations between individual experience and search routines. Finally I examine the relations between organizational search routines and innovation.

Figure 1 – Full Conceptual Model of Experience, Search, and New Knowledge Creation



Individual Experience and Organizational Search Routines

Building on the review of the search literature, the first relations in the proposed model explores the link between individual experience and the search routines used by individuals in their research investigations. Extending the research on individual quantitative experience from the micro-level tradition, higher levels of individual quantitative experience are posited to lead to a tendency toward the selection, usage, and development of more efficient search routines. Efficient search routines are defined as processes that exist in organizations to guide typical action toward exploration for relevant information that attempts to be as fast and competent as possible given constraints. These experiences increase the tendency toward efficient search routines in three ways. First, research on individual career experience has shown that with increasing levels of quantitatively-intensive experience individuals develop enhanced job knowledge (Schmidt, Hunter, & Outerbridge, 1986), which allows the individual to develop in-depth tacit knowledge about the best ways to do their work (Berman, Down, & Hill, 2002). This extensive job knowledge helps individuals to develop short-cuts and heuristics which make future search investigations easier, faster, and more efficient. Second, increasing levels of individual quantitative experience allows individuals to develop extensive knowledge of where to find important new information. In research on teams this type of knowledge is known as transactive memory, or the knowledge of where knowledge resides in a team (Wegner, 1986). In searching for other information the same type of where-to-find-it knowledge is developed, such that with extensive experience individuals learn where to locate information they need to solve problems that are similar to problems they have solved in the past. This transactive memory has been shown to

improve performance and efficiency (Austin, 2003), saving individuals from the need to try out different tools in an exploratory model of trial-and-error. Finally, increasing levels of individual quantitative experience also allow individuals to become increasingly adept in their search. This advanced user knowledge allows individuals to avoid the pitfalls and frustrations of first-time search (Compeau, Higgins, & Huff, 1999; Burkhardt & Brass, 1990) and proceed in search activities efficiently with confidence that achieved search results reflect the best use of tools available. Based on these ideas, I propose:

> *Proposition 1: Increasing levels of quantitatively intense individual experience will lead to the selection, use, and development of more efficient organizational search routines.*

Examining an alternative perspective of individual experience (from Table 2), qualitatively diverse individual experiences are posited to have a different effect on search. In contrast to the efficiency benefits of narrow experience, the qualitative diversity of experiences is proposed to be associated with the selection and development of broader search routines. Broad search routines are defined as processes that exist in organizations to guide typical action toward exploration for relevant information that attempts to be as comprehensive and inclusive as possible given constraints. This broader effect on search is posited for several reasons. First, diverse experiences expose the individual to diverse sources of knowledge and a wider range of potential tools to use in search. This knowledge of diverse sources of information provides such individuals with a wider 'evoked set' (March & Simon, 1958) of available alternatives when faced with new problems. As such individuals are able to draw on a wider variety of search aids to investigate a new research question, and are likely to consider more potential sources of knowledge than those with more limited experience. Second, a diverse set of individual

experiences exposes the individual to alternative cognitive models (Pitcher & Smith, 2001). These unique cognitive models provide a variety of distinct lenses through which to consider new problems, and may lead to alternative framings of new problems. As these more novel cognitive framings are explored, a wider set of information is necessary to pursue the ideas, leading to wider search. Finally, a diverse set of experiences also helps the individual to build more advanced individual skills in the use of a variety of different search methods. A major obstacle that hinders the breadth of search is the knowledge of where to find new information and how to use the investigative tools needed for such wide search (Rosenkopf & Almeida, 2003). Because individuals with advanced skills in the use of such tools do not face such obstacles, they should be more willing and able to search broadly. These ideas come together to support the following proposition:

> *Proposition 2: Increasing levels of qualitative diversity in an individual's experiences will lead to the selection, use, and development of more breadth-oriented organizational search routines.*

Organizational Experience and Organizational Search Routines

Moving now to the other side of experience in organizations, the next set of relations in the proposed model explores the link between organizational-level experience and search. In this part of the model, increasing levels of quantitatively-intensive experience encountered by the organization are again argued to be associated with a focus on the selection, usage, and development of more efficient search routines in the organization. Several findings support this conclusion. First, similar to the dynamics at the individual-level (Schmidt, et. al, 1986), increasing levels of quantitative experience at

the organizational-level allow for the development of tacit knowledge, search short-cuts, and helpful search heuristics. However, because these efficiency improvements and short-cuts are learned at the organizational level, they can be institutionalized into standardized procedures (Pugh, Hickson, Hinings, & Turner, 1968). Where individual quantitative experience provides employees with the opportunity to develop such helpful tools, organization-level experience provides the opportunity for such short-cuts and heuristics to be standardized and made widely available, known, and accessible, helping to increase the efficiency of future search. Second, increasing levels of organizational experience facilitate the development of centralized information and search centers, knowledge management systems, and knowledge repositories (Davenport & Prusak, 1998). In this sense, an organization that has a long set of experiences and a tradition of engaging in specific types of search activities is likely to develop centralization systems to make knowledge widely available, providing a convenient and proximal search environment for future searches. This helps to increase the efficiency of such searches. Finally, increasing levels of organizational experience also facilitate the development of organizational-wide competences (Orlikowski, 2002; Henderson & Cockburn, 1993; Snow & Hrebiniak, 1980), in this case in the knowledge and skilled use of certain search tools. These skills are then perpetuated over time, as organizations with such widely distributed skills in search become very good at training new employees and developing employees in the efficient use of these tools (Feldman, 1981; Chao, O'Leary-Kelly, Wolf, Klein, & Gardner, 1994). Building on these ideas, I propose:

> *Proposition 3: Increasing levels of quantitatively intense organizational experience will lead to the selection, usage, and development of more efficient organizational search routines.*

Moving again to a qualitative view of experience from the new experience matrix (Table 2), the variety, challenge, and complexity of an organization's experiences are all posited to have the opposite effect on organizational search. Specifically, diverse organizational experiences are argued to positively influence organizational search breadth in at least three ways. First, increasing levels of diversity in an organization's historical experiences allow the organization to develop diverse sources of knowledge inside the organization (Grant, 1996). In this sense, over the years the wide variety of experiences will have forced the organization to develop systems and tools for investigating the many different technologies or services in their product portfolio. Over time this facilitates the development and institutionalization of a wide variety of information search tools. These diverse knowledge tools can then help to provide access to a wide range of knowledge domains and resources internal to the firm to assist future search activities. Second, organizations with a wide set of experiences have the opportunity to develop multiple cognitive models among individuals inside the organization. Cognitive models, or 'dominant logics' (Prahalad & Bettis, 1985), can be created over time in response to the tradition of collective experiences in the firm. When these experiences are narrow, restrictive and focused cognitive models can lead to the development of problematic core rigidities (Leonard-Barton, 1992). However, when experiences are wide, diverse, and distributed throughout the organization, such restrictive models can be avoided and instead intellectual breadth and respect for a diversity of ideas can be fostered. This makes a wide variety of diverse perspectives, cognitive models, and alternative solution sets available to future search investigations – helping to foster broad search routines. Finally, because the organization has a wide base

of experience, this allows individuals in the organization to develop a strong collective competence (Orlikowski, 2002) in use of multiple search tools and methods in-house. Research has shown people often suffer from 'spatial myopia,' (Levinthal & March, 1993), tending to rely on information in their proximal environment rather than expand out to more diverse potential sources. In fact, in a study of building layouts, Allen (1977) noted that researchers in laboratories often restrict their search to individuals located near them in geographic space and that increases in distance from just 10 to 50 meters resulted in a serious drop in communication. Instead, people focus on the resources available around them. Because organizations with wide experience sets have diverse skills and knowledge sets all located in a socially proximal environment (in-house), this makes it easier and more likely for individuals to engage in wide future search. Based on these arguments, I propose:

> *Proposition 4: Increasing levels of qualitative diversity in an organization's experiences will lead to the selection, use, and development of more breadth-oriented organizational search routines.*

Organizational Experience and Organizational Norms

Moving now to the influence of organizational-level experiences on organizational norms, several relationships are proposed. To begin with, increasing levels of quantitatively-intensive experiences are argued to lead to the development of institutionalized norms of efficiency in at least three ways. First, with more quantitatively-intensive experience an organization's entire focus can be directed at the perfection of a certain set of tasks and technologies. An organization that is new to a technical area needs to experiment to try and find the best ways to do things. In contrast, an organization with extensive experience can simply focus on optimal execution. This

narrow focus helps to increase efficiency by reducing distractions, helping to create an organizational competency for efficient task execution. As corporate cultures and normative structures tend to be built around what an organization does best, and does most often (Feldman, 1984; Martin, 2002), norms are likely to be created to support this competency.

Second, organizations with extensive quantitative experience often develop implicit cultural systems to support efficiency. One such cultural system is the development in many organizations of informal practices that support the dominant culture (Martin, 2002). For example, at General Motors in the 1960's a standardized efficiency mentality was evident in everything from the assembly lines to the corporate executive suites, where standardized dress codes and office décor were restricted to muted tones and minimalist designs (Martin & Siehl, 1983). Such informal systems help to reinforce expectations and keep the normative focus on efficiency throughout the organization. Further, these practices make an efficiency expectation and norm more ubiquitous and institutionalized. Finally, over time experience and efficiency orientations tend to become supported by the development of supervisory systems focused on efficiency (Patchen, 1962) and compensation systems that reward efficient outcomes (Jansen & Von Glinow, 1985). As employees are motivated to do what they are told and paid to do (Yukl, 1998; Vroom, 1960), such systems help to create a normative environment supporting efficient execution. Based on these ideas, I propose:

> *Proposition 5: Increasing levels of quantitatively intense organizational experience will lead to the development of more productivity-oriented organizational norms to support the efficient execution of organizational tasks.*

Next, variety in an organization's experience set is argued to lead to very different organizational norms. In this case, several ideas and findings support the argument that diversity in experience at the organizational-level will lead to the development of more creativity and breadth norms in the organization. First, with a greater diversity of experiences, the organization can foster the development of diversity in its communities of learning (Brown & Duguid, 1991) such that many different ideas and cognitive frameworks are respected (Fiol, 1994). In narrow, single-business organizations it is easy for a narrow set of execution norms to take center stage. However, in more broad and widely experienced organizations no single ideological orientation has the ability to hijack the corporate norms (Raelin, 1997). Instead this diversity provides space for a more interactive and creative discourse to become the pervasive mentality for knowledge creation endeavors (Nonaka, 1994). In organizations where no single set of ideas reign supreme, breadth becomes part of the culture and diversity becomes the norm (Fiol, 1994). Further, research has suggested that information technology may be created in such organizations to support diverse community-level hermeneutics and interpretive processes (Boland, Tenkasi, & Te'eni, 1994). As corporate cultures and normative structures tend to be built around the consensus values of the organization (Feldman, 1984; Martin, 2002), the lack of a dominant coalition will lead to norms that support the openness of the community to new ideas.

Second, organizations with diversity in experience are also likely to develop implicit cultural systems to support the openness of their culture. As in the previous section, an important part of such cultural systems are the development of informal practices that support the culture (Martin, 2002). For example, at Hallmark (the greeting

card company) the artistic creativity mentality is so predominant that employees are encouraged to find a quiet place for reflection outside of work in a park or nature center that they can go to occasionally for inspiration when they are having trouble thinking of new ideas (Shields, 2005). This type of informal system helps to reinforce openness and creativity expectations in the workplace and keep the normative focus on broad imagination throughout the organization. Further, these practices make breadth as an expectation and norm more ubiquitous and institutionalized. Finally, over time these open orientations tend to become supported by the development of supervisory systems (Patchen, 1962) that encourage breadth and compensation systems that reward integrative outcomes (Jansen & Von Glinow, 1985). As employees are motivated to do what they are told to do and paid to do (Yukl, 1998; Vroom, 1960), such systems help to create a normative environment supporting broad thinking and integrative pursuits. Based on these ideas, I propose:

> *Proposition 6: Increasing levels of qualitative diversity in an organization's experiences will lead to the development of more learning-oriented organizational norms to support the creative pursuit of organizational initiatives.*

The Moderating Influence of Organizational Norms

Moving on to the influence of organizational norms, two relationships are proposed. To begin with, organizational productivity norms are argued to moderate the effects of individual experience on routine selection, use, and development. In this sense, although Proposition 2 suggests that the relation between individual experiences and search is such that more qualitative experience is expected to lead to breadth in search routines, in the presence of strong productivity norms more efficient search routines are argued to become adopted. Several ideas and research findings support this proposition.

Most notably, both laboratory and field research provide evidence that in situations where the individual experiences and biases are out of fit with the accepted culture, such individuals either adapt to the culture (Francis, 1991), suffer from poor performance (O'Reilly, Chapman, & Caldwell, 1991), or leave the organization (Vandenberghe, 1999). Providing support for this idea, McNamara and Bromiley (1997) found in a study of 223 commercial lenders that when making risk assessments of customers, organizational factors overwhelmed the influences of individual cognitive biases. In the case of individual biases toward technological search, although individuals may desire to engage in wide search it is likely that they will have difficulty overcoming social pressure (Jaeger, 1983) from peers and managers to be more productivity-oriented. Further adding to this mis-alignment problem is the fact that in a strong productivity-oriented culture jobs are often designed specifically to support and require efficiency, in an effort to increase task focus and conformance to organizational standards (Camerer & Vepsalainen, 1988). Based on these restrictive job designs, individuals who have an individual bias toward increased breadth in their information search would need to engage in extra role behaviors to find search tools beyond the few tools available. These factors combine to create a hostile and difficult environment in which to engage in broad search and lead to the overall institutional pressure for conformity. On the other hand, in the case of individual and organizational experience fit, such normative support should help to strengthen the relationship between quantitatively intensive experience and efficient search by providing a strong and supportive environment for efficient action. This leads to the following proposition:

Proposition 7: Productivity-orientation in organizational norms will moderate the relation between individual experience and search such that these normative pressures will bias individuals toward less broad and more efficient search.

In contrast to the normative environment of productivity, in other organizations norms encouraging breadth and integration are argued to overwhelm the effects of individual experience on routine selection, use, and development. In this sense, where in Proposition 1 the relation between individual experiences and search is such that more quantitative experience is expected to lead to efficiency in search routines, in the presence of breadth norms broader search routines are argued to become adopted. Again, several ideas and research findings support this proposition. As outlined above, significant evidence suggests that in situations where the individual experiences and biases are out of fit with the accepted culture, individuals tend to either adapt to the culture (Francis, 1991), suffer from poor performance (O'Reilly, Chapman, & Caldwell, 1991), or leave the organization (Vandenberghe, 1999). In the case of individual tendencies toward search, although individuals may desire to engage in the narrow and efficient search that they are accustomed to, they will have difficulty overcoming social pressure (Jaeger, 1983) from peers and managers to search more broadly. Further adding to this argument is the fact that in a creativity-oriented culture jobs are often designed specifically to support and require extended search in an effort to increase breadth and a culture of integrative thinking (Amabile & Conti, 1999; Blau & McKinley, 1979). Based on these integration-minded job designs, individuals who have an individual bias toward narrow and efficient focus in their information search would have to essentially ignore the diverse set of tools made available to and expected to be used by each employee. For example, one can imagine a R&D team progress report meeting where each team member

presents the details and results of their broad information search to the team. Individuals who present search results without an explanation of rejected alternatives from broad search would likely face a hostile and questioning set of peers whose expectations for breadth would have been unfulfilled. These factors combine to create a difficult environment in which to engage in only narrow search and lead to institutional pressures for conformity. On the other hand, in the case of individual and organizational experience fit, such normative support should again help to strengthen the relations between qualitatively diverse experience and broad search by providing a strong and supportive environment for creative action. This leads to the following proposition:

> *Proposition 8: Breadth-orientation in organizational norms will moderate the relation between individual experience and search such that these normative pressures will bias individuals toward broader and less efficient search.*

Connecting Search Routines to Innovation

Finally, in the last section of the model the different types of search routines developed are posited to lead to very different innovation outcomes. Starting with efficiency, several findings support the proposition that efficient search routines lead to an increased rate of incremental innovation in organizations, but not breakthroughs. First, the efficient use of human capital in this search paradigm allows the same research personnel to do more with their time and produce more innovations. However, because this search is efficient in large part due to the lack of integration of diverse sources of information, such search is unlikely to bring together novel solutions in the ways necessary for the achievement of radical innovation (Ahuja & Lampert, 2001). Second, the rate of innovation is enhanced by the faster turnaround on bad ideas that is possible when search does not need to be as wide. This makes it possible for design problems to

be solved faster (Fleming & Sorensen, 2004). This increased speed in problem solving will help support a more rapid schedule of producing innovations at a more robust pace than operations that focus on wide search. Third, research has clearly demonstrated that certain structures support incremental innovation, where others support radical innovation (Downs & Mohr, 1976). For example, Ettlie, Bridges, and O'Keefe note that in a study of firms in meat, canning, and fish industries that structures used to support efficiency (i.e. formalization) were positively correlated with the rate of innovation in such firms, and more strongly associated with incremental innovation than radical innovation (1984: 692). Finally, because efficient search focuses on narrow and familiar sources of information, the consistency of such knowledge with the investigator's existing knowledge paradigms helps to make such knowledge more easily accessible. Specifically, this familiarity allows researchers to make more efficient use of existing knowledge in the pursuit of incremental innovation (Fleming & Sorensen, 2004). These arguments lead to the following proposition:

> *Proposition 9: Increasing levels of efficiency in organizational search routines will be associated with an increasing rate of innovation by the organization.*

Next I explore the culmination and ultimate goal of the proposed model in the creation of radical innovations in organizations. To this end, breadth in organizational search routines is argued to support radical innovation for several reasons. First, in studies of creativity and the creation of breakthroughs, creativity has generally been found to result from the synthesis of disparate and novel ideas (Simonton, 2002). For example, in a narrative on the development of Hewlett-Packard's thermal ink-jet technology, Fleming (2002) found that it was the integration of diverse ideas from

electronics, fluid dynamics, and physics that led to the successful creation of this breakthrough. Second, this idea is supported by research which has suggested that it is in the exposure to a wide and diverse set of ideas that allows researchers to form new and innovative cognitive models which help to conceptualize problems differently (Nemeth, 1986). This broad exploration and unique perspective then acts as a foundation for radical innovation (Rosenkopf & Nerkar, 2001; Fleming, 2001). Without the out-of-the-box thinking that is induced by wide search, discovery of path-breaking new products and services is an unmanageable process of chance and good fortune. However, with the management of search routines to make the integration of novel ideas common and the bending of cognitive models routine, radical innovation becomes the natural and expected outcome of sound managerial practice (Fleming, 2002). Based on these arguments, I propose:

> *Proposition 10: Increasing levels of breadth in organizational search routines will be associated with an increasing rate of radical innovation by the organization.*

Finally, the last propositions argue that these relations not only act to support very different innovation outcomes, but that they also actively act to suppress each other. In this case increasing efficiency in organizational search routines is proposed to be associated with fewer breakthrough innovations and increasing breadth in organizational search routines is proposed to be associated with a slower rate of overall innovation. These cross-negative relations are proposed for several reasons. First, in breadth-oriented organizational search routines the focus is on exploring a wide and varied set of information sources to find an ideal solution. Increasing the rate of innovation requires that search be completed quickly, which sparks a conflict. The time spent searching

through a diverse set of alternatives will act to directly impede the speed and efficiency of innovation efforts, leading to a slower rate of new innovation. In addition, knowledge of a diverse set of information sources may make it difficult for researchers to focus narrowly on a single set of ideas or narrow projects. Supporting this idea, research on information processing has shown that in teams where efficiency is expected, providing access to diverse information sources impedes the efficiency of team performance due to information overload (Katz & Tushman, 1979; Keller & Staelin, 1987).

> *Proposition 11a: Increasing levels of breadth in organizational search routines will be associated with a decreasing rate of innovation by the organization.*

However, on the other side, routines which are focused on efficiency are likely to work against the conditions that support creative breakthroughs. Although creative breakthroughs are impossible to specifically plan, conditions that support such radical advances include the integration of novel and unconnected ideas (Ahuja & Lampert, 2001) as well as the exposure of researchers to alternative cognitive models (Nemeth, 1986; Pitcher & Smith, 2001). Scientists who work quickly and efficiently by focusing on narrower search routines would be less likely to be exposed to these new ideas or alternative cognitive structures and thus less likely to find or pursue radical or novel new ideas. Together, these arguments support the following proposition:

> *Proposition 11b: Increasing levels of efficiency in organizational search routines will be associated with a decreasing number of radical innovations by the organization.*

DISCUSSION AND CONCLUSIONS

The consistent theme throughout this endeavor has been the idea that key differences exist between quantitatively-intensive and qualitatively-diverse experiences,

and further, that such differences have significant influences on organizational norms and routines. In moving forward from more traditional and narrow definitions of experiential learning, this research has the potential to open new doors both for future theoretical and empirical research.

Implications of this Research for Organizational Learning Theory and Practice

To begin with, this research has implications for theory in the domain of organizational learning. First, this research highlights the fact that we are likely reaching the end of traditional research on learning curves and the benefits to firms that accrue to increasing levels of similar experience. However, this paper does not close the door on all experience-based organizational learning, it simply re-directs such research toward a focus on qualitative diversity in organizational experience. In fact, I would argue that the most fruitful directions for continued research in organizational learning lie in further breaking apart qualitative diversity in experience and the very different effects such diversity has on organizational choices and performance. This research provides both the direction and some tools for moving in these new directions. Second, this research takes initial steps into better considering the antecedents of search in organizations. After Cyert and March (1963) initially introduced the idea of organizational search into the management literature, search research moved forward in small steps until recently. However, in the last 10 or 15 years, such research has greatly expanded (Ahuja, & Lampert, 2001; Katila, 2002; Katila & Ahuja, 2002; Nerkar, 2003; Rosenkopf & Almeida, 2003; Stuart & Podolny, 1996). The current research provides an important extension to this new stream of search research by developing theoretical arguments for the experiential roots of such search to demonstrate how such search may be shaped and

at times path-dependently constrained in many organizations. Third, this research has implications for research on norms and routines. In fact, despite years of research on norms and routines in the organizational literature (Nelson & Winter, 1983; Stuart & Podolny, 1996; Levitt & March, 1988; Feldman, 1984), we are only beginning to learn more about how such core processes are formed and re-created over time in organizations. This broader conceptualization of organizational experience provides a first step toward better understanding how these fundamental organizational processes are created and shaped over time. This challenges simple definitions of the experiential roots of norms and routines (Bettenhausen & Murnighan, 1985; 1990; Stuart & Podolny, 1996) to suggest key differences in the effects of different types of experience on norm and routine development.

In addition to implications for theory, this research also has several potential implications for practice. First, this research provides a model for helping managers understand the path dependencies that explain why their business may be stuck in a certain type of knowledge creation mode. Although the development of rigidities may be difficult to trace over time, the model proposed in this research provides a method for managers to begin making attributions to understand accrued path dependencies. Second, this research provides guidance for how organizations can take steps to shape their norms and routines. Specifically, by pushing into the sort of black box of antecedents to norms and routines, this research breaks apart the experiential roots of such processes to suggest how future change management programs can focus on the development of different types of experience to support different norms and routines. Finally, this research also provides a new way for managers to build up organizational learning initiatives toward

the types of innovation they would prioritize for their organization. Although many executives preach learning to their stakeholders, the ideas in this research provide a path to aid the development of specific types of learning competencies over time.

Future Directions

In terms of future directions, this research also highlights several potential paths. First, additional theory is needed on the differential influences of qualitatively diverse experience. In exploring the antecedents of different types of search routines in this research, I simply argued that any type of qualitatively diverse experience would have the effect of broadening individual and organizational approaches to search. Although this broad classification made sense for this research, where exposure to new ideas and methods was key, in other contexts splitting the effects of experience variety, challenge, and complexity could have interesting consequences for theory development. For example, individual and organizational experiences that are challenging could have different effects, both at different levels of analysis, and on potential outcomes. Specifically, depending on the resiliency and internal fortitude of such individuals and organizations to persist after failure, challenge may lead to either increased or decreased motivation. These represent potentially fruitful theoretical extensions of the proposed model.

In addition, this research also points to the need for future empirical research on experiential learning. Although direct empirical testing of the proposed model (Figure 1) provides one avenue for research, there is significant opportunity for testing the effects of the quantitative vs. qualitative divide in a variety of different contexts and on a variety of different outcomes. For example, although traditional research has demonstrated the

value of cumulative experience quantity on economic outcomes, little has been done on the effects of qualitatively diverse experience on such outcomes. Alternatively, evaluating the effects of different experiences on performance consistency or the ability to create breakthroughs represents another direction. Further, much has been made of firm's efforts at creating balance between exploration and exploitation, and empirically assessing the role of different types of experience in promoting such ambidextrous outcomes could also produce new findings (Gupta, Smith, & Shalley, 2006).

In conclusion, the goal of this research was not only to broaden our conceptual understanding of organizational experience, learning, and radical innovation but also to stimulate new research into the effects of experience diversity in organizations. By providing a new framework for exploring such experience, new theory for connecting such experience to organizational action and a new model of experience, learning, and radical innovation, future research will be better equipped to push forward into new territory.

CHAPTER 2

EXPERIENTIAL LEARNING AND KNOWLEDGE CREATION IN THE PHARMACEUTICAL INDUSTRY

OVERVIEW

This research explores the influence of different types of organizational experience on knowledge creation in the pharmaceutical industry. Although the idea that organizations learn from experience has been well established, to a large extent research on organizational learning has focused on a single type of organizational experience – how organizations learn from similar experiences over time. Extending beyond this traditional approach, in this research I explore how different types of organizational experience (experiential depth, breadth, and diversity) influence the rate and impact of knowledge creation in the pharmaceutical industry. Results from 20 years of data provide support for the independent and divergent influences of experience depth and breadth on the rate of new knowledge creation and the impact of such knowledge. In addition, several forms of experiential diversity are found to help promote both the rate and impact of knowledge creation in the pharmaceutical industry, though these effects are often found to have diminishing influence at high levels of diversity.

Beginning with research on airplane manufacturing over 80 years ago, (Rohrback, 1927; Wright, 1936) and continuing on in force through the post-war economics literature (Alchian, 1963; Asher, 1961; Garg & Milliman, 1961), the economic benefits to organizations that build up similar experiences over time have been demonstrated to be quite robust. In recent years new industries and strategic contexts have been explored, as diverse as nuclear power generation and pizza-making (Zimmerman, 1982; Darr, Argote, & Epple, 1995). Nonetheless, over time there has been a consistent focus on the benefits to organizations of repetitive experience over time.

Although organizations certainly can learn from similar experiences, this prevailing perspective raises the obvious question of whether or not all experiences are comparable. Recognizing this potential for qualitative diversity in experience, recently several researchers have begun to probe the question of how organizations might learn from different types of experiences. For example, Melissa Schilling and co-authors examined the efficiency benefits of learning by doing *something else* (Schilling, Vidal, Ployhart, & Marangoni, 2003). Continuing this trend, Nerkar and Roberts (2004) explored the effects of technical versus market experience on R&D, and several others have begun to examine broader conceptions of experience in other contexts (Haleblian & Finkelstein, 1999, Baum, Li, & Usher, 1999; King & Tucci, 2000). In addition, research outside of the traditional organizational learning literature in industrial / organizational psychology has developed new complex models of job experience that integrate quantitative and qualitative facets of such experience (Quinones, Ford, & Teachout, 1995; Tesluk & Jacobs, 1998). Together, this trend in research provides much of the foundation needed to push forward our understanding of organizational learning to the

differential effects of different types of experience on important firm outcomes, toward a broader theoretical view of experiential learning.

Building on these ideas, in this study I explore the divergent influences of different types of organizational experience on knowledge creation in organizations. Despite a strong foundation of research on organizational learning, and a growing stream of research on knowledge creation in organizations, the link between different types of organizational experience and different knowledge creation outcomes is not well understood (Grant, 1996; Nonaka & Takeuchi, 1995). Further, extant theory provides potentially different paths for understanding the nature of these links.

With these issues at the focus, the structure of this paper is designed to address these questions in three ways. First, I examine the influence of experience depth on knowledge creation, building from the traditional literature but hypothesizing mixed positive and negative influences on the rate and impact of knowledge creation endeavors. Second, I examine the influence of experience breadth on knowledge creation, but this time hypothesizing opposite positive and negative influences on the rate and impact of knowledge creation efforts. Finally, I propose that organizations can promote both the rate and impact of knowledge creation by fostering diversity in the experiences in their workforce. Together, these three approaches explore the divergent influences of different types of experience on knowledge creation.

To evaluate the role of different types of experience in helping organizations to create new knowledge, this study investigates experience through the analysis of the U.S. patenting activities of pharmaceutical firms from 1980-1999. By focusing on the context of intellectual property protection through patenting, I am able to evaluate the degree to

which organizations with different types and levels of experience in their R&D workforces are able to create new knowledge.

THEORY AND HYPOTHESES

Experience and Knowledge Creation

In recent years, knowledge-based approaches to the study of organizations have increased dramatically (Grant, 1996; Ichijo & Nonaka, 2006; Spender, 1996). Although this new work holds great promise for organizations, particularly given the rise of a service economy that puts a premium on the value of knowledge, for many organizations the greatest promise lies in increased understanding of knowledge creation (Nonaka, 1994). Knowledge creation holds a prominent place in knowledge-based research (von Krogh, Ichizo, & Nonaka, 2000), in large part because it is often through knowledge creation that firms are able to create proprietary intellectual property that has the characteristics needed to provide sustainable competitive advantage (Barney, 1991; Peteraf, 1993).

Although experience has been described as a key antecedent to effective knowledge creation, the theoretical links between experience and knowledge creation have not been well defined. Often it seems as though authors, generally focusing on other issues in the study of knowledge creation, use implicit theoretical ideas and heuristics to describe the experiential antecedents of knowledge creation. For example, Nonaka and Takeuchi (1995) describe experience as an important foundation that underlies knowledge creation efforts, particularly as experience is a root for 'creating knowledge in practice.' In another example from the knowledge creation literature, von Krogh, Ichizo,

and Nonaka (2000) specifically position tacit knowledge as the primary precursor to knowledge creation, arguing that enabling knowledge creation requires that organization take steps to unlock such tacit knowledge. This implicitly highlights the role of experience in knowledge creation, as tacit knowledge is largely gained through personal experience (Polanyi, 1967). Research on exploration and exploitation, two specific approaches to knowledge creation endeavors, has also highlighted the role of experience in knowledge creation. For example, Holmqvist (2004) builds on March (1991) to outline the critical role of experience in developing exploration and exploitation capabilities in organizations, arguing that experiential learning processes play an important role in exploitation and exploration endeavors within the organizations.

Despite all of this attention to experience as an antecedent to knowledge creation this research has been surprisingly limited in exploring how different types of experience relate to the knowledge creation effort. Reflecting on this lack of research, Nonaka and colleagues stated in a recent review article on the future of knowledge creation research that a key remaining issue is to understand more about the diverse origins of knowledge creation in organizations (Nonaka, von Krogh, & Voelpel, 2006: 1196). Responding to this need, I aim to build from existing learning theories to show how different types of experience (including experience depth, breadth, and diversity) are independent and differentially influence knowledge creation outcomes in organizations. Further, as 'knowledge creation' is a broad term that encompasses all of an organizations knowledge creating activities, I will focus on how these different types of experience influence two different dimensions of the knowledge creation effort: the rate of knowledge creation (often studied in the context of exploitation) and the impact of knowledge creation (often

studied in the context of exploration). Breaking knowledge creation out into these two different dimensions helps to highlight the different goals organizations have for knowledge creation in their own firms. Although firms can certainly benefit from both high rates of knowledge creation as well as highly impactful knowledge creation efforts, these two outcomes underscore the potentially very different aims of different organizational approaches to knowledge creation. Further, as will be described below, extant theory provides potentially different directions for the influence of different types of experience on these two knowledge creation outcomes, and provides a framework for exploring the divergent influences of experience in organizations.

Experience Depth and Knowledge Creation

To begin with, depth in experience – gained from repeated encounters with many similar situations over time – is argued to positively influence the rate of knowledge creation in several ways. First, experience depth allows organizations to develop efficient practices, search short-cuts, and helpful heuristics in a particular line of work. Further, as these efficiency improvements and short-cuts are accumulated throughout the organization, they can be institutionalized into standardized procedures (Pugh, Hickson, Hinings, & Turner, 1968), helping to increase the efficiency of future work. An organization that is new to a technical area needs to experiment to try and find the best ways to do things. In contrast, an organizational workforce with extensive experience can simply focus on efficient execution. This focus helps to increase the rate of knowledge creation by reducing distractions, helping to create an organizational competency for efficient execution. Second, increasing levels of depth in workforce experience facilitates

the development of centralized information and search centers, knowledge management systems, and knowledge repositories (Davenport & Prusak, 1998). In this sense, an organization that has a long set of similar experiences is likely to develop centralized systems to make gained knowledge widely available, providing a convenient and proximal search environment for future work. This helps to increase the efficiency of knowledge creation and promotes the rate of knowledge creation. Finally, organizational workforces with extensive knowledge in an area can improve their rate of knowledge creation by speeding the turnaround on bad ideas, as they are working in well understood knowledge landscape, making it possible for design problems to be solved faster (Fleming & Sorensen, 2004). This increased speed in problem solving will help support a more rapid schedule of producing new knowledge. Together, all of these ideas build on the traditional learning-by-doing literature (Argote, 1999) to hypothesize:

> *Hypothesis 1a: The overall level of depth in the experience of an organization's research workforce will be positively related to the rate of knowledge creation by the firm.*

However, despite the promise of efficiency from the traditional learning curve literature, there is also a potential 'dark side' to experience depth that has been less well explored. Specifically, deep workforce experience may hinder the creation of high-impact knowledge. This is hypothesized for several reasons. First, building on the work of Leonard-Barton (1992) and Dougherty and Heller (1994), increasing levels of experience depth promotes the development of core rigidities over time. In this sense, core rigidities support a dominant paradigm within organizations that can act to stifle new ideas. Building on this, increasing depth also supports the rise of a dominant logic in the

research workforce and management to support certain projects and reject others. Although this type of focus is probably good for the rate of knowledge creation (H1a) it creates resistance to out-of-the-box thinking that helps to create breakthroughs (Leonard-Barton, 1992). In the pharmaceutical domain, scientists who work narrowly within these organizationally-supported domains would be less likely to be exposed to new ideas or alternative cognitive structures and thus less likely to find or pursue novel ideas. Over time, organizational systems of evaluation and control come to support the dominant paradigm, and those who support the dominant paradigm gain elevated status in the firm (Leonard-Barton, 1992). Together, these factors support the creation of myopias to outside thinking (Levinthal & March, 1993) and reduce the potential for creating high-impact knowledge.

These ideas support the following hypothesis, that experience that helps a firm succeed in one dimension of knowledge creation (the rate of knowledge creation) may directly restrict their ability to achieve success on another dimension (the impact of new knowledge).

> *Hypothesis 1b: The overall level of depth in the experience of an organization's research workforce will be negatively related to the creation of high-impact knowledge by the firm.*

Experience Breadth and Knowledge Creation

On the other hand, breadth of organizational experience – gained from encounters with many different situations over time – is argued to flip these relations such that it positively influences the impact of new knowledge but negatively influences the rate of new knowledge creation. Specifically, broad workforce experience is proposed to hinder

the rate of new knowledge creation for several reasons. First, with wider breadth of workforce experience a tendency can develop to explore a wide and varied set of information sources to find ideal solutions to problems. Although this helps to promote the impact of such solutions, delays can slow the pace of innovation. The time spent searching through a diverse set of alternatives directly impedes the speed and efficiency of knowledge creation efforts, leading to a slower rate of new innovation. Second, experience with a diverse set of information sources may make it difficult for researchers to focus narrowly on a single set of ideas or narrow projects. Supporting this idea, research on information processing has shown that in teams where efficiency is expected, providing access to diverse information sources impedes the efficiency of team performance due to information overload (Katz & Tushman, 1979; Keller & Staelin, 1987). Finally, again building on work of Leonard-Barton (1992), as was argued previously, core rigidities can develop over time to support a dominant paradigm in an organization. In this case scientists and managers become engrained in routines of wide search rather than more focused efforts, creating rigidities toward breadth that can be problematic. In such cultures breadth of search, creativity, and novelty can become the standard and the norm (rather than efficiency) and any solution brought to the table will be evaluated for its novelty and origin. Well known examples of such creativity focused cultures are those of Apple computers, Virgin group, 3M, and IDEO product design (McGregor, 2008) where the focuses on creativity can itself be a force to overcome to get products to market.

These ideas support the following hypothesis, that experience which helps a firm succeed in one dimension of knowledge creation (the impact of knowledge) may restrict their ability to achieve success on another dimension (the rate of knowledge creation).

> *Hypothesis 2a: The overall level of breadth in the experience of an organization's research workforce will be negatively related to the rate of knowledge creation by the firm.*

However, in addition to this negative influence of experience breadth on rate, once again I propose that there is also a potential tradeoff associated with this experience. Although breadth is argued to negatively influence the rate of new knowledge creation, I hypothesize a positive relationship with the impact of such created knowledge. This opposite relation is proposed for several reasons. First, with broad workforce experience available an opportunity is presented for the organization to explore and grow familiar with a varied set of information sources. Such diverse sources of knowledge inside the firm then aid future problem solving to make a wider variety of familiar alternatives available to find better solutions (Grant, 1996) and potentially create high impact new knowledge. Second, a diverse set of workforce experiences provides the organization with alternative cognitive models (Pitcher & Smith, 2001) to use in developing new products and services. These unique cognitive models provide a variety of distinct lenses through which to consider new problems, and may lead to alternative framings of problems within the firm. As these different framings can lead to new and novel combinations of ideas (Henderson & Clark, 1990), high impact knowledge is more likely to emerge. Finally, because the organization has a wide base of experience, this allows the organization to develop skills in the use of different types of research tools (e.g.

databases, patent libraries, physical lab equipment, etc.) and methods in-house. This helps to ameliorate the problems of 'spatial myopia,' (Levinthal & March, 1993), the tendency for individuals to rely on information and resources available near them. As organizations with wide experience sets have diverse skills and knowledge sets located in a socially proximal environment (in-house), this makes it easier and more likely for individuals to engage in wide search for novel solutions to problems.

These ideas continue to build on the trend in the recent experience literature to explore new and broader conceptualizations of experience (Nerkar & Roberts, 2004; Schilling, et. al, 2003) and support the following hypothesis:

> *Hypothesis 2b: The overall level of breadth in the experience of an organization's research workforce will be positively related to the creation of high-impact knowledge by the firm.*

Experiential Diversity and Knowledge Creation

Up to this point, the proposed hypotheses have painted a somewhat bleak picture of knowledge creation for organizations hoping to balance the rate and impact of their research and development efforts. Building a research workforce with strong experience depth was hypothesized to promote the rate of new knowledge creation but came at the cost of hindering the impact of such knowledge. On the flip side, experience breadth was argued to do the opposite, promoting impact but hindering the rate of new knowledge creation. With each of these paths, organizations would be forced to make a choice between rate and impact.

In contrast, this section of the paper suggests that organizations may be able to promote both the rate and impact of their knowledge creation efforts by fostering

experiential diversity in their workforce. Rather than choosing a single direction in knowledge creation, this approach suggests that organizations could have a high rate of knowledge creation and yet still create high-impact knowledge.

Experiential diversity occurs when individuals with high and low levels of experience work together toward a common goal. In the context of this research, this could happen either by mixing individuals with deep experience together with those who are new to a knowledge domain or by mixing those who have broad experience with others who have very narrow experience. For example, one organization might have a group of scientists working together who have each worked in their field for over twenty years (homogenous high depth). Another organization might have a more diverse group of a few scientists with twenty years of experience and a few with less than five years of experience (high experiential diversity). From a breadth perspective, a diverse group might be a collection where some scientists have worked in ten different therapeutic domains mixed together with other scientists who have only worked in one or two domains (high breadth diversity).

These types of experiential diversity are hypothesized to promote both the rate and impact of knowledge creation in two primary ways – by facilitating knowledge sharing and by encouraging task-based cognitive conflict. First, mixing individuals together who have varying levels or types of experience is posited to encourage knowledge sharing. With significant diversity in different employee's experiences, an opportunity emerges for researchers with deeper or broader experiences to share their gained knowledge (both accumulated insights and content from other domains) with their less experienced colleagues. This stands in contrast to homogenous workforces where

such knowledge might not be shared because less task-based dialogue occurs between similarly experienced individuals as compared to the dialogue that is common between experienced and inexperienced individuals (Sundgren, Selart, Ingelgard, & Bengtson, 2005). In addition, this diversity in experience helps to mix old and new ideas in a way that has been demonstrated to aid the development of creative new knowledge, through what Leonard-Barton called "creative abrasion" (Leonard-Barton, 1995). This empirical research on the 'age' of technical knowledge has suggested that key insights can be created through the bridging of 'old' ideas and 'new' ideas (Katila, 2002; Nerkar, 2003). In this sense, by creating diversity in experience, the 'old guard' of experienced professionals (some with significantly outdated knowledge) can interact with new college graduates (potentially trained in new knowledge paradigms) to create cognitive friction that helps to promote the development of new and potentially high-impact ideas.

Second, mixing individuals together who have different levels or types of experience can also promote task-based cognitive conflict (Jehn, 1995; Jehn, et. al, 1999; Pelled, et. al, 1999). In this context, task-based cognitive conflict occurs when individuals working together disagree on how to best approach or solve a problem. Experiential diversity makes such conflicts likely as people often rely on their previous experiences to guide them in solving problems. When people draw from significantly different experiences, conflicting ideas are likely to emerge. Although some types of diversity can be problematic for groups by creating relationship-based conflict (Jehn 1995; 1997), cognitive conflict of ideas has been often shown to productively influence group outcomes (Amason, 1996; Pelled, Eisenhardt, & Xin, 1999). However, recent meta-analytic analysis of the conflict literature has noted that despite this evidence, task-based

conflict it not always positive, and additional research is needed to further understand the context in which such cognitive conflict helps teams perform (De Dreu & Weingart, 2003). The positive findings for task conflict suggest that "teams benefit from task conflict when they cultivate an environment that is open and tolerant of diverse viewpoints and work with cooperative norms preventing those disagreements from being misinterpreted as personal attacks" (De Dreu & Weingart, 2003: 747). In addition, research on top management teams has suggested that managers can do well to cultivate information-based diversity (Simons, Pelled, & Smith, 1999), particularly when such diversity culminates in 'having a good fight' (Eisenhardt, Kahwajy, & Bourgeois, 1997) between different ways of thinking. Related research on devil's advocacy, where people take purposefully divisive positions on topics, also highlights the importance of diversity in opinions within organizations (Schwenk, 1990), as such strategies improve strategic decision making (Schweiger, Sandberg, & Regan, 1986). When this type of conflict occurs it promotes increased discourse as individuals defend their different positions, and such increased communication can get more ideas out in the open. With such expanded discussion of task-based ideas, creative breakthroughs become more likely, as creativity is aided by such broad and open dialogues (Wanous & Youtz, 1986).

Through these two processes both the rate and impact of knowledge creation endeavors can be enhanced. The impact of knowledge creation is helped as the increased knowledge sharing and cognitive conflict facilitate the flow of new ideas for products that often combine distant sources of experience (technologically, organizationally, and temporally) to create potentially novel new knowledge. Experiential diversity can help to promote the rate of knowledge creation in two ways. Such diversity helps to make

potential product extensions more likely to be recognized and discussed (identification of new potential markets for existing products / knowledge), creating an enhanced ability for the firm to recognize new commercialization opportunities. As a lack of commercialization opportunities is often cited as a key impediment to the rate of innovation (Gans & Stern, 2003; Shane, 2001), factors that help to overcome this obstacle should promote a higher rate of knowledge creation. In addition, diversity can help to improve the rate of creation by providing a forum and impetus for the sharing of best practices for efficient work (von Krogh, Nonaka, & Aben, 2001; Verona & Ravasi, 2003) as well as benchmarking for continuous efficiency improvements (Winter, 1994). In summary, these arguments suggest that it is the presence of different levels of knowledge, not the overall quantity, which helps organizations to achieve both high rate and impact in their knowledge creation.

However, building on these ideas, it is not clear that the relation between diversity and knowledge creation would be linear or uniformly positive. In fact, it may be possible that this proposed relation between experience-based workforce diversity and knowledge creation could be subject to diminishing returns, or even negative returns, at high levels of diversity. Specifically, for many of the same reasons diversity was argued to be good for knowledge creation, such as promoting knowledge-sharing and cognitive conflict, at the extreme such influences could be harmful. Too much of a good thing can become counterproductive. For example, when absolutely no agreement exists (everyone is an island), diversity can be counter-productive as individuals may not be able to find common ground to communicate effectively with each other. Further, although a moderate degree of task-based conflict can be good (Jehn, et. al, 1999), too much conflict

may overwhelm the realized benefits and conflict can become the center of social interaction (Van de Vliert & De Dreu, 1994). As a result, these hypotheses will posit that experience-based diversity will exhibit an inverted-U shaped relation with knowledge creation outcomes.

> *H3a: The diversity of experience reflected in an organization's research workforce will exhibit an inverse-U shaped influence on the rate of knowledge creation by the firm.*
>
> *H3b: The diversity of experience reflected in an organization's research workforce will exhibit an inverse-U shaped influence on the creation of high-impact knowledge by the firm.*

METHODS

Data and Setting

The value of the rate and impact of knowledge creation is likely to vary by industry such that in some industries these outcomes will have much less value for performance than in other cases. As such, to evaluate these hypotheses empirically it was important to choose an industry setting where both rate and impact are likely to be valuable. Although several potential industries that meet this criterion were considered, research on the pharmaceutical industry (SIC 283; NAICS 3254) provides significant support for the value of both dimensions of knowledge creation in the production of commercial drugs (Bierly & Chakrabarti, 1996; Rothaermel & Deeds, 2004). Thus this study investigates the workforce experience of 167 unique firms in the pharmaceutical industry, which included all of the firms in this NAICS code for which data were available. The time period for study are the years 1980-1999, creating a pooled longitudinal and cross-sectional panel dataset. This time period was selected because

1980 was the first year in which full citation information is reliably available for patents, and 1999 because this is the latest year full information is available from the National Bureau of Economic Research (Hall, Jaffe, & Tratjenberg, 2001).

Measures

Patent data were used to create the experience variables. This approach is consistent with research in recent years that has examined innovation in organizations (Ahuja & Katila, 2001; Rosenkopf & Nerkar, 2001; Sorensen, et. al, 2006) and provides an in-depth look at the experience of individuals who engage in research within organizations. As noted by Sorensen and colleagues (2006), patent data offer something of a "fossil record for following the flow of knowledge and the build up of experience, providing a lasting reflection of ephemeral interactions." Although the use of patent data has some significant limitations (see Agarwal & Henderson, 2005; Mowery, Oxley, & Silverman, 1996), including the exclusion of many potentially relevant non-patent-related experience and members of the research workforce, the clear trail of experience reflected in these archival data provides a detailed portrait into the experience history of individual scientists in an organization's research workforce. Further, the use of patent data allows our analyses to focus on some of the most important knowledge in these firms (that which the organization thought was important enough to patent) and provides a method of consistently measuring knowledge creation between companies and over time. In many ways patents represent one of the most concrete measures of the abstract organizational knowledge construct. As such, these data provide a deep and objective

source for the examination of depth, breadth, and diversity in the experience of research scientists in organizational workforces.

Independent Variables

The calculation of the workforce experience and experience diversity variables was completed in several steps, starting at the individual scientist level and building up through aggregation to understand the composition and diversity of an organization's patenting research workforce. First, the individual patenting histories of every scientist who was named as a contributor on a U.S. patent from 1960-1999 were calculated to determine the depth and breadth of each individual scientist's experience on a patent-by-patent running basis, regardless of the specific organization for which they worked or industry in which they were working. Second, for each of an organization's patents in each year from 1980-1999 (the years in which adequate patent information were available) the average depth and breadth in experience of each team of researchers named on these patents were calculated. These patent-level experience scores were then aggregated up to the organizational level to include all of an organization's patents in the focal year. Next, the diversity of each organization's workforce was assessed similarly, by calculating the standard deviation in each of the individual-level experience variables (depth and breadth) among scientists named on each patent. These patent-level diversity scores were then aggregated up to the organizational level (averaging the diversity among all of the organization's patents in the focal year) to give an average diversity score across all patent teams in the organization in that year[2]. The selection of standard

[2] An alternative to this 3-stage process of scientist experience accumulation, patent level aggregation, and then organizational level aggregation is to simply pool all named scientists on the organization's patents in

deviation as the measure for diversity in this context was a careful decision. This decision was reached by following the theoretical guidance provided by Harrison and Klein (2007), in which the type of diversity of interest in this research is called 'separation'-based diversity. Harrison and Klein (2007) argue that the most appropriate and well-accepted measurement of separation-based diversity is the measurement of standard deviation in the focal variable. As such, standard deviation was used in the measures below to represent diversity.

Specific measures for experience depth and breadth are outlined below. To provide a broad and rigorous test of proposed theory, two measures were calculated for each type of experience of interest and included both separately and together in various econometric models.

Depth of Workforce Experience

Number of Patents. The first approach used in the experiential learning literature (Argote, 1999) as a measure of the depth of experience is volume, in this case measuring the total volume of cumulative experience an individual has accumulated in their previous work. This is measured as the total number of patents on which an individual has ever been named as a contributor.[3]

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a given year and assess the depth, breadth, and diversity of their experiences as a collective pool. To determine if the analyses were sensitive to using a pooled approach rather than the 3-stage aggregation method, I ran models using both approaches. The pattern of results was largely the same regardless of the method of aggregation. I chose to present the 3-stage approach for the primary analyses, as this approach more firmly places the measurement emphasis on teams of researchers working together, which is particularly important given my theoretical arguments regarding experiential diversity, in which increased discourse and knowledge sharing require 'creative abrasion' (Leonard-Barton, 1992) to occur between individuals with different experiences actually working together.

[3] An alternative approach to the assessment of experience depth would be the measurement of an individual's previous work only in the exact same technical domain as a current project. This approach was rejected in favor of a more inclusive approach that measured an individual's work on any previous patents,

Years of Experience. The second approach used in the experiential learning literature (Argote, 1999) as a measure of the depth of experience is time, in this case measuring the total amount of time an individual has been actively involved in patentable research. This is measured as the total number of years an individual has been actively working on patents up to each given period.[4]

Breadth of Workforce Experience

Technological Breadth. The first measure of breadth in an individual's experience is a measure of the total range of an individual's technological experience. This is measured by a count of the number of different technical subclasses in which the individual has been granted patents in the individual's career. In this sense, if a researcher had been granted patents in 20 different pharmaceutical domains, this would represent that individual's technological breadth.

Organizational Breadth. The second measure of breadth in an individual's experience is another measure of the range of an individual's experience. This is measured by a count

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regardless of exact technical class, to give a more complete picture of each scientist's true depth of patent research experience. Nonetheless, depth variables were also calculated using this more restrictive approach to depth measurement. Models that used these more restrictive depth measures followed the same pattern of results as the primary analyses, but were generally weaker in terms of significance, likely due to the omission of many relevant prior experiences that were not exactly in the same technical class as a given project.

[4] Again, an alternative approach to the measurement of this variable is possible. In this case, 'years of experience' was assessed as a count of the number of previous years in which a scientist actually filed a patent. Although 20 years may have passed between a scientist's first patent and the current year, if they only were named on patents in 10 of the intervening years, their 'years depth' score would be 10. The alternative is to count all years that have passed since a scientist was named as a contributor on their first patent (20 years in this example). The count of active years rather than all years was selected to give a more focused look at the active experience histories of scientists, and to avoid errors of measurement that would give a scientist 30 years of experience credit in the hypothetical situation where a scientist had a single patent 30 years ago and none until the current period. However, to assess the influence of this measurement decision on results, both approaches were assessed empirically. Again, models that used the less-precise measure that just counted years from a first patent were generally lower in level and significance than the more focused 'active years' approach, likely due to the inclusion of noise in measurement of the underlying construct.

of the number of different outside organizations for which the focal scientist had worked and created patents in the past, prior to the focal year. In other words, if an individual from Merck had only created patents for Merck in their career, this would indicate low organizational breadth with a value of 1. If, however, the individual had previously submitted patents while working at 3 or 4 unique organizations, this would indicate high organizational breadth. These two approaches to breadth in patenting (technical and organizational) build on the work of Rosenkopf and Nerkar (2001) who argued that both of these types of breadth are important to understanding innovation in firms.

Diversity of Workforce Experience

In addition to the average level of workforce experience, to measure the diversity of experience in each organization, the standard deviation of each of the four measures above was also calculated. As noted above, standard deviation follows Harrison and Klein's (2007) approach to separation-type diversity and helps to capture the degree to which each workforce is characterized by significant differences in experience between research scientists. To evaluate the inverse-U shaped relation hypothesized in the effects of experience-based diversity on the development of knowledge by organizations, each of the diversity terms were squared.[5]

[5] Issues with collinearity in multiple regression become particularly salient when models are evaluated that include both theoretical variables and their squared terms. Although there are different approaches to the evaluation of such models (Gordon, 1968), including centering higher order terms prior to including them in analyses, such transformative techniques have been criticized (Tate, 1984). To address the potential for bias in such models, but still represent the important effects of these terms in such models (Friedrich, 1982), several steps were taken and are described on pages 71-73.

Dependent Variables

Rate of Knowledge Creation

Number of New Patents Granted. The first of the dependent variables is the measure of the number of patents received by an organization in a given year, assessing the rate at which new patentable knowledge is created by the focal firm.

Impact of Knowledge Creation

Number of High Impact Patents. Several measures of the impact of knowledge creation have been proposed through the years (Dahlin & Behrens, 2005). For this research, the focus was simply to assess the ability of an organization to create new knowledge that significantly impacted future research in the field. With this goal, the most widely used measures of impact in the literature on knowledge creation in organizational research are those that measure the impact of a new patent on the development of future patents, measured by the citation counts of such patents (Ahuja, 2000). To measure this variable, each patent is compared to other patents filed in the same year's cohort. In each cohort year, the average number of citations received by patents is calculated, and then two measures are proposed to indicate whether a particular patent had a high impact. These two levels of impact are the calculation of patents that received citations at a rate 1 or 2 standard deviations above the mean number of citations in a given year. Together these two levels provide indications that a patent had a significant impact on the field, but at varying levels of impact. In addition, by making each assessment of impact relative to other patents in a specific year's cohort, the issue of non-comparability of impact from one year to another across 20 years is mitigated, as the degree to which each year's

patents are highly impactful is evaluated relative to other patents originating in that year. Together, these measures of widely cited patents are a strong indication of an organization's ability to create high impact knowledge.

Control Variables

By limiting this study to the investigation of the pharmaceutical industry, industry-specific alternative explanations for the results are largely controlled. This was perhaps the most important control factor considered, as several of these industry-relevant factors include the influence of industry-level technical complexity, market competition, and legal / regulatory restrictions on business practice. In addition, to further control for the possible influence of other firm-specific factors, several additional control variables are included in these analyses.

Firm R&D Expenditures. Firm research and development investments are an important determinant of a firm's patenting activities. As such, and to eliminate the possibility of this factor confounding or providing an alternative explanation for achieved results, the dollar amount of each firm's total research and development expenditures each year is included as a control.

Size of Patenting Research Workforce. To control for the differences in the scope of patenting research being carried out by these firms, research workforce size will also be included as a control variable, measured as the number of unique individuals that were named as part of the patenting activities of the firm each year.[6]

[6] Again, as noted earlier, the evaluation of only researchers named on patents is an imperfect approach to studying knowledge creation in organizations as it excludes 'unproductive' research personnel who did not achieve patentable knowledge in their work, and other scientists involved in knowledge-creating work in the organization that did not have a natural termination in a patent. However, this does very firmly place

Pharmaceutical Sub-Domain. Building on the idea that subtle differences in knowledge creation could potentially exist between different pharmaceutical industry sub-domains, indicator variables for each subclass were included as control variables. These subclasses are described in Appendix A.

Fixed Firm Effects. Fixed firm effects were necessary to control for unobserved heterogeneity between firms not captured in other controls. This choice was supported by the Hausman test, which showed significant differences between the fixed and random effects estimations, indicating that the fixed effects were appropriate for this data.

Econometric Analyses

To evaluate the proposed hypotheses, several different estimation procedures were necessary. Models with the rate of knowledge creation as the dependent variable were evaluated using fixed effect negative binomial panel regression, a typical analysis for such data (Hausman, Hall, & Griliches, 1984; Fleming & Sorensen, 2004) in the case of count-based dependent variables with demonstrated high levels of overdispersion (based on test of the overdispersion parameter alpha). This overdispersion led to the need to use negative binomial estimation rather than Poisson estimation, as Poisson estimation makes assumptions regarding mean and variance that are not viable in overdispersed data. This complex regressive technique is necessary due to the fact ordinary least squares analysis (OLS) can give biased and inefficient estimates when analyzing

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the focus on some of the most critical knowledge and research personnel in an organization (knowledge that is so important that the organization needs to patent it to secure legal property-right protections), and thus provides a well-placed window through which to view experience and knowledge creation in organizations.

longitudinal panel data, as the year-to-year observations of specific firms are not fully independent, violating OLS assumptions regarding the residuals in such analyses.

However, models with knowledge creation impact as the dependent variable had an additional problem that required further attention. As you can see from Table 3, a fair percentage of firms never created a high impact patent, particularly a 2 standard-deviation high impact patent, leading to a large number of zeros in the dependent variable for the knowledge impact models. Standard negative binomial regression is susceptible to bias in the case of excess zeros (Cameron & Trivedi, 1998). The solution is to use zero-inflated negative binomial regression, which specifically accounts for the excess zeros, as well as overdispersion and unobserved heterogeneity in the data (Long, 1997). The test to determine definitively if zero-inflated negative binomial regression is statistically superior to other approaches in a dataset is the Vuong test (Vuong, 1989; Greene, 1994). Vuong tests in the statistical package Stata were significant at a 0.001 level for all knowledge impact models (Vuong test statistics ranged between 3.04 to 6.10), confirming that zero-inflated negative binomial regression was the appropriate choice for these data. Thus, Tables 3 and 4 report the zero inflated negative binomial regression results for predicting the number of high-impact patents created by an organization.

To assess the potential for multicollinearity in the analyses, several diagnostic and analytical steps were taken. First, diagnostic tests using the 'colldiag' function and variance inflation factors were evaluated in Stata to assess the presence of multicollinearity. The proposed analytical models did demonstrate significant levels of multicollinearity in fully saturated models that included multiple measures of the same theoretical constructs. This was not surprising given the high bivariate correlations

between some variables as shown in Table 3, and the fact that these measures were specifically selected to provide multiple measures of the same theoretical constructs. However, less saturated models that included only subsets of variables were free from problematic levels of multicollinearity. As a result, to address these concerns, but also to fully represent the data and proposed hypotheses, separate econometric models are reported that contain both fully inclusive as well as selective subsets of the measures. For example, in the Table 4 reporting of the relations between experience and knowledge creation rate, models 1, 3, 5, and 7 assess the hypotheses with only one measure of each type of experience included. In addition, models 2, 4, 6, and 8 include these measures together with their diversity and diversity squared terms (for evaluating Hypothesis 3). Model 9 then evaluates all measures of all constructs together in one fully saturated model. This pattern is repeated for the knowledge creation impact dependent variables in Tables 5 and 6.

By reporting analytical models that assess these various types of experience together and independently I am able to evaluate the unique contributions of each different type of experience on the various knowledge creation outcomes. This is important, as it helps to answer questions about how these different types of experience come together to both jointly and independently influence knowledge creation in organizations.

Table 3 – Correlations between Study Variables

	Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Knowledge Creation Rate (new patent applications)	10.86	23.08	--																
2.	Knowledge Creation Impact 1 (1 std. dev. above mean citation rate)	0.69	1.52	.59	--															
3.	Knowledge Creation Impact 2 (2 std. dev. above mean citation rate)	0.32	1.02	.38	.81	--														
4.	Firm R&D Expenditures[1]	79.67	260	.59	.34	.18	--													
5.	Size of Patenting Research Workforce	3.51	4.63	.84	.56	.37	.50	--												
6.	Experience Depth - # of patents	10.12	10.25	.29	.17	.10	.16	.08	--											
7.	Experience Depth - # of years	5.00	2.75	.19	.08	.03	.19	.01	.84	--										
8.	Diversity - patent depth diversity	4.22	6.58	.27	.17	.08	.16	.14	.67	.46	--									
9.	Diversity - years depth diversity	1.27	1.55	.14	.09	.02	.18	.10	.41	.40	.79	--								
10.	Patent depth diversity squared	61.10	194	.16	.08	.01	.07	.04	.60	.38	.91	.61	--							
11.	Years depth diversity squared	4.01	9.74	.02	-.01	-.03	.17	-.02	.33	.34	.69	.89	.62	--						
12.	Experience Breadth – # of unique technologies	3.55	3.24	.09	.08	.08	.06	-.04	.71	.70	.24	.12	.20	.15	--					
13.	Experience Breadth – # of unique organizations	1.52	1.12	-.07	-.08	-.06	-.05	-.08	.35	.47	.11	.16	.09	.19	.51	--				
14.	Diversity - technological diversity	1.02	1.72	.15	.14	.08	.12	.05	.53	.41	.75	.70	.60	.64	.41	.25	--			
15.	Diversity - organizational diversity	0.28	0.70	-.02	-.03	-.03	-.02	-.02	.21	.24	.40	.53	.30	.50	.19	.50	.58	--		
16.	Technological diversity squared	4.01	15.07	.02	.03	.01	.05	-.04	.37	.28	.56	.51	.50	.55	.37	.27	.89	.57	--	
17.	Organizational diversity squared	0.57	3.87	-.04	-.04	-.03	-.03	-.05	.13	.14	.28	.35	.24	.37	.17	.45	.46	.85	.57	--

Correlations greater than .05 are significant $p < .05$. Correlations greater than .07 are significant $p < .01$.
[1] Firm R&D Expenditures are reported in millions of U.S. dollars.

Table 4 – Fixed Effect Negative Binomial Regression Results (Knowledge Creation Rate)

		Knowledge Creation Rate								
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
	Subclass Controls[1]	*	*	*	*	*	*	*	*	*
Controls	Firm R&D Expenditures	-.01**	-.01**	-.01**	-.01**	-.01**	-.01**	-.01**	-.01**	-.01**
	Size of Research Workforce	.06***	.05***	.06***	.05***	.06***	.06***	.06***	.06***	.06***
Experience Depth	# of patents	.01***	.01**							.00
	# of years			.04**	.04***					-.03
Diversity in Depth	patent depth diversity		.03*							.00
	years depth diversity				.31***					.26***
	patent depth diversity squared		-.01*							.00
	years depth diversity squared				-.06***					-.06***
Experience Breadth	# of unique technologies					.07***	.05***			.10***
	# of unique organizations							-.03	-.02	-.15*
Diversity in Breadth	technological diversity						.22***			.11*
	organizational diversity								.39***	.30**
	technological diversity squared						-.02***			-.01*
	organizational diversity squared								-.08***	-.03
	Constant	1.17***	1.14***	1.11***	1.12***	1.10***	1.08**	1.21***	1.23***	1.30***
Wald χ^2		284***	296***	267***	322***	282***	327***	249***	269***	400***
N		868	868	868	868	868	868	868	868	868

Note: $N = 167$ firms; 868 observations. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include subclass indicators but their coefficients are not included in this table.

Table 5 – Zero-Inflated Negative Binomial Regression Results (Knowledge Creation Impact 1)

		Knowledge Creation Impact 1								
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Controls	Subclass Controls[1]	*	*	*	*	*	*	*	*	*
	Firm R&D Expenditures	.00	.00	.00	.00	.00	.00	.00	.00	.00
	Size of Research Workforce	.07***	.07***	.07***	.08***	.07***	.07***	.06***	.08***	.07***
Experience Depth	# of patents	.02*	.04**							.04†
	# of years			-.14*	-.05*					-.10*
Diversity in Depth	patent depth diversity		-.05							-.04
	years depth diversity				-.03					-.47*
	patent depth diversity squared		.00							.00
	years depth diversity squared				-.02					.06
Experience Breadth	# of unique technologies					.12***	.11*			.06
	# of unique organizations							-.30*	.00	-.50**
Diversity in Breadth	technological diversity						.11*			.61***
	organizational diversity								-.49*	.24
	technological diversity squared						-.02*			-.06***
	organizational diversity squared								.06	.14†
	Constant	-.79***	-.94***	-0.73***	-1.09***	-0.95***	-1.05***	-0.39***	-0.92***	-0.13
Likelihood Ratio χ^2		112***	119***	107***	113***	123***	124***	108***	120***	152***
N		868	868	868	868	868	868	868	868	868

Note: $N = 167$ firms; 868 observations. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include subclass indicators but their coefficients are not included in this table.

Table 6 – Zero-Inflated Negative Binomial Regression Results (Knowledge Creation Impact 2)

		Knowledge Creation Impact 2								
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
	Subclass Controls[1]	*	*	*	*	*	*	*	*	*
Controls	Firm R&D Expenditures	.00	.00	.00	.00	.00	.00	.00	.00	.00
	Size of Research Workforce	.04***	.06***	.04***	.05**	.05**	.04**	.03†	.03†	.04*
Experience Depth	# of patents	.04***	.08***							.08*
	# of years			-.05	-.08					-.21
Diversity in Depth	patent depth diversity		-.13*							.00
	years depth diversity				-.42†					-.95*
	patent depth diversity squared		.00							-.01
	years depth diversity squared				.00					.19
Experience Breadth	# of unique technologies					.20***	.26***			.10*
	# of unique organizations							-.34*	-.17	-.02
Diversity in Breadth	technological diversity						.14*			.57*
	organizational diversity								-1.06*	-.93*
	technological diversity squared						-.01			-.07*
	organizational diversity squared								.13	.24*
	Constant	-1.18***	-1.54***	-1.22***	-1.22***	-1.33***	-1.39***	-0.55	-1.10**	-0.47
Likelihood Ratio χ^2		35***	53***	29***	42***	51***	58***	31***	35***	74***
N		868	868	868	868	868	868	868	868	868

Note: $N = 167$ firms; 868 observations. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include subclass dummy codes but their coefficients are not included in this table.

Table 7 – Regression Results Summary

	Rate	Impact 1	Impact 2	Hypothesis A Support	Hypothesis B Support
Depth-Quantity	Positive / Significant	Positive / Significant	Positive / Significant	H1a Support	H1b Opposite
Depth-Time	Positive / Significant	Negative / Significant	Negative / Insignificant	H1a Support	H1b Partial Support
Breadth-Technological	Positive / Significant	Positive / Significant	Positive / Significant	H2a Support	H2b Opposite
Breadth-Organizational	Negative / Significant	Negative / Significant	Negative / Significant	H2a Opposite	H2b Support
Diversity-Depth-Quantity	Positive / Significant	Negative / Insignificant	Negative / Significant	H3a Support	H3b Partial Opposite
Diversity-Depth-Time	Positive / Significant	Negative / Insignificant	Negative / Significant	H3a Support	H3b Partial Opposite
Diversity-Breadth-Technological	Positive / Significant	Positive / Significant	Positive / Significant	H3a Support	H3b Support
Diversity-Breadth-Organizational	Positive / Significant	Negative / Significant	Negative / Significant	H3a Support	H3b Opposite

Results

Table 3 provides descriptive statistics and correlations for the study variables. Tables 4 through 6 report the results of these analyses. Table 7 summarizes the results of the regressions. To begin with, these results provide support for Hypothesis 1a. Table 4 provides support for the positive influence of experience depth on the rate of knowledge creation, with Models 1 through 4 all indicating positive and significant relations for depth variables. However, providing some boundaries on this relation, in the fully saturated model (Model 9), the positive effects of depth on knowledge creation rate are overwhelmed by other experience variables and fall insignificant. Moving on, the results provide mixed support for Hypotheses 1b. Table 5 provides a fair amount of support for the negative effect of experience depth on the creation of high impact knowledge, with Models 3, 4, and 9 all showing significant and negative relations between time-based depth and the impact of knowledge creation. The pattern remains the same in Table 6 (2-standard deviation impact), but the effects are weaker and fall insignificant. However, demonstrating an interesting difference between time vs. quantity-based measures of depth, the time-based measures of experience depth provided opposite results. In both Tables 5 and 6, although the time-based measures supported H1b, the quantity-based measures were significant and positive (Models 1, 2, and 9), indicating that although more time in the field was negatively related to impact in knowledge creation, increasing quantity of previous work was positively related to impact.

Moving to Hypothesis 2, the results provide mixed support for Hypothesis 2a. Table 6 shows that one type of experiential breadth (organizational-breadth) is significantly negatively related to the rate of knowledge creation (Model 9). However,

contrary to Hypothesis 2a, technological-breadth is positively related to the rate of knowledge creation (Models 5, 6, & 9 in Table 6). In terms of Hypothesis 2b, Tables 5 and 6 provide mixed support for the positive effect of experience breadth on the creation of high impact knowledge. In this case, similar to the findings with experience depth, again the two indicators of experience (in this case breadth) break apart with opposite relations to knowledge creation. Technological-breadth in experience is positively related to the impact of knowledge creation in Models 5, 6, and 9 in Table 5 and Models 5 and 6 in Table 6. However, organizational-breadth in experience is significantly negatively related to the creation of high-impact knowledge (Models 7 and 9 in Table 5 and Model 7 in Table 6). This is consistent with the correlation between this variable and these dependent variables also being significantly negative (Table 3), the only core experience variable so correlated.

Moving to Hypothesis 3, the results provide strong support for Hypothesis 3a. Table 4 provides support for the positive influence of experiential diversity on the rate of knowledge creation by firms in every model in which diversity is evaluated. Further, there is also significant evidence that these influences are subject to diminishing returns. In Table 4, models 2, 4, 6, 8, and 9 all show a significant positive relation between different measures of experiential diversity and the rate of knowledge creation by firms. Further, these effects are largely robust to the inclusion of measures of all types of experience in the fully saturated model of experience (Model 9). Evidence of an inverted-U relation[7] is provided by the negative and significant squared diversity terms in Models

[7] Due to the small number of observations at high levels of diversity, additional tests of the significance of post-peak levels of the hypothesized inverted-U relationship were not possible. However, in addition to the significance of the squared diversity terms in the models, correlational analysis provides some additional insight to support the found relationships. For example, I find significant positive correlations for diversity

2, 4, 6, 8, and 9. In addition, these analyses provide mixed support for Hypothesis 3b. In Tables 5 and 6 there is some support for the positive influence of experiential diversity on the creation of high impact knowledge in Models 6 and 9, where diversity in technological breadth experience is positively related to both high-impact measures of knowledge creation. In addition, in each of these models such benefits are subject to diminishing returns with significant negative squared terms. However, contrary to Hypothesis 3b, Tables 5 and 6 also show several instances where diversity is significantly negatively related to the creation of high-impact knowledge (Model 8 in Table 5 and Models 2, 4, 8, and 9 in Table 6).

DISCUSSION

Overall, the two most significant and consistent findings from these analyses are that different types of organizational experience vary significantly in their impact on knowledge creation and that experiential diversity plays an important role in such knowledge creation. In this sense, these results confirm the need for more sophisticated approaches to the conceptualization and measurement of organizational experience in experiential learning research, as the influences of different types of experience can vary

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in experience depth-quantity and experience depth-time with the rate of knowledge creation as .27 (quantity) and .05 (time) when all of the date is included. This supports the argument that experiential diversity positively influences knowledge creation rate. However, at higher levels of diversity such positive influences are argued to peak and become negative due to various problems created by such diversity. Supporting this contention, the correlations for diversity observations that are above the mean in the sample for experience depth-quantity and experience depth-time are significant and negative (-.06 for quantity and -.14 for time). These become even more negative at higher levels, when we look at the few observed cases of experience diversity that are more than a standard deviation above the mean level of diversity in the sample. In these cases the correlations for experience depth-quantity and experience depth-time are -.28 for quantity and -.40 for time. Although inference from these findings is limited as this is only correlational evidence, due to the small number of observations at these high levels of diversity, this further supports the argument that diversity is valuable up to a point, but becomes an increasingly negative factor at high levels of diversity.

widely (in terms of both significance and sign) in their effects on firm outcomes. The implications of this research can be broken down into several observations.

First, this research has several implications for experiential learning theory and research. To begin with, these findings support an overall contention of this paper that depth and breadth of experience are distinct theoretical constructs that exhibit differential predictive associations with key outcomes, supporting arguments of discriminant validity. Further, in addition to demonstrating differences between depth and breadth, these analyses also suggest that we may need to think more carefully about the convergent validity of different measures of well-understood constructs, as these findings provide evidence of the divergent influences of different types of experience depth (i.e. time and quantity split influences). These split findings regarding quantity and time suggest a need for more investigation into these two factors as potentially distinct constructs as well. In addition, although experience depth is a well-studied construct (Argote, 1999), the finding of a negative relation with the impact of knowledge creation represents a notable exception to the primarily positive relations proposed between experience depth and firm outcomes in the past (Yelle, 1979). Moving to experience breadth, these analyses provided strong support for the influence of experience breadth on various dimensions of knowledge creation, and again provide some interesting split findings between different types of experience breadth. Although arguments can be made that the consistent negative relations between organizational-breadth in experience and all three knowledge creation outcomes could be the result of problems integrating old experience into new environments, there is a need for more research into this phenomena to unravel its

mysteries. Together, these findings highlight how little we understand about experiential breadth, and point to several new directions for additional research.

These results also highlight the important role of experiential diversity in understanding the learning processes of organizations. This empirical evidence both builds on and challenges the findings of Katila (2002) and Nerkar (2003) regarding the mixing of old and new ideas in innovation. Specifically, although these results confirm the positive influence of diversity on the rate of knowledge creation (Table 4), they also challenge the idea that integrating old and new ideas is a positive opportunity for organizations by showing negative influences of such integration on knowledge creation impact (Table 4 in particular). Further, in addition to the investigation of 'age of knowledge' being integrated, the current study also found support for the positive influence of diversity in breadth of experience, a theoretical path not previously explored. Together, these findings suggest that although experiential diversity has promising potential as a construct in experiential learning, these mixed effects make it clear that we still have much to learn about diversity and how it is managed.

In addition, this research also provides some of the first empirical support for core rigidities arguments (Leonard-Barton, 1992). Although core rigidities arguments are well established in the strategy literature, there has not been very much empirical research into this phenomenon. By assessing core rigidity ideas directly through the analysis of actual experience (H1b), these results bolster the theoretical arguments for core rigidity's negative influences in organizations, though they also demonstrate some of the limitations of such ideas (only partial support).

Finally, also notable for the experiential learning literature is the sensitivity of these results to different types of experiential measures (time-based vs. quantity-based as well as technological vs. organizational breadth). Although previous research has employed each of these methods, few studies examine all of these different operationalizations of experience together. By examining the independent and joint influences of different operationalizations, it became clear that how experience is conceptualized and measured has an important effect on the results. This may serve as a warning to future research.

In addition to the implications of this research for experiential learning research, this research helps to answer the call from Nonaka and colleagues (Nonaka, et al. 2006) for new research into the origins of knowledge creation. This study helps to bridge the gap between experiential learning research and knowledge creation research to specify the nature and complexity of the experiential antecedents to knowledge creation in organizations. In doing so, these results suggest that simplified and implicit approaches to experiential antecedents are probably not sufficient to understand complex dynamics of knowledge creation, given the significant divergence in effects found here. Further, these analyses highlight the importance of considering different dimensions of knowledge creation outcomes (rate and impact), as different experiential origins were found to have divergent influences on different dimensions of knowledge creation outcomes.

This research also has several implications for practicing managers and organizations. First, experience can be a double-edged sword. Although the accumulation of experience can provide considerable benefits to organizations (such as the positive relation found between experience depth and knowledge creation rate), the same

experiences can also have notable negative consequences as well (core rigidities and less knowledge impact). Additionally, these results suggest that executives should think about experience in terms of more than just depth of experience, particularly given the findings regarding breadth of experience and the creation of high-impact knowledge, and that experiential diversity can be a significantly positive force in organizations. Although difficult to predict practical business realities often create experiential diversity (turnover, industry dynamism, etc.), such diversity should be fostered and can lead to positive organizational outcomes.

Finally, this research also highlights several future directions for additional research. Although this study primarily examined two different types of experience, there is a considerable opportunity to investigate the influence of additional dimensions of experience (challenge, timing, context, density, etc.) on knowledge creation. Building on this, research could also begin to explore the differential effects of different types of organizational experience (at multiple levels) on other performance and strategic outcomes (competitive dynamics, different types of financial performance, alliance formation and value creation, survival, mergers and acquisitions, etc.). Another new research direction would be to look at these issues in the context of mergers and acquisitions. For example, it is possible that the negative finding regarding organizational breadth of experience in this study could include two different types of breadth, forced / involuntary organizational breadth as the result of mergers and acquisitions, and voluntary breadth as a result of proactive scientist mobility. Differentiating these two different types of experience breadth, and the different challenges associated with these

moves (culture shock, scientist motivations, financial rewards, etc.), could be fruitful ground for new research.

In addition, although this research explored a large number of technologies in a single industry, it is possible that different types of experience could be differentially important at unique points in the lifecycle of a research domain. For example, it might be possible that breadth of experience is the primary driver of success at early stages of a technological lifecycle, but at later points experiential depth becomes key to marching the technology forward. Additionally, future research could also break knowledge creation down further based on the actual novelty of the innovation. For example, although this study examined high-impact patents as a specific outcome, it would also be possible to explicitly study the experiential antecedents of distinctively incremental knowledge creation or only knowledge creation that is a continuation of a firm's own previous work. Finally, future studies could also consider the influence of different types of experience on intermediate knowledge creation processes (conflict, discourse, knowledge sharing, search processes, use of technology), steps that were beyond the scope of this research but could provide more insight into the micro processes of experience and knowledge creation.

In conclusion, this study aimed to take new steps toward a deeper understanding of the influences of different types of experience on knowledge creation in organizations. By investigating the influence of research scientist experiences in the pharmaceutical industry, some questions were answered and new questions were raised. Hopefully this study will encourage more research into some of these complex, important, and interesting questions.

CHAPTER 3

CREATING BLOCKBUSTERS: UNIVERSAL AND CONTINGENCY PERSPECTIVES ON EXPERIENTIAL LEARNING AND PERFORMANCE IN HOLLYWOOD

OVERVIEW

In this study the relation between different types of organizational experience and different types of performance is explored. Building on experiential learning theory, two perspectives are advanced. First, a universalistic approach is developed from the traditional learning literature, building on the logic that all experience is good experience. Second, a more contingency-based approach is hypothesized, in which the influence of different types of experience on performance can vary, and even be negative in some cases. Data from the Hollywood motion picture industry is used to evaluate these perspectives. Results provide only limited support for a universalistic perspective, suggesting that the universalistic approach employed in some previous experiential learning research may be only one piece of the puzzle, and could lead to misleading answers to important questions. Instead, the current research provides strong evidence for the importance of various contingencies in this relation, including the type of experience, the type of performance assessment, and the locus of performance evaluation (internal reference points or market-based comparisons).

Although experiential learning has been studied in organizations for many years, until recently much of this research has taken a simplified view of organizational experience as consisting of repeated exposure to similar situations over time (Yelle, 1979). In recent years this research has branched out to some degree, to better consider how organizations might also learn from doing 'something else' (Schilling, Vidal, Ployhart, & Marangoni, 2003), the implications of more local and distant learning (Rosenkopf & Nerkar, 2003; Nerkar & Roberts, 2004; Ahuja & Lampert, 2001), and the influences of specific types of experience (Haunschild & Sullivan, 2002; Hoang & Rothaermel, 2005; Haleblian & Finkelstein, 1999; Zollo & Singh, 2004). This progress has marked a significant departure from the more narrowly focused traditional learning-by-doing literature (Yelle, 1979; Argote, 1999) and has highlighted how little we understand, both theoretically and empirically, about how organizations learn from different types of experience.

In the current study this departure is further advanced by exploring a basic theoretical question in organizational learning. Specifically, I examine the question of whether different types of organizational experience have a universal or contingent effect on different types organizational performance. A universal perspective is the simplest and most intuitive explanation, building on the traditional logic that *any experience* is *valuable experience*. In contrast, a more contingent perspective would suggest that the value of different experiences vary and that in some cases certain types of experience might have little or even negative influences on some types of performance.

To evaluate these two potential perspectives on the relation between experience and performance, I will examine the influences of two different types of experience in the

production of major motion pictures in Hollywood. On one hand, I will argue from a universalistic perspective to suggest that any accumulated experience, regardless of type, will have a positive influence on film performance. On the other hand, I will also offer hypotheses from a contingency perspective to suggest that experience depth (repeated exposure to similar situations over time) and experience breadth (exposure to a variety of different situations over time), two different types of experience, will have divergent influences on the creation of blockbuster performance. In this contingency logic, I build from ideas from creativity research to argue that experience breadth will have a significant positive influence on the creation of blockbuster movies. Then, building from core rigidities research, I will argue that experience depth can negatively influence the probability of creating a blockbuster movie. In this sense, these arguments would suggest that these two different types of organizational experience have opposite influences on blockbuster performance.

Further, as organizational performance can be theoretically and empirically conceptualized in many ways (Dess & Robinson, 1984; March & Sutton, 1997), particularly in this context (Ferriani, Cattani, Baden-Fuller, 2007), several perspectives on performance will be considered. First, I begin with the most traditional evaluation of performance in this industry, an overall performance measure of commercial success – box office revenue created by the U.S. release of a film (a continuous variable). Second, I build hypotheses to explore the divergent influences of different types of experience on the creation of blockbuster hits as an indicator of performance (a binary variable), an important measure of success in this industry given the large percentage of box office revenue generated by the most successful films (as shown in the Lorenz curve for this

industry in Figure 2)[8]. Third, although firms compete to survive in a competitive marketplace, performance can be evaluated as success relative to the market (external comparisons) or relative to a firm's own previous performance (behavioral theory's internal reference points). As such, both of these perspectives will be explored. Finally, in the Hollywood context success can be conceptualized in both a commercial and creative sense, although the two are not always well correlated. Thus, to examine performance in this industry, both subjective evaluations of creative success (critical ratings) and objective financial performance (box office revenue) will be considered.

In advancing these different ideas, I aim to make several contributions to the literatures on organizational learning and performance. First, by outlining the differences between universal and contingency perspectives on the link between experiential learning and performance I help move forward our theoretical understanding of how organizational experience can influence performance. Second, by hypothesizing from both universal and contingency perspectives rather than advocating one over the other I can investigate empirically both perspectives on this link between organizational experience and performance. Third, by including multiple types of experience (depth and breadth) this research continues the push to expand beyond narrower approaches to organizational learning, to consider both the depth and breadth of organizational experience independently. Finally, by exploring a variety of different theoretical conceptualizations of performance, I hope to open new doors to the understanding of the link between organizational experience and different forms of performance.

With the goal of exploring these issues, this study is structured as follows. I begin by developing the theoretical differences between universal and contingency perspectives

[8] See a more complete description of the importance of blockbuster hits in this industry on pages 99-101.

to link organizational experience and organizational performance. I then proceed to develop hypotheses from each of the perspectives, first arguing that any experience helps to improve performance, but then moving on to hypothesize that the type of accumulated experience might matter when seeking to explain blockbuster performance. These ideas are then tested empirically in the Hollywood motion picture industry, providing a rich data context for the evaluation of the proposed hypotheses. The paper concludes with a discussion of the implications of this study for organizational learning theory and also for practice, in addition to identifying potential directions for future research.

THEORY AND HYPOTHESES

Universal and Contingency Perspectives on Experiential Learning and Performance

Exploring how experiential learning influences organizational performance is fundamental to the study of organizational learning because it helps to motivate research into organizational learning as a field of research. Reflecting its fundamental nature, this link has been well explored in research (largely in economics) that has clearly established the link between organizational experience and economic outcomes such as learning rate and production efficiency (Argote, 1999; Dutton, Thomas, & Butler, 1984). However, although the literature has branched out in a variety of ways to explore new contexts in which such learning occurs (from nuclear power generation to pizza-making [Darr, Argote, & Epple, 1995; Zimmerman, 1982]), new methods of study (from field to lab and simulation [Muth, 1986; Schilling, et. al, 2003]), and new outcomes (from learning rate to the reduction of errors and firm survival [Baum & Ingram, 1998; Haunschild & Sullivan, 2002; Hirsch, 1952]), there has been little systematic evaluation of the nature of the link between different types of experience and overall organizational performance.

Reasonable arguments can be made to support either a universal or a contingent perspective to link experiential learning and organizational performance. From early research (e.g. Alchian, 1963; Wright, 1936) through recent work (e.g. Darr, et. al, 1995), the universal perspective has been the predominant approach to this relation, and increasing experience was argued to move a firm along the learning curve. Examples such as Preston and Keachie's (1964) work on decreasing labor costs in the production of radar equipment and Darr, Argote, and Epple's (1995) work on decreasing production costs in pizza making are typical of the universal approach. In these examples, and many others, the relation between organizational experience and organizational performance is simplified and represented as a direct positive influence that is subject to diminishing returns.

Nonetheless, additional reasonable arguments can also be made to support a contingency perspective of the organizational experience to performance link. For example, research on learning traps and biases (e.g. propinquity traps, familiarity traps, maturity traps, and superstitious learning) suggest that in some cases experience can negatively influence organizational performance (e.g. Ahuja & Lampert, 2001; Levitt & March, 1988). Further, empirical examples such as Baum and Ingram's (1998) work on organizational survival in the hotel industry and Nerkar and Robert's (2004) work on innovation in the pharmaceutical industry are also typical of a more contingent approach. In the Baum and Ingram (1998) research the contingency of interest was the local or non-local nature of the experience accessed by hotels. In Nerkar and Roberts' (2004) research the contingency was the type of product or market experience accumulated. In each of these cases, it was argued that the relation between organizational experience and

organizational performance is contingent upon some characteristic of the experience or situation. In the case of learning traps, some organizational experiences are argued to specifically impede the achievement of firm goals by predisposing firms to sub-optimal behavior. In this way, the theoretical argument implicitly being advanced is that although experience may be good, it could come with conditions attached.

Rather than forcefully advocating one perspective over the other, I will argue that both universal and contingent perspectives could be legitimate approaches to the study of organizational learning. In the following sections each of these perspectives will be used to motivate hypotheses. In this way, both universal and contingent perspectives are advanced as potentially useful and informative, allowing the data to provide further insight into this issue.

All Experience is Good Experience? The Universal Benefits of Experience for Performance

The idea that all experience is good experience is a common reflection that has become well established in the literature. This perspective takes an undifferentiated view of experience as a positive opportunity for learning, building on Kolb's (1984) theoretical framework applied to the organizational level of analysis (Popper & Lipshitz, 2000). The theoretical argument for this perspective, developed by Kolb, is that any and all experience provides the raw material and impetus for observation, reflection, forming abstract concepts, and testing out new ideas to improve future interactions (Kolb, 1984). Synthesizing these ideas and bringing them formally to the organizational level of analysis, Popper and Lipshitz (1998; 2000) have argued that such experiential learning processes also work in organizations. The idea is that as organizations gain experience,

these experiences give organizations the opportunity to improve their performance over time by learning to avoid mistakes from past failures (Vaughan, 1999), learning new best practices (Schwandt & Marquardt, 2000), learning how to manage their alliances (Simonin, 1997), learning to improvise effectively (Barrett, 1998), learning to better identify technological opportunities (Dodgson, 1991), learning to reduce errors (Argote & Darr, 2000), and learning from a host of other experience-generated insights to improve performance (Bapuji & Crossan, 2004). Such improvements could be in terms of efficiency-related performance (Argote & Epple, 1990), error-related performance (Argote, 1999), quality-related performance (Argote, 1993), survival (Baum & Ingram, 1998) or any other type of firm performance outcome (Dodgson, 1993). The defining theoretical argument is simply that increased experience improves performance.

As noted earlier, a consistent stream of empirical research has been presented through the years to support this undifferentiated perspective, with much of the focus being directed at the nature of the diminishing returns for such learning (the learning curve) in different settings, and factors that influence these diminishing returns (for a review see Argote, 1999). Nonetheless, the primary argument in this research has been that learning from experience does occur and that increasing experience promotes organizational performance.

In this tradition, the most common representation of organizational experience has been the accumulation of similar experiences over time, usually represented by cumulative output (experience depth). Building on this, recent research has continued the universal approach by suggesting that not only do similar experiences accumulate to improve performance, but organizations may also improve performance by learning from

doing 'something else' as well (experience breadth). Although this was a lab-based experiment (Schilling, et al., 2003), it represents a yet more pronounced endorsement of the universal perspective, suggesting that any experience, even if it is experience that is not a direct replication of previous experiences, can improve performance.

In this research I build on this universalistic idea, implicitly advanced by organizational learning scholars through the years, that organizations learn from all of their experiences to improve overall performance. Thus, the argument is that regardless of the type of experience gained, whether it is depth of experience resulting from the accumulation of similar experiences or breadth of experience resulting from the diversity of such experiences, increasing levels of experience will universally improve organizational performance.

> *H1: All forms of organizational experience in the industry will promote improved performance.*

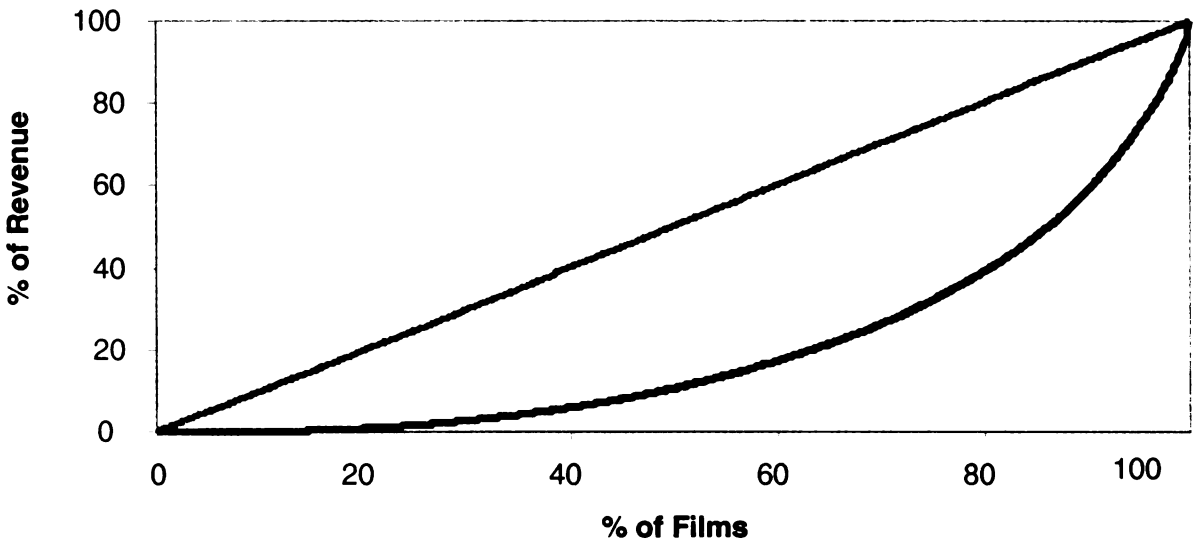
A Contingent Perspective on Experience: Tradeoffs for Blockbuster Performance

In contrast to the previous section, a more contingent perspective would suggest that not all experience will improve performance, and that various contingencies could interfere in this direct link. As outlined earlier, this contingency approach has been reflected in several recent research findings, from Baum and Ingram's (1998) work on the local versus non-local locus of experience and the timing of such experience as contingencies, to Nerkar and Robert's (2004) suggestion that the type of experience (product versus market) can act as a contingency to amplify or weaken the effects of experience on performance. Although neither Baum and Ingram (1998) nor Nerkar and Roberts (2004) explicitly characterized their research as taking a contingency

perspective, both studies took a contingent approach to experience by describing the relation between experience and performance as subject to different conditions. In the case of Baum and Ingram (1998), the timing and locus of experience were found to be important in the survival of Manhattan hotels. In the case of Nerkar and Roberts (2004), complementarities between technological and product-market experience were theorized to create a joint positive synergy and improve the success of new product introductions, contingent on the presence of both types of experience together in the same firm.

In this study I build on these contingency approaches to theory on the link between organizational experience and performance, but take the contingency arguments in several new directions. First, I focus on new experience types (the differences between experience 'depth' and 'breadth') to suggest that these two different types of organizational experience also act as a contingency in the link between experience and performance. Further, instead of arguing for an amplification or weakening effect, I suggest that these two different types of experience can have opposite effects. In addition, I extend the contingency to the performance outcome as well to explore the dependent variable as a potential contingency in addition to the independent variables. The performance outcome I focus on is the achievement of blockbuster performance rather than just overall performance, new product introductions, economic efficiency, or survival. As will be described below, I chose blockbuster performance specifically because this organizational performance outcome has the opportunity to provide an interesting theoretical test for experiential learning's effects, as research from two different research traditions motivate support for two different directions in anticipated performance effects.

Figure 2 – Lorenz Curve for Box Office Revenue in Hollywood



Note: Based on data from IMDB.com for the years 1993-2000.

Although 'blockbuster performance' is not a traditional dependent variable in the organizational learning literature, in the empirical setting of this research blockbuster performance (i.e. performance significantly above typical performance in the industry) plays an important role in the survival and thriving of movie producing organizations. Indeed, some have argued that blockbuster success is critical to the viability and success of many Hollywood production companies as one big movie success is often enough to set up the firm for years of future work (Stringer, 2003). A Lorenz curve (shown in Figure 2) demonstrates how the distribution of box office revenue between films in a year makes blockbuster movies so important and attractive. In fact, this increased focus on big successes is not unique to the movie production business, as similar arguments have been made in other high fixed-cost industries, such as the pharmaceutical industry where the

big profits of blockbuster drugs provide the capital for an organization to engage in a wide range of less lucrative therapeutic endeavors. In other industries similar dynamics occur, such as book publishing (e.g. creating the 'Da Vinci Code' brand), consumer goods (e.g. beer and home products), and electronics (e.g. the iPod phenomenon), where a blockbuster success can create a new brand that generates a disproportionate positive impact for the firm that creates it relative to typical film performance. In the context of Hollywood, blockbuster movies provide several important benefits to the firms that produce them, both in terms of financial rewards and status enhancement. For example, out-of-theatre commercialization opportunities (such as toy sales and licensing arrangements) accrue disproportionately to blockbuster movies, providing enhanced recognition and revenue generation for the firms that produce such movies. Further, the opportunity sets available to such firms may become enhanced, as these firms may get preferential access to talent, scripts, partnership arrangements, and studio distribution deals which can have long-term implications for the viability and survival of such firms. As a result, blockbuster performance can be viewed as an important organizational performance outcome for many industries, and one that has not been well explored in the literature.

Experience Breadth and Blockbuster Performance

To begin with, increasing levels of experience breadth is argued to promote blockbuster performance. This is hypothesized for several reasons. First, research on creativity suggests that diverse experience can provide an organization with exposure to unique sources of knowledge which can then be infused into future projects to increase the potential for big ideas. Specifically, such research has found that breakthrough

performance is most likely to result from the integration of previously unconnected ideas in different domains (Kelly & Caplan, 1997). In an ethnography describing the work of IDEO, a product design company, Hargadorn and Sutton (1996) described how the location of this firm as a central technology broker allowed the firm to identify high-potential opportunities not clearly visible to other firms. Similarly, diverse organizational experiences also are likely to provide firms with access to opportunities with higher uncertainty but higher return potential, as an artifact of the boundary spanning role of such firms, increasing the potential for creation of high-potential projects. Second, Nemeth (1986) suggests that the exposure to qualitatively different technologies over time has the effect of expanding an inventor's cognitive models and can help them to make novel connections that they may not have otherwise recognized. As creative endeavors are often inherently uncertain processes that draw heavily on an individual's developed tacit knowledge (Polanyi, 1967) and intuition (Policastro, 1995), expanded cognitive models drawn from diverse experience are likely to support such creative work. Finally, access to diverse knowledge from multiple domains combined with such diverse cognitive model exposure helps to aid such individuals in knowledge recombination efforts (Fleming, 2001), raising the potential for blockbuster synergistic combinations of related but distinct ideas. Together, these ideas support the overall contention that increasing breadth in an organization's experience set should better equip it to achieve blockbuster performance.

> *H2: Increasing breadth in organizational experience will lead to an increasing likelihood of blockbuster performance.*

Experience Depth and Blockbuster Performance

In addition to the positive influence of experience breadth, we can also consider the effect of experience depth on the creation of blockbuster performance in Hollywood. In contrast to the previous hypothesis, I posit that experience depth has a negative effect on the production of blockbusters, and that with increasing levels of depth in organizational experience blockbusters become less and less likely. Thus, the effect of experience on the creation of blockbusters is proposed to be contingent on the type of experience accumulated such that experience breadth promotes blockbusters but experience depth reduces the chance of achieving a blockbuster.

This hypothesis is based on several related ideas. First, increasing levels of depth in prior organizational experience has been argued to create core rigidities in the way organizations approach future problems (Leonard-Barton, 1992; Dougherty & Heller, 1994). Specifically, with increasing levels of historical dominance of one specific knowledge domain inside a firm, the ideas and processes involved in this recurring area are elevated to a high status position in the firm, and outside experiences receive less attention and representation in firm strategic decision making (Leonard-Barton, 1992). As a result, over time with increasing levels of specialization in a domain, the values of the firm become aligned in the pursuit of this work to the exclusion of other ideas, and the dominant logic of the organization's senior management can become entrenched (Hambrick, Geletkanycz, & Fredrickson, 1993; Prahalad & Bettis, 1985). The result over time is a rigidity that is likely to constrain the integration of creative new ideas that would help to create blockbuster performance. Second, increasing levels of depth in a particular knowledge domain can have the unintended consequence of developing an inside-the-box mentality, or the 'not-invented-here' syndrome (Katz & Allen, 1982), and can grow into a

tendency to look at things according to the conventions of one's own profession, not learning broader points of view. As such closed-off thinking is contrary to the factors that positively influence creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996), such deep but narrow mentalities are likely to predispose the firm to a variety of learning traps (Ahuja & Lampert, 2001) and reduce the likelihood of such firms achieving breakthrough innovation. Finally, with increasing depth of experience over time firms develop norms and routines to support such typical operations. Norms have been called one of the least visible but most powerful forms of social control over human action (Bettenhausen & Murnighan, 1985), and with increasing levels of organizational experience in a product domain, norms grow to both support and eventually socially require standardized work practices. As norms and routines create inertia (Hannan & Freeman, 1984), over time such norms act to constrain the organization toward more of the same and make it difficult to create the novel projects that lead to blockbuster performance. Together, these arguments support the following hypothesis.

> *H3: Increasing depth in organizational experience will lead to a decreasing likelihood of blockbuster performance.*

METHODS

Data and Setting

The U.S. motion picture industry was selected as the setting to study the proposed hypotheses, providing an information-rich setting to evaluate the effects of different types of experience on organizational learning and performance. This is an industrial context where organizational learning is prized, and firms are eager to transfer their learning from one project to future endeavors through both formal and informal mechanisms, as the

costs of failure are significant but the rewards for success are high. To explore experiential learning in this context, data on every movie commercially released in the United States during the years from 1993-2000 were collected to create organizational experience variables for the production companies involved in creating these films.

However, due to significant differences in the scope and mission of different production companies during this time, it is difficult to compare the learning that takes place in different types of production companies. For example, although production companies are responsible for the creation of new films, in some cases production companies are formed as more of a financial backer than a creative production partner and in other cases they may simply represent the interests of a foreign government or agency involved with the film. Thus, to help to ensure consistency in the nature and scope of production companies included in the study, I restricted the sample for primary analysis to only include movies made by production companies that were affiliated with and distributed by a major Hollywood studio. These studio-affiliated production companies represent the primary developers of mainstream movies in Hollywood and compete with each other to create successful movies for the public. As the goal of this research is to understand how different forms of organizational experience influence performance, these firms represent the primary sources of such learning in Hollywood. By restricting the sample to include only these well defined production companies, I help to ensure that the experiential influences being measured represent the experiences possessed by the primary technical and creative forces behind the production of each new movie in the dataset. In total, the data included 2,888 films released between 1993 and 2000. Of these films 1,149 unique movies were released by major Hollywood studios,

produced by 269 unique production companies. As the focus of this research is on the accumulation of experience, the analyses presented in the tables report only the 559 films released during the five years 1996-2000, the years in which at least three years of prior data existed to assess prior experience.[9] The data from 1993 to 1995 and the films that were not released by major Hollywood studios were only used for experience accumulation calculations and robustness checks.

Independent Variables

The independent variables fall into three categories, following the delineation between overall experience, experience depth, and experience breadth developed in the theory and hypotheses section of the paper. All measures were calculated at the organizational level of analysis and updated with each new movie that an organization produced.

Overall Organizational Experience. The first independent variable measured the overall level of movie-making experience for each firm prior to working on a new movie project. The overall level of production company experience was measured by counting the number of films a production company had created in the three years prior to working on a new project. This measure was undifferentiated, in that it did not take into account the type of movie being made (adventure, horror, etc.) or any other characteristic of the experience, and instead was just a generic overall measure of experience in the movie business. This was the primary measure for the analysis of the idea that any experience is

[9] This 3-year time frame was used to focus analyses on the experiences most relevant to each firm, and taking into account that knowledge gained from older experiences decays (especially in the presence of new experience), particularly for project-based organizations with significant turnover. For robustness, alternative models were also specified to include experiences as old as 5 years to assess the differences in results between models that focused on more proximal and more distal experiences. There were no systematic differences in results, although the 3-year results are a little stronger.

valuable experience argument. The average firm in our sample had produced over eight movies in the three years prior to producing a new movie.

Depth of Organizational Experience. The second independent variable measured the depth of organizational experience for a firm prior to working on a new movie project. Depth in a production company's experience was measured by counting the number of previous films a production company had created in a particular genre in the previous three years. To signal to movie audiences what a movie is about, upon release every movie is categorized into a genre, and in some cases a secondary or tertiary genre, to specify the category of movies to which it belongs. These different categories reflect unique knowledge domains, as the skills needed to make a 'comedy' differ significantly from those needed to make an 'adventure' movie. Thus, this measure simply provides a count of the number of movies a production company has made in a particular genre. In the case of movies that fall into more than one genre, the production company's experience making films in any of the genres associated with the film are counted. Thus, if the focal film is an adventure-comedy, the depth of a firm's experience would be assessed as the number of films the firm had previously produced that were either adventure films or comedy films[10]. The 15 primary movie genres are provided in Appendix B, and are based on the genres identified by Miller and Shamsie (1996). The average firm in our sample had produced about 2.5 movies in the specific genres

[10] An alternative approach to the measurement of experience depth would be to only count depth as experience making the EXACT same type of film over time. In other words, if the current film being produced was a crime-comedy, only previous crime-comedies would be counted as relevant previous experience, and prior experiences making just 'comedies' or 'crime' films would not be counted. Models analyzed using these exact-matched experiences followed the same pattern of results as those described here, but as this exact-matched measure was less inclusive of relevant previous experiences in the same genres, the experience depth measures reported were those that measured all previous experience in the focal genres.

represented in a new project over the three years prior to producing a new movie, and ranged in experience depth from 0 to 17 previous films.[11]

Breadth of Organizational Experience. The third independent variable measured the breadth of an organization's prior experience. Breadth in a production company's experience was measured with a count of the number of unique genres in which a production company had produced movies in the previous three years. These different categories reflect potentially unique knowledge domains, and represent the breadth of an organization's experience with different types of movie products. Again, in the case of movies that fell into more than one genre, the production company was credited with experience for all of the genres associated with a particular film. Thus, if a film was classified as a crime-drama, a firm would get credit for both 'crime' and 'drama.' Again, the 15 primary movie genres are provided in Appendix B, and are based on the genres provided by Miller and Shamsie (1996). The average firm in our sample had produced movies in about five different genres over the three years prior to producing a new movie, and ranged in experience breadth from 0 to 12 unique genres.

Dependent Variables

A significant advantage of choosing the Hollywood motion picture industry as a setting for this research was the availability of unique and consistent performance criteria for evaluation over time. As organizational performance is a complex construct with

[11] Similar to the issues in the previous footnote, another potential question regards the number of films that were classified as representing more than one genre (74% of the films). In calculating the experience of production companies, these firm's experience making prior films in any of the genres of the current movie were added together to give a full picture of the accumulated experiences of such firms. However, this could potentially inflate the experience numbers of firms that had produced many films that were classified with multiple genres. To assess the influence of this issue, alternative measures were calculated that averaged the experiences of a firm making films in each genre represented in a current film rather than adding them together. The results were identical, in many cases identical to the third decimal place.

many different indicators (March & Sutton, 1997), several different indicators of organizational performance were analyzed to provide a rich view of the effects of organizational experience on such performance. These various indicators of organizational performance fall into two categories – overall performance and blockbuster performance.

Overall Performance. The first category of dependent variables was a set of indicators that assessed overall performance. In Hollywood, overall performance is a complex concept. For most, success is measured by the money generated by a film – its commercial / popular success at the box office. For others, however, success for a film is measured by the critical acclaim generated by a film, the degree to which the film is viewed to be a masterful artistic creation. To assess both of these types of success, overall performance for films was assessed in both ways to measure both the commercial and critical success of a film. First, overall commercial success was assessed by examining the total box office revenue generated (in U.S. dollars) from the U.S. release of each of the firm's films. This is the most widely used criterion for performance in the motion picture industry. Second, critical movie success across movie projects was assessed using the evaluations of professional movie critics from major news media outlets in the United States. These evaluation ratings of professional critics were gathered from an industry source of such ratings, rottentomatoes.com, and averaged to create a composite critical rating score. In these data, movies were evaluated by an average of 41 professional critics[12]. As an example, a representative movie from the dataset was "Enemy of the

[12] An alternative approach to the use of all professional critics reported by rottentomatoes.com was the use of a selective group of the top, most nationally influential movie critics from around the country (the cream of the crop of professional movie critics). Analyses that utilized only the ratings of this more selective

State," an Adventure-Thriller starring Will Smith and Gene Hackman, which was evaluated by 65 professional critics ranging from Peter Travers of *Rolling Stone* magazine to James Sanford of the *Kalamazoo Gazette*.

Blockbuster Performance. The second category of dependent variables included indicators that assessed blockbuster performance. In this case, again both critical and commercial success metrics were used to provide alternative views of stand-out performance. A 'critical blockbuster' was identified as a film with a cumulative professional critic rating that was at least one standard deviation above the mean critical rating for films in a particular genre in a given year. This was dummy coded as a '1' for critical blockbusters and '0' for other films. The second measure - a 'box office blockbuster' – was assessed similarly, but using box office revenue instead of critical ratings. This was dummy coded as a '1' for blockbuster hits and '0' for other films[13]. In addition, although these two measures assess the degree to which a focal project resulted in blockbuster performance relative to other films in the market in a given year (overall market blockbuster), the behavioral theory of the firm (Cyert & March, 1963) argues that it is also important to consider the degree to which a film was a blockbuster *for the production company that produced it* (firm-specific relative blockbuster), regardless of how it compared to other films in the overall marketplace. Thus, two additional variants of blockbuster performance assessed the degree to which a particular film was a 'critical blockbuster' or 'box office blockbuster' relative to the performance of the production

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group of critics provided consistent results with those reported in the results tables, but with a smaller sample of films, as these top critics evaluate a smaller percentage of Hollywood films.

[13] To assess the robustness of these genre-specific blockbuster measures to the comparisons of films to all films in the marketplace, rather than just in the same genre, alternative models were examined that compared a film's performance to all other films in the marketplace (absolute blockbusters). These were no systematic differences.

company's own previous work. Firm-relative blockbuster performance was assessed as box office revenues or critical ratings more than one standard deviation above the firm's previous performance[14].

Controls

To control for potential alternative explanations of results or the effects of other influential factors, several additional variables were included in the analyses as control variables. First, the budget of a film was included as a control, as the money put into making a film has an important role in the success of the film, particularly for the commercial success measures (i.e. big budget versus small budget films). Second, dummy variables for the year a movie was produced were included to control for differences over time in models of overall performance (Table 9). Time was already controlled in the blockbuster-based dependent variables by assessing blockbuster status within year, so period controls were not included in Tables 10 or 11 (though the inclusion of such controls had no effect on the results). Third, the number of screens the film was initially released on to audiences was added to control for the impact of breadth of release on performance. Fourth, in cases where the core production companies (with studio affiliations) brought on other production companies as partners to create a new film, a variable measuring the number of partners involved was included to control for the influence of such partners.

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[14] A firm's previous performance was judged by the performance of their 5 most recent films. If the firm had not produced five previous films, the comparison would be the performance of the current film relative to all previous films the firm had produced. Alternative versions of this measure compared the performance of the current film to the previous 3 films the firm had produced, or all of the films a firm had produced in the previous 3 to 5 years. Further, as calculating a standard deviation on only a few films could be comparing current performance to a very small number of previous films (e.g. the standard deviation of performance on only 2 or 3 previous films), alternative models were also evaluated that only analyzed firms that had 5 or more films from which to calculate a standard deviation. All comparison windows provided identical results, with only small changes to the actual effect coefficients.

Analyses

The data were analyzed using panel regression in the statistical package Stata. For the regressions involving blockbuster performance, the binary nature of the dependent variable required the use of panel-based logistic regression (Greene, 2003). Hausman tests (Hausman, 1978) were used to determine if firm-specific fixed or random effects estimators were appropriate for the various models by testing the null hypothesis that the coefficients estimated by the more efficient random effects estimator were consistent with those estimated by the fixed effects estimator (Stock & Watson, 2003). Hausman tests on all models (insignificant) suggested that random effects regressions were appropriate for the analyses. Variance inflation factors were used to assess the potential for multicollinearity in the data. Despite significant correlations between several individual measures (e.g. 0.85 between two of the experience indicators and 0.84 between breadth of opening distribution release and box office revenue), calculated variance inflation factors indicated that the collinearity in the data did not reach problematic levels (Kutner, Nachtsheim, and Neter [2003] suggest average VIFs above 4 can be biasing; no VIF was higher than 2, except in models where all three types of experience were considered together), indicating that the presence of some collinearity was not enough to bias the results of the analyses. Still, given the high individual correlations between variables in certain models, and particularly given the high correlations between experience variables, alternative specifications of models are presented in sequential order to show the effects of different subsets of variables and to investigate the influence of multi-collinearity in the data.

Table 8 – Descriptive Statistics and Correlations

	Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12
1.	Overall Experience (# Prior Movies Made in any Genre)	8.31	12.23	--											
2.	Experience Depth (# Prior Movies Made in Same Genre as Focal Film)	2.46	3.88	.85	--										
3.	Experience Breadth (# of Unique Genres Represented in Prior Films)	4.96	4.18	.84	.75	--									
4.	Production Budget[1]	17.16	0.88	.06	.03	.08	--								
5.	Breadth of Opening Release (# screens)	1800	904	-.01	-.04	-.04	.67	--							
6.	# Production Partners	2.78	1.53	-.07	-.04	-.03	.04	-.01	--						
7.	Box Office Revenue[1]	16.45	2.02	.04	.03	.01	.64	.84	-.03	--					
8.	Critical Ratings	5.25	1.39	-.02	-.01	.02	.16	.00	-.01	.26	--				
9.	Box Office Blockbuster	0.36	0.48	.03	.08	-.01	.23	.31	-.05	.46	.26	--			
10.	Critical Blockbuster	0.11	0.31	.03	-.01	.01	.14	.07	.05	.22	.57	.08	--		
11.	Firm-Relative Box Office Blockbusters	0.12	0.32	.22	.18	.27	.21	.24	.10	.30	.14	.25	.08	--	
12.	Firm-Relative Critical Rating Blockbusters	0.07	0.26	.18	.14	.28	.11	.05	.04	.14	.38	.15	.27	.41	--

Correlations greater than .07 are significant $p < .05$. Correlations greater than .10 are significant $p < .01$.
[1] Due to unit size differences the natural log of these variables was calculated.

Table 9 – Panel Regressions for Depth and Breadth of Experience to Overall Performance

		Box Office Revenue					Critical Ratings				
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
Controls	Period Controls[1]	**	**	**	**	**	**	**	**	**	**
	Production Budget	.21***	.21***	.21***	.21***	.21***	.42***	.43***	.43***	.43***	.42**
	Breadth of Opening Release	.01***	.01***	.01***	.01***	.01***	-.01***	-.01**	-.01***	-.01**	-.01***
	# Production Partners	-.01	-.01	-.01	-.01	.01	-.02	-.02	-.02	-.02	-.03
Overall Level of Experience	# Prior Movies Released by Firm in any Genre		.01			-.01		-.01			-.01
Depth of Experience	# Prior Movies Made in Same Genre as Focal Film			.03*		.04*			-.02		.03
Breadth of Experience	# of Unique Genres Represented in Prior Films				.01	.02				-.01	-.01
	Constant	10.51***	10.52***	10.52***	10.57***	10.55***	-1.49	-1.54	-1.52	-1.49	-1.44
Wald χ^2		1179***	1178***	1187***	1180***	1195***	25.73**	26.68**	26.61***	25.74**	27.78***
R^2		.69	.69	.70	.69	.71	.05	.05	.06	.06	.06
N		559	559	559	559	559	488[2]	488[2]	488[2]	488[2]	488[2]

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include period effects but their coefficients are not included in this table.

[2] Models 6 through 10 had fewer observations due to 71 films missing available critical rating data.

Table 10 – Logistic Panel Regressions for Depth and Breadth of Experience to Blockbuster Box Office Performance

		Box Office Blockbusters					Firm-Relative Box Office Blockbusters				
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
Controls	Period Controls[1]	**	**	**	**	**	**	**	**	**	**
	Production Budget	.15	.15	.13	.15*	.16	.40	.30	.36	.27	.30
	Breadth of Opening Release	.01***	.01***	.01***	.01***	.01***	.01***	.01***	.01***	.01***	.01***
	# Production Partners	-.05	-.04	-.04	-.04	-.04	-.03	.00	-.01	.03	.02
Overall Level of Experience	# Prior Movies Released by Firm in any Genre		.01			-.02		.06**			-.04
Depth of Experience	# Prior Movies Made in Same Genre as Focal Film			.06*		.14**			.13**		-.05*
Breadth of Experience	# of Unique Genres Represented in Prior Films				.01	.00				.33***	.50***
	Constant	-4.53†	-4.48†	-4.46†	-4.49†	-4.76†	-12.06**	-11.45**	-12.02**	-12.82**	-13.64**
Wald χ^2		56.18***	56.67***	58.19***	56.22***	61.67***	39.99***	50.67***	44.48***	61.43***	60.45***
N		559	559	559	559	559	559	559	559	559	559

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include period effects but their coefficients are not included in this table.

[2] Models 6 through 10 had fewer observations due to 71 films missing available critical rating data.

Table 11 – Logistic Panel Regressions for Depth and Breadth of Experience to Blockbuster Critical Ratings Performance

		Critical Blockbusters					Firm-Relative Critical Rating Blockbusters				
Group	**Variable**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
Controls	Period Controls[1]	**	**	**	**	**	**	**	**	**	**
	Production Budget	.67*	.68*	.68*	.68*	.67*	.57†	.50	.53	.48	.51
	Breadth of Opening Release	-.01	-.01	-.01	-.01	-.01	-.01	.00	.00	.00	.00
	# Production Partners	.02	.02	.02	.02	.02	.09	.10	.09	.14	.13
Overall Level of Experience	# Prior Movies Released by Firm in any Genre		.00			.00		.04***			-.05
Depth of Experience	# Prior Movies Made in Same Genre as Focal Film			-.02		-.02			.09**		-.05**
Breadth of Experience	# of Unique Genres Represented in Prior Films				.01	.01				.24***	.47***
	Constant	-13.60**	-13.61**	-13.58**	-13.61**	-13.58**	-12.40**	-11.69*	-12.05*	-13.14**	-14.66**
Wald χ^2		16.56*	16.61*	16.66*	16.58*	16.66†	14.85*	27.91***	22.50**	43.51***	44.28***
N		488[2]	488[2]	488[2]	488[2]	488[2]	488[2]	488[2]	488[2]	488[2]	488[2]

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Models include period effects but their coefficients are not included in this table.

[2] Models had fewer observations due to 71 films missing available critical rating data.

Results

Table 8 provides correlations and descriptive statistics for the variables in the analyses. Tables 9, 10, and 11 provide the results for hypothesis testing. The analyses provide mixed support for Hypothesis 1. In fact, the analyses provided no support for the effects of overall experience on overall performance, in terms of box office or critical ratings. However, there is some evidence that when considered alone, overall experience does help firms to create firm-relative blockbusters (see Model 7 on both Tables 10 and 11) both in terms of critical and box office success. This effect is overwhelmed by the effects of experience breadth when considered together. In total, the results provide, at best, some mixed support for the universalistic perspective. The results also provide support for Hypothesis 2. Model 8 on Tables 10 and 11 provide support for Hypothesis 2, suggesting that increasing levels of experience breadth do promote blockbuster performance relative to a firm's previous success. Further, in models that consider all three types of experience, the effect of experience breadth overwhelms the influences of any other type of experience, suggesting that breadth really drives the creation of firm-relative blockbusters over time (see Model 10 on both Tables 10 and 11). However, these effects were not found with broad market-based indicators of blockbuster performance. The results also provide a mix of support for Hypothesis 3. When considered in isolation, depth was found to enhance the likelihood of blockbuster performance, in terms of market-based and firm-relative box office blockbuster performance, and in terms of firm-relative critical blockbuster performance. This finding was opposite to the premise of Hypothesis 3. However, support for Hypothesis 3 can be found in Model 10 on both Tables 10 and 11, where the effects of experience depth

significantly negatively influence the creation of firm-relative blockbusters when the effect of experience breadth is controlled in a fully saturated model. This flipped sign issue points to an important finding that deserves a little extra attention. When considered in isolation, the independent effects of different types of experience can be significant and positive (e.g. Model 8 in Tables 10 and 11) but then flip signs and be a significant and negative (e.g. Model 10 in Tables 10 and 11) when considered jointly with other experience constructs. For example, in Model 8 from Table 10 the effect of experience depth is positive and significant in predicting box office blockbusters, but reverses sign when its shared variance (its correlation with experience breadth is .75) is partialed out in a more saturated model and it is left to only explain its unique variance. Thus, when considered alone, experience depth helps to promote firm-relative blockbusters, but this effect is largely driven by its proxying effect for experience breadth. When the two are allowed to account for only their unique variance, the effect of depth actually hurts a firm's chances for achieving a blockbuster (as hypothesized in Hypothesis 3). This situation provides a major caution for the evaluation of the effects of experience in the broader experiential learning literature, and provides strong evidence for the need to examine multiple types of experience in research.

DISCUSSION AND CONCLUSION

These results provide some support for both the universal and contingency perspectives, but overall fairly limited support for the universalistic perspective. It is simply not clear that *any experience* is *valuable experience*. In fact, in many models experience just did not matter (non-significant findings). Further, in other cases overall experience did not matter, but more specific types of experience were very significant

(depth in some cases, breadth in other cases). Thus the conventional 'common sense' is not quite as obvious as it may seem. The implications of this research can be broken down into three categories.

First, this research has implications for experiential learning theory and research. Experiential learning research has made significant progress in recent years, and the current findings help to advance this research in several ways by both providing new answers and raising new questions. Although the primary contingencies hypothesized focused only on the type of experience (depth and breadth) and the type of performance (blockbuster) as contingencies, these results provide strong evidence for the importance of several contingencies for the relation between organizational experience and performance. Specifically, contingencies found to have an influence on the results included the type of experience (depth, breadth, and overall), the type of performance assessment (overall performance vs. blockbuster success), the audience for these performance evaluations (critical ratings vs. commercial success), and the locus of performance evaluation (internal reference points or market-based comparisons). Each of these different contingencies played a role in the results presented here, highlighting the complex nature of experiential learning in organizations. In fact, these results may point to a big-picture contingency perspective, where in some cases the universal perspective may have some merit. However, in most cases, various contingencies influence the effect of experience on performance.

Another potential contribution of these findings for experiential learning research is that these findings suggest that previous research on organizational learning from experience may be misleading. Most notably, these results suggest that we may want to

re-examine prior findings on the relation between organizational experience and performance. In these data, although an overall measure of experience was significant in some models when considered in isolation, more precise measures of experience overwhelmed the effects of this generalized measure. Further, in cases where the overall measure of experience was not significant, other more specific measures of experience were significant. Due to the nature of publishing standards in the organizational sciences, non-significant results often do not get published (Rosenthal, 1979; Sigelman, 1999). This suggests that re-examining previous research for non-significant findings that simply employed generic 'overall' experience measures might be fruitful grounds for examining the effects of more specific measures of organizational experience or different types of performance evaluations. As 'overall' experience measures are common, particularly in organizational theory and strategy research for which experiential learning is not the primary focus, this potentially represents a fair number of studies to re-examine.

Second, this research has implications for organizational performance research. Most notably, these findings provide evidence that research on organizations should continue to branch out to consider alternative approaches to performance. As different approaches to performance have both theoretical (the subjective evaluation of creativity vs. financial performance) and practical (the need to achieve a blockbuster hit to establish a reputation or even survive in an industry) roots and implications, there is a need for more diverse methods to evaluate organizational performance. As was demonstrated in this research, each of the three different approaches to performance considered here was found to be uniquely influenced by experiential learning. These included the type of performance assessment (overall performance vs. blockbuster success), the audience for

these performance evaluations (critical ratings vs. commercial success), and the locus of performance evaluation (internal reference points or market-based comparisons). Further, this highlights the need for more research into the nature of creative success, and how such perceptions are formed. Interestingly, the formation of creativity perceptions has received little attention in the organizational literature (Amabile, et. al, 1996; Flowers & Garbin, 1989). Given the importance of critical ratings in many entertainment contexts (art, music, theatre, etc.) and the increased prominence of design and aesthetics in product development (Eisenman, 2007; Nussbaum, 2004), this represents an important line of inquiry for future research.

Third, this research has implications for the industry and for practicing managers. For the movie industry, these results confirm the folk wisdom that very little helps to predict what positively influences critical ratings (see Models 6-10 in Table 9 and Models 1-5 in Table 11). This builds on the earlier point that we simply do not have much research on this important performance outcome, despite its importance to industry. However, these results do provide a clearer path for production companies that hope to improve their own results over time through experience, and provide some insight on how to create box office blockbusters (via depth and breadth of experience). For the broader practitioner audience, this research also has several implications. First, it points to the differing effects of organizational experience depth and organizational experience breadth. Such differences could have important policy implications for organizations attempting to become 'learning organizations' (Senge, 1990). Further, this research in some ways refutes the generalized idea that "any experience is good experience" common sense widespread among executives, as many models had non-significant

results, or even negative relations as the effects of organizational experience. Thus, corporate executives should be more discriminating in considering organizational experience, to carefully consider the type of experience that would best suit the organization and its performance goals.

In conclusion, the goal of this research was to shed new light on the nature of experiential organizational learning by probing differences between different types of organizational experience and performance. In doing so, several avenues for future research have been uncovered. Hopefully this will encourage more research into some of these complex but interesting questions.

CONCLUSION

In reflecting back on the core themes of this dissertation, these three chapters help to overcome several significant limitations in the traditional organizational experiential learning literature. As has been a consistent theme throughout this dissertation, historically research has made generalizations about organizational experience that have limited the scope of this work. Further, and perhaps more importantly, almost no research has considered different types of experience simultaneously to disentangle the unique and joint influences of different types of experience. This dissertation has helped to address these shortcomings in several ways.

Chapter 1 developed a new theoretical model of organizational experience to help disentangle these different types of experience. The key to this effort was bringing together micro-level research (e.g. Tesluk & Jacobs, 1998) and integrating it with more recent advances in organizational-level research (e.g. Nerkar & Roberts, 2004), with Table 1 as the result. This integration was critical to the development of the rest of the dissertation, where these different types of experience were used to motivate new directions in several firm processes and outcomes. Continuing on with Chapter 1, this framework provided a new theoretical approach to the antecedents of search in firms, a new direction for the line of work launched by Cyert and March (1963). In Chapter 2, this framework helped to motivate new theoretical directions in the origins of knowledge creation in firms, responding to calls for such work from Nonaka and colleagues (Nonaka, von Krogh, & Voelpel, 2006) where different types of experience were hypothesized (and found) to promote different knowledge creation outcomes. Finally, in Chapter 3, this new framework provided the base for hypothesizing differential

theoretical links between different types of organizational experience and different firm outcomes (universal and contingency perspectives), answering the call for such work from Argote (1999).

In addition to these new theoretical directions, in Chapters 2 and 3 the problems with prior research approaches to organizational experience were demonstrated empirically. Without these empirical tests, the premise of this dissertation that different types of organizational experience have different influences on firm processes and outcomes would simply be a theoretical exercise. With these empirical chapters, these criticisms are borne out with empirical evidence. In fact, in two very different industrial settings, different types of organizational experience were found to have very different relations with knowledge creation and performance. Further, and a more important critique of the previous literature, is my consistent finding that even when some measures of experience are not significant, specific types of experience can be significant, and have different signs. This suggests that prior research that has only considered a single type of experience in a study may not be providing a full picture of the nature of experiential learning. As was demonstrated in Tables 10 and 11, in many cases when individual metrics were considered in isolation their effects were dramatically different (in sign and significance) than when considered jointly with other types of experience together. This suggests that prior findings presented in the traditional organizational learning literature might be worth revisiting to assess whether the found relations were the result of true findings or proxy effects for an unmeasured dimension of experience. In these cases it is at least possible that the unique influences of found relations might be subject to change.

In addition to these broad implications for the organizational learning literature, together the three chapters in this dissertation also provide a wide set of specific new findings regarding the nature of organizational experience and learning. Starting in Chapter 2, there are several findings regarding the nature of organizational experience and knowledge creation of note. First is the split finding regarding the influence of experience depth on the creation of high impact knowledge. As expected, time-based approaches were negatively related to impact (core-rigidities). However, quantity-based approaches were positively related to impact. This raises interesting questions about prior research, which has alternated between these two measurement approaches (time and quantity) without much theoretical basis, suggesting notable differences that need to be explored. In addition, the results regarding experiential breadth are also intriguing, as they also split a construct that was hypothesized to be uniform. In fact, organizational breadth (working for a wide variety of companies) and technological breadth (working in a wide variety of different technical areas) were found to have distinctly different influences on knowledge creation in the pharmaceutical industry. Finally, in this chapter experiential diversity was introduced to consider how mixed teams of scientists with varying levels of experience were able to work together to create new knowledge. Although some types of diversity had the expected positive influence on knowledge creation with diminishing returns, other types of diversity had negative influences on the impact of knowledge creation efforts. Probing further into these differences will provide new directions for future research.

Chapter 3 also provides evidence for several expected relations together with several surprising findings. In this case, the relations between different types of

organizational experience and performance were found to vary across several different contingencies, including the type of experience (depth, breadth, and overall), the type of performance assessment (overall performance vs. blockbuster success), the audience for these performance evaluations (critical ratings vs. commercial success), and the locus of performance evaluation (internal reference points or market-based comparisons). A particular strength of chapter 3 was the evaluation of experiential learning influences on a wide variety of related but distinct forms of performance. The fact that these different types of performance, though related, provided a fair degree of divergence in significance and signs in relations provides a strong argument for a broader approach to the study of organizational learning in future research.

In addition to these contributions to organizational learning research, this research provides several findings relevant to organizations and their managers. Most notably is the potentially differential value of different types of experience for organizations. By raising serious challenges to a universalistic perspective of 'any experience is good experience' and demonstrating a disparity in the value of different types of experience in different settings, this research cautions managers in their pursuit of creating learning organizations. In particular, this research suggests that managers should assess their vision for organizational learning, and then build experience strategically to support such learning goals.

In addition to the directions described above, this research also provides additional new directions for future research to uncover the power of experiential learning in all of its forms. In particular, there is a significant opportunity to explore the dimensions of organizational experience that diverged in these analyses (time vs.

quantity, organization vs. technical breadth, etc.) to provide theoretical direction in these cases. A starting point may be to look back before looking forward, to re-examine existing research in the learning curve tradition for evidence of time-based vs. quantity-based splits in prior research that were potentially disparate and have escaped attention. In addition to exploring these differences, Chapter 1 in particular provides a big picture vision for the future of organizational learning research to push further into the dimensionalization of experience. If the empirical results of Chapter 2 and 3 are any indication, then further research into the timing, density, complexity, and other dimensions of experience may hold additional promise in understanding the rich dynamics of experiential learning in and by organizations. Further, although micro-mediational mechanisms were largely beyond the scope of this research, the divergence in significant relations between different types of experience may suggest that different mediational processes may lie between these experiences and various outcomes. By pressing down into the different influences of experience on behavior, norms, routines, and culture in organizations we may find notable differences to support these divergent findings.

Finally, as has been highlighted throughout the conclusions of the chapters, this research provides significant cautions for the field against simple approaches to experiential learning in organizations. With singular approaches to experience or unsophisticated measures, there is a strong potential for oversimplification of experiential learning models into heuristics that may be unpredictable in different settings. This leads to a real possibility for unreliability in research findings, and even a potential for opposite significant relationships (due to unmeasured proxy effects). Hopefully, this dissertation

provides caution for the field in the future measurement and conceptualization of organizational learning research.

APPENDIX A: Pharmaceutical Sub-Domains

Industry SIC Codes:

283 Drugs
- 2833 Medicinal Chemicals and Botanical Products
- 2834 Pharmaceutical Preparations
- 2835 In-Vitro and In-Vivo Diagnostic Substances
- 2836 Biological Products, Except Diagnostic Substances

Corresponding NAICS Codes:

3254 Pharmaceutical and Medicine Manufacturing
- 325411 Medicinal and Botanical Manufacturing
- 325412 Pharmaceutical Preparation Manufacturing
- 325413 In-Vitro Diagnostic Substance Manufacturing
- 325414 Biological Product (except Diagnostic) Manufacturing

APPENDIX B: Film Genres

1	Adventure
2	Animated
3	Comedy
4	Crime
5	Drama
6	Fantasy
7	Historical
8	Horror
9	Musical
10	Mystery
11	Romance
12	Sci-Fic
13	Thriller
14	War
15	Western

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