Learning Ambidexterity in Organization

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Dedication

This dissertation is dedicated to my children, Anthony and Shayna,

and to my wife, Kimberly, for their belief in me.

Acknowledgments

My fascination with high-performing teams, helpfulness, and connectedness with others and the recognition of individual diversity in organizations has been with me all my life. Several experiences in my life have punctuated these feelings and brought them to the forefront. Academia has provided a place to explore them, a forum to discuss them, and a glimpse of how to incorporate them into present and future behavior.

Being a member of the Executive Leadership Program gave me the privilege of learning alongside my Cohort 23 classmates. I am grateful for the conversations, insights, and many hours of learning and exploring together. In particular, I'd like to acknowledge my comprehensive study team for challenging me and being patient with me. I'm a better scholar for having studied with each of them.

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My parents, although they left long ago, were a source of motivation in providing me with the inspiration to renew and improve my family's legacy for my children and family in attempting to demonstrate hard work, health, perseverance, and continuous learning as a way in which to improve one's life for oneself, one's family, and society.

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Lastly, I'd like to acknowledge my wife, Kimberly. Without her continued support and strength, these studies would have been impossible. I thank her for all the long weekends alone with the kids, for absorbing all my stress and tension, for pushing me to continue on, and for listening to hours of one-sided conversations. Most of all, I want to thank her for postponing her dreams so I could pursue mine.

Abstract of the Dissertation

Learning Ambidexterity in Organization

As organizational exploitation drives out exploration, companies must reach beyond traditional organizational learning practices to become learning organizations, learning in action as they also perform. As traditional companies tip the balance between entropy and negative entropy, they ultimately begin to focus almost exclusively on evolutionary learning and refining more of what they already know.

High-Tech Optics avoided this success trap of focusing on past performance by routinely assessing and perturbing its cultural and structural inertia and continually reaffirming that performance and learning should be integrally linked objectives. Exploitation was kept from crowding out exploration by several factors, namely the company CEO and the ambidextrous organizational culture. When learning was emphasized, it was in the context of ambidextrous learning, not simply a reference to incremental learning associated with the refinement of existing products and processes. Instead, this company's learning fell across a spectrum, from learning within a specially created structurally ambidextrous space to research projects, customer problem solving, perturbing its own processes, and helping others.

This qualitative single-case study, with its nine findings and four conclusions, strongly suggests not only that it is possible for organizations to learn ambidexterity, but that such learning most likely happens in all organizations. This study discovered that High-Tech Optics naturally converged on all three kinds of ambidexterity: contextual, structural, and temporal. What might not be possible, or natural, for most organizations, however, is the sustainment of ambidexterity, learning how to make an ambidextrous

culture permanent. Remarkably, High-Tech Optics, a manufacturing company, emerged as an ambidextrous organization naturally over time, but then deliberately set mechanisms, structures, and processes in place to continue these behaviors indefinitely.

The main implication for practitioners is to consider an ambidextrous plan for their own organizations. As exploitation tends to drive out exploration as organizations mature, favoring what is already known over what is new, organizations should not forget their early explorative learning behaviors.

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CHAPTER 1:

INTRODUCTION

Overview

Whether a company starts out with a focus on exploration or exploitation within the marketplace, the intent of all productive organizations (Katz & Kahn, 1966) is to exploit the market with known skills, abilities, or products, dominating it in production, performance, and market share. Eventually, however, many of these organizations fall into decline because they adopt a myopic bias in which exploitation is routinely overemphasized and practiced at the expense of exploration (Denrell & March, 2001; Fang, Lee, & Schilling, 2010; Levinthal & March, 1981). The price they pay for abandoning exploration is a race to suboptimal performance (Fang et al., 2010) grounded in the laws of bounded rationality (Simon, 1979), with the intent of discovering more salient, familiar, and immediate answers (Fang et al., 2010).

Unlocking the secrets of the ambidextrous organization—an organization that engages in both exploitative and explorative behavior—is the focus of this research. This study can provide practitioners and organizations with valuable insights into previously unconsidered moderators, antecedents, practices, and concepts necessary to become an ambidextrous organization. Though many studies have discussed aspects such as moderators (Gibson & Birkenshaw, 2004; Jansen, Van den Bosch, & Volberda, 2006; Rothaermel & Alexandre, 2009; Siren & Kohtamaki, 2010), antecedents (Gibson & Birkenshaw, 2004; Jansen, Van den Bosch, & Volberda, 2005, 2006), and specific exploitative and explorative behaviors (Afuah, 2001; Burt, 2004; Dover & Dierk, 2010; Jansen, Tempelaar, Van den Bosch, & Volberda, 2009; Jensen & Szulanski, 2004;

Rothaermel & Alexandre, 2009; Siren & Kohtamaki, 2010; Szulanski, 1996; Tushman & O'Reilly, 1996; Unsworth, 2001), researchers have yet to consolidate these findings and link them to the constructs of culture and learning, which is the intent of this research.

In regard to learning, ambidextrous companies have also bridged a gap between the concept of organizational learning and that of being a learning organization (Schwandt & Marquardt, 2000). Effectively, these companies have learned the practice of "learning in action," in which programmed knowledge is combined with questioning and reflection, and group learning shares an equal place with problem solving and performance (Schwandt & Marquardt, 2000, pp. 148-149).

The notion of having a template to follow in order to leverage the benefits of ambidextrous behavior is an inviting one. While this study cannot produce a bona fide list that would apply to every organization and context, it reveals principles that can be generally applied, considered, and used as a foundation for further inquiry. Utilizing the constructs of organizational learning and culture combined with the concept of ambidexterity, this single-site case study reveals the forces in motion within organizations that create and sustain the ambidextrous organization.

Statement of the Research Problem

Companies that exclusively adopt an exploitation orientation—a "lather, rinse, and repeat" production and performance cycle with no thought given to explorative innovation—risk losing an opportunity for a balance between exploitation and exploration and risk losing the ability to learn in a way that will guarantee sustained long-term performance and success (Fang et al., 2010; Tushman, Smith, & Binns, 2007).

When this occurs, these companies may discover that they have inadvertently placed an organizational expiration date upon their heads.

Because organizations seldom consider ambidextrous behavior, they are unaware of the evolutionary changes they undergo that favor exploitative over explorative behaviors (Suzuki, 2013). As a result, companies are often left believing they no longer have the resources, knowledge, or ability for growth through exploration. For a few resourceful companies, however, the solution to this dilemma is the discovery and practice of ambidexterity (March, 1991), the ability to simultaneously be exploitative and explorative in the marketplace, managing both aspects in a pattern and balance that promote the best compromise in short-term and long-term performance (Benner & Tushman, 2003; Raisch, Birkenshaw, Probst, & Tushman, 2009).

Companies with both explorative and exploitative characteristics are prevalent in various proportions, from mostly exploitative to predominantly explorative, and in different stages of maturity, from young startups to old institutions. An unfortunate dilemma that emerges causes these organizations to eventually assume a "one-size-fits-all" model for their organizational processes, and any evolutionary process towards ambidexterity stops or is ignored in favor of an evolution towards converging exploitation. As one researcher characterized it, they have encountered the fortunate misfortune of falling into a success trap brought about and perpetuated by cultural or structural inertia (Tushman & O'Reilly, 1996).

Purpose and Research Questions

The purpose of this study is to explore how ambidextrous organizations are created and sustained through organizational learning and culture. This study explains

how one organization successfully navigated its evolutionary journey to become a functioning ambidextrous organization. This study additionally explores moderators, antecedents, and behaviors that may determine organizational success and introduces new models that examine organizational learning cycles that connect the dual structures of exploitation and exploration.

This study addresses four primary research questions (RQs) regarding organizational ambidexterity in two primary research areas (RAs): how organizations achieve and sustain ambidexterity:

RA1: How did the organization become ambidextrous?

RQ1: *What are the behaviors and conditions that encourage market exploration?*

RQ2: *What are the behaviors and conditions that encourage market exploitation?*

RA2: How does the organization sustain ambidexterity?

RQ3: *What are the behaviors and conditions that encourage the sustainment of market exploitation?*

RQ4: *What are the behaviors and conditions that encourage the sustainment of market exploration?*

The research questions explore the creation and maintenance of ambidexterity at the intersection of organizational learning and culture and the patterns of learning inherent within organizational cultures (Boisot, Nordberg, Yami, & Nicquevert, 2011). The sub-questions focus on the nature of behaviors within the organization in the exploitative and explorative realms within ambidexterity and were addressed through interview questions.

Study Significance

This study and its research is significant because the exposure and validation of ambidextrous organizations (Andriopoulos & Lewis, 2009; Dover & Dierk, 2010; Jaussi & Dionne, 2003; March, 1991; Pascale, 1999; Rothaermel & Alexandre, 2009) and knowledge of their complex structure will enable companies to attain a deeper understanding of their unique organizational landscapes. As a result, companies will be able to make richer and more beneficial leadership, cultural, and management-based decisions based on this understanding of both the exploitative and explorative sides of their organizations. In addition, this work reveals the subtle relationships between learning, culture, and ambidexterity, highlighting the antecedents, moderators, and behaviors that comprise an ambidextrous organization. This study has the potential to contribute not only to practice but also to social science theory, and it lends itself as a base for further research on the constructs of organizational structure and complexity science.

Conceptual Framework

The constructs and concepts in this study are grounded in *organizational learning* (Fang et al., 2010; Fenwick, 2003; Ingram & Baum, 1997; Kamasak & Bulutlar, 2010; Kumar & Ganesh, 2011; Lam & Lambermont-Ford, 2008; March, 1991; Miller, Zhao, & Calantone, 2006; Pascale, 1999; Prieto, Revila, & Rodriguez-Prado, 2009; Schwandt & Marquardt, 2000; Seidler-de Alwis & Hartmann, 2008; Siren & Kohtamaki, 2010; Wei, Yi, & Yuan, 2011), *organizational culture* with an emphasis on social learning cycles within culture (Boisot et al., 2011; Schein, 1992, 1993), and *ambidextrous organizations* with a focus on their exploitative and explorative components (Birkinshaw & Gibson,

2004; March, 1991; Tushman & O'Reilly, 1996). As shown in Figure 1.1, the conceptual framework considers how the constructs of culture and learning integrate with influencing antecedents and moderators to create and sustain the concept of organizational ambidexterity.

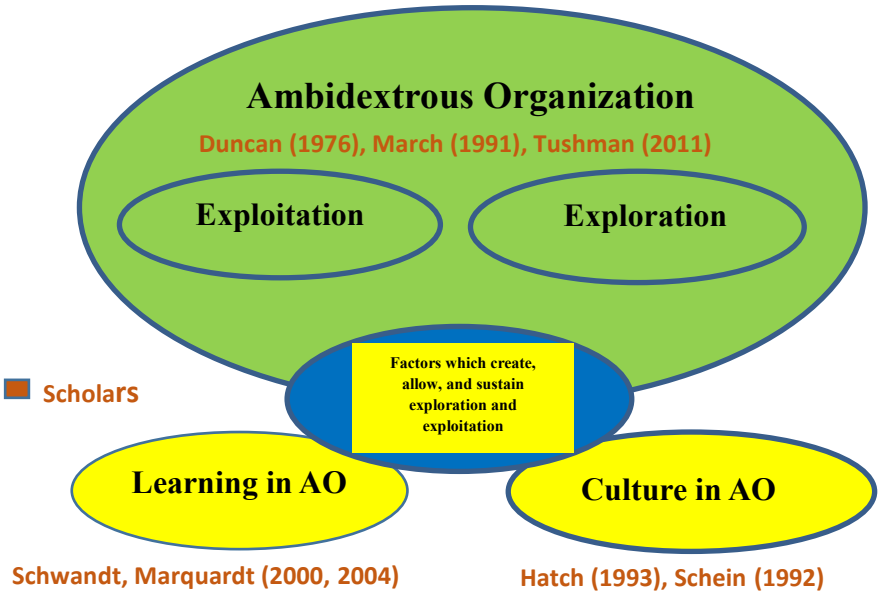

Figure 1.1. Conceptual framework: Main theories and constructs.

The Ambidextrous Organization: Exploitation and Exploration

Virtually all discussions of ambidexterity begin with a reference to March's 1991 work and, because of this reference, include learning as a centerpiece of ambidexterity; thus, learning and ambidexterity have been linked in research conversations almost from the inception of the term. Unlike March, however, Duncan's earlier 1976 work on ambidexterity, which coined the phrase "ambidextrous organization," centered instead on the dual structures of exploitation and exploration and the action of switching between the two. Together, these two seminal theorists and their initiating conversations on

learning and the action of structures within ambidextrous organizations represent foundational discussions on ambidexterity that have persisted for well over 30 years.

Ambidexterity involves the simultaneous execution of both exploitation and exploration. Exploitation—the use and refinement of existing knowledge within an organization's internal domains (Suzuki, 2013), associated with existing improvements, increased efficiency, and incremental adjustments (March, 1991)—has been characterized in the literature using terms such as refinement, choice, production, efficiency, execution, structural and cultural inertia, tightly coupled systems, and resistance to change. Exploration—the search for and pursuit of new knowledge within an organization's external domains (Suzuki, 2013), accompanied by variety generation, distant search, risk taking, experimentation, and discovery (March, 1991)—has been characterized in the literature using terms such as variation, flexibility, innovation, organic, informal structure, loosely coupled systems, and emergence (March, 1991). Thus, ambidexterity represents a dichotomy of opposites with dual structures that can work sequentially or in tandem.

Learning in Ambidextrous Organizations

The overarching body of literature regarding organizational learning (Argyris & Schon, 1978; Fiol & Lyles, 1985; Levitt & March, 1988; Nonaka & Takeuchi, 1995; Schwandt & Marquardt, 2000) discusses the ways in which organizations learn, adapt, and change. In defining organizational learning, Fiol and Lyles noted that "organizational learning refers to the process of improving actions through better knowledge and understanding" (1985, p. 803). They concluded their research by defining learning as "the development of insights, knowledge, and associations between past actions, the

effectiveness of those actions, and future actions" (p. 811). Simon (1991) defined organizational learning as "learning by an individual that has consequences for an organizational decision" (p. 125). In contrast, Weick and Westley (1996) viewed organizational learning as an "oxymoron," given that organizing and learning are "antithetical processes" (p. 440). Finally, while Schwandt and Marquardt (2000) may not disagree with Weick and Westley's assessment of organizing and learning, they would most likely argue that the antithetical characteristic in this union is organizing and what gives organizing an opposing character lies in the relationship between change, learning, and performance.

Learning in organizations is often a tricky endeavor for several reasons, as learning of any kind can be looked upon as a code for change (Owens, 2012), something that individuals naturally resist. Furthermore, organizational learning must often be accompanied by performance, as performance rarely takes a respite for learning in an organizational context (Schwandt & Marquardt, 2000).

A subset of organizational learning, the concept of a learning organization is probably best characterized by Schwandt and Marquardt (2000), who defined it as a difference of process versus product. Whereas organizational learning is a representation of the dynamic human processes required to increase the cognitive capacity of the total organization, a learning organization is one that has executed those processes and achieved a learned end state. More simply put, a learning organization is one that successfully puts learning into action.

Culture in Ambidextrous Organizations

Organizational culture, a discipline born out of anthropology and sociology and first hypothesized in the Westinghouse studies of the 1920s, is still open to new interpretation and discovery. Seminal cultural organizational theorists such as Kroeber and Kluckhohn (1952), Geertz (1973), Schein (1992, 1993, 2003), Hatch (1993, 2004; Hatch & Schultz, 2002; Hatch & Zilber, 2012), and Martin (1992, 2002) theorized and continue to theorize as to both the importance and presence of culture in organizations.

According to Schein, a learning culture is built on the shared assumptions that human beings are "good, proactive problem solvers and learners, dominant over the environment, pragmatic, fully connected, near-future oriented, and diverse; while balancing between individualism and groupism, and between collegial and authoritative relationships" (1992, pp. 364-365). Martin (1992) pointed out that these sentiments may not transfer between different subcultures within the same organization. To achieve this transfer between subcultures, a learning organization depends on cultural understanding and agreement between organizational subcultures, which comes out of dialogue (Schein, 1993).

One individual who has extensively examined cultures and learning across an organizational environment is Max Boisot, and he has recreated the human organizational ecology in the construction and development of the I-Space model and the characterization of clans, markets, fiefs, and bureaucracies within an organizational space (Boisot et al., 2011). Boisot bound these subcultures together as one larger organizational culture along with learning and structure in a cube model to portray social learning cycles throughout an organizational ecology and the complex intricacies they create.

The model is portrayed and utilized in three dimensions, with the outer dimensions representing *codification* (from uncodified to codified along the vertical access of the cube), indexed as the amount of data processing required to distinguish between categories and assign events to these categories; *abstraction* (from abstract to concrete and running along the bottom horizontal front face of the cube), indexed as the number of categories required to perform a categorical assignment; and *diffusion* of data (from undiffused to diffused running along the bottom side axis of the cube), indexed as the amount of codification and abstraction achieved. Along these three axes we can envision data, information, knowledge, or learning moving three dimensionally inside of the cube as it goes from abstract to concrete, uncodified to codified, and undiffused to diffused through the different subcultures within the organizational cube (Boisot et al., 2011, pp. 32-36).

Boisot defined organizational agents as residing in different subcultures and as either impeding or facilitating the social learning cycle within the I-space model. The social learning cycle is defined as the cyclical process of knowledge generation, articulation, generalization, dissemination, internalization, and application and is an emergent outcome of the data processing and transmission activities interacting within and across the different groups (2011, pp. 36-38). Boisot's conceptual framework is discussed further in chapter 2, and in chapter 5 a conceptual model is introduced, landscaping an ambidextrous ecosystem borrowed in part from Boisot's I-Space model.

Summary of the Methodology

A qualitative single-site case study was chosen as the research design for this study because of its ability to provide in-depth understanding of an ambidextrous

organization by focusing on the process rather than the outcomes. An innovative manufacturing organization based in the Great Lakes region of the United States, here called "High-Tech Optics Inc.," served as the study site; its sustained growth in both exploration and exploitation each year made it a good exemplar.

Data was collected through multiple sources, including 20 individual interviews and two focus group sessions; observations of individuals, groups, and organizational artifacts and symbols gained through two week-long visits to the site and attendance at both informal and formal meetings; analysis of documents and historical data; and field notes. Participants were purposely selected (Merriam, 2009) for the interviews and focus groups so as to draw a representative sample of individuals who were senior leaders, senior managers, and shop-floor workers, as well as a representative of a family employee, the newest employee, and the longest-tenured employee.

The goal of the data analysis process was twofold: to formalize generalizations and reduce findings to their lowest common denominator, which can be more broadly overlaid as a template onto other cases, and to incorporate clear bounding of the case and research as well as stated assumptions. With safeguards in place such as bounding of the case, data triangulation, thick and rich descriptions, member checking, and peer debriefing, the qualitative study was strong and responsible, presenting the case in its complexity without eliminating what cannot be discounted.

Limitations

This study involved a single case and was limited by the experiences of one organization and its members. With this said, it could also be argued that the organization's members could carry forward organizational memories from other places

in which they had worked and convey those thoughts during interviews. While the organization was selected as a representative case of an organization that behaves ambidextrously, it operates in one specific high-tech industrial niche. The findings of this study are relevant to theory building on ambidexterity, but are not necessarily generalizable to other organizations (Yin, 2009). The research site was relatively small, and while this allowed for a thorough investigation, it may also present a limitation, as a site bound to a certain geographical location may have participants that are more homogenous than in a site with multiple locations.

Second, the potential for research bias existed. As a scholarly practitioner in human and organizational learning with a special interest in innovation and exploration, I have worked in several organizations that have experienced challenges in behaving ambidextrously and made conscious efforts to be aware of my own biases and experiences as I collected and analyzed data. My personal experiences relate primarily to actions, behavior, and effects of low-level workers and mid-level managers. This study focused on the macro organizational level of analysis, and while leaders were included in the data collection, they were an integral part but not the primary focus of this study. In addition, the literature informed the data collection methodology and methods, as this study sought to identify key aspects from the literature. As this was an exploratory study, I hoped to identify specific behaviors, moderators, antecedents, and phenomena that created and sustained ambidexterity in this organization. With this stated, I made every effort to remain open to possible explanations and new phenomena not derived from the literature.

Definition of Key Terms

The terms presented in this dissertation came from a variety of disciplines, including sociology and management. For the purposes of this study, the following definitions were identified to add clarity and understanding to this research.

Entropy: In a social organizational context, a closed system and its tendency to run down, consume resources, and pursue a static state (Gleick, 2011; Pascale, 1999). The term is also used in sociology as a metaphor for dissipation of energy without renewal.

Episodic change: "Organizational changes that tend to be infrequent, discontinuous, and intentional," which occur "during periods of divergence when organizations are moving away from their equilibrium conditions" (Weick & Quinn, 1999, p. 365).

Exploitation: The use and refinement of existing knowledge within an organization's internal domains (Suzuki, 2013), associated with existing improvements, increased efficiency, and incremental adjustments (March, 1991).

Exploration: The search for and pursuit of new knowledge within an organization's external domains (Suzuki, 2013), accompanied by variety generation, distant search, risk taking, experimentation, and discovery (March, 1991).

Learning organization: "An organization skilled at creating, acquiring, and transferring knowledge and modifying behavior to reflect new knowledge and insights" (Garvin, 1993, p. 4).

Negative entropy: An open system that can undergo the renewal of systems by the introduction of new resources. Living systems export entropy in order to keep

their own entropy low and therefore avoid a static equilibrium state (Bloom, 2010; Gleick, 2011).

Organizational ambidexterity: "The ability of an organization to both explore and exploit—to compete in mature technologies and markets where efficiency, control, and incremental improvement are prized and to also compete in new technologies and markets where flexibility, autonomy, and experimentation are needed" (O'Reilly & Tushman, 2013, p. 1).

Organizational culture: "A pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid, and therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein, 2003, p. 17).

Organizational learning: A process of detecting and correcting errors (Argyris & Schon, 1978).

Social learning cycles: An aspect of an ambidextrous culture operationalized through the conceptual frames of Boisot et al.'s I-Space model (Boisot et al., 2011).

Summary

This chapter has provided an overview, problem statement, research questions, statement of potential significance, conceptual framework, summary of the methodology, and definition of key terms. Chapter 2 reviews relevant literature and provides an argument for studying how an organization achieves and sustains organizational ambidexterity. Chapter 3 reviews the methodology and research design and analysis that

will be used during the study. Chapter 4 presents the results, and chapter 5 discusses those results in the context of the literature and presents conclusions and implications.

CHAPTER 2:

REVIEW OF THE LITERATURE

Revisiting the research questions—"How did an organization become ambidextrous and sustain ambidexterity?"—this chapter frames what is currently known about ambidextrous organizations as organizations that learn, with a focus on their cultures, attempting to get to the essence of how the constructs of learning and culture aid in creating and maintaining the unique phenomenon of ambidexterity. The chapter is organized into seven sections: the components of ambidexterity and their coexistence; learning and ambidexterity; culture and ambidexterity; complexity and ambidexterity; change and ambidexterity; antecedents and moderators of ambidexterity; and a review of key findings in the literature.

An initial search through multiple databases and 30 journals resulted in the review of more than 90 articles and research papers related to organizational ambidexterity. Articles ranging in date from 1976 to 2013 rendered information on 17 different subjects related to learning, culture, behaviors, moderators, and antecedents to ambidexterity; however, there was little consensus or insights into how these subjects contributed in creating an ambidextrous organization. It was only through analysis, combined with synthesis and correlation that answers to questions such as these began to emerge.

The Components of Ambidexterity and Their Coexistence

O'Reilly and Tushman (2013) defined organizational ambidexterity as "the ability of an organization to both explore and exploit—to compete in mature technologies and markets where efficiency, control, and incremental improvement are prized and to also compete in new technologies and markets where flexibility, autonomy, and

experimentation are needed" (p. 1). The components of exploitation and exploration operate in enough of a balance as to allow both to exist under one roof. Generally, however, exploitation edges out exploration (Suzuki, 2013; Tushman & O'Reilly, 1996).

Exploitation involves the use and refinement of existing knowledge within an organization's internal domains (Suzuki, 2013), associated with existing improvements, increased efficiency, and incremental adjustments (March, 1991). The literature characterizes the exploitative side of organizational success in the market using a variety of terms: refinement, choice, production, formalized, efficiency, selection, implementation, execution, structural and cultural inertia, tightly coupled systems, resistance to change, stability, explorative complacency, hubris, constraint, familiar, comfortable, short-term gains, traditional practices, knowledge management, centralized control, compartmentalized social relations, evolutionary innovative change, incremental innovative change, homogeneity, new risk aversion, convergent thinking, and adaptation (March, 1991). It is safe to state that all sustained productive organizations that produce goods or services for the marketplace are exploitative, or they would not be in business for any sustained period (Katz & Kahn, 1966).

Exploration involves the search for and pursuit of new knowledge within an organization's external domains (Suzuki, 2013), accompanied by variety generation, distant search, risk taking, experimentation, and discovery (March, 1991). The literature characterizes the explorative side of organizational success in the market in the following terms: variation, risk taking, risk tolerance, play, experimentation, flexibility, discovery, innovation, organic, informal structure, knowledge sharing, loosely coupled systems, path breaking, improvisation, autonomy, chaos, emergence, decentralized, densely connected

social relations, flat organizations, decentralized control, change, heterogeneity, revolutionary innovative change, punctuated innovative change, complexity, diversity, divergent thinking, and creativity (March, 1991). With these descriptive words characterizing both exploitative and explorative behavior in organizations, we establish a literary reference from which to define both sides of organizational ambidextrous behavior.

Thus, ambidexterity represents a dichotomy of opposites: dual structures sometimes working sequentially, sometimes in tandem. These dual characterizations can be combined into pairings for examination, such as knowledge sharing and knowledge management, divergent thinking and convergent thinking, risk aversion and risk taking, centralized control and decentralized control, evolutionary innovative change and revolutionary innovative change, and homogeneity and heterogeneity.

March (1991) said that while exploration and exploitation may coexist, "it is often in an imbalance or suboptimal equilibria as they are often engaged in implicit and explicit competition for scarce organizational resources" (p. 71). These two behaviors are thought to be in such opposition that Duncan (1976) suggested that organizations adopt "switching rules" for transitioning from one to the other rather than attempting to undertake them simultaneously.

Others have explored this question. Moon and Huh (2011) examined whether ambidexterity should be approached from a synchronous view of differentiated organizational subunits operating in tandem as individuals or a punctuated equilibrium view that is more temporal rather than organizationally differentiated. Their research

suggested that cycling through periods of exploration and exploitation is a more viable approach than the simultaneous pursuit of the two.

Organizations pursuing ambidexterity can choose different approaches to achieving ambidextrous balance, including structural, contextual, and temporal (Moon & Huh, 2011). Whereas structural ambidexterity comprises exploitative units that are larger and more centralized, with tight cultures and a focus on maximum efficiency and control through process management, contextual ambidexterity involves a supportive context that empowers organizational members to meet performance standards guided by shared ambitions and a collective identity. Hence, contextual ambidexterity nurtures well-designed systems, cultures, and processes, enabling simultaneous alignment and adaptability (Gibson & Birkenshaw, 2004; O'Reilly & Tushman, 2013). The last possibility, temporal separation, describes a culture that cycles between exploration and exploitation, focusing on one activity at a time.

The importance of ambidexterity is clear. Continual exploitation in the marketplace is unsustainable due to entropy, technological advancement, and obsolescence, and organizations must eventually explore, change, or adapt to stay relevant in the marketplace. Both exploitation and exploration must be present, and furthermore there must be some sort of balance or relationship between the two. Short-term performance and return on investment must also accommodate long-term performance with return in the form of new innovation. If organizations do not find this ambidexterity and balance, it does not necessarily mean that they cannot operate in the marketplace, perform, or be profitable for a time, but it may mean that they will

experience unproductive bouts and will ultimately become inefficient and underperforming.

Learning and Ambidexterity

In considering the coexistence of the behavioral and structural extremes of exploitation and exploration in an ambidextrous organization, it is important to examine what keeps them together and channels any created tension in such a way as to allow sustained ambidexterity. This effort requires considering overarching constructs, concepts, and structures that both govern and facilitate these spectral groupings. These concepts may relate to learning, which involves collaboration, awareness, validation, and respect. After showing the historical importance of learning in the discussion of ambidextrous organizations, this section discusses several aspects related to learning: learning organizations, boundary spanners, and stickiness. Other aspects of learning tied to culture—such as a culture of divergent thinking, interpersonal learning, and knowledge sharing—are covered in the next section. These bridging characteristics link exploitative and explorative activities and are representative of ambidextrous behavior and a learning organization. This section also outlines examples of exploitative and explorative learning.

March: The Early Pairing of Ambidexterity and Learning

Duncan (1976) first coined the term *ambidexterity* in regard to organizations and their exploitative and explorative structures, offering important insights regarding temporality and ambidextrous organizations. However, the term was made popular by March in 1991, and his article "Exploration and Exploitation in Organizational Learning" is considered a seminal work on ambidextrous organizations and the beginning of popular

discussions on organizational ambidexterity. In March's work, ambidextrous organizations and learning were first paired; later, additional concepts were linked with ambidexterity by other researchers, to include structure, agency, tacit knowledge, subgroups, performance, knowledge sharing, knowledge management, the roles of managers and leaders, chaos, evolutionary and revolutionary change, ambiguity, and antecedents and moderators to ambidextrous organizations. Nevertheless, at the forefront of most ambidextrous organization conversations today can still be found the construct of organizational learning.

March's early discussions centered on learning between members of an organization and an organizational code (March, 1991) and learning in relation to competitive advantage in competition for primacy. March discussed mutual learning between the organizational code and the individuals within the organization, suggesting that when individuals adjust to an organizational code before the code can learn from the individual, it is a "threat" to the effectiveness of the organization (p. 85). In other words, it is just as important or perhaps even more important for the organizational code to learn from its members and for members to contribute to that code as it is for the individuals in the organization to learn.

Regarding learning and contributing to an organizational body of knowledge, March also addressed fast and slow learners within organizations and suggested that while slow learners are more prone to be punished by an organization socially, they actually contribute more to the organization and represent the backbone of the organization's learning. Fast learners, on the other hand, contribute little to nothing in regard to organizational learning growth, contributing the least to the codified cumulative

knowledge of the organization. March went on to say that "the code learns best from people who deviate from it" (p. 76).

These important concepts suggesting that explorative and exploitative behavior must both be present in learning organizations were not explored again in the literature until Daniel Kahneman mentioned them in his book *Thinking Fast and Slow* (2011). Any mention of ambidexterity or March in his discussion is absent, leading me to believe that Kahneman's conversation is both fresh and emergent, validating the point made by March as it represents independent thought that has resurfaced in a different time and context. Kahneman suggested that fast thinking (representative of more exploitative behavior) is prized in comparison to slow thinking (representative of more explorative behavior) in organizations but that the two are critical for balance and sound judgment. March concluded that an adaptive process of refining exploitation in a learning perspective more rapidly than exploration is probably more effective in the short term for organizations but is self-destructive in the long run. Not only is it important for organizations to learn, and learn in both exploitative and explorative ways, but it is also important that organizations realize the importance of the act of learning or learning in action (Marquardt, 2004).

Learning Organizations

Siren and Kohtamaki (2010) distinguished between organizational learning and a learning organization. Whereas organizational learning is a process of detecting and correcting errors, Argyris and Schon (1978), Slater and Narver (1995), and Senge (1990) defined learning organizations as "organizations where people continually expand their capacity to create the results they desire, where new and expansive patterns of thinking

are nurtured, where collective aspirations are set free and where people are continually learning how to learn together" (p. 4). Garvin (1993) defined a learning organization as "an organization skilled at creating, acquiring, and transferring knowledge and at modifying its behavior to reflect new knowledge and insights" (p. 4).

In this study, it was assumed that a learning organization is a refined subset of organizational learning, an operationalization of it, and, often, an initially unstructured, emergent process. Organizational learning is a collective activity that takes place under certain conditions, and learning organizations experience "emergent, temporally unscheduled, spontaneous learning often directed from the ground up vs. the top down" (Siren & Kohtamaki, 2010, p. 4).

Schwandt and Marquardt (2000) defined organizational learning and learning organizations in slightly different terms. Similar to Siren and Kohtamaki (2010), they viewed organizational learning as more of an overarching construct, whereas a learning organization is a dynamic and fluid organization in action (Schwandt & Marquardt, 2000). To put it in another way that characterizes the learning-in-action component, where "dynamic organizational learning occurs" (p. 26), there is the potential for a learning organization. Organizations often espouse the virtues of learning yet may not be able to "implement the actions required for reaching the end result," that is, becoming a learning organization (p. 26). Finally, the authors likened the path from organizational learning to a learning organization in terms of turning theory into practice (p. 26). A subobjective of the current study is to reveal a reverse-engineered path from learned practices, behaviors, and processes currently in the field to the theories of ambidexterity

borne out of the literature in order to learn how organizations create and sustain ambidexterity.

Boundary Spanners

Burt (2004) examined boundary-spanning people, who provide a link and conduit between the structural and contextual duality of the exploitative and explorative sides of an organization, effectively integrating the two halves. Boundary-spanning people are key moderators in learning organizations and in ambidexterity. Brokerage, the act of negotiating agreements between different groups, provides the context for boundary spanners' social capital, which allows them to establish firm connections across groups and have a rare vision advantage where good ideas can be discovered and captured at the intersection of different social worlds (p. 351). People whose networks span these structural holes have early access to diverse, often contradictory information and interpretations, which gives them a competitive advantage in seeing good ideas (p. 356); companies with a heterogeneous mix of alliance partners, for example, enjoyed faster revenue growth and reported higher earnings (p. 358).

The ability to negotiate and broker laterally across organizations in formal cliques and connections can lead to a superior advantage when compared with operating in siloed stovepipes (Burt, 2004, p. 369), if organizations are first able to make sense of and see value in this practice. Four ascending levels of brokerage are chief among these: awareness, making people on both sides of a structural hole aware of one another; transfer, transferring best practices between groups; analogy, drawing analogies between groups ostensibly irrelevant to one another; and synthesis, seeing new beliefs, behaviors, connections, and combinations. This study searched for boundary-spanning individuals

and attempted to interpret their context in the organization. It was the general conclusion of Burt (2004) that boundary-spanning people not only discover good ideas and potential innovation but also dislodge organizational stickiness, promoting the transfer of good ideas.

Stickiness

Lam and Lambermont-Ford (2008) discussed organizational knowledge sharing and motivation. They argued that facilitating knowledge sharing in organizations is a difficult task, as individuals are often unwilling to share and integrate their knowledge, which results in an organizational "stickiness." While this can be true in organizational learning situations (Dixon, Meyer, & Day, 2007; Levitt & March, 1988; Schein, 1993), it is a problem that is largely overcome in a learning organization (Schwandt & Marquardt, 2000) and an ambidextrous learning organization (Fenwick, 2003; Holmqvist, 2004; Miller et al., 2006; Siren & Kohtamaki, 2010; Swart & Kinnie, 2007). One way to resolve this social dilemma is to recognize that in an ambidextrous organization, learning can be either exploitative or explorative in context and therefore assume different structures requiring different behaviors and processes (Siren & Kohtamaki, 2010; Su, Li, Yang, & Li, 2011).

Szulanski (1996) explored the sources of internal stickiness and the impedance of knowledge transfer. The top three causes were casual ambiguity (not realizing a piece of knowledge was vital to share), absorptive capacity (not having the capacity to absorb transferred knowledge due to a number of factors), and source-recipient relationship (an impedance in a relationship that creates a barrier to knowledge transfer). The ability for a firm to transfer best practices is critical to its ability to be competitive. Contrary to

popular belief, which primarily blames motivational factors for the impedance of knowledge, Szulanski found the primary reasons to be knowledge related.

The sources of internal stickiness could be abetted by an ambidextrous organization. Attendance to and awareness of the complexity within the organization's dual structure could help overcome casual ambiguity, as it would raise awareness of the internal workings of the organization and the fact that all organizational knowledge is of potential value somewhere in the organization. Absorptive capacity could also be alleviated, as knowledge would be disseminated more efficiently on either the explorative or exploitative side of the organization, and source-recipient relationship problems could also be reduced, as individuals would have a better understanding of individuals' intent, behaviors, and motivations on either the exploitative or explorative side of the organization, promoting contextual ambidexterity (O'Reilly & Tushman, 2013).

Jensen and Szulanski (2004) explored how the adaptation of organizational practices affects the stickiness of cross-border knowledge transfers. They concluded that adaptation significantly increases, rather than decreases, the stickiness of cross-border knowledge transfer. Learning organizations learn how to balance rigid adaptation with flexibility, and organizations that can unlock tacit knowledge and transmit interpersonal learning across an organization are also learning organizations (Miller et al., 2006). Flexible exploitative and explorative antecedents and moderators could counteract this process of adaptation inhibiting cross-border knowledge transfer and modify subsequent behavior, allowing exploitative and ambidextrous organizations to cross borders more thoroughly with knowledge and become more explorative.

Exploitative and Explorative Learning

Exploitation has a direct effect on organizational performance while exploration does not. Organizational learning helps take advantage of exploration, and overall organizational learning heightens an organization's performance (Levinthal & March, 1981). This is a distinction worthy of note, which ties back to March's and Kahneman's discussion of learning and thinking and ambidextrous organizations. The subordinate/superior discussion of exploitative versus explorative organizational behavior indicates that exploitation often drives out exploration (Ingram & Baum, 1997; Suzuki, 2013; Tushman & O'Reilly, 1996) and consequently learning associated with exploitation drives out learning associated with exploration (Su et al., 2011).

Siren and Kohtamaki (2010) found that exploitation has a direct effect on and relationship to company performance and partially mediates the relationship between exploration and performance. Again, this finding seems to suggest that exploration is subordinate to exploitation and that explorative learning is subordinate to exploitative learning. Their results also indicate that organizational learning has an important role in the transformation of the effects of exploration and exploitation into performance, and a learning organization may have an even larger influence on both exploitative and explorative (ambidextrous) behavior.

Su et al. (2011) split organizational learning into exploitation- and exploration-oriented learning, introduced the additional concepts of incremental or evolutionary learning and punctuated or revolutionary learning (Tushman & O'Reilly, 1996), and studied them in different organizational structures. They claimed that the two kinds of

learning are substitutes for one another when the work is mechanistic and are complementary when the work is organic.

Owens (2012) described adaptive learning and radical learning and associated them with exploitation and exploration, respectively. When learning and innovation are considered together, all but the smallest and incremental innovation can often be considered "a bridge too far" for organizations to consider adopting. Radical, revolutionary, and explorative innovation and learning can be considered alien and unadvisable; only learning and innovation tethered to the known, familiar, and exploitative activities of the organization is often culturally allowed and structurally accommodated (Tushman & O'Reilly, 1996).

Culture and Ambidexterity

Organizational culture, a discipline born out of anthropology and sociology and first hypothesized in the Westinghouse studies of the 1920s, is still open to new interpretation and discovery. Seminal cultural organizational theorists such as Kroeber and Kluckhohn (1952), Geertz (1973), Schein (1992, 1993, 2003), Hatch (1993, 2004; Hatch & Schultz, 2002; Hatch & Zilber, 2012), and Martin (1992, 2002) continue to theorize as to both the importance and presence of culture in organizations.

The culture of ambidextrous organizations is not something widely researched and studied; however, it is not difficult to hypothesize when considered in the context of available research on exploration, exploitation, complexity, and organizational culture. Ambidextrous organizational cultures, like other organizational cultures, can be thought of as integrated, differentiated, or fragmented (Martin, 2002), and the characteristic

cultures of explorative organizations can be quite different and polarized when compared to those of exploitative organizational cultures.

Ambidextrous organizations are natural examples of a differentiated organizational culture in which an organization can be made up of two subcultures, in this case exploitation and exploration. The isolation of subgroups denotes a differentiated culture (Martin, 2002). If these cultures are well connected by boundary-spanning people such as individual members, managers, or leaders, then the overall culture can be unified and healthy (Burt, 2004). Fang et al.'s (2010) discussion of balancing exploration and exploitation through structural design and better maintaining the balance between exploration and exploitation then becomes a matter of maintaining a balance of cultures. Their research showed that moderate levels of cross-group linking achieve the highest equilibrium performance by enabling superior ideas to diffuse across groups (Burt, 2004). Differentiated subcultures nested within the two halves of an ambidextrous organization can establish an overall ambidextrous culture by attending to this cross-cultural linking. This is another instance where the validation of, and attentiveness to, ambidexterity and building a structural design to accommodate it creates a culturally ambidextrous reality.

Su et al. (2011) suggested that the potential cultural duality of ambidexterity can be divided along structural and contextual lines: learning, exploratory culture, and exploitative culture can follow structurally mechanistic or structurally organic paths, and these landscapes could affect culture in very different ways (Miller et al., 2006).

This section discusses a number of issues related to an organization's culture and its effects on ambidexterity. It begins by discussing the I-Space model of Boisot et al. (2011). It then addresses the different foci of different types of leaders and the

organization's view toward divergent thinking, cultural aspects of interpersonal learning and knowledge transfer, and structural issues that affect the organization's culture.

I-Space Model

Max Boisot and his colleagues (2011) recreated the human organizational ecology on a large scale in terms of culture, structure, diffusion of data, and learning in the construction and development of their I-Space model. They developed this model in their study of a large organization in Cern, Switzerland, at the site of the large Hadron collider and the ATLAS detector, which has a network of over 3000 physicists and engineers, 1000 doctoral students, 174 research institutions, 38 countries, and over 400 materials and services suppliers.

As outlined in chapter 1, Boisot's work and model is based on the creation of clans, markets, fiefs, and bureaucracies within an organizational model space. Boisot situated these subcultures together and then examined them against data and its dissemination, learning, and structure bounded in an ecological model to characterize social learning cycles throughout an organizational ecology. They showed that through processes of codification (from uncodified to codified), abstraction (from abstract to concrete), and diffusion (from undiffused to diffused), data moves and changes as it is processed and created by the different organizational subcultures (Boisot et al., 2011, pp. 32-36).

Diversity in Leadership and Leaders' Focus

Dover and Dierk (2010) suggested that managers, entrepreneurs, and leaders bring different skills and capabilities to their organizations and company roles. Managers focus

on current complexity, leaders focus on change, and entrepreneurs focus on opportunities; ambidexterity occurs at the intersection of these three aspects. This ambidextrous leadership concept, which is similar to complexity leadership (Uhl-Bien, Marion, & McKelvey, 2007; Marion & Uhl-Bien, 2011), suggests that an organization has achieved the designation of a learning organization when it validates and attends to its ambidexterity by recognizing these different kinds of leaders and paying attention to their interactions. In the current study, examples of interactions of this kind along with validation of ambidexterity will be sought.

The cultural diversity of the leaders also brings significant context to the organization's culture. Dover and Dierk (2010) attested that as managers, entrepreneurs, and leaders bring different skills and capabilities to their organization's company roles, they also bring different cultural traits. What they bring to the organization's ambidextrous culture lies in the very nature of their individual focus, and these individuals can be quite different across exploitative or explorative lines Middle managers are often conflicted based on their positioning in the center of the organization, besieged at both ends of a hierarchical structure by workers and leaders.

Divergent Thinking Attitudes

Williams (2004) examined attitudes toward divergent thinking, their effects on organizational structure, and whether they were perceived positively or negatively. Openness to experience is a personality trait that relates to divergent thinking and is hypothesized to be related to creative performance. Attitudes toward divergent thinking are also likely to be influenced by supervisors' attitude. Williams' study is one of a few that provide support for a divergent thinking model that connects openness to experience,

creativity, divergent thinking, and manager support. Organizations must have an appreciation for not only convergent exploitative thinkers but also explorative divergent thinkers. As exploitation often drives out exploration in organizations for a number of reasons, to include risk aversion and resource scarcity (Ingram & Baum, 1997; Suzuki, 2013; Tushman & O'Reilly, 1996), and can be thought of as the dominant model in most organizations, it is important for exploitative structures to recognize and support divergent thinking within organizations.

Complexity leadership models (Uhl-Bien et al., 2007) and ambidextrous leadership models (Dover & Dierk, 2010) take into account both convergent and divergent thinking within organizations. Neurologically, organizations can be thought of as being at war with themselves and can be prone to organizational psychotic behavior (Slaughter, 2008) due in part to individuals' predisposition to default to either the left or right hemispheres of their brains (often the left hemisphere's linear, logical, and exploitative side dominates) as they solve problems and work through daily objectives (Sapolsky, 2010; Kahneman, 2011).

Cultural Aspects of Interpersonal Learning

Miller et al. (2006) suggested that different cultures have variations in interpersonal learning (learning between individuals) and in the sharing of tacit knowledge. Direct interpersonal learning takes on different processes and follows different structural pathways when conducted in exploitative cultures as opposed to explorative ones, and in ambidextrous cultures the pathways can be different still. Locating individuals in a physical space and recognizing the tacit dimension of knowledge that cannot be transmitted through codification is heavily dependent on the

values and underlying assumptions of the culture (Boisot et al., 2011; Hatch, 1993). There is little research synthesizing interpersonal learning ambidexterity and culture; however, literature on each of these subjects individually would suggest that a deliberate ambidextrous organization is better equipped to transfer as well as codify knowledge (March, 1991).

Cultural Aspects of Knowledge Sharing

Lam and Lambermont-Ford (2008) argued that facilitating knowledge sharing in organizations is difficult and is heavily dependent on a culture of not only openly sharing knowledge but also attending to knowledge through motivation. They developed a motivation-based perspective to explore how organizations resolve the social cultural dilemma of knowledge sharing and added hedonic motivation as a subset to the concept of intrinsic motivation, defining it as motivation such as training, promotion, and advancement and those activities that an individual considers pleasurable (pp. 51, 53).

The authors effectively split intrinsic motivation into two types, normative and hedonic, and then examined the relationship of these two types of motivation as they interacted with extrinsic motivation in both professional bureaucracies and operating adhocracies. The authors concluded that facilitating open knowledge sharing may be easier said than done in a professional bureaucracy as opposed to an operating adhocracy (Lam & Lambermont-Ford, 2008). In an organization with both elements of bureaucracy and adhocracy, as is the case with an ambidextrous organization, the specific culture and its dual nature could create knowledge sharing, which takes on several forms from knowledge sharing to knowledge management, dependent on whether this knowledge is

exploitative or explorative and on whether it flows freely in some parts of the organization while being heavily controlled in others (Boisot et al., 2011).

As ideas diffuse across an organization, they transition through a stage of heterogeneity diffusing into homogeneity or even vice versa as they move from an explorative realm into an exploitative one; similar patterns also occur with the transition of tacit knowledge into explicit knowledge (Boisot et al., 2011). An organization that has fine-tuned its knowledge transfer and learning in this way is more likely to be an ambidextrous learning organization engaged in learning in action.

Organizational Structure

Jansen et al. (2005) examined multiunit-level firms and ambidexterity. They concluded that organizational units with decentralized and densely connected social relations were able to act ambidextrously and that multiunit firms were better equipped to cope with the contradictory pressures of exploitative and explorative innovation, denoting the characteristics of an explorative culture. Jansen et al. (2006) discussed short-term performance, and like fast thinking and learning (Fang et al., 2010; Kahneman, 2011; March, 1991), described a culture centered on exploitation that squeezes out exploration. Centralization negatively affects exploratory innovation, while formalization positively influences exploitative innovation. They concluded that pursuing exploratory innovation is more effective in dynamic environments, whereas pursuing exploitative innovation is more beneficial to a unit's financial performance in more competitive environments.

Andriopoulos and Lewis (2009) discussed the paradoxes of ambidexterity by presenting three "nested paradoxes" (p. 696) of innovation—strategic intent (profit-breakthroughs), customer orientation (tight-loose coupling), and personal drivers

(discipline-passion)—and offered a choice of either an architectural or contextual approach. An architectural approach is the view that ambidextrous organizations should be aligned in a dual structure pattern, which differentiates the activities between exploitative or explorative, focusing the actors on either one or the other. A contextual approach uses behavioral or social means to integrate the two components. Effectively managing ambidexterity may require a paradoxical mindset and may require paradoxical antecedents at the onset of an organization and paradoxical moderators during an ambidextrous organization. This would require combating the natural and counterproductive tendencies to over-rationalize or avoid tensions (Eisenhardt & Bhatia, 2000; Van de Ven, 1989).

Complexity and Ambidexterity

Surfing the Edge of Chaos (Pascale, 1999) addressed exploitative and explorative environments through the lens of complexity and complex adaptive systems. Like March's 1991 article on exploration, exploitation, and learning, Pascale's book covered many subjects on the evolution of complex adaptive systems that are analogous to the dual nature of ambidexterity. Among them, he discussed the characteristics of complexity, balance and equilibrium, emergence, chaos, and living systems. A proponent of complexity and, by virtue of this, ambidexterity, Pascale substantiated the ebb and flow and balance of the complex components within organizations. Ambidextrous organizations share strong characteristics with organizational complexity (Pascale, 1999), due to their dichotomous nature, with its emergent, diverse, and disparate properties.

Pascale discussed equilibrium as organizational death, citing entropy—the tendency of living systems to run down, consume resources, and pursue a static state—

and negative entropy—the renewal of systems by the introduction of new resources—as natural ways in which organizations (like living systems) ebb and flow. In other words, a closed organizational system is unsustainable over time, and very few closed systems occur in nature. One example of negative entropy acting upon and renewing an organization is the introduction of new information and learning. An organization in the midst of learning is most likely in motion and changing structurally, behaviorally, and culturally. Organizations facing the natural tensions between exploitation and exploration would also likely be in a situation of negative entropy (Bloom, 2010; March, 1991).

Recognition of Ambidexterity and Complexity

Acknowledging a culture of ambidexterity (a culture with both exploitative and explorative characteristics) is akin to acknowledging a culture of complexity (Pascale, 1999). It involves recognizing balance and equilibrium, tension and chaos, emergence, and diverse thinking of organizations in terms of biological complex adaptive systems, entropy and negative entropy, exploitation, exploration, and ebb and flow. It also involves seeing heterogeneity and homogeneity, incremental innovation and radical innovation, and evolutionary change as well as revolutionary change. Validation of complexity (ambidexterity) from leaders and managers is necessary in order to breathe to life an ambidextrous culture. How to embrace and validate a culture of ambidexterity, like that of complexity, may be best described by Pascale's recounting of the origins of organizational complexity thinking, which has been characterized as "the science of all sciences" (Johnson, 2007).

The author briefly outlined how work on organizational complexity began in the 1980s at New Mexico's Santa Fe Institute when a group of distinguished scientists with

backgrounds encompassing disciplines as diverse as physics, microbiology, zoology, botany, paleontology, astrophysics, archeology, and economics were drawn together for a specific reason. All of their disciplines shared the commonality of being made up of building blocks composed of many agents who continually organized and reorganized themselves (sometimes clashing) in a boundary between rigidity and randomness (Bloom, 2010; March, 1991; Pascale, 1999). Agents continually organizing and reorganizing themselves are also a way to see ambidexterity and the dichotomy between exploitation and exploration.

The recognition of complexity within an organization (Pascale, 1999) is both an antecedent and moderator for an ambidextrous organization because by its very nature an organization must be recognized, validated, attended to, and treated as a complex entity in order for a constructivist reality to create and validate an ambidextrous organization.

Change and Ambidexterity

Evolutionary and Revolutionary Change

In 1996, Tushman and O'Reilly introduced the terms *evolutionary and revolutionary change* into the conversation of ambidextrous organizations, indicating that incremental and evolutionary change is punctuated by discontinuous and revolutionary change. Along with the contribution of He and Wong (2004), Tushman and O'Reilly's contribution represents one of the most referenced works on organizational ambidexterity after that of March (1991), and these researchers took March's work further by introducing new phenomena and concepts. Whereas March focused on the union of exploration, exploitation, and learning, Tushman and O'Reilly (1996) discussed

ambidexterity in the face of change, specifically evolutionary and revolutionary change under the influence of the moderators of structural and cultural inertia.

Afuah (2001) provided insights into ambidexterity in his study of incremental and discontinuous technological change. The author indicated that if the structural path into the old technology was vertical, than the organization would perform poorly in trying to integrate a new technology. If the organization was not aligned vertically into the old technology, however, the organization would perform well in integrating the new technology. Afuah (2001) concluded that firms need to be capable of pursuing both incremental and discontinuous technological changes at the same time. They need to be ambidextrous (Tushman & O'Reilly, 1996), and they need to have "dynamic capabilities in an age of rapid and pervasive technological change" (p. 1226). This means that promoting practices (antecedents) and moderators should have both exploitative and explorative characteristics and abilities. What the authors described are organizations within the throes of specific market exploitation (the reference to vertical), which when faced with new technological innovation must, at least for a time, behave in an explorative manner as they adjust to the business of learning to exploit the new innovation for organizational profit. Organizations that know how to behave both vertically and horizontally (ambidextrously) will be better suited to apply either one or the other tactic when faced with a business objective.

The Dangers of Inertia, with Minimal Change

Structural inertia, the building up of organizational structure to the point of rigidity or not being able to adapt to or implement anything except "the smallest or incremental of change" (Tushman & O'Reilly, 1996, p. 18), and the more pervasive

cultural inertia that amounts to building up of norms, stories, or values in the organizational code, which thwarts timely adaptive change, both represent the danger of organizations potentially falling into a "success trap" (Ingram & Baum, 1997; Levitt & March, 1988; Tushman & O'Reilly, 1996). What these phenomena represent is a nullifier and potential destroyer of ambidexterity and organizational performance, since a complex system in motion without changeability, adaptability, or negative entropy cannot perpetually sustain itself and will eventually run down (Bloom, 2010; March, 1991; Pascale, 1999).

Brunner, Staats, Tushman, and Upton (2010) viewed injecting intentional "perturbation" into an organization as the missing mechanism that allows exploitation and exploration to work successfully. In their article, "Wellsprings of Creation: How Perturbation Sustains Exploration in Mature Organizations," they prescribed a culture that included intentionally "shaking things up" or "perturbing" specialized exploitative routines in order to break cultural inertia and stimulate explorative learning (Brunner et al., 2010).

Coevolution and Chaos

Anderson (1999) defined complexity in terms of nested coevolution, nonlinear behavior, agents with schemata, self-organizing networks, importing energy, and coevolution at the edge of chaos (Levin, 1999). For Gell-Mann (1994), the difference between complex adaptive systems and nonadaptive systems is that complex adaptive systems code their internal environments into many schemata, which compete with one another internally. In this way, exploitative and explorative components within an ambidextrous organization may sometimes compete for scarce resources (March, 1991),

and there are antecedent behaviors in ambidextrous organizations that allow this tension to coexist as well as moderators that regulate it. Ambidextrous and complex organizations have the ability to achieve balance harmoniously, continually, and nondestructively. As Weick (1979) pointed out, "Managers often get in the way of activities that have their own self-regulation, form, and self-correcting tendencies" (p. 222). Barnard (1938) and others remind us that organizations are dissipative structures that are maintained by members contributing energy to them as they ebb and flow between entropy and negative entropy (Bloom, 2010; Gleick, 2011; Pascale, 1999). Order requires that interactions remain within upper and lower boundaries, and so we have coevolution operating at the edge of chaos (March & Simon, 1958; Simon, 1996) in a decomposed loosely coupled hierarchy. These antecedents and moderators have evolved in place to provide these checks and balances.

Antecedents and Moderators of Ambidexterity

Antecedents are preceding circumstances, histories, and prior events, and moderators are circumstances, phenomena, and behaviors that preside over any given reality. Both are important to consider in ambidextrous organizations and can manifest physically, cognitively, temporally, behaviorally, or in any number of forms within organizations.

In their empirical study, "Exploratory Innovation, Exploitative Innovation, and Ambidexterity: The Impact of Environmental and Organizational Antecedents," Jansen et al. (2005) concluded that organizational units with decentralized and densely connected social relations are able to act ambidextrously and that multiunit firms are better equipped to cope with the contradictory pressures of exploitative and explorative innovation. Their

findings suggest that antecedents and moderators that support decentralized and densely connected social relations are useful for organizational survival when the organization is faced with challenging innovation.

Judge and Blocker (2008) suggested that two moderators that will sustain a healthy ambidextrous organization are change slack, or organizational slack, along with a new kind of ambidexterity, strategic ambidexterity, which they characterized as "the ability to undergo ambidextrous change moderated by environmental uncertainty and organizational slack" (p. 915). Owens (2012) would characterize this as strategic innovation, the ability to innovate exploratively within an exploitative market, or incremental innovation. The authors attested that the way to create and sustain ambidexterity is through applying strategic ambidexterity, which cultivates organizational capacity for change.

Szulanski (1996) discussed antecedents and moderators that can be sources of internal stickiness and impede knowledge transfer, the top three being casual ambiguity, absorptive capacity, and source recipient relationship. The ability for a firm to transfer best practices is critical to its ability to be competitive and to ambidexterity. Contrary to popular belief, which tends to blame motivational factors for the impedance of knowledge, most knowledge stickiness is the result of the first two reasons.

Other moderators and behaviors that could negatively or positively affect exploration, innovation, and creativity in organizations and therefore promote or discourage ambidexterity were described by Amabile (1998) as "creativity killing practices" (p. 81). Examples include such things as homogeneous teams; leaders and managers having little or no knowledge of their employees; criticality, or a negativity

bias towards new ideas, and a lack of a safety net for people who make suggestions; a climate of fear or retribution concerning the introduction of new ideas; little encouragement or support for intrinsic motivation and only monetary reward systems; a lack of sharing of problem-solving solutions; an ecosystem that kills creativity; a lack of valuing of knowledge from disparate fields; a lack of a place for slow learners to explore the "creativity maze" (p. 80) and no allowance for incubation; a lack of thought given to job matching; tight control of resources when not necessary; poor use of physical space; lack of design considerations when building teams; and lack of value placed on failure.

Organizational allowance for the open expression of voice in job dissatisfaction (Zhou & George, 2001) often leads to creativity when it is accompanied by members with an active and constructive response vs. a destructive or passive response. Similarly, positive deviance—defined as successful outliers in organizations when their behavior is not seen as threatening (Pascale, Sternin, & Sternin, 2010)—can lead to creativity. Behaviors such as these seen in the right context can also be signs of exploration and will be searched for during field research.

Many other antecedents and moderators were discussed elsewhere in the chapter and are summarized in Table 2.1. Behaviors of ambidexterity are also listed in the table.

Table 2.1
Summary of Selected Antecedents, Moderators, and Behaviors of Ambidexterity

Variable	Reference	Type of study
Moderators		
Dynamism and competitiveness	Jansen et al., 2006	Quantitative
Absorptive capacity	Rothaermel & Alexandre, 2009	Quantitative survey study
Stretch, discipline, support, trust, and performance	Gibson & Birkenshaw, 2004	Quantitative, multicase analysis
Organizational learning	Siren & Kohtamaki, 2010	Quantitative, multicase analysis
Tacit knowledge and interpersonal learning	Miller et al., 2006	Quantitative study, model creation
Attitudes toward divergent thinking	Williams, 2004	Quantitative, multiple regression correlation analysis, model creation
Paradoxical mindset	Andriopoulos & Lewis, 2009	Qualitative multicase study
Intrinsic motivators, hedonic and normative	Lam & Lambermont-Ford, 2008	Qualitative, multicase analysis
Antecedent		
Environmental and organizational	Jansen et al., 2005	Quantitative
Connectedness	Jansen et al., 2006	Quantitative
Stretch, discipline, support, and trust	Gibson & Birkenshaw, 2004	Quantitative, multicase analysis
Problemistic search and deliberate learning	Suzuki, 2013	Quantitative
Attitudes toward divergent thinking	Williams, 2004	Quantitative, multiple regression correlation analysis, model creation
Perturbation, tension, far from equilibrium	Marion & Uhl-Bien, 2011	Qualitative literature review
Perturbation	Brunner et al., 2010	Quantitative, model creation
Paradoxical mindset	Andriopoulos & Lewis, 2009	Qualitative multicase study
Behaviors		
Exploratory and exploitative innovation	Jansen et al., 2009	Quantitative

Variable	Reference	Type of study
Organizational learning, exploitation, exploration, and performance	Siren & Kohtamaki, 2010	Quantitative, multicase analysis
Absorptive capacity	Rothaermel & Alexandre, 2009	Quantitative, survey
Structural alignment and technological change	Afuah, 2001	Quantitative, survey
Inertia, structural and cultural	Tushman & O'Reilly, 1996	Qualitative, model creation
Creativity	Unsworth, 2001	Qualitative, four-dimension model matrix
Stickiness	Jensen & Szulanski, 2004	Quantitative, structural equation modeling and multicase analysis
Stickiness	Szulanski, 1996	Quantitative, canonical correlation analysis
Boundary-spanning people	Burt, 2004	Qualitative, literature review
Ambidextrous leadership	Dover & Dierk, 2010	Qualitative case study, model creation
Interpersonal learning	Miller et al., 2006	Quantitative, model creation
Unconventional leader behavior	Jaussi & Dionne, 2003	Quantitative using Multifactor Leadership Questionnaire
Creativity killers (18)	Amabile, 1998	Review
Complexity leadership	Marion & Uhl-Bien, 2011	Qualitative literature review
Expression of voice	Zhou & George, 2001	Quantitative survey study

Key Findings in the Literature

Common threads and themes in the research on ambidextrous organizations include an acknowledgment that ambidexterity exists and tends to emerge naturally in organizations more often than intentionally. There is an ongoing discussion, albeit subtle, regarding the need for managers and leaders to recognize and validate ambidexterity and complexity if they intend for it to be productive in the organization (Bloom, 2010; Burt, 2004; March, 1991; Moon & Huh, 2011; O'Reilly &Tushman, 2013; Pascale, 1999).

From a constructivist perspective, this is easy to understand, as reality is largely socially constructed and if explorative endeavors, behaviors, and people are not recognized as existing or having value, then they most likely will not have value. This subtlety of validation towards exploration and ambidexterity may also represent an area for future research and may include mindfulness or attentiveness towards ambidextrous behavior.

Common threads and trends about ambidexterity that are either missing from the literature, changing, or locked in continual discussion include a lack of acknowledgment and discussion of ambidexterity as a type of, or characterization of, complexity or a complex adaptive system. There has been a decrease in scholarly conversation regarding ambidexterity in the United States and a surge of interest in the phenomenon abroad, including countries such as India, China, and Japan, as well as a persistent disagreement as to whether ambidexterity is better practiced with both sides operating simultaneously (structural ambidexterity), sequentially (sequential ambidexterity, with exploitation and then exploration), or contextually (O'Reilly &Tushman, 2013). Also, there are discussions as to whether it is vital to an ambidextrous organization to be perfectly balanced and whether either the underuse or overuse of ambidexterity comes at a cost (March, 1991; O'Reilly & Tushman, 2013). The culture of ambidexterity is also something not widely explored and discussed. Finally, a continuing opaqueness persists about the nuances of ambidextrous organizations, including the critical antecedents, moderators, and behaviors that might influence their creation and sustainment (O'Reilly & Tushman, 2013); hence the justification for this study.

The study has exciting potential. Unlocking the secrets of ambidexterity could give practitioners and organizations a valuable checklist of moderators, antecedents,

practices, concepts, and behaviors that may help to replicate ambidexterity in their contexts. There is also the possibility of inspiring, reinvigorating, or repurposing disenfranchised people who have found themselves out of place in a complex environment, helping them reignite their potential on either the exploitative or explorative side of an ambidextrous organizational model. The next chapter describes the methodology for the study.

CHAPTER 3:

RESEARCH METHODS

This study's purpose is to fill a gap in the literature relating to the creation and maintenance of ambidexterity and to inductively build theory from discovered behaviors and phenomena researched in a single case (Yin, 2009). Specifically, this study focuses on two primary research areas (RAs) with four research questions (RQs) centered on organizational exploration and exploitation (ambidexterity):

RA1: How did the organization become ambidextrous?

RQ1: *What are the behaviors and conditions that encourage market exploration?*

RQ2: *What are the behaviors and conditions that encourage market exploitation?*

RA2: How does the organization sustain ambidexterity?

RQ3: *What are the behaviors and conditions that encourage the sustainment of market exploitation?*

RQ4: *What are the behaviors and conditions that encourage the sustainment of market exploration?*

This chapter describes the research design applied to answer these questions. It then provides details on site and participant selection, procedures for data collection and analysis, efforts to ensure the study's trustworthiness, and ethical precautions.

Research Approach and Design

To illuminate the components of organizational ambidexterity, both in its creation and its maintenance, a bounded single-site case study research design was chosen. The case constitutes an exemplary sample of this complex phenomenon, that is, one in which continued market exploitation was observed annually, as characterized by profit, and

market exploration was observed annually, as characterized by new innovation. The case study approach was selected since it allows the researcher to gain an in-depth understanding of the situation by focusing on the process rather than the outcomes (Merriam, 2009). Yin (2009) suggested that case study has a distinct advantage over other methodologies, as it answers *how* and *why* questions on contemporary sets of events. All of these characteristics made case study a logical choice, as the research questions required a robust and detailed investigation of a bounded space and how an organization consistently and productively incorporated exploitation and exploration over time.

With a qualitative study of a single site, there is a question of external validity and generalizability, that is, whether or not the findings from this study can be applied and considered relevant elsewhere. Furthermore, since the researcher is the instrument of data collection and a subjective "experiencer" of past organizational behavior, there is an additional question of researcher objectivity in this qualitative study. To address the first question, this study may not be generalizable to other organizations, and its findings will have to be carefully considered in context for potential appropriateness before attempting to apply them elsewhere (Markides, 2013), as they are meant to guide research and organizations in how one might compete with two business models simultaneously (Markides, 2013). Additionally, anomalous or disconfirming data that did not seem to fit were not thrown out, one of the strengths of qualitative research (Merriam, 2009), but instead were considered, presented, and compared with literature that challenges ambidextrous models for meaning and potential new discovery (Junni, Sarala, Taras, & Tarba, 2013; Markides, 2013). In regards to the question on researcher subjectivity, I

exposed my assumptions and prior experiences, discussing them in chapter 5 as appropriate.

This study was both particularistic and descriptive (Merriam, 2009). It not only provided a rich, thick description of ambidexterity but also, in the words of Bogdan and Biklen (2007), was observational, with one of the main data-gathering techniques being participant observation triangulated with document review and interviews, as well as intrinsic (Stake, 2005), as it covered a component of ambidexterity that I have a keen interest in, namely organizational exploration. Multiple stages of data collection, analysis, and interpretation (Leedy & Ormrod, 2010; Yin, 2009) characterized the methodological approach used in this exploratory study.

Crotty (1998) pinpointed four elements of social research—methods, methodology, theoretical perspective, and epistemology—that represent the pillars of a research study. My epistemology, *constructionism,* contends that reality is largely socially constructed. My theoretical perspectives, which align with this thought, comprise *postmodernism* (supposing transient and emergent realities), *critical realism* (a juncture where constructivism meets positivism), and *pragmatism* (the idea that truth is modified to purpose as discoveries are made). Together, this complex theoretical perspective attests that at least part of our world is transient, emergent, and modifiable, and my methodology, case study with an ideographic perspective, provides a rich mix of instruments (interviews, focus groups, observations, and document review) to draw out not only theory regarding how ambidexterity is created but also description, explanation, and evaluation (Hammersley, 1995).

The research questions in this study required collecting information on the organization's exploitation, exploration, and sustainment and required extensive investigation to identify behaviors, processes, and mechanisms. Case study methodology allows use of a diverse array of data collection materials (McCaslin & Scott, 1993) and provides for the integration of this information to create a convergence and triangulation of evidence (Yin, 2009). Triangulation of data through multiple sources and methods in turn improves the probability that findings and interpretations will be found to be credible, generalizable, and valid (Lincoln & Guba, 1985).

Site and Participant Selection

Choosing a suitable subject site in which to research ambidexterity proved to be more challenging than originally anticipated. The site needed to show clear signs that it was able to both exploit as well as explore in the market. Several potentially exciting subject sites were initially discovered, only to find that they were either "too explorative," being almost exclusively composed of research and development activities, or "too exploitative," being almost exclusively involved in manufacturing or sales of known services and products. The desired case needed to have a significant mix and balance of both, and the determinant criteria for ambidexterity were evidence of continued historical profit annually and continued historical annual innovation.

The site chosen for this study was an innovative manufacturing organization based in the Great Lakes region; the pseudonym "High-Tech Optics Inc." is used throughout the study to protect the identity of the organization. The organization's chief business is the manufacture of high-tech optics grinding, polishing, and measurement equipment for various applications used in defense, aviation, automotive, medical, and

space applications. The industry in which High-Tech Optics operates has traditionally been competitive, both nationally and internationally, with Germany being the historic industry world leader in optics manufacturing and technology. High-Tech Optics Inc. provides an excellent example of a representative case of an ambidextrous organization (Yin, 2009) that is largely exploitative with a strong component of exploration and sustained growth in each category annually. The company was formed in 1983 and has experienced growth annually. At the time of the study, it had 68 employees. The company agreed to participate in the study through its chief financial officer, who also served as the study's key informant. This executive's assistant served as the gatekeeper, providing contact information for potential participants, company documents, and logistical support during site visits.

Purposeful sampling (Creswell, 2006) was used to identify interview participants from within the organization, with the goal of having participants who provided perspectives from varying parts of the organization that inform the understanding of the central phenomenon in the study, exploitative and explorative behavior. Twenty individuals were ultimately invited to participate: representing the senior leadership positions were the chief executive officer, chief financial officer, and one other senior leader; representing the senior managers were those responsible for the advertising and marketing division, the sales division, and the human resources division; representing the front-line employees were machinists and engineers; and representing other perspectives were a family employee, the newest employee in the organization, and the longest-tenured employee in the organization (see Figure 3.1). The researcher was open to considering other potential participants through snowball sampling, wherein they are

discovered or recommended by interviewees during the research (Yin, 2009), and through this effort added customers of the business.

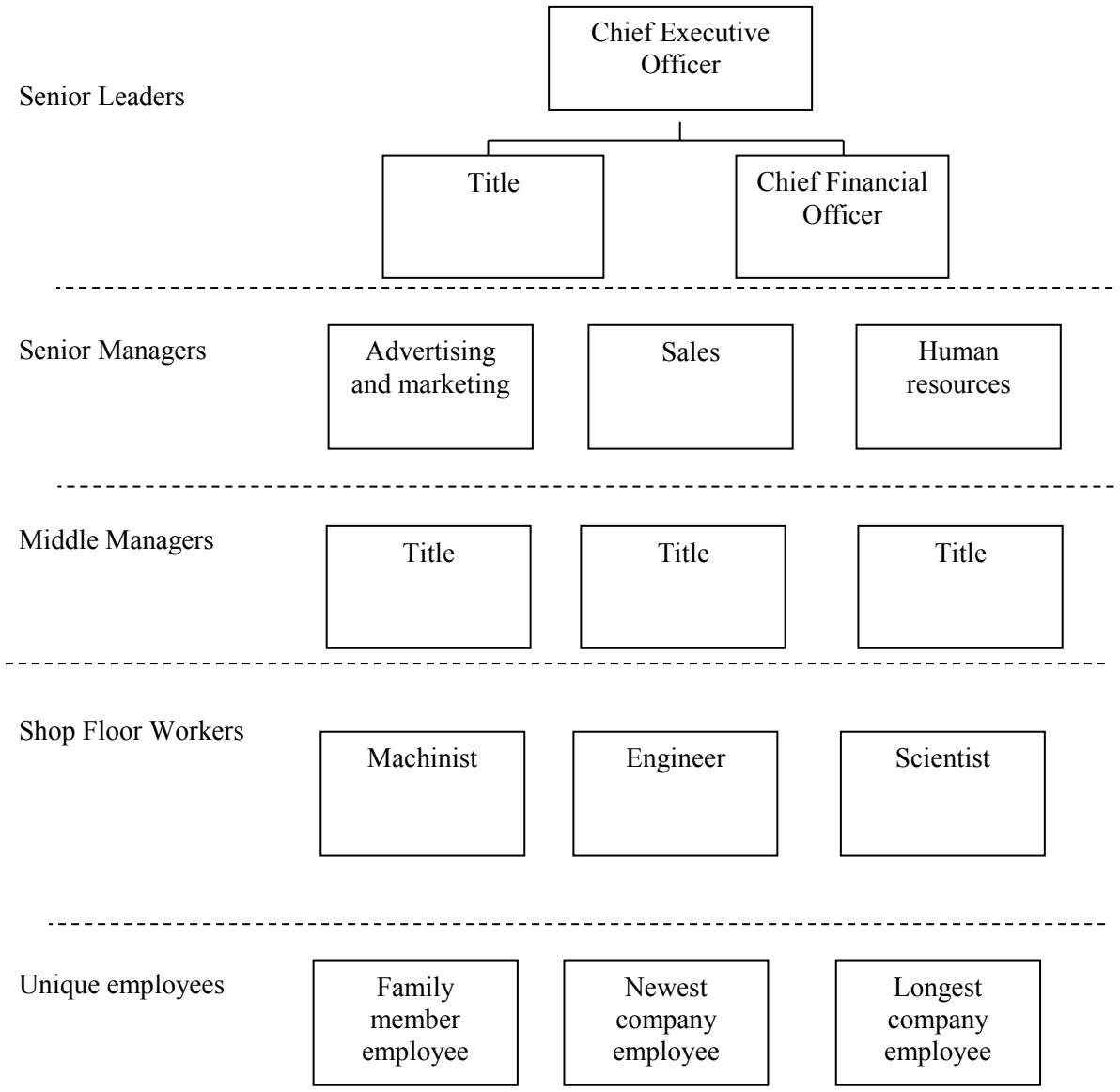

Figure 3.1. Partial organizational chart showing individuals who were initially invited to participate in the study.

Data Collection

Case study methodology includes a variety of data collection methods and techniques (Merriam, 2009; Yin, 2009). Four of these methods were used in this case study: interviews, both individual semi-structured and unstructured interviews and focus groups; review of archival records; observation of human behavior, symbols, and artifacts; and review of documents.

The literature provided variables for investigation, and Table 3.1 outlines how each method contributed data for each variable.

Table 3.1
Content of Data Collected by Method

Theories and contributing literature	Method			
	Document review	Archival records	Interviews	Observation
Models/theories: I-Space model (Boisot et al., 2011; OLSM (Schwandt & Marquardt, 2000)	Review of exploitative behavior, explorative behavior, and structure	Records depicting exploitative behavior, explorative behavior, and structure	Focus on exploitative behavior, explorative behavior	Observed exploitative behavior, explorative behavior, and structure
Organizational learning/ learning organizations (Schwandt & Marquardt, 2000)	Learning references	Learning acceptance and frequency	Narratives of learning	Observed learning, teaching, and sharing
Ambidexterity (Duncan, 1976; March, 1991; O'Reilly & Tushman, 2013; Tushman & O'Reilly, 1996)	Exploitative and explorative references	Records of innovation, creativity, exploration	Narratives of innovation, creativity, exploration	Observed innovation, creativity, exploration
Culture (Hatch, 1993; Martin, 2002; Schein, 1984)	Artifacts, symbols, and espoused values	References to culture, differentiated, integrated, fragmented	Espoused values, underlying beliefs and assumptions	Artifacts, symbols, espoused values

Note. OLSM indicates Organizational Learning Systems Model.

Data Collection Plan

Data collection began with discovery of archival records and continued with document review, interviews, and observations. All data were collected within a 3- to 6-month period, which included two 1-week field excursions at the company's factory office. The steps are outlined in Table 3.2.

Table 3.2
Data Collection Plan

Step	Activity	Timeframe	Description	Goal
1	Review of publicly available documents	2-4 weeks	Review of the website and external reports, including data that have been discarded, forgotten, or inadvertently dispersed, as well as data that are residual or outdated	Determine what can be discovered remotely that might be of significance
2	A directed look at available documents	2-4 weeks	Review of information that is volunteered or to which the researcher is directed by others upon inquiry	Gain a clearer picture of the site footprint, storefront, and the general face of the organization in its landscape
3	Site visit 1, part 1	1 day	Make general observations as a silent, self-guided field observer	Obtain thick, rich descriptions of data that are not requested, directed to the researcher, or intentionally presented
4	Site visit 1, part 2	1-2 days	Observe items the researcher is directed to, including artifacts, symbols, data, specific observations, individual suggestions, and witness of behaviors	Obtain thick, rich description of items believed to be of organizational importance
5	Site visit 1, part 3	1-3 days	Individual interviews and first focus group session	Same as item 4

Step	Activity	Timeframe	Description	Goal
6	Initial data analysis	1 month	Analyze, coalesce, and triangulate data; add codes; conduct historical data analysis; engage in personal memoing	Using a constant comparative method (Merriam, 2009), triangulate data; gain perspective and personal insights in preparation for second site visit
7	Site visit 2 (and site visit 3 if needed)	1 week	Continue observations; conduct new, missed, and follow-up interviews and second focus group	Complete data collection
8	Final analysis	1-2 months	Handle any unfinished items, code data, and complete dissertation chapters	Complete research

Semi-structured and Informal Interviews

The interview data collection method was selected as a means of learning about the organization by collecting data from individuals (Yin, 2009). Semi-structured as well as informal interview formats were chosen over a highly structured/standardized interview format to allow for open-ended and follow-up questions (Merriam, 2009). An interview protocol was designed to gain an understanding of the participant's role in the organization and to gain insight into processes and mechanisms of balance (see Appendix A).

Interview questions were distilled from the primary research questions and were designed to focus on the practice and sustainment of exploration and exploitation in the researched organization's practices, processes, innovations, and skills. Questions were designed to gather data such as what new services the organization provided each year; how employees stayed interested, focused, and stimulated; why the company was

creative, productive, and successful; and what behaviors supported or hindered such endeavors. Additionally, questions were designed to discover what enabled the organization to explore and exploit the market for profit and new innovation annually. Other questions were literature based, looking for phenomena in the organization that have been described in the relevant literature, and some questions and techniques were designed to reveal underlying assumptions and emergent behaviors.

With the help of the gatekeeper, and with a preliminary note from the chief executive officer, the individuals selected were sent an e-mail outlining the study and inviting their participation. They were assured of confidentiality and the voluntary nature of the study. Interviews were scheduled during the site visits and were held in the interviewee's office or a place deemed comfortable for the interviewee. The interviews, which lasted from 15 to 45 minutes each, were recorded and transcribed, and personal reflective memos were also completed immediately after the interview (Merriam, 2009). Each participant was provided a transcript of the interview to ensure accuracy of the content (Lichtman, 2009). In addition to internal interviews, several external company interviews were also planned based on recommendations from the company CEO or gatekeeper in order to gather data from outside sources regarding how the company exploited and explored the market as well as sustained these practices.

Focus Groups

Two focus groups were conducted in the study, one during each site visit, to allow people to contribute in an open forum. The purpose of these focus groups was primarily to evaluate organizational behavior centered on group and individual processing of exploration, innovative ideas, and learning, assuming that exploitative behavior was

always present (Suzuki, 2013). During and after each focus group, members were evaluated collectively and individually to determine ambidextrous behavior.

The first focus group focused on the organization's disposition toward contextual ambidexterity and exploration at the micro, meso, and macro organizational levels. In the first 25 minutes, participants were asked to share and comment on any personal or observed stories or insight regarding company ideas and innovation. This segment was followed by a 10-minute break, during which data were also collected and observations made. The last 25 minutes consisted of an open discussion about creativity and the barriers to innovation. Participants were asked to share any personal or observed stories or insight regarding their own perceived internal or external barriers to innovation.

The second focus group, held during the second week of field research, addressed organizational learning and learning organizations. Participants in the focus group were asked to provide feedback regarding their personal thoughts about learning and how they thought learning disseminated throughout the organization and was used by the organization.

Protocols for the focus groups are provided in Appendices B and C. Both focus group sessions were audio recorded and transcribed. I observed behavior and took notes, with an emphasis on determining participants' disposition towards the topics being discussed and their perception of the group as positive, negative, or neutral.

Observation

Observation was conducted to gain a first-hand encounter of the activities in the organization (Merriam, 2009). The interactions of participants in formal and informal settings were observed to gain content knowledge and observe interactions. The physical

surroundings were observed for evidence of artifacts, symbols, and clues towards espoused values (Hatch, 2004; Martin, 2002; Schein, 1987). The data were recorded using the document found in Appendices D and E.

During regular business hours, the following locations were observed: the lobby/reception area, an internal open area, the open cubicle area, offices, and the lunch/break room. Other areas were selected based on the suggestion of the key informant or the belief that they would provide data. While it was not anticipated that the areas observed would always be occupied, it was expected that occasionally employees would walk by and offer verbal greetings.

Review of Documents

The final data collection method used in this study was document review (Yin, 2009). Documents related to the context of the study and to the research questions were collected throughout the data gathering process. External documents to be collected included newspaper/press articles and awards. Internal sources to be examined included the company website, and various internal reports and memoranda, as provided by the key informant and other participants. The list of documents examined appears in Appendix F.

Data Analysis

Data analysis proceeded simultaneously with data collection, with coding added to interview and focus group transcripts, document and observation forms, and field notes. In vivo coding was used to assign labels to sections of collected data, which were later examined for study relevance and denoted as concepts (Strauss & Corbin, 1998).

Coding was accomplished electronically using Atlas.ti qualitative data analysis and research software. Step 6 in the data collection plan set aside time after the first site visit for an intense initial analysis of data, so that interview questions could be refined, additional documents could be sought, and observations could be focused to address any questions that arose and clarify emerging themes. Narrative analysis was used to understand each participant's experience in the organization as obtained in the interviews (Merriam, 2009). The first-person accounts of experience gained from each participant were analyzed and coded to identify overarching categories. The final round of data analysis at the end of the study involved review of coding, with creation, definition, and summaries of themes and subthemes. Throughout the data analysis process, a constant comparative method was used (Merriam, 2009) to compare and triangulate data from different individuals and data collection methods. The result was a description of themes and findings and, ultimately, insight for organizations who want to not only exploit the marketplace in performance with known abilities, processes, and products but also explore it, creating new ones within the tailorable specific context of their organizations.

In addition, using the I-Space model of Boisot et al. (2011) as a template, this research created an ambidextrous ecosystem model to examine and better understand the creation and sustainment of exploitation and exploration in an organization. Ambidextrous antecedents, moderators, as well as behaviors that either had an impeding or facilitating effect on the ambidextrous social learning cycle—defined by Boisot et al. (2011, pp. 36-38) as the cyclical process of knowledge generation, articulation, generalization, dissemination, internalization, and application—were sought and characterized in the model. Furthermore, characteristics of Boisot's I-Space model

subcultures, such as feudal and charismatic groups (fiefs), groups with shared or no shared values or beliefs (clans and bureaucracies), or groups of competitive individuals where there is an air of each person for himself, were examined and were characterized in the context of the ambidextrous organization and the resultant data findings.

Robustness and Trustworthiness

Robustness and trustworthiness were ensured in this study by triangulating the data among participants and data sources on each question and sub-question. The participants included leaders and individuals in the organization, giving different perspectives on exploitation and exploration. The use of different data sources—interviews, observation, archival records, and document review—also increased the credibility of the study. Additionally, comparisons were made between data as well as with field notes and personal memos. Also increasing the study's credibility were a member check of the interview data, in which a transcript was sent to participants so they could ensure its accuracy, and a peer debriefing and coding check, in which another doctoral student checked the first several interview transcripts to provide feedback on the interview process and on the codes applied.

Transferability of the data was provided by "thick description" (Geertz, 1973; Lincoln & Guba, 1985; Merriam, 2009). Detailed descriptions were provided in the findings using direct quotations from the interviews. The findings are generalizable to theory rather than to a population (Yin, 2009). The conceptual framework involves a variety of theories, and the findings relate to each of them and potentially add to subsequent theory development.

Human Participants and Ethical Precautions

This study was conducted under the guidelines provided by the institutional review board of the George Washington University. Signed consent forms (Appendix G) were obtained from each of the interview participants. All documents acquired were handled in a confidential manner and kept in a secure place. Confidentiality agreements were obtained from the editor and transcriptionists. To ensure confidentiality, pseudonyms were created for each participant and for the organization. A final publication copy of this study was provided to the organization to review to ensure that its confidentiality had been protected.

Summary

This chapter has outlined aspects of the study methodology. A case study approach best captures the information required to answer the research questions. The study was expected to reveal the paradoxical nature of ambidexterity, which involves multiple individuals, departments, decisions, and processes. The methods used in the case study provided a convergence of evidence (Yin, 2009) designed to reveal mechanisms and processes of balance. The research procedures selected for this study ensured a thorough, relevant, and confidential acquisition of information. The data collected were analyzed to identify how organizations achieve and sustain ambidexterity and maintain a balance between market exploitation and exploration.

CHAPTER 4:

RESULTS

> Where do new ideas come from in the organization? That's an exciting thing about our company: They come from everybody. —Company employee

This chapter presents the findings from this case study, which was begun to answer the research questions: What are the behaviors and conditions that encourage market exploration? What are the behaviors and conditions that encourage market exploitation? What are the behaviors and conditions that encourage the sustainment of both exploration and exploitation, the main components in an ambidextrous organization? The research results represent a 6-month time period from May to December 2014 at "High-Tech Optics," a pseudonym for an optical grinding, polishing, and measuring machine manufacturer.

This chapter is organized into seven sections: (1) background on the organization, (2) summary of results by data source, (3) an overview of findings derived from the data, (4) findings related to exploitative organizational behaviors, (5) findings related to explorative organizational behaviors, (6) findings related to ambidextrous organizational behavior, and (7) chapter summary. This chapter gives a voice to the people in the company who otherwise would not have one. In telling their stories, I functioned as their scribe. Scholarly theory and practice related to the body of literature in chapter 2's literature review is also referenced, and the culmination of chapter 4 informs chapter 5, which presents the study's conclusions and implications.

Organizational Context of Study and Background

Evidence collected from document review, interviews, focus groups, and observation was used to provide contextual information about the research site, supplementing the basic information provided in chapter 3.

Company History

The company was established in 1982 and originally started under another name, changing its name to the current name several years later. The current name was chosen because it represents an amalgamation of two words synonymous with the high-tech optics field. Today, the business has five distinct divisions: machine manufacturing, software sales, optics manufacturing, research and development, and tool sales. At the time of the study, the organization's employees had an average tenure in the company of 2.7 years. The company's employee base had grown from 42 employees in 2011 to 68 employees in 2014.

The business's recent growth included new additions totaling 17,500 square feet of manufacturing space—7,500 square feet added in 2011 followed by an additional 10,000 square feet added in 2013. This additional 10,000-square-foot space was originally built for eventual expansion of company equipment and additional workspace. However, when a potential partner viewed the empty space during an introductory visit and tour in 2014, the visitor asked if his company could occupy this space with its machines and asked High-Tech Optics to be its distributor. Thus, the space was subsequently filled with the new partner's machines relatively quickly.

Competitors, Financial Status, and Customers

High-Tech Optics has no national competitors, having early on pursued domestic market areas in manufacturing and service that other potential competitors either avoided or ignored. The company currently has three international competitors that it is quickly catching up to and surpassing. A discussion with the company's chief financial officer (CFO) and the owner/chief executive officer (CEO) confirmed that the company has been solvent since its inception, with the exception of the year 1999, in which it could not pay its debts upon request and was forced to sell the company to an investor with the option to purchase the company back after a predetermined period of time. From 2000 to 2008, the company was owned by an investor. It did not make a profit from 2000 to 2002; however, it did continue to innovate during that time and actually experienced a surge in innovative successes for many of those 8 years. After 2002, the company once again began to show an annual profit. The company was repurchased by the original owner early (before contract completion) and has since continued to show both annual profit and annual innovation.

Machine sales have risen from 25 machines in 2011 to 32 machines in 2014, with an average cost of over $250,000 per machine. Furthermore, the sale of prototype (one-of-a-kind or completely new-concept machines) has steadily risen, from four in 2011 to seven in 2014. With its compound annual growth rate of 40% over the last 4 years, High-Tech Optics is well above the Standard & Poor's 500 rate of 4% to 5% for the same period.

High-Tech Optics' primary customers have traditionally come from the optics and machining manufacturing industries. Two customers were interviewed during field

research, one with a customer relationship of 3 years and the other with a customer relationship of 30 years. The company's customers for optics manufacturing, polishing, grinding, measuring, sales, and software run the gamut from small private optics companies and the auto industry to the federal government, to include the U.S. Navy, the U.S. Air Force, and NASA.

Results by Data Collection Method

Data were collected through document review, interviews, focus groups, and observation. This section reviews the process for each method as well as some of the main insights that resulted. Further discussion of the data obtained is provided in the findings section.

Document Review

Data collection began months before field research commenced with an Internet search for the company's name, represented here as "High-Tech Optics," as well as remote document review, review of video media, and review of case studies and research papers. A search for the company name initially produced 274,000 results, of which 374 were relevant and 36 were noteworthy references on 35 different websites. The top results were the company's website and references on social media sites such as LinkedIn, Facebook, a Twitter page, electronic Yellow Pages, Thomasnet.com, Manta, the local city chamber of commerce, and Industrial Machinery Digest. In addition, there were 99 design advertisements and various videos, including training and advertisement videos. Documents included news articles such as "Local High-Tech Optics Co. President Wins Award," a machine information sheet, various fliers describing company

products, and career and hiring information. The document search efforts also involved reading Small Business Innovation Research (SBIR) and Small Business Technology Transfer (SBTT) agreements, scientific white papers on topics such as aspheric and freeform mirrors, and articles in an electronic specifier magazine on optical grinding machines.

All documents reviewed were examined for data relating to the research questions. The documents highlighted the organization's academic relationships, federal relationships, and employee and customer relationships.

Academic relationships. The company created several academic partnership pipelines that were presenting future opportunities, not only in innovation but also in resources realized in the potential for trained future employees. These partnerships were with five institutions and universities:

- *University of Rochester*. High-Tech Optics subcontracted with the University of Rochester for SBIR research funding. The university developed a grant to investigate innovative ideas for research in the field of optics, and the company donated two machines for use in the research. As a result of this partnership, High-Tech Optics regularly engages and collaborates with the staff and student body; it also currently has five engineers who graduated from the University of Rochester.
- *Rochester Institute of Technology*. High-Tech Optics worked with the Rochester Institute of Technology in the past on manufacturing and design projects and has current plans to work with the institute on a new SBIR project. The company has

hired several engineer graduates from Rochester Institute of Technology and established cooperative work-study internship agreements.

- *Pennsylvania State University*. Pennsylvania State University works with High-Tech Optics on several SBIR projects and has purchased three High-Tech Optics grinding and polishing machines, which it uses for collaborative research and development projects with High-Tech Optics as well as for its own projects.
- *University of North Carolina*. High-Tech Optics has recently started working in partnership with the University of North Carolina Chapel Hill through the Center for Freedom Optics, a partnership between the University of Rochester and the University of North Carolina Chapel Hill to advance the state of the art in freeform optics. The company also has plans to work with the university on a new SBIR project.
- *Monroe Community College*. Engineers and machinists from High-Tech Optics have been teaching the advanced optics fabrication class for several years since Monroe Community College reached out to the company and community, seeking help in saving its ailing technical industrial manufacturing curriculum. The laboratory portion of the class is now held at High-Tech Optics. The college recently received a grant for two grinding and polishing machines, with a portion of the funds being donated by the company. These machines will be installed at Monroe Community College as part of the revitalized advanced optics fabrication class later this year, and the laboratory class will move back to the campus proper.

Federal relationships. Federal government relationships—SBIR funding, STTR grants, and independent research and development (IRAD) projects—expand

opportunities and allow small businesses to formally collaborate with world-renowned premiere research institutions, often with superior resources. Such programs are not easy to garner or execute, yet all were utilized by High-Tech Optics, as revealed through documents. Within the past 10 years, STTRs totaling $699,000 were leveraged, as well as SBIR funding totaling almost $15 million and IRAD funds in excess of $2.5 million.

Interviews

Twenty individual interviews were conducted. Two of the interviews were conducted with customers of the business, and one of these interviews was conducted by phone. The other interviews were conducted on site in one of the company offices or at an off-site conference. Characteristics of the interviewees are outlined in Table 4.1.

Table 4.1
Characteristics of Interview Participants

Subject #	Years with company	Employee status	Primary occupation	Gender*	Interview location	Interview date
S1	27	Active/FT	Engineer	Male	Conference	5/16/2014
S2	5	Active/FT	Sales	Male	Conference	5/16/2014
S3	10	Active/PT	Sales	Male	Office	10/7/2014
S4	1.5	Active/FT	Mid Mgt.	Male	Office	10/7/2014
S5	32	Active/FT	CEO	Male	Office	10/7/2014
S6	5	Active/FT	R&D	Male	Office	10/7/2014
S7	7	Active/FT	Engineer	Male	Office	10/7/2014
S8	5.5	Active/FT	HR	Female	Office	10/8/2014
S9	5	Active/FT	Marketing	Male	Office	10/8/2014
S10	8	Active/FT	Operations	Male	Office	10/8/2014
S11	2	Active/FT	Sales	Female	Office	10/10/2014
S12	4	Active/FT	CFO	Male	Office	10/11/2014
S13	3	Active/FT	Engineer	Male	Office	10/13/2014
S14	1.5	Active/FT	Engineer	Male	Office	10/14/2014
S15	2	Active/FT	Service	Male	Office	10/15/2014
S16	8	Active/FT	Sales	Male	Office	10/15/2014
S17	20	Active/FT	Sales	Female	Office	10/15/2014
S18	3	Active/FT	Machinist	Male	Office	10/16/2014
S19	8	Customer	CEO	Male	Office	10/17/2014
S20	30	Customer	VP	Male	Phone	10/23/2014

Mgt indicates management; CEO, chief executive officer; R&D, research and development; HR, human resources; CFO, chief financial officer; VP, vice president; FT, full-time; PT, part-time.

Interview questions were designed to draw out data related to ambidextrous (exploitative and explorative) behavior, and the primary study questions were compiled and utilized during interviews conducted with the two initial subjects at the off-site convention. These questions were later refined and modified into 17 interview questions.

Initial in vivo coding from interview transcripts using Atlas.ti software produced 1,376 codes. Exploitation was coded 399 times with 36 quotes; exploration, 320 times with 14 quotes; and ambidexterity, 310 times with 29 quotes. Additional codes included learning (7 quotes), knowledge sharing (8 quotes), culture (17 quotes), and helping (2 quotes). Numerous stories were also captured in the data.

Focus Groups

Two focus groups were held during the 2-week period of field research, one during the first week of research and the other during the second week. The first focus group, themed around creativity and innovation, was conducted during lunch and attended by 12 people, including machinists and engineers from the shop floor, the company CFO, software and machine salespeople, and members of the company's Advanced Programs Division (APD). The second focus group, also conducted during lunch, centered on the topic of learning and involved 15 people. Both sessions, which lasted approximately 1 hour each, started off slowly but quickly picked up momentum, producing rich and animated interview dialogue and observational data. "Interview data" presented in this study represent coalesced data from both interviews and focus groups.

Focus Group 1: Creativity and innovation. Two predominant topics were discussed at length during the first focus group. The first topic, related to creativity, highlighted that the feeling of acceptance toward creativity and creative behavior from

leadership gave the employees a feeling of permission to behave in creative ways and to think creatively, and this in turn spurred and fueled innovation. This feeling was expressed in the following dialogue:

> *Focus group attendee:* To comment on the creativity innovation question you were asking us, to me it almost seems what you're defining is the difference between creativity and innovation. Where creativity is just free mind and new ideas, innovation is applying those ideas in a disciplined way that achieves whatever goals you're after and makes sense to real applications.
>
> *Interviewer:* So are you saying that if you have an atmosphere where you can be creative, then that can help you turn that into innovation?
>
> *Focus group attendee:* Yes, an atmosphere where you can be creative but where there is also a set of disciplines to bring a creative idea through the process of developing into a product with a real application.

The second predominant topic involved helping customers develop successful solutions by collaborating with them in partnerships. The central message was that in helping customers, the company was not simply solving problems for them by building new or specialized pieces of equipment, but was also helping customers learn and perform. This theme is highlighted in the following dialogue:

> I spent a week with a customer once learning about a machine that we were designing for them—what they liked and what they didn't like on the competitor's equipment. We've done that with a lot of companies. Before we ever put a piece of metal together, we talked with these companies and said: What do you like? What don't you like? What would you like to see? And they have a personal feeling of ownership in that machine because they put their hat in the ring on what they wanted.
>
> And then we teach them the process on how to make that product so that they understand they're not only buying the machine, they are actually buying the process of how to make that product. And that's beneficial for us, because we learn, and for the customer. That's what we're striving for: something that is going to make us successful and make the customer successful.

Focus Group 2: Learning. The question asked during the second focus group was an inductive question that emerged after listening to the respondents discuss work

routinely done on the shop floor: whether learning was more specifically focused on performance (incremental, evolutionary) or specific needs or was spontaneous, revolutionary learning, that is, situated in the specific moment and work at hand or at the disposition of the workers. When asked, "Is learning here centered on questions related to what if, what next, or right now?" one attendee responded: "Definitely all three. You never know what that next thing is going to be; sometimes, it all happens at once."

Noteworthy during the second focus group was an extended discussion on knowledge sharing. The overarching sentiment was that knowledge was shared freely and that to not share knowledge would be a detriment to the company and its employees and even unadvisable. The following corroborating comments were captured:

> We all have to rely on each other to keep learning and growing. We wouldn't really benefit from keeping information from one another. I think everyone has the overall view that we need to share information in order for us to all grow.
>
> One of the things that drive not hoarding information is all our livelihoods depend on each other.

Regarding the last statement; when asked if there were rewards in sharing learning, one attendee stated: "Yes, it's called a paycheck." That comment led to chuckles all around.

Observation

Field research observations were consistent with interviews, focus groups, and documents reviewed. When entering the factory through the front door into the reception area, visitors immediately got a sense of a small austere reception space attended by a friendly receptionist and sparsely decorated with samples of manufactured products and a few industry advertisements and posters. It was noted that having a full-time dedicated

receptionist was not the norm in most organizations of this kind. Although the description of the small and unadorned reception area may sound uninviting, it hardly appeared to have this effect on guests, as visitors who arrived at the facility were not there long before they were engaged by friendly, enthusiastic employees and invited into the office spaces and factory floors beyond. An employee explained:

> Every time somebody comes in here, they always feel very warm and welcome. That starts with the owners but flows down through the whole organization. Everybody's very friendly with customers when they come in the building, and people are always very impressed by the culture here.

While conducting field research, I was also invited to attend the annual meeting of the local Technology and Manufacturing Association, an important association for regional tool and manufacturing companies and employees. As an active member and board member of several associations, the company sponsored many events in order to give back to the community and garner goodwill. The owner said that these venues offered the opportunity to talk to customers. He[1] also commented:

> One of the biggest opportunities of tech conferences and forums is you meet other companies and talk with small businesses, and this presents opportunities to collaborate and learn how to troubleshoot problems together.

During early, remote document review, I learned that the company was participating in an off-site conference near my location and took the opportunity to observe the organization. The conference was known as the SPIE.DSS, an international society advancing an interdisciplinary approach to the science and application of light. Its conference provides a forum for attendees to see the latest discoveries in defense, homeland security, and industrial sensing through optics.

[1] In this chapter, all participants are referred to with male pronouns as a way of preserving anonymity.

I visited the company booth for a day, taking advantage of the proximity of two company members for both two interviews and observation. The company's booth was situated within a cluster of companies from the same city, identified by a large sign hanging from the convention center ceiling. It was discovered these companies had intentionally cohabitated, agreeing to highlight themselves as a "regional cluster," even though they could have viewed themselves as direct competitors. It was also noted that this was the only regional group among hundreds of exhibitors who had collaborated to band together, distinguishing their geographic location within the country much like Silicon Valley, California, has done with computers or Boston and San Diego have done with the biotechnology industry. I also observed visitors to the booth for the day. One such visitor commented: "Our QA [quality assurance] department needs to see this machine. This is a must have. We have got to get one of these."

In summary, observational data suggested that relationships with employees and the larger professional community within the industry were both present and important.

Overview of Findings

This remainder of this chapter presents and discusses the nine findings that emerged from analyzing the data from observations, interviews, focus groups, and documentation. Table 4.2 summarizes these findings according to their sources and the three categories of exploitation, exploration, and ambidextrous behavior.

Table 4.2
Summary of Major Findings and Source of Supporting Data

	Finding	Observation	Interview/ focus group	Documents
Exploitive				
1	Employee and organizational focus on performance was related to customer satisfaction as well as financial metrics.		X	X
2	Performance was achieved by developing the right people in the right places.	X	X	
Explorative				
3	The company engaged in behavior characterized by risk taking, flexibility, and openness to change.	X	X	
4	The company emphasized innovation and had a process for vetting creative ideas.	X	X	
Ambidextrous				
5	The Advanced Programs Division was the company's place to create, explore, and execute.		X	
6	The company engaged in problemistic search, with numerous positive consequences.		X	
7	The company routinely embraced perturbation to induce learning and increase performance.		X	
8	The company had a legacy of helping individuals and organizations build relationships, network, create goodwill, and learn new skills.	X	X	X
9	Organizational members viewed performance and learning as equally important.	X	X	

Findings Related to Exploitative Organizational Behaviors

Organizational exploitation involves the use and refinement of existing knowledge within an organization and is associated with improvements, increased efficiency, and incremental adjustments. The literature characterizes the exploitative side

of organizational success in the market using a variety of terms, including refinement, choice, production, formalization, efficiency, execution, stability, constraint, familiarity, short-term gains, traditional practices, centralized control, evolutionary innovative change, incremental innovative change, convergent thinking, and adaptation. Regarding exploitative organizational behaviors, the study identified two findings: (a) employee focus on performance was related more to customer satisfaction than to financial metrics; and (b) performance was achieved by having the right people and developing them.

1. Employee and Organizational Focus on Performance Was Related to Customer Satisfaction as Well as Financial Metrics

Although some documents and interviewees discussed metrics such as annual profit and return on investment (a compound annual growth rate of 40%, putting High-Tech Optics above the S&P 500's rate of 4%), the majority of interviewees focused more on performance as it related to serving the customer. One interviewee highlighted the expectation for high performance:

> Performance is extremely important in the company. If you're not performing at a level that the owner determines to be high, he may talk to you once or twice but you really won't be here very long.

A high level of performance was expected for all. As another participant noted, "Everyone's got to pull their weight." Yet, in the culture of the company, performance served the customer:

> Performance is very important because our performance directly affects our customer's performance and we want that to be second to none.

Another employee put it this way: "What the customer needs, we're going to take care of it every time, and we're not going to worry about the cost."

Sometimes the performance expected might be seen by some to be impossible or unlikely, but employees were to push themselves beyond more obvious solutions:

> I think that we do well with not giving up when something is said to be impossible. So I think that's one of the best attributes of our company. That starts at the top.

Another participant related this effort to the customer:

> When everyone else has refused to help our customer, then they will come to us and say: Can you guys try this? We help them with their problem which others won't approach.

Although the interviewees did not discuss profit per se, they did mention an effort to remain competitive in their industry. One participant discussed this in terms of federal grants, specifically SBIRs:

> SBIRs help us add new talent, engineering. It's really been a driver for ways that we can improve our company in terms of staying ahead of our competition. So if we can have funding that helps us improve our technology or improve new ideas and help make concepts into commercial products that can help us become profitable, it's beneficial in that we can offer new products and solutions or improve our products and solutions to stay ahead of our competition.

The high level of engagement in performance and the processes of exploitation affected the company culture. "You have to have a thick skin around here!" was one of saying that was periodically mentioned. When asked what this comment meant, several respondents said that people express what is on their minds and occasionally "emotions fly" when discussing the best way to tackle a problem and "that was okay":

> Emotions happen here—in meetings, in discussions—and the message is that it's okay to get emotional about stuff. You're allowed to have emotions.

2. Performance Was Achieved by Developing the Right People in the Right Places

High-Tech Optics focused on hiring the right people, developing them, and ensuring that they were in the right place within the organization as a way to enhance company performance. The nature of the work at High-Tech Optics was complex, as this company leader explained:

> We're doing some complex things here. A lot of times it's complex materials for a customer, it's a complex shape. It's, you know, complex requirement, so it's not easy stuff that we do here. So whether it's an engineering task or advanced process development task or a machine assembly, we're not in a simple world here. You want simple, don't come to our company.

To perform to the company standards, an individual must be able to perform autonomously and at the same time consider collaboration from specialized expertise at appropriate points in the manufacturing process:

> So there's individual's personalities that need [constant guidance]: it's like, task, hand in your homework, task, homework, task, homework, bad grade, good grade—they need that constant, everyday: What are you doing? We're doing stuff that's so complex and requires so many different things from so many different individuals, and there's so much collaboration that there's just not time for that. You just have to do it.

Working with this level of manufacturing complexity also required individuals who were not afraid of challenges or failure and who displayed a tenacity that would sustain and energize them through the process.

To address the high level of complexity, the company needed diverse individuals with disparate skill sets in order to generate as many ideas and solutions as possible when solving complex problems. One participant explained:

> So we have people who are more about the production side, where it's all let's push towards efficiency, while others are more on the thinking side, looking for new ways to do things. If we have a service call come in and we need to

> troubleshoot a machine, we'll have more perspectives on it, and likely if it's something that we haven't seen before, we'll come to an actual solution faster because you can relate to other things other than just the same old "well, this happened once," "then we do this," "then we do this."

Another addressed the value of diversity among the staff:

> [Diversity] is one of the things that make us unique and allows us to do some of the things we do. Oftentimes we'll be introduced as a cast of characters, and it's really true: everyone's very different, and that's where we get some of our benefits. If everyone is doing the same thing and everyone acts the same, you're not going to have anything other than that same thing. It really is what makes us unique. The very different backgrounds of different people produce hugely different answers.

With these characteristics in mind, the company CEO said that the company preferred to "grow their own" whenever they could, hiring young engineers and machinists from local universities, community colleges, and technical schools. One reason was the intricacy of relationships between companies in the community and region—some being friends, some being customers or potential customers—the potential to strain or harm those relationships if one were to inadvertently hire someone away from another employer. Regarding this, the owner commented, "I always think of how I want to be treated."

Interviewees described an ability to move around within the organization if they had a desire to do so. One person explained: "Internally the company is very open to saying: 'Hey, I'm interested in this.' People can move around if they choose to based on their interests and their skills." Another confirmed that there were "multiple stories of people moving to different departments throughout the company; that's not uncommon." In the following story, the owner suggested a better fit for an employee after being asked for advice from a manager who wanted to help the employee:

> It wasn't my decision actually. I brought the question to the owner and said: This is where we are. What would you propose? And because he works with all the departments, he knew of a need in another department and asked: Do you think they would be okay doing this? And I was like: Yes. I actually think they'd be great at that, and they were.

Findings Related to Explorative Organizational Behaviors

Exploration—the search for and pursuit of new knowledge within an organization's external domains (Suzuki, 2013), accompanied by variety generation, distant search, risk taking, experimentation, and discovery (March, 1991)—has been characterized in the literature using terms such as variation, flexibility, innovation, organic, informal structure, loosely coupled systems, emergence, and decentralized control (March, 1991). Regarding explorative organizational behaviors, the study identified two findings: (a) the company engaged in behavior characterized by risk taking, flexibility, and openness to change, and (b) the company emphasized innovation and had a process for vetting creative ideas.

3. The Company Engaged in Behavior Characterized by Risk Taking, Flexibility, and Openness to Change

Data gathered in the form of interviews, focus groups, observation, and document review suggested that the company routinely engaged in behavior characterized by risk taking, flexibility, and change.

Risk taking. Risk taking meant, for example, taking on new projects with no revenue in order to learn or build new relationships:

> When work slowed in one area, we would go out and look for work in other areas. We would engage with other companies by helping them solve their problems either inexpensively or pro bono, and then we would learn from them.

In a discussion on risk with a company employee, I asked whether it was risky making a certain machine and taking critical resources away from daily operational tasks needed to make a profit. The employee offered his perspective regarding ways of investing resources smartly and why you should never stop reaching for the next goal:

> There's always risk in anything. It's a risk and reward kind of thing. I mean, if you're complacent in what you do, you're going to be in the same spot you were yesterday and left in the dust! And it's not a matter of stop everything and let's take half of the company and design a machine that everyone says can't be done. It's take a couple hours from here and there and try this piece of it [and proceed in a step-by-step fashion]. . . .
>
> It's at a certain level right now of ability and it meets a lot of the customer's requirements, but with that said there are customers out there that are requiring higher precision. So we are continuing—we're not sitting back and saying: Okay, this is good enough for most of our customers; we're not going to pursue it any further. . . . We're continuing to push the envelope of what that machine is capable of and trying to improve it the best that we can to get it. And I would say we have certain goals of where we want it to be right now. I would say as soon as we reach that goal, it's going to be another goal, and then as soon as we reach that goal, it's going to be another goal, because without those benchmarks you're just kind of sitting there twiddling your thumbs. And that's really what drives us to innovate and improve. And there's customers out there that probably don't even know they're going to need it, but we can foresee it.

While the participant understood the need to move forward, not all employees were so anxious to change, accept risk, and attempt what they viewed as difficult. A line manager described various employee perspectives as they tried to make sense of change regarding operations on the shop floor and the acceptance of risk:

> I can't say: Oh, I'm not building that. I haven't built it before. Why would I want to build that? To me, it's work for the guys that work for me. They're going to get paid for doing it as long as the company makes money off it—even if it's the first one: You develop it, they come. You've got to take it with an open mind and say: Let's take a crack at this. And sometimes you enjoy a little bit of a challenge. But a lot of people want to be like: Okay, why are we doing this? That's impossible. Well, it's not really impossible, or someone wouldn't have given you the task.

Flexibility. The strategy for risk taking involved flexibility—not only in the employees, but also built into the machines, so they could be easily modified or changed to suit customers' needs or market changes:

> There isn't a wild and crazy idea the owner won't explore. I mean, if a customer says: I've got an odd-shaped part I want to manufacture. Can you help me? . . . We will redesign an entire machine to be able to do that. So his willingness to explore those extremes and the built-in flexibility that's in the equipment makes it possible to do those kinds of things. So we have customers every day asking us if we can do job "X."

A history of innovation brought on by unconventional customer design requests and a willingness to change and accept risk for the customer had made the company and equipment inherently flexible and garnered a positive reputation for the company, as described here:

> There aren't many companies out there that can and will do some of the things we do. They'll hear about us, find out about us through whatever means, and find that, you know, that our company might be the only one that can really help us with this. Other companies haven't been asked to do as many strange things as we have. So because we have that history of doing some strange things and having to build flexibility in the machine in order to do that, the flexibility stays in the machine.

Another employee described flexibility as handling one's own job description but being ready for change when it came:

> Everybody here has a job description of what they're supposed to do day-to-day, but that changes; it could change day-to-day. And you don't hear "That's somebody else's problem" here. . . . You have to be adaptive and you have to be ready for that change whenever it happens. You know, if—we met with a machine company in the very early part of July. We had no idea that was coming so soon; you know it was like bang, bang. Somebody called us up and said: Hey, this company is looking for a new distributor. So we made a phone call. They said: Why don't you come up next week? And then they came here the week after and we signed a contract. So it was just being ready to accept that kind of change. When it happens, adjust on the fly and make quick decisions.

He then explained that the small size of the company was an advantage in being flexible and open to new opportunities:

> That's why I wanted to be part of a small company, was because you can make quick decisions like that. You don't have to deal with the bureaucracy of a big company where change happens too slowly. So I think that's our advantage right now is that we can act quickly on things and adjust on the fly to market opportunities.

Another interviewee expressed a similar sentiment regarding flexibility: "I guess probably the biggest thing we do well is adjust for change quickly, and we do a good job of coming up with unique solutions to customer problems."

Change. The company regularly sought out and embraced change through the bidding for, and execution of, SBIR contracts. For companies willing to accept the challenge, SBIRs allow small businesses to assume less research risk and innovate with the potential of leveraging these innovations for future commercial use. The adaptations the company willingly assumed with these research projects could ultimately change the way the company thought and did business, as evidenced in the following:

> [Participating in SBIRs has] helped us think about long-term, future, what's going on. Like some of the stuff that we're doing for the DoD [Department of Defense] is not commonplace optical shapes. It's stuff that probably won't be used in systems for years, but can we make some prototype technology from it? Can we make technologies to make these types of shapes that we can experiment with? I've always been of the opinion that through SBIRs the government spurs a lot of innovative research that I think will filter out into commercial products or consumer products as well.

Finally, internal recurring changes were also frequent, whether born out of necessity or intuitively occurring. One participant explained:

> I've been here 5 years, and there have been nine floor plans in the process development that I've laid out. It changes every 6 months, no matter what; it's in flux anyway due to expansions, real estate constraints. Areas would expand and then we'd change it. Others times we've created new technology and need to

> incorporate it into the lab to do research. Other reasons have been that university programs shut down and we acquire a bunch of equipment from that and implement it into the lab, and there are other reasons as well.

4. The Company Emphasized Innovation and Had a Process for Vetting Creative Ideas

Data from interviews suggested strong shared feelings regarding creativity and innovation; focus groups, documents, and observation also provided supporting evidence of these behaviors. In the first focus group on creativity and innovation, there was agreement on this participant's definition of the terms: "Creativity is just free mind, new ideas; innovation is applying those ideas in a disciplined way that achieves whatever goals you're after or makes sense to real applications." One commented that creativity was evident in the company culture: "I would say that our company is probably in a constant state of creativity, always trying to do things differently, or always trying to do things better." Yet, the culture not only provided freedom for creativity but also discipline:

> [The company has] an atmosphere where you can be creative, but there is also a set of disciplines to bring just a random, creative idea through the process of developing into a product or real application.

Several structures exemplified and supported the creative and innovative nature of the organization. One was the APD lab, which was a place where employees were expected to take more time while in the pursuit of performance to explore innovative ideas. Since the APD lab involves both exploitative and explorative elements, it is discussed under the ambidextrous subheading. Other structures included SBIR grants, trade shows, and a process for vetting ideas.

SBIRs. SBIRs provided a powerful vehicle for both creativity and innovation. One participant explained that "the company has traditionally relied on SBIR research dollars to help fund new innovation, so you wouldn't be able to realize that innovation and growth without small business innovative research." He continued:

> SBIRs have been instrumental in helping to fund innovation and really use our knowledge in technology to further advance that technology to meet the requirements for the Department of Defense, and that directly applies to the optics community and the fabrication requirements needed. That's been a real driver for us to be able to innovate new products and then get funded to actually try those new ideas because we're a very small company and funding [is] limited as far as what we can do with these new innovations.

Calling SBIRs "instrumental for a small company to be able to continue doing research and development," another participant commented on the major effects in terms of innovations and sales for customers:

> Half of the technology that we sell to customers is spawned out of SBIRs, and I think it's one of the reasons that we've been successful. With the SBIR program, the majority of the time there's some sort of product that's developed out of it that we can then sell in the marketplace.

In addition, SBIR research dollars allowed the company to hire new engineers from the city's local universities: "We're able to add new talent and we're able to bring in engineering professionals, young kids that are just coming out of college, and SBIR funding definitely helps drive that for sure."

Trade shows. High-Tech Optics also experienced temporal periods of creativity and innovation centered on a trade show event that the company held every 2 years in order to showcase its new products. An interviewee explained that "someone will say: Okay, what's new? What are we going to have for the next trade show? What new products or new software or new innovations are we going to unveil?" The company also

experienced periods of creativity and innovation as a result of other trade shows company employees attended. Following such a visit, the company would hold a meeting and discuss what the attendees discovered at the show and receive feedback from meeting members: “We’ll sit down and talk about things and from there, you know, that will generate other ideas.”

A process for deciding which innovations to pursue. When asked if the company came up with new products or processes or innovations or ideas on a regular basis, an interviewee responded: “So I would say, half joking but somewhat serious, sometimes too often. We’re always looking for customer projects, new innovations to solve and new avenues to make money as a company.”

Participants indicated that innovations in products and processes were frequent—with some saying such innovations occurred annually, quarterly, or even daily. Interviewees considered themselves creative and innovative and considered innovative behavior a natural part of their daily activities. One employee indicated that innovation was constant and added: “It’s never a lack of ideas; it’s choosing which are the right ones to chase.” Another stated, “One of the things that’s a struggle sometimes is to get all of that down and move forward on you know maybe five out of the hundred things that are on the plate—because there’s no lack of innovation around here, that’s for sure.” One participant explained the company’s top 100 list and how they reviewed this list and chose projects to pursue:

> We have a Top 100 List. We don’t have any need for any more ideas, but we always come up with them. So we have a list of our new product opportunities. They might not be a machine; it may be an add-on to our product, it might be a chunk of software or a wish list of things we’d like to get done, you know, what’s the biggest. We’ve got this list, and it’s actually organized in fairly methodical valuation process where we try to decide which ones are going to give us the

> biggest bang for the buck. So we're looking at company's needs for innovation. It's not based on us just saying: Well, let's design a flying saucer and go to the moon if nobody needs that right now. So what we're basing our innovation on is known roadblocks or needs for our customers.

Another participant elaborated on choosing innovations based on the intellectual and physical resources available, as well as the need:

> We're going to create with the things that are out there from an engineering standpoint and we're going to have the best tools for designing them. We're going to have the best knowledge base for building the best systems; that's what we're very, very good at. So it's the knowledge of how to do things and the knowledge of what's required and then taking what we know and solving that problem. It's kind of like there's a lot of ingredients out there and we've got to figure out how to make the cake; that's what we're good at. We take those ingredients and design a cake. If it doesn't taste quite right, we change it until we get it right.

One customer commented that not only did the company create and innovate consistently through the years, but the innovation was occurring at a faster rate, with new equipment going from the design phase to market more quickly than in previous years:

> In the early days, when they was a smaller company, it would take quite a while to develop a new machine. It would take them years to come up with that design and then proof it out for test and data test it before it was on the market. But because they're growing and getting bigger, there's more things happening at a faster rate. Just a few years ago I remember I was looking at some metrology equipment—it was just on the drawing board let's say 5 years earlier; they had just drawn this thing up on a chalkboard and within 3 years they had a highly functioning piece of metrology equipment, able to measure freeform optics. Everything's happening at a much higher rate. They've put together smaller platforms that maybe within 2 years were up and running and in the market. It's amazing! They recently built a new machine within a year. That thing was sketched out and ready to use a year and a half later. So I mean everything going from concept to market seems to be exponential, way faster over the years.

These innovations always involved employee collaboration, as noted by an interviewee and focus group participant:

> It's just a lot of collaboration, I think, is what drives the ideas and what drives innovation.

New ideas come from collaboration with others, combined with the experience in which they are working in.

Findings Related to Ambidextrous Organizational Behavior

Companies with both explorative and exploitative characteristics are known as ambidextrous. High-Tech Optics showed both of these sides, as discussed above. Five findings highlighted this dual nature. Specifically, (a) the APD was the company's place to create and explore as well as execute; (b) the company engaged in problemistic search, with numerous positive consequences; (c) the company routinely embraced perturbation to induce learning and increase performance; (d) the company had a legacy of helping individuals and organizations, building relationships, networking, creating goodwill, and learning new skills; and (e) organizational members viewed performance and learning as equally important.

5. The Advanced Programs Division Was the Company's Place to Create, Explore, and Execute

The APD within High-Tech Optics—mentioned in coded interviews and stories 30 times—was characterized by members as a place where problems were solved and ideas took shape in an atmosphere where members could perform and the organization could compete in the marketplace. The division was started in 2003 as a way to support customers' unique and specialized manufacturing needs after a corporation asked the company to make it a unique manufactured part that no one else would make for it. Fueled further by the U.S. Department of Defense's SBIR programs, the APD eventually evolved into a division with three primary purposes: to perform research and development for small business SBIR research and related projects, to perform research

and development for internal company development and customers, and to perform demonstrations for customers.

The APD was a robust facility that served customers with top-of-the-line specialized equipment and a demonstration laboratory for customers and potential customers to observe and learn specific processes, applications, and techniques. The lab had developed into a multifunctional facility with which to perform with more agility in the marketplace. One participant explained the customer focus of the APD:

> So we'll take that information, we'll make the part, the customer will come in for a demo, we'll go over the process with them, and if they decide to invest in equipment, we will provide them 4 days of training on how to operate our equipment and do their parts. During the first year, they basically have unlimited access to every technician and manager in this company.

Participants also described the ambidextrous culture of the APD: "Our culture is chaotic. We're all over the place. A lot of good things come from that, though it poses some interesting challenges." When I asked if the chaos worked, this participant responded that "it's one of the things that make us unique and allows us to do some of the things we do." This chaos could mean unexpected change. Interviewees indicated that unexpected insights or learning that could change one's way of thinking "happens all the time in APD."

The APD lab was an engine for both performance/exploitative behavior and creativity and innovation. New learning and discovery occurred and could be exercised and brought forth into the rest of the company to be shared, considered, and formally and informally discussed. Data suggested there were no guarantees that this explorative behavior would be met unquestionably or with open arms, but it was culturally acceptable and possibly even valued and expected of employees.

6. The Company Engaged in Problemistic Search, with Numerous Positive Consequences

Problemistic search—or learning that combines performance with urgent problem solving—was commonly used by High-Tech Optics (being mentioned 93 times in the data) and can be characterized as ambidextrous behavior because it combines exploitative performance for profit through customer problem solving with explorative discovery and learning for the purpose of company growth and learning. Problemistic search practiced internally within organizations is not uncommon and is undertaken when companies experience significant profit loss and must search for aggressive solutions. Data collected during field research portrayed longstanding problem-solving practices. The interviews provided strong evidence of problemistic search as a tool for ambidextrous learning and performance. One participant explained:

> If a customer has a challenge, it's really wrapped around a problem. Coming up with a solution for somebody else's problem is something that's very unique with our organization.

Another compared the organization to NASA in its focus on problem solving:

> You know, we can put enough mechanical engineers, process people, and software engineers on a problem and figure some stuff out! We've had people compare us to a young NASA in how we attack a problem.

The positive consequences of problemistic search, according to participants, included higher customer loyalty, higher organizational performance, individual and organizational learning, and deliberate perturbation.

7. The Company Routinely Embraced Perturbation to Induce Learning and Increase Performance

Research discusses injecting intentional "perturbation" into an organization as a way to allow exploitation and exploration to work successfully. In this way, problemistic search, applied on behalf of solving others' problems, suggests company practices designed around "shaking up" or "perturbing" specialized exploitative routines and breaking cultural or structural inertia, thus stimulating increased learning.

In this case, the company routinely embraced perturbation during problem solving and when helping customers and furthermore leveraged it as a mechanism to induce organizational learning and increase performance, as evidenced in the interviews and focus group sessions. Intentional perturbation was routinely injected by virtue of seeking out and accepting unanticipated customer problems. SBIRs, problemistic search on behalf of customers, and the creation of the APD were all ways in which the company perturbed its routine exploitative processes and activities, thereby creating a harbor in which to facilitate and encourage explorative behavior.

While problem solving was discussed in detail above, the following interview quote suggests perturbation, in that the company "always" signed up:

> We're almost honored by it [our problem-solving abilities]. So there will be inquiries from customers and they'll say: We can't find anybody to do this. Will you guys take a stab at figuring it out? And if it's for something like that, we always sign up, always!

Similarly, although many companies are involved in innovation, the fact that this company routinely innovated suggests perturbation. One participant commented:

> I would say that we do it [innovate] every day. I would, truly, because 80% or 90% of the projects we take on are those projects that nobody else wants to do,

> and that constantly drives us to have to innovate, to be able to create, measure, draw—every aspect of it.

Another noted that if this problem solving were easy, "everybody else would be doing it. That's kind of the mantra we have around here!"

Finally, perturbation was indicated by a willingness to work outside of one's comfort level, as this participant explained:

> People protest difficult problems because it's outside of their comfort level. A lot of times, 80% of what we do is outside of our comfort level. That's what really drives us to be the leader compared to our competition.

Stories involving perturbing exploitative company behavior were common and included the following short story:

> They had to literally rip the entire machine apart. In 4 days, they had that thing back up and running. I mean, it was incredible. They came down with two guys and just got on it and were there for 12 to 14 hours a day.

8. The Company Had a Legacy of Helping Individuals and Organizations, Building Relationships, Networking, Creating Goodwill, and Learning New Skills

As evidenced in interviews, focus groups, and observation, the company and its members described a legacy of helping individuals and other organizations. Helping customers was mentioned 33 times during interviews and was also noted as an antecedent and moderator in the company's present behavior and success. According to the data collected, help was sometimes offered with a goal of economic gain for the company, but just as often there were other reasons, such as the opportunity to perform, gain experience, build goodwill and relationships, and explore and learn. The culture of

helping applied both internally, within the company, and externally in terms of helping customers and potential customers, as well as students and universities.

An internal culture of helpfulness. One interviewee summed up the helping theme in the internal context when he said, "We're like a family around here because everybody helps everybody." Data also suggested that this helping characteristic began with the owner. The owner said:

> I teach—I give them every bit of knowledge I have. I expect it in return, and I expect them to be willing to do the same thing for each other. I'd say don't ever let me hear that you weren't willing to help somebody or teach somebody what you know.

When asked why he felt so strongly about that, he replied:

> Because it's the only way we're going to grow. In a football game, are you going to have the quarterback keep secret what the plays are from his other team members? You can't get the ball down the field if you do.

Continuing with the football metaphor, the owner went on to explain his view of his own job as helping and coaching the team:

> So really my job is, I think, helping our people move the ball in the right direction. And I think it's about not telling them what to do but helping them. . . . I think I could be considered the coach, the head coach, in helping them to figure out what it's going to take to get it done. And, once in a while I'm even a player coach where I'm in the game with them. Whether it's engineering, a piece of equipment, creating a new idea, my job, I think, as the saying goes, is jack of all trades, master of none. I mean, I have a lot of knowledge because of my time in this business and seeing a lot of different things. I try to share those experiences with the team players, whether they're managers, people on the floor, or any level of person in the company, trying to help them help us.

The owner indicated that he expected company managers to have the approach of "more of a coach, not a policeman."

Helping customers. Opportunities for performance and learning that built stronger customer relationships also arose from a culture of helping. Interviewees described always trying to help customers: "Whatever their challenges are, they'll bring them to us, and we'll find a way to solve them." This participant explained further:

> One of the great things about the Advanced Programs Division demo lab is customer-related stuff. We don't get easy demos. . . . They come in with the most complex things and the hardest demo you could ever do: Here, make this for me. If you do that, I'll buy your machine. . . . So we'll do demonstrations in the lab—sometimes paid, sometimes unpaid.
>
> There are times where we'll say: You should really be looking at a different process for that instead of our machines; we don't sell that, but there are the two companies in the U.S. who do, so we'd recommend you go talk to one of them about it because it's a better process for you. Customers can rely on us for good, honest, technical advice. So we'll have customers call us as their first call. Even if they know we can't help them with that need, they'll still call us to find out where they can get that because they trust us so much.

Interviewees also mentioned their organization's culture when discussing helping customers. One interviewee described "High-Tech Optics and the owner's whole philosophy of servicing what you sell and supporting what you sell." He commented:

> It's much more rewarding being in that type of environment and culture. You learn a lot and a lot more because you're engaging with different companies as well as different engineering teams.

Participants also described helping customers in order to build relationships, customer loyalty, and learn. Employees would even help a company with a machine it bought from someone else, and that had positive consequences for the company:

> You can learn about what's wrong with their product and you can also win a strong customer when you're willing to help them. You take care of a customer like that when they're down, and you create a strong bond with them. If we can help them out, you know, we'll do it.

In this instance, "You begin by problem solving with them, approaching them, and then if they come back and ask you for help with a different problem, then that's customer loyalty." Growing customer loyalty by reaching out to new potential customers and offering help also provided opportunities to learn and network:

> This also provides a learning experience as far as learning more about the industry, seeing who's busy, who's not busy, what's being manufactured and what requirements do these new products have and do we have a piece of equipment that will help them manufacture their product as well? It's also very good for networking. With the networking, we also get a heartbeat of how the industry is doing in general.

An attitude of helping also permeated service, repair, and training:

> Our service is without question the best service of all the companies, no question about it! We respond faster. At times we go to a fault of repairing a customer's piece of equipment. In other words, at times we may do it at a loss because the customer happens to be a good customer and they've bought a lot of equipment from us. But that endears those customers to us so that they don't go anywhere else.

> The other thing that I think gives us a very good competitive advantage is our training and our willingness to partner with our customers. . . . During the first year, they basically have unlimited access to every technician and manager in this company. We get their employees trained correctly so that they take care of the equipment and can make quality parts for their customer. Them making money is one of our most important goals. If they make money with our equipment, we know they're going to buy more.

Helping with education. Finally, a culture of helping led the organization to branch out into a new unexpected discipline of teaching. An employee told the story:

> I got asked to participate [in a university program] and when we started talking about what their needs were and everything, we realized there was a real need for machines and a curriculum to run their advanced optics university program. They wanted to run it and they didn't have that capability. So, you know, I said: You know what? We'll help with that. . . . That will be my contribution. We'll let you use our lab to run the class during nights after work hours. And they said: Oh, that would be wonderful. You know, the students would have to travel out there, but that's better than not having anything. . . .

> So they came out, we had the meeting, we talked about it, and I said: Who's the instructor? We don't have one, they replied. . . . Okay, well, you don't have an instructor, so then let's think about what else can we do for an instructor. We can get some industry people—and then I'm thinking well, all right, maybe we can do that too. Maybe we could have our guys teach the class because they know our equipment. . . . And then it was like: Good, that's solved. Let's look at your curriculum and see how we mold that into what we do in our lab and in our instruction. And it's like: Well, we really don't have a curriculum.

In the end, the company helped with the machines, the instructors, and the curriculum. The participant summarized:

> And so that's what we currently have, a class that we teach twice a year at High-Tech Optics U that our customers and potential customers come to. Sometimes educators—we've had a couple professors from the [university] take the course, and we'll also have the instructors from [community college] taking the course when they select their new teachers. They're also purchasing two machines which we gave them a very special price on to put in their labs. . . . I think eventually it will help us. . . . We'll be grabbing some of their graduating students eventually.

Another interviewee, also reflecting on the same story of the company setting up an academic training facility, discussed its benefits:

> We said, you know, this would be a good thing that we could offer to other companies. If we could do this for our customers, it would be a very good thing for promoting High-Tech Optics and getting us known as the place to learn how to make optics. It also turns out to be a very good sales tool too, because you're not only getting technicians that come to High-Tech Optics U but management also to learn about how to make precision optics and what's going on, so that maybe they might understand what's going on with their technicians at the technical level a bit more. We've also had customers that don't have any of our equipment; they have our competitor's equipment but want to learn the theory of making optics. Our competitors have also said, "You might want to go to High-Tech Optics U course." Quite often after that happens, it leads to some sort of sale with those customers or it leads to relationship building.

9. Organizational Members Viewed Performance and Learning as Equally Important

When asked whether performance or learning was more important, the message from organizational team members was that the two were equally important. When asked how important learning was in the company, one interviewee responded, "It's huge." This individual was then asked how he would put learning in relation to performance and responded:

> I'm an operations guy, so I've got to say performance [laughing], but really you need a mix. It's ever-changing, depending on your position and the time. You might need to get training. Other times we might need to build machines or service equipment. You cycle through. Hopefully, everyone's improving in both all of the time.

Another respondent suggested the two were intrinsically linked:

> I think that they're relatively equal because if you're performing you're learning. If you're not out there trying to better yourself, you're really just coasting. I'm constantly trying to pick up new skills, pick up new pieces of information—and to me, that's performance.

Yet another interviewee provided a different answer, suggesting learning was more important:

> I think that learning might be a little bit more important than performance because it can improve your performance.

Another agreed, saying:

> I would put learning above performance slightly, but I think each are tools. You can use learning to better your performance, and the better you perform the more you can learn.

When asked if learning took a backseat to performance in the company, one respondent answered:

> No, I don't think so. A lot of the employees at High-Tech Optics are engaged in learning and therefore finding new solutions and better ways to do things because we don't have that bread and butter widget that we make every day. You're not being judged on total performance as far as how many widgets did you get out today. So because of that environment, I would say we're more learning. Because the customers come up with a lot of different problems that we try to come up with a lot of different solutions, and that I think engages different styles of learning that have to be gone through to find information.

As the interviews proceeded, I moved from asking "How important is learning in the company?" "How important is performance in the company?" and "Where would you put learning in regard to performance?" and began to ask instead "Which is more important, performing or learning?" Based on interviewees' thoughtful responses in all my question variations and the care they took to answer them, I came away with the impression that although this was a difficult question to answer in any form, it was also not a troubling one. In this final interviewee response discussing the relationship of performance to learning, the respondent suggested that the two are equal, intrinsically linked, and necessary:

> Personally, I don't think you're going to be a very successful performer here at High-Tech Optics if you're not learning all the time because we're not stagnant—we're constantly implementing new software, new systems, new product designs, and new technologies. So I don't see how you would perform very well if you want to be just doing the same old same old. Part of performance is learning and improving in almost every aspect of our business. Part of that performance thing is for them to be able to perform, and for us to be successful as a company we've got to be learning new stuff all the time. And that's me included; I'm not exempt. I'm learning something every day. So it goes hand-in-hand. I don't think I could put one above the other because on the other side of it is I'm not looking for average players here; if you're average, you might not make it here.

Chapter Summary

This chapter has summarized the data collected during this qualitative case study, with its nine findings. Seventeen interview questions were ultimately presented to 20

interview subjects. Interviews, combined with focus groups and document review, produced 1,376 in vivo codes. The findings present behavioral data related to performance, learning, problem solving, helping, innovation, creativity, and change. Specifically, participants described engaging in collective behaviors that included helping, problem solving, learning, and working hard; these behaviors, as well as a focus on external competitiveness and performance, appeared to be part of the organization's culture. Participants also described a familiarity, comfort level with, and appreciation for change that could be characterized as a tolerance for existing in a state of permanent whitewater (Vaill, 1996). The culture they described emphasized collaboration and team effort above individual recognition, as well as openness, diversity, knowledge sharing, and tolerance for risk. Finally, it was noted that while there appeared to be expectations of sustained high performance, this was coupled with permission and even encouragement to explore and learn. There were also many stories suggesting a practiced policy of "over" before "out"—that is to say, considering better employee fit for someone who was thought to be underperforming rather than termination. The next chapter draws conclusions from these data relating to cultural and learning behaviors and practices that support the existence of ambidextrous organizational behavior constructed and practiced in unique ways.

CHAPTER 5:

INTERPRETATIONS OF FINDINGS AND CONCLUSIONS

Because organizations seldom consider organizational ambidexterity, they are often unaware of the evolutionary changes they undergo that favor exploitative over explorative behaviors (Suzuki, 2013). It is a belief of this researcher that the ability of an organization to both explore and exploit—to compete in mature technologies and markets where efficiency, control, and incremental improvement are prized while simultaneously competing in new technologies and markets where flexibility, autonomy, and experimentation are needed (O'Reilly & Tushman, 2013, p. 1)—will be a valuable survival skill in the future. The impact of increasing levels of complexity in today's organizations suggests that one way companies can respond in kind is by acknowledging, addressing, and refining the complex nature within their own organizations (Anderson, 1999; Bloom, 2010; Dover & Dierk, 2010; Gell-Mann, 1994; Johnson, 2007; Levin, 1999; March, 1991; Marion & Uhl-Bien, 2011; Pascale, 1999; Uhl-Bien et al., 2007), which in most cases includes varying degree of exploitative and explorative (ambidextrous) behavior. If they wish to maximize the performance of their current products, processes, and procedures in a continually changing market and also explore and innovate new ones, then they will need to examine their current practices as well as a path toward ambidextrous practices. This is what this study discovered High-Tech Optics had learned to do. This exploratory case study examined four research questions:

RQ1: What are the behaviors and conditions that encourage market exploration?

RQ2: What are the behaviors and conditions that encourage market exploitation?

RQ3: Regarding ambidextrous sustainment, what are the behaviors and conditions that encourage the sustainment of market exploitation?

RQ4: What are the behaviors and conditions that encourage the sustainment of market exploration?

This chapter summarizes the findings, presents four conclusions, and describes contributions to theory, implications for future research, and implications for practice. The chapter closes with concluding remarks.

Summary of Findings

The findings from this study identified nine ways that High-Tech Optics balanced exploitation with exploration to achieve and sustain organizational ambidexterity. As shown in Table 5.1, two of the findings related to exploitative behavior, two to explorative behavior, and five to ambidextrous behavior. Two mechanisms and two processes within the findings were also identified for keeping this particular organization's correct balance renewed and refreshed.

Table 5.1
Summary of Major Findings and Source of Supporting Data

	Finding	Observation	Interview/ focus group	Documents
Exploitive				
1	Employee and organizational focus on performance was related to customer satisfaction as well as financial metrics.		X	X
2	Performance was achieved by developing the right people in the right places.	X	X	
Explorative				
3	The company engaged in behavior characterized by risk taking, flexibility, and openness to change.	X	X	
4	The company emphasized innovation and had a process for vetting creative ideas.	X	X	
Ambidextrous				
5	The Advanced Programs Division was the company's place to create, explore, and execute.		X	
6	The company engaged in problemistic search, with numerous positive consequences.		X	
7	The company routinely embraced perturbation to induce learning and increase performance.		X	
8	The company had a legacy of helping individuals and organizations, building relationships, networking, creating goodwill, and learning new skills.	X	X	X
9	Organizational members viewed performance and learning as equally important.	X	X	

Early in the data collection process, this study identified the organization's cultural and learning behaviors and practices that naturally supported a supposed organizational ambidexterity model. The organization's history, learning behaviors, cultural practices, knowledge sharing, and structure were included. As a result of this study, it was discovered that the following types of behavior resulted in the organization being ambidextrous:

1. Helping others as a company practice
2. Learning through problem solving for customers

3. Linking performance, learning, and customer problem solving
4. Being comfortable with discomfort and change
5. Adopting a culture that included openness, flexibility, and knowledge sharing
6. Expecting high performance of employees while granting them permission to explore and learn

In scholarly research on ambidextrous environments and their models, I considered in part the work of Boisot, Nordberg, Yami, and Nicquevert (2011) and their I-Space model (Figure 5.1) as an early influencer. The "information space" model explored organizational aspects of social learning, knowledge sharing, knowledge management, culture, and structure on a grand scale. While it did not address ambidexterity directly, it did discuss ambidextrous aspects within the organization through these lenses, in this case science (exploration) and technology (exploitation). As discussed later, this model influenced and inspired the models created from this study, specifically Figures 5.2, the ambidextrous environment model, and Figure 5.3, the ambidextrous evolution model.

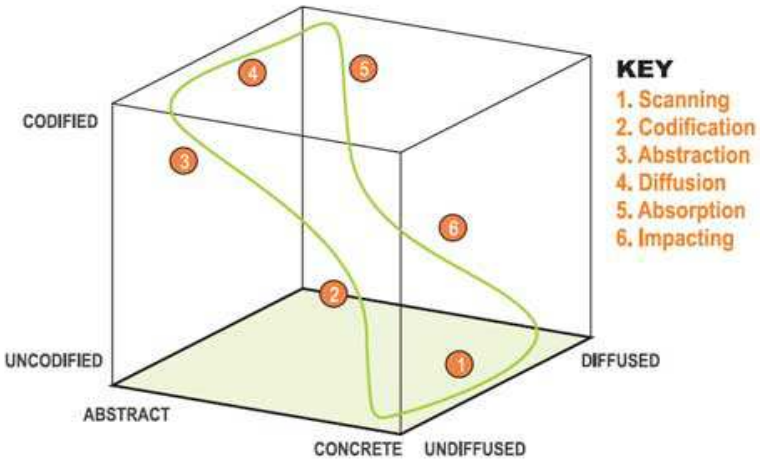

Figure 5.1. Boisot I-Space model.

From the early behaviors discovered came the following findings.

Finding 1 stated that *employee and organizational focus on performance was related to customer satisfaction as well as financial metrics.* This first finding related to organizational performance was anticipated and not considered to be significant in and of itself, yet it verified and validated a baseline in order to show the exploitative side of a production company (Katz & Kahn, 1966). What was significant, however, was that most subjects interviewed on the topic of exploitation focused more on performance as it related to serving customers than on performance as it related to company profit.

In *Finding 2*, *performance was achieved by developing the right people in the right places,* an informal and loosely structured process for onboarding and maturing employees was noted. This partially active, partially passive, and largely intuitively stitched-together system started with leadership and management control and oversight and then gradually shifted these rational processes, eventually handing these things over to the member. Leadership focused on hiring the right people, management focused on developing them in their duties, and then the organizational members themselves focused on ensuring that they felt as if they were in the right place within the organization.

Finding 3, engaging in behavior characterized by risk taking, flexibility, and openness to change, outlined risk-taking behavior practiced by the organization and its members which was approved by the organization, particularly if the risk represented a trade between exploitation and exploration, as in the example of helping a customer pro bono if the benefit of that assistance represented new learning. It was also noted that flexibility and an ambidextrous mindset were not just present among employees but also built into the machines to allow existing designs to be more easily explored and modified

to suit a changing market. A history of innovation brought on by exploring unconventional customer design requests and a willingness to change and accept risk had made the company, the employees, and the equipment inherently flexible (Jaussi & Dionne, 2003). These unique organizational behaviors, along with processes summarized in Findings 5 to 9 below, were also moderating contributors that allowed High-Tech Optics to sustain its ambidextrous practices and avoid exploitive practices from eventually driving out exploration (Tushman & O'Reilly, 1996).

Finding 4, emphasizing innovation and having a process for vetting creative ideas, was discovered primarily from data collected from interviews suggesting strong shared feelings of interest regarding creativity and innovation; focus groups, documents, and observations also provided supporting evidence. Creativity and innovation, indicators that suggest explorative behavior, were encouraged in the organization, as evidenced by the creation of the Advanced Programs Division (APD), an organizational space to nurture both structural and contextual ambidexterity. Furthermore, organizational members considered creativity to be an integral part of their company's culture and considered their company to be in a "constant state of creativity."

Finding 5 called attention to *the APD as the company's structurally ambidextrous place to create, explore, and execute.* This division was originally started as a way to support customers' unique and specialized manufacturing needs, and early on it was fueled by support from the U.S. Department of Defense's Small Business Innovation Research (SBIR) program. To the company's employees, the APD was a place where problems were solved and ideas took shape in an atmosphere where members could

perform and explore and the organization could compete in the marketplace with new innovation.

Finding 6, the company engaging in problemistic search, with numerous positive consequences, was a major finding from this study in which the company's use of problemistic search on behalf of customers in order to help them solve urgent and important problems benefited High-Tech Optics by way of new learning. Combining performance with urgent problem solving (Suzuki, 2013), problemistic search was characterized as ambidextrous behavior because it combined exploitative performance for profit with explorative discovery and learning.

Finding 7, routinely embracing perturbation to induce learning and increase performance, was another significant finding from this study, outlining the use of perturbation in the employment of customer problem-solving as a mechanism to induce learning, increase performance, and stimulate an ambidextrous cultural inertia (Tushman & O'Reilly, 1996, p. 18). Brunner, Staats, Tushman, and Upton (2010) viewed the injecting of intentional "perturbation" into an organization as the missing mechanism that allows exploitation and exploration to work successfully.

Finding 8, *having a legacy of helping individuals and organizations build relationships, network, create goodwill, and learn new skills,* was noted as an antecedent as well as a moderator to the ambidextrous behavior and research at High-Tech Optics. These activities led the company to ultimately perform and exploit the marketplace for profit.

Finding 9, organizational members viewing performance and learning as equally important, was the last major finding in this study. Most subjects interviewed said the

two components were inseparable, and a few attested that learning might actually be more important than performance, as it had the ability to enhance and increase performance.

An ambidextrous organizational environment model was developed based on the I-Space model and the nine research findings. Borrowing from Boisot et al. (2011) and the information space model, Figure 5.2 depicts an ambidextrous landscape with an exploitative side as well as an explorative side; social learning that circles throughout the organization; the APD and SBIR contracts, which support and connect exploitative behavior with explorative behavior; an organizational "estuary" for supporting the nurturing of creative ideas; and an organizational repository for capturing, storing, and periodically reviewing those ideas.

The "estuary" and its complementary "repository" are designed to work in tandem and alleviate some of the common ills experienced by traditional organizations regarding knowledge sharing and knowledge transfer (Burt, 2004; Jensen & Szulanski, 2004; Rothaermel, 2009; Szulanski, 1996). As new knowledge and learning are introduced to the organization and creative ideas and innovative concepts are discussed and explored, the organizational repository acts as the short- or long-term "parking spot" for the safe and secure capture and storage of those ideas. This repository serves not only complete and refined ideas but more importantly fractional pieces of ideas, concepts that may be ahead of current industry technology or that may not currently be resource executable. For High-Tech Optics, the collection and attendance point was manifested in its "100 ideas" list, in which it regularly discussed the top 100 company ideas for maturity and subsequent use.

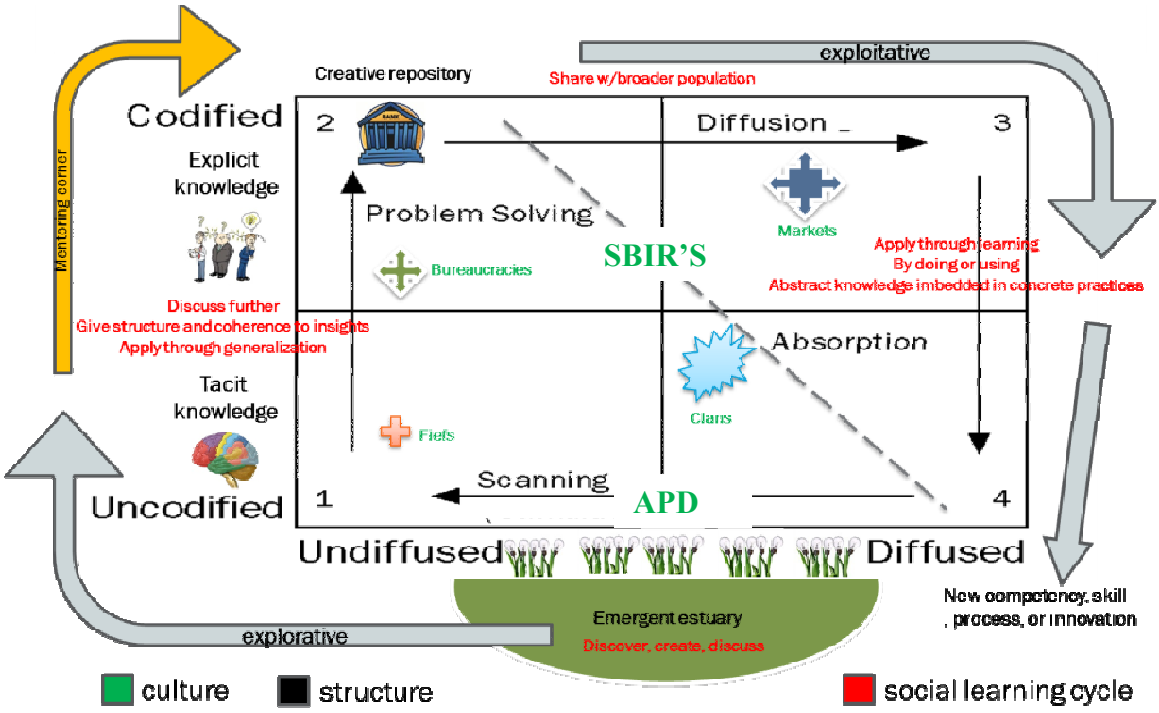

Figure 5.2. Examining ambidextrous organizations and learning through the I-Space model.

Conclusions

The findings in this exploratory case study provide an understanding of how High-Tech Optics practiced ambidexterity in an environment where exploitation often drives out exploration (Suzuki, 2013). This section presents four conclusions that provide meaning for the nine findings and begin to fill gaps in the literature regarding how an organization balances the antithetical nature of exploration vs. exploitation. The major conclusions that resulted from this study represent patterns derived from the nine findings described above and relate directly to the overarching research questions: *What are the behaviors and conditions that encourage and sustain market exploration and exploitation?* These conclusions are the result of new knowledge resulting from this study and the relevant literature used in developing the conceptual framework.

Table 5.3
Findings That Informed Each Conclusion

Conclusion	Origin	Ambidexterity of finding
Mechanisms		
1	Findings 3, 4, 6, 7, 8, 9	Explorative, ambidextrous
2	Findings 4, 6, 7, 8, 9	Explorative, ambidextrous
Processes		
3	Findings 3–9	Explorative, ambidextrous
4	Findings 1–9 (all findings)	Exploitive, explorative, ambidextrous

Conclusion 1

Organizations use problemistic search on behalf of customer problem solving as a way to help customers and continually renew and refresh their own ambidextrous behavior.

High-Tech Optics routinely employed urgent problem solving, known as problemistic search (Suzuki, 2013), on behalf of other companies. This practice, along with the practice of dynamic capabilities (Teece, Pisano, & Shuen, 1997; Winter, 2003) proved highly effective for the company in regard to ambidextrous learning. When analysis derived from Finding 3 (engagement in behavior characterized by risk taking, flexibility, and openness to change), Finding 4 (emphasis on innovation and a process for vetting creative ideas), Finding 6 (engagement in intentional problemistic search), Finding 7 (embracement of perturbation to induce learning and increase performance), Finding 8 (a legacy of helping), and Finding 9 (the importance of learning) were integrated into theoretical insights, what surfaced was a powerful engine for company learning and exploration. When organizations employ problemistic search as an explorative stop gap emergency procedure to buttress exploitative practices and fix their performance dilemmas, it is not unusual for them to go back to normal patterns and

familiar exploitative routines once the perceived crisis is resolved. What is unusual, however, and not present in the literature is the practice of explorative problemistic search applied for the benefit of solving others' problems, which perpetually reinforces and updates the executing company's exploitative practices, effectively feeding its learning with new and novel ideas.

Levitt and March (1988) discussed routines that change in response to the mechanism of organizational search, drawing from a pool of routines and adopting better ones when they are discovered. In the case of High-Tech Optics, the routine was problemistic search on the behalf of others. Because the rate of discovery is in part a function of the richness of the pool from which to pick, High-Tech Optics experienced high rates of discovery in its practices, as it tapped into a virtually endless resource. Sapolsky (2010), Bloom (2010), Gleick (2011), March (1991), Katz and Kahn (1966), and Pascale (1999) all described stable equilibrium as a form of stagnation or ceasing of movement, be it biological, sociological, or organizational.

Pascale (1999), treating organizations as complex adaptive systems, said that they share in the characteristics of complex living systems in that they have many agents acting in parallel; continually shuffle these building blocks, generating multiple levels of organization and structure; are subject to thermodynamics (entropy and negative entropy); and exhibit a capacity for pattern recognition and employ this to anticipate the future. High-Tech Optics, as an ambidextrous organization akin to a complex adaptive system, also demonstrated all of these characteristics. Regarding the characteristic of entropy and negative entropy, it learned through its problemistic search practices, as well as other practices, to replenish itself in terms of learning in a negative entropy fashion,

rendering itself resistant to falling into equilibrium, a precursor to death. In discussing learning and the organizational code of accumulated knowledge and beliefs, March (1991) said that the highest equilibrium knowledge for the code occurs when the code learns rapidly from individuals whose socialization to the code is slow; conversely, an equilibrium is reached when organizational individuals and the code share the same (not necessarily accurate) beliefs. In both of these instances, the common denominator is movement (action) and the idea that new learning occurs when this action takes place. With High-Tech Optics, the greatest degree of learning occurred in the course of helping other companies with their respective problems through the process of problemistic search.

Problemistic search (Suzuki, 2013) provided an engine for the company's ambidextrous behavior by routinely providing High-Tech Optics with urgent customer problems representing potentially detrimental consequences for these companies, such as profit loss, if not quickly resolved. As an exploitation orientation that positively influences ambidexterity and promotes exploration (Cyert & March, 1963; Levinthal & March, 1981), the ambidextrous benefits of this problemistic search, like the nature of the problem solving itself, were first focused on helping *others* problem solve and not originally directed toward the company executing it, as traditional literature has discussed. This represents a significant discovery, as the site employed these traditional techniques in a remarkably new way, by applying problemistic search to others' problems. This new "off-set" approach with problemistic search had several beneficial secondary effects for the company, which fueled ambidextrous behavior and supported learning.

Among the additional beneficial side effects were that High-Tech Optics had become experienced in the act of urgent "problemistic" problem solving for itself and others and had also become comfortable with and learned to become focused and productive in perturbed environments (Brunner et al., 2010). Because it was tapping into an inexhaustible resource of other companies' problems, it was also able to dip into a deep well of learning from continual problem-solving opportunities, providing it with infinite creative practice and potentially new problems. This would most likely not be the case were the company only occasionally addressing its own periodic crisis and drawing from a pool of its own familiar routines (Levitt & March, 1988).

Amabile (1998), writing on the subject of creativity, stated that in order to be creative, an idea must be appropriate, useful, and actionable. In the case of problem solving for others, appropriateness is regulated by the customer in a heterogeneous mix of collaboration. Problem solving also must employ expertise, creative thinking skills, and motivation. Intrinsic motivation in helping others problem solve was documented in High-Tech Optics' engineers, as many stated enjoyment and satisfaction in solving problems for others and learning in the process.

Problem solving also had a positive effect in that culturally, High-Tech Optics' engineers, machinists, and other employees considered organizational activities grounded in problemistic search or perturbation to be challenging, enjoyable, and a source of organizational pride, as they often resulted in positive organizational stories of success, accolades, or overcoming adversity. Culturally, the phenomenon of "shaking things up" in a mature organization and breaking a company's cultural and structural inertia to stimulate explorative learning was experienced by High-Tech Optics, which also

transferred the benefit of routinely challenging its inertia (Tushman & O'Reilly, 1996, p. 18). The learning benefits of these problemistic searches went to High-Tech Optics as the company taking on the cognitive and physical challenges of these urgent problems, while a large portion of the risk supposed from disruption went to the company being helped. Positive consequences of problemistic search on behalf of other companies, according to study participants, included higher customer loyalty, higher personal organizational performance, individual and organizational learning, and deliberate perturbation, which reverberated to other parts of their own organization. The directly transferable nature of the problem-solving learning for High-Tech Optics could be adopted by any productive (Katz & Kahn, 1966) organization wishing to leverage the learning benefits of continual problemistic search in new and novel ways.

Problemistic search on behalf of others' challenges also naturally provided the opportunity for perturbation by High-Tech Optics of its own organic challenges and did so at lower risk, as it was being applied to others' problems first and not perceived as a threatening disruption to their own organization. Levitt and March (1988) wrote that exploitation crowds out subsequent exploration because an organization's exploitation of existing knowledge is the source of its organizational competence. In the case of High-Tech Optics, problemistic search on behalf of others and the subsequent perturbation it generated represented an integration of exploitation and exploration. These methods of helping, problem solving, designing, and improving upon machinery were a source of the organization's competence.

Conclusion 2

An organization that leverages perturbation by way of problem solving for customers can continually renew and refresh its learning behavior.

Conclusion 2, derived from Finding 4 (emphasis on innovative creative solutions), Finding 6 (engagement in intentional problemistic search), Finding 7 (embracement of perturbation to induce learning and increase performance), Finding 8 (a legacy of helping), and Finding 9 (the importance of learning), and also in part from Finding 3 (engagement in behavior characterized by risk taking, flexibility, and openness to change) was the second important discovery and intrinsically integrated to Conclusion 1 on customer problemistic search. A surprising discovery of regular problem solving and perturbation on the behalf of customers for High-Tech Optics was the effect of leveraging perturbation for the company's own processes and innovations, leading to new questions, learning, and innovation. Most remarkable about the novel way in which High-Tech Optics employed problemistic search (Brunner et al., 2010; Marion & Uhl-Bien, 2011) by applying it to others' problems was the natural effect it had of perturbing the processes and challenging the assumptions within its own organization. While literature exists discussing organizations' perturbing their own processes in order to learn (Brunner et al., 2010; Brunner et al., 2010), there was no literature suggesting that organizations perturbed their own processes by virtue of perturbing others' first, effectively transferring what they learned to their own company as new learning and potentially new behavior. This, however, was the case with High-Tech Optics, and customer problemistic search was used in conjunction with perturbation in an effective "one-two" punch strategy of

exploitative performing in the marketplace combined with explorative learning and innovating on the factory floor.

In this instance, the company leveraged perturbation applied to customers' processes to learn in what ways to perturb and question its own processes, culminating in ambidextrous learning for High-Tech Optics and the perpetuation of its own ambidexterity. One remarkable result was flexibility and an ambidextrous mindset that traversed the organization's individuals to the very equipment that it manufactured. Flexibility was intentionally built into the machines the company innovated in order to allow for market changes and customers' customization needs.

To validate High-Tech Optics' explorative ambidextrous learning behavior, both Pascale (1999) and Sapolsky (2010) discussed one consequence of emerging complexity in nature: that one cannot see the end from the beginning. Considering the cellular starting state of an organism as an example, there is no way of knowing what the mature state will look like exactly. Applying this theory to organizational complexity and ambidexterity, in the case of High-Tech Optics and its upgradeable, flexible machines, it was not originally known that the machines would be designed in this way. In this instance, ambidexterity "jumped" from the organization, its individuals, and their culture to the machines they made. As told by interview subjects, a history of innovation brought on by exploring unconventional customer design requests and a willingness to change and accept risk for the customer had made the company, the employees, and even the equipment inherently flexible (Jaussi & Dionne, 2003).

High-Tech Optics had learned to continually shake up and challenge its structural and cultural inertia by leveraging perturbation induced in the course of problem solving

for others and then transferring those findings to regularly perturb its own processes, products, and procedures. Furthermore, these practices could easily be adopted and copied by other organizations. Brunner et al. (2010) viewed injecting intentional perturbation into an organization as the missing mechanism that allows exploitation and exploration to work successfully by intentionally "shaking things up" or "perturbing" specialized exploitative routines in order to break cultural inertia and stimulate explorative learning. Problemistic search on behalf of customers and the creation of the APD were ways in which High-Tech Optics perturbed its routine exploitative processes and activities, thereby creating an element of exploration within a safe harbor in which to facilitate and encourage explorative behavior in the midst of pursuing market exploitation. This behavior then radiated out and into other areas within the organization by virtue of an ambidextrous learning organization culture (Schwandt & Marquardt, 2000).

Schwandt and Marquardt (2000) wrote that learning inside an organization must be equal to or greater than changes outside the organization or the organization will not survive; adaptation is achieved only by learning, and an organization must learn faster than its competitors. By learning from others through problemistic search and perturbing its own processes by way of this learning, High-Tech Optics routinely exposed itself to more learning opportunities than its competitors and also routinely exposed itself to an artificially higher percentage of outside organizational changes than would be encountered normally through the companies it sought out or was enlisted to help.

While organizational members frequently spoke of looking for customer problems to tackle, being good at solving difficult problems no one else would consider, and being

asked to solve the most difficult of problems by others, they never said directly that they did these things in part to challenge (perturb) their own processes or products. With this said, however, they did suggest that this type of regular urgent customer problem solving (problemistic search) and perturbation led them to reevaluate and rejig their own processes or products or consider completely new ones. Perturbation, as with problemistic search on behalf of others' challenges, naturally provided this opportunity for perturbation by High-Tech Optics of its own organic challenges and naturally did so at lower risk, as it was being applied to others' problems first and was not initially seen as a threatening disruption to the organization. Processes and products, once perturbed within others' companies by way of customer problem solving, could then if desired be introduced into High-Tech Optics for discussion or analysis through the company's APD, an explorative and ambidextrous conduit into the company providing a low-risk, safe environment with which to apply its own perturbation inside of the company. The novel way in which High-Tech Optics employed problemistic search and induced perturbation in others and its own company are not practices that are exclusive to this organization. Any organization could customize and employ similar strategies to meet its unique needs.

Conclusion 3

An organization can utilize intentionally created ambidextrous spaces as opportunities to practice structural ambidexterity.

An ambidextrous space is used as an estuary for transitioning potentially disruptive technology and discovering and socializing new innovation. Theoretical insights for this conclusion were derived from Finding 3 (engagement in risk-taking, flexible, open, and change-tolerant behavior), Finding 4 (emphasis on innovative creative

solutions), Finding 5 (utilization of the APD), Finding 6 (engagement in intentional problemistic search), Finding 7 (embracement of perturbation to induce learning and increase performance), Finding 8 (a legacy of helping), and Finding 9 (the importance of learning).

The APD presented itself as a place that supported structural ambidexterity. Serving much as an "air-lock" separating an inhospitable climate from a more tolerable one, the APD provided a barrier as well as a transition space to safely explore, create, innovate, and integrate "explorative" new ideas within a revered and protected exploitative environment. Effectively creating negative entropy for the company in regard to revolutionary technological change (Tushman & O'Reilly, 1996), the APD sometimes served as a conduit for new potentially disruptive innovation, sometimes as an innovation nursery, sometimes as a protective barrier, and sometimes as a technological refinement, demonstration, and test area (Afuah, 2001; O'Reilly & Tushman, 2013). In a study exploring the management of evolutionary and revolutionary change, Tushman and O'Reilly (1996) discovered that long-term success was marked by increasing alignment among strategy, structure, people, and culture driven by either performance problems or major shifts in the organization's environment, with less successful firms reacting to environmental jolts and more successful firms proactively initiating innovation that reshaped their market (p. 11). The creation and utilization of the APD within High-Tech Optics, not only as a structural ambidextrous space but also as a dynamic multifunctional transitional space, validates Tushman and O'Reilly's study discussing patterns in organizations and the best way to manage evolutionary and revolutionary change—with High-Tech Optics fitting the description of a successful firm as described above. High-

Tech Optics built the APD as an ambidextrous focal point within its structure, avoiding the need for costly restructuring or changes later.

The significance of this finding and the importance of this conclusion lie not only in its existence and the versatile, functional utility of its use by the company but also in its co-location within the center of the company's factory. According to Moon and Huh (2011), structural ambidextrous spaces are often physically separated so as not to disrupt mastered exploitative processes that the company depends on heavily. To this end, Duncan (1976), the originator of the concept of ambidexterity, suggested that ambidexterity could only be practiced successfully if one were to "switch" the rules from the entire organization exploiting to the entire organization exploring, never behaving in both ways at once.

Separating an explorative organizational component from a larger exploitative one had evolved into an integral part of the company. Here, risk taking by organizational members was approved by the organization and its leadership, particularly since the risk represented a trade between exploitation and exploration (Andriopoulos & Lewis, 2009; Gibson & Birkenshaw, 2004; Jaussi & Dionne, 2003; Williams, 2004). The APD was a naturally intuitive space for this to happen. As an example, the idea of flexibility being built into High-Tech Optic machinery was first explored in the APD and was encouraged in the organization (Andriopoulos & Lewis, 2009; Jaussi & Dionne, 2003; Marion & Uhl-Bien, 2011; Unsworth, 2001; Williams, 2004). The organization discussed the APD as a place where the company could explore creative ideas and innovate new designs.

Organizational members considered creativity to be an integral part of their company's culture and considered their company to be in a "constant state of creativity."

To this end, Williams (2004) discussed divergent thinking and creativity as fundamental to one another, with creativity in the management literature requiring both divergence (novelty and originality) and usefulness in a given context (p. 188). Central to creativity and divergent thinking is openness to experience, or the propensity to be imaginative, original, unconventional, and independent, with open individuals seeking out new and varied experiences as well as tolerating ambiguity (p. 189). As proof of an organizational culture of creativity and creative individuals, members had been conditioned, or perhaps allowed depending on their disposition, through the practice of problemistic search to be open to experience and seek it out.

With these positive attitudes toward divergent thinking (Williams, 2004), exploration, and as manifested here, creativity, there is also the expectation of production (Katz & Kahn, 1966) and performance. The APD provided a physical and permeable space to welcome exploration, exercise creativity in a safe estuary, and transform creative tacit knowledge (Amabile, 1998) into more tangible explicit innovative creations to exploit in the market. The culture that provided this freedom for creativity in the APD space also required discipline and constraint in order to refine those creative ideas into innovative solutions. As one organizational member explained, that space supported the alchemy required to transform a new idea into an innovative solution and ultimately into a marketable process or product.

This process has helped High-Tech Optics avoid the fortunate misfortune of falling into a success trap brought about and perpetuated by cultural inertia towards only exploitative behaviors (Tushman & O'Reilly, 1996). Tushman and O'Reilly's study, which also looked at what they called "the success syndrome," indicated that internal

congruence among strategy, structure, culture, and people drives short-term performance but not necessarily long-term success due to the building up of complex structures, both cultural and structural, leading to institutionalization, complacency, and arrogance (p. 18). The authors noted that successful companies learn what works and incorporate it into their operations. To navigate the pitfalls of Tushman and O'Reilly's success trap, High-Tech Optics erected the APD as a structurally ambidextrous space designed to accommodate new complexity. Problemistic search on behalf of customers and the creation of the APD were ways in which High-Tech Optics perturbed its routine exploitative processes and activities, thereby creating an element of exploration within a safe harbor in which to facilitate and encourage explorative behavior in the midst of pursuing market exploitation. This behavior then radiated out into other areas within the organization by virtue of a learning organization culture.

Opportunities to perform and learn while at the same time building stronger customer relationships often arose from an organizational culture of helping and problem solving. One of the places where these opportunities would culminate was the APD demonstration laboratory. In the demo lab, customers would work in conjunction with company employees to create and innovate solutions for their specific needs. In this instance, the company initially created the APD to support customers' problems and challenges. By virtue of the nature of this explorative work, the APD became the benefactor of ambidextrous activities and a structurally ambidextrous space within the organization, helping it maintain a robust structurally ambidextrous space and ambidextrous culture.

The concept of an explorative space is not new; having an "advanced" division or department, a "dreamworks," "skunkworks," or "prototype facility" is a success strategy in many companies. What is potentially different, however, regarding the APD within High-Tech Optics is the versatile, complex, and adaptive nature of its use, its visible co-location at the center of the organization's facility, and its permeable nature in its service to the organization's culture. It would not be difficult for other organizations to adopt a similar model as a structural ambidextrous space, for example, or to modify their existing explorative space to become more useful and versatile. The key would be to make sure the space was a complex and adaptive versatile "ambidextrous" space between both sides of the organization, as opposed to simply being explorative or creative.

According to Brunner et al. (2010), studies conducted at the Toyota Corporation have revealed a factory floor that is in itself one large structural ambidextrous space. Toyota was able to achieve this in a number of ways, including characterizing breakdowns of established routines on the factory floor as opportunities to explore and learn rather than as threats. Toyota employees are taught to go and see problems for themselves rather than being told about them or reading of them and by using perturbation as a mechanism for transitioning from exploitation to exploration and back again. The problem faced by mature organizations is not the failure to exploit but the gradual erosion of their capacity to explore (Brunner et al., 2010). Toyota employees, like High-Tech Optics employees, are encouraged and sanctioned to perturb routines in the name of new discovery and learning.

Conclusion 4

An organization can practice contextual ambidexterity by virtue of the learning organizational culture, the pursuit of research contracts, and a special organizational department dedicated to explorative and exploitative behavior.

One of the biggest validators of the presence of contextual ambidexterity within High-Tech Optics was the careful balance of performance and learning, a behavior at the very heart of any ambidextrous organization. Given a great deal of thoughtful consideration during subject interviews, this significant finding (Finding 9) was just one of the contributors to this conclusion. The fact that this conclusion, derived from Findings 1 to 9, was connected to every discovery and finding regarding ambidexterity is not surprising. Instead, it is a validation of the presence of contextual ambidexterity representative of an ambidextrous culture and organization. What was surprising, however, was that High-Tech Optics had inadvertently converged on all three types of ambidexterity and sustained them with mechanisms, processes, behaviors, and physical spaces in order to perpetuate these practices. Because contextual ambidexterity is akin to an ambidextrous culture, literature and theory related to all nine findings can reach across this conclusion. Also, because ambidexterity is also akin to complexity science and complex adaptive systems, theory and literature from these concepts is also applicable.

Perhaps the single most important thing a chief executive officer (CEO) does for an organization is set the organization's culture (Schein, 1992). If a leader is aware of and values both explorative and exploitative behavior, that will be reflected in the culture through artifacts, symbols, values, and assumptions (Hatch, 1993, 2004; Schein, 1992, 1993, 2003) and will be present in members' behaviors. Having a structurally

ambidextrous space means having an environment that allows explorative creativity along with exploitative behavior to take up residence in the same physical location (O'Reilly & Tushman, 2013). To say an organization has contextual ambidexterity goes beyond the claim that an organization has prepared a place to be explorative to saying that ambidextrous behavior is part of the organization and the individual organizational members' cognitive behavior. Effectively, it has become part of their physical behavior, part of their muscle memory (O'Reilly & Tushman, 2013). Discovering both types of ambidexterity, then, presents a strong argument for validation that explorative and exploitative organizational behavior has taken up permanent residence in the company.

High-Tech Optics has proven itself as an ambidextrous organization in a number of ways in this study and in theory because of its contextual orientation, structural architecture, as well as temporal practices. Contextual ambidexterity, which speaks in part to an organization's learning behaviors, can be validated through the theory and writings of James March (1991), among others. March (1991), writing with Cyert (Cyert & March, 1963) on theories of limited rationality, stated that the usual assumption is that search is inhibited if the most preferred alternative is above, but in the neighborhood of, the target. On the other hand, search is stimulated if the most preferred known alternative is below the target (p. 72). For High-Tech Optics, learning occurred in real time as it helped other companies solve their problems, which always contain unknowns starting out, their most preferred known alternatives invariably being below the target. Furthermore, these ideas, which are also found in theories of satisficing and prospect theory, have led to attempts to specify conditions under which target-oriented search rules are optimal (p. 72). Problemistic search on behalf of others may be one of these

optimal conditions as "going in" to solve a customer's problem most likely starts with all preferred alternatives as unknowns and, as stated above, below the target.

Because the simultaneous pursuit of exploitation and exploration is difficult (Levinthal & March, 1993), most organizations choose to focus only on exploitation, as it represents the source of the organization's existing competence and knowledge (Levitt & March, 1988). This study discovered that by virtue of the organization's learning culture, the pursuit and execution of SBIR contracts, and the establishment and utilization of the APD, the organization's competence and knowledge traversed both exploitation and exploration, creating a contextually ambidextrous organization (O'Reilly & Tushman, 2013). Within the APD, risk taking was approved if the risk represented a trade between exploitation and exploration (Andriopoulos & Lewis, 2009; Gibson & Birkenshaw, 2004; Jaussi & Dionne, 2003; Williams, 2004).

Helping was also encouraged and expected, to include helping a customer pro bono if it represented new learning or a chance to sharpen employees' skill and improve their performance, or if there was a chance for the organization to innovate and create new products (Amabile, 1998). In a study on creativity and motivation, Amabile wrote that discoveries from almost two decades of research found that managerial practices that affect creativity fall into six categories: challenge, freedom, resources, workgroup features, supervisory encouragement, and organizational support. In the case of High-Tech Optics, all six of these categories were met by supervisors and were displayed by employees. Employees suggested that they enjoyed and were proud of challenges they were able to tackle, they enjoyed a certain amount of freedom to make their own decisions and mistakes, and resources were available, such as the use of the APD and

helping customers as a function of work. Additionally, workgroup considerations were closely considered—from the CEO, who cared deeply about teams working and learning together, to managers, who matched people up carefully in informal mentor/mentee relationships.

For High-Tech Optics, the importance of helping within the organization was rooted in learning and growth and was a barometric indicator for the organization's health and climate. Edgar Schein's (1992) statement that perhaps the single most important thing a leader does for the organization is set the culture for that organization also applied here, as the company CEO had strong feelings regarding the setting of an organizational culture grounded in shared basic assumptions (Schein, 2003) of helping, sharing, learning, performing, and knowledge sharing. The CEO sometimes referred to himself as a coach and sometimes as a coach/player within the company. An attitude of helping also permeated service, repair, and training, and the company boasted providing the "best service without question" within its industry. In addition to learning from customer problems, experiencing new designs, and building relationships, helping behavior also provided a learning experience as far as learning more about the complex optics industry.

The culture of helping applied both internally, within the company, as well as externally. At home (in the organization), helpfulness could be observed everywhere, from the shop floor to the boardroom, in what was described as an atmosphere where "everybody helps everybody." This culture of helping, building relationships, and learning also led the organization to branch out into a new and unexpected area, to include the building and teaching of new academic programs and curriculum designed

around optics manufacturing. Burt's (2004) study on brokerage and social capital indicated that people whose networks span structural holes within and between organizations can have early access to diverse, often contradictory information and interpretations, which gives them a competitive advantage in seeing good ideas, as ideas can come over a variety of paths from a variety of sources (p. 356). Ambidextrous (Dover & Dierk, 2010) and complexity (Marion & Uhl-Bien, 2011) leaders who have the capability and wherewithal to enable employees, see impending change, and focus on opportunities are also needed.

Flexibility was also encouraged in thinking (Williams, 2004), where middle managers discussed helping employees make sense of new phenomena and getting the most from them in terms of productivity and learning. To this end, they characterized part of their position as managers as helping workers with transition and sometimes transformation as they struggled to make sense of changes in operations on the shop floor, demonstrating the practice of ambidextrous and complexity leadership (Marion & Uhl-Bien, 2011; Uhl-Bien et al., 2007). Structural inertia, the building up of organizational structure to the point of rigidity and not being able to adapt to or implement anything except "the smallest or incremental of change" (Tushman & O'Reilly, 1996, p. 18), and cultural inertia, which amounts to building up of norms, stories, or values in the organizational code which thwart timely adaptive change, both represent the danger of organizations potentially falling into a "success trap" (Ingram & Baum, 1997; Levitt & March, 1988; Tushman & O'Reilly, 1996). These phenomena represent potential destroyers of ambidexterity and innovative organizational performance since complex systems in motion without changeability, adaptability, and

negative entropy cannot perpetually sustain them indefinitely and are subject to eventual rundown (Bloom, 2010; March, 1991; Pascale, 1999). High-Tech Optics learned to continually shake up and challenge inertia and produce negative entropy, avoiding many of these traditional pitfalls.

Balancing ambidexterity (exploitative performance with explorative learning) is at the very heart of the exploitation vs. exploration discussion. Within this discussion are two schools of thought: one says that the two will forever be at odds (Abernathy, 1978; Benner & Tushman, 2003; Levinthal & March, 1993), and the other says they can be complementary and that exploitation can provide a foundation for and facilitate exploration (Adler, Goldoftas, & Levine, 1999; Feldman & Pentland, 2003; Nelson & Winter, 1982; Zollo & Winter, 2002). In the case of High-Tech Optics, customer problem solving, injecting perturbation, and embracing perturbation by way of exploratory interpretation (Gilbert, 2006; Lant, Milliken, & Batra, 1992; Nonaka, 1994; Schon, 1983) validated the complement school of thought, an argument that if settled could prove that successful ambidexterity is not accidental nor an aberration but instead a byproduct of superior leadership and administrative capabilities (Adler et al., 1999; Agarwal & Helfat, 2009; Helfat et al., 2007). Learning ambidexterity in an organization is first and foremost most heavily dependent upon learning and learning behaviors that are based on both existing and novel knowledge (Raisch & Birkinshaw, 2008). These learning behaviors are then heavily influenced by characteristics within an organization's culture, and this in turn is heavily influenced by a company's leader, whose only job of real importance is to create, manage, and understand the organization's unique culture (Schein, 1992). If the definition of culture as the sum total of all its assumptions and everything it has learned is

considered (Schein, 2014), then learned ambidextrous behavior becomes part of that culture. The unique characteristics of the company CEO—who had a graduate degree in physical education with an emphasis on coaching, developing others, performance, and learning, combined with a lifelong fascination with mechanical engineering and high technology—resulted in the creation of a high-tech learning culture that was naturally ambidextrous.

Every organization in its evolutionary lifecycle most likely converges on ambidexterity and ambidextrous practices, perhaps multiple times. However, as quickly as the organization converges with ambidexterity, it subsequently diverges away from it (exploration and exploitation) and goes back to practicing exclusive exploitation until it again converges on or initiates simultaneous exploitative and explorative behavior. Contrary to the normal practice of most organizations, however, who hastily stumble into ambidextrous behavior, benefiting from it sporadically, often using it as a stop-gap emergency measure, or encountering it when it manifests itself as an aberration brought by a new employee before he or she becomes indoctrinated into the culture (March, 1991), High-Tech Optics prepared a place for ambidexterity to take up permanent residence. Because High-Tech Optics and other ambidextrous companies have done this, they have validated the complementary school of thought that successful ambidexterity is a byproduct of superior leadership and administrative capabilities, benefiting an organization in remarkable ways (Adler et al., 1999; Agarwal & Helfat, 2009; Helfat et al., 2007).

Contributions to Theory

Past research warns that generally, exploitation edges out exploration in the pursuit of market performance and shorter-term profit (Denrell & March, 2001; Fang et al., 2010; Levinthal & March, 1981). For an organization to be ambidextrous and sustain ambidexterity, it must have an explorative component that is robust, valued, and not in retreat. In this study, data supported this description for High-Tech Optics.

This study and its research questions explored the creation and maintenance of ambidexterity within an organization at the intersection of organizational learning and culture and the patterns of learning inherent within organizational cultures. Conclusions drawn from findings determined that the organization used problemistic search on behalf of customer problem solving; the organization leveraged perturbation as a way to continually renew and refresh its own learning; the organization utilized its APD space to facilitate structural ambidexterity; the organization practiced contextual ambidexterity by virtue of its culture, SBIR research, and the APD; and the organization maintained a careful balance between performance and learning. This study additionally introduces two new models inspired by the information space model in Figure 5.1 (Boisot et al., 2011) depicting the organizational ambidextrous environment connecting the dual structures of exploitation and exploration, and the ambidextrous evolution depicting the organizational transformation from exploitation to ambidexterity. This final model, shown in Figure 5.3, outlines the evolution of an ambidextrous organization from original heavy leveraging on explorative behavior in an effort to master exploitation of marketable processes and products (Amabile, 1998; Andriopoulos & Lewis, 2009; Burt, 2004; Dover & Dierk, 2010; Gibson & Birkenshaw, 2004; Jaussi & Dionne, 2003;

Marion & Uhl-Bien, 2011; Miller et al., 2006; Rothaermel & Alexandre, 2009; Siren & Kohtamaki, 2010; Suzuki, 2013; Tushman & O'Reilly, 1996; Williams, 2004), to exploitation of those products and an inconsistency or turning away from future exploration (Afuah, 2001; Rothaermel & Alexandre, 2009; Siren & Kohtamaki, 2010; Tushman & O'Reilly, 1996; Williams, 2004), to validation of regular exploration and creation of ambidextrous structures and processes.

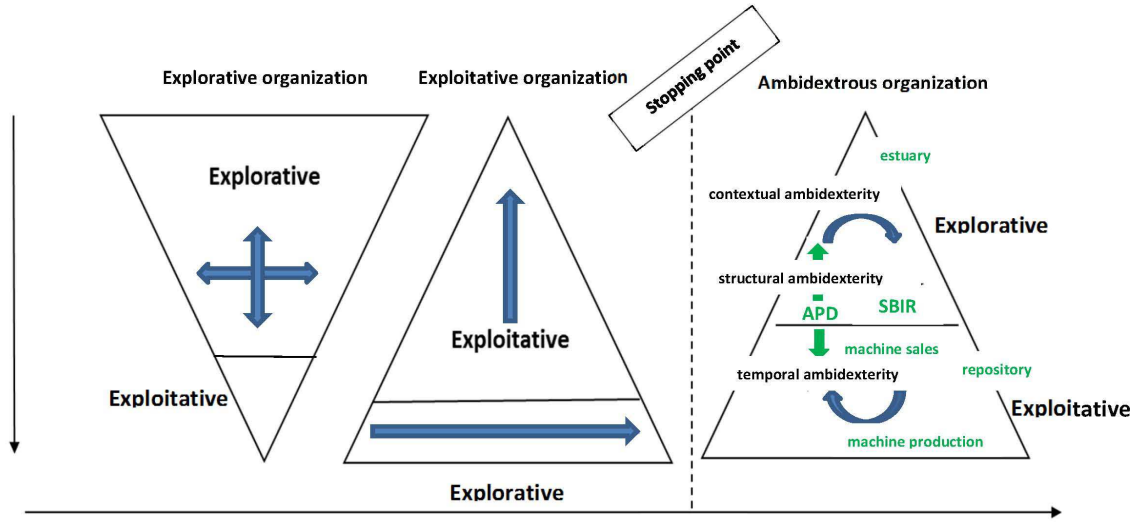

Figure 5.3. Ambidextrous evolution flow chart.

A secondary implication for theory is the importance of considering ambidexterity as a form of complexity. An early stated sub-objective of this study was to reverse-engineer a path from discovered learned ambidextrous practices, behaviors, and processes currently utilized in the field to new theories of ambidexterity with which to challenge the existing ones. Ambidexterity has enjoyed a place in academia since the 1970s and has been studied through many lenses. However, little has been written regarding the complexity of ambidexterity or about ambidexterity as a form of complexity. The

similarities between ambidexterity and complexity have not been discussed in the literature, but they are compelling in the areas of complexity leadership (Burt, 2004; Marion & Uhl-Bien, 2011; Uhl-Bien et al., 2007) and ambidextrous leadership (Burt, 2004; Dover & Dierk, 2010), complex structures (Afuah, 2001; Andriopoulos & Lewis, 2009; Burt, 2004; Gibson & Birkenshaw, 2004) and ambidextrous structures (Afuah, 2001; Andriopoulos & Lewis, 2009; Burt, 2004; Gibson & Birkenshaw, 2004; Pascale, 1999), and culture (Geertz, 1973; Hatch & Schultz, 2002; Hatch & Zilber, 2012; Hatch, 1993, 2004; Kroeber & Kluckhohn, 1952; Martin, 1992, 2002; O'Reilly & Tushman, 2013; Pascale, 1999; Schein, 1992, 1993, 2003; Williams, 2004). Acknowledgment of ambidexterity and new theory on ambidexterity as a type of complexity or complex adaptive system could open interesting new discussions when comparing complexity theory and ambidexterity models.

Implications for Future Research

This study provided interesting findings and insights that warrant further research. There are seven areas for further research for scholars.

1. The Neuroscience of Ambidexterity

Understanding organizational ambidexterity from the position of neuroscience could provide very insightful research regarding the disposition of individuals (leaders, managers, and employees) toward either exploitation or exploration and their dominant orientation toward either left or right brain thinking. Social research discussing behavior such as attitudes toward divergent thinking, paradoxical mindsets, creativity, boundary-spanning people, unconventional leader behavior, creativity-killing organizational

behavior, complexity leadership, and expression of voice has all discussed psychological and neurological organizational behavior, but to date largely from individual sociological perspectives.

Testing using existing instruments such as the Myers-Briggs Type Indicator, the Strong Interest Inventory, and surveys and tests to determine levels of creativity, attitudes toward divergent thinking, and unconventional behavior may also inform organizations as to who might be attracted to ambidextrous work environments and help determine best hiring practices.

2. Further Exploration of the Use and Occurrence of Perturbation

Perturbation has thus far been spoken of in terms of intentionally perturbing one's own organizational processes. Two remarkable things were discovered during research: (1) the organization, instead of directly perturbing its own processes or products, would perturb other companies' processes or products on behalf of problem solving for that company; and (2) this induction of perturbation was not intentionally initiated for the purpose of challenge or learning but instead was done to help and problem solve on behalf of the customer, leveraging learning later. Further research can be done to explore these types of perturbation connected with perturbing others' processes and their effects on challenging cultural and structural inertia.

3. Organizational Size and the Adoption of Ambidexterity

In early days of an organization's evolution, conditions for ambidexterity are unique in many ways, with more flexible structures and processes and a smaller number

of organizational members. Because size itself may be a factor, future quantitative studies could address whether there is a relationship between size and ambidexterity.

4. Management Recognition of Organizational Ambidexterity and Complexity

Although much has been written on the subjects of organizational ambidexterity and complexity, there is an ongoing discussion, albeit subtle, regarding the need for managers and leaders to recognize and validate ambidexterity and complexity if they intend for it to be operational and productive. This subtlety of validation towards exploration and ambidexterity may also represent an area for future research and may include mindfulness or attentiveness towards ambidextrous behavior. While ambidexterity and complexity can be complicated subjects to understand and are generally not processes that are discussed or even recognized in the average organization, the researched organization did characterize ambidextrous behavior 29 times in interview quotes, and the term was coded 310 times. Complexity, a more generally recognized concept in organizations, was also mentioned numerously within the study, to include multiple references from the company CEO.

5. Cost-Benefit Analyses for Adopting an Ambidextrous Model

Qualitative research is needed to identify ways to complete cost-benefit analyses so organizations can better understand if adopting an ambidextrous model would be right for their organization—and then be able to measure the benefits at a later point in time. A move toward ambidexterity may represent significant structural and cultural changes, and organizations are more likely to attempt such changes when they recognize the associated costs and benefits and can document the outcomes.

6. Efforts to Overcome the Stickiness of Knowledge

For an ambidextrous organization or an organization wishing to be ambidextrous, knowledge stickiness could be crippling, as knowledge sharing and transfer is the lifeblood of the ambidextrous organization. This study showed that for the company being researched, the APD and the 100 ideas list promoted knowledge sharing. Further qualitative research is needed to identify additional ways to overcome internal stickiness.

7. Ambidexterity in Different Types of Organizations

Ambidexterity can be practiced in any organizational structure, from professional bureaucracies to operating adhocracies. The keys to successful operation include knowing which information and knowledge must flow freely throughout the organization and having in place mechanisms and processes with which to challenge and disturb company inertia, both structural and cultural. Further qualitative studies are needed to examine ambidexterity in a range of organizational types.

Implications for Practice

Implications also exist for practitioners managing the results of performance and productive behavior. Five implications relate to how practitioners may be able to gain knowledge from the conclusions of this study to inform decisions, clarify behavior, phenomena, and values, and shape actions within the organization. Many of the implications for further research also naturally imply implications for organizational practice.

1. Consider an Organizational Ambidexterity Plan

All companies start out ambidextrous or largely explorative, looking for something to exploit well enough to profit in the market. It's not long after they achieve this expertise that they begin to abandon their explorative roots in exchange for what they have mastered. At this point their learning focus shifts exclusively to refinement of what they already know, and at this point they most likely attach an expiration date upon their foreheads unless something changes these behaviors. To avoid the success trap brought about by cultural and structural inertia, organizations can consider an ambidextrous initiation or sustainment plan that might include the establishment of structurally ambidextrous spaces like the APD within their companies or a creative repository for capturing and storing ideas; the establishment of an innovative, creative, or educational position within the company; or intentionally inducing perturbation.

2. Allow Workers to Behave Exploratively in Structured Spaces

During field research on site I found myself on the machine shop floor during a Friday afternoon accompanied by the company chief financial officer as well as my 17-year-old daughter who had flown up for the weekend to spend some time with her wayward dad. I had arranged a tour for her to see a real machine shop and factory, as she was preparing to enter a university and eventually a professional career. As we toured the facility, we found ourselves in front of a very sophisticated automated metal milling machine operated by a young machinist. As we observed his work and a nearby computer screen, we immediately noticed a radio close by playing top 40 music loud enough for him to enjoy as he worked. This impressed my daughter, who was fascinated by the juxtaposition of the rock and roll music against the backdrop of the sophisticated

equipment and the college intern deftly manipulating the controls with both technical expertise and craftsmanship.

Allowing workers to explore creatively within their workspaces as well as move around in the search for a more optimal place within the boundaries of the structured spaces of the organization is another way the company moderated ambidexterity and retained loyal employees. More research centered on contextual ambidexterity and giving workers more unstructured freedom within structured spaces could prove valuable in regard to loose and tight organizational structures at play within ambidextrous organizations and employee engagement.

3. Recognize and Validate Ambidextrous Behavior

From a constructivist perspective, ambidextrous behavior as a reality is largely socially constructed. If explorative endeavors, behaviors, and people who think ambidextrously are not recognized as legitimate, or having value, then they most likely will not have value and not be seen. Better understanding by managers and leaders of ambidexterity and ambidextrous leadership as well as complexity, complex adaptive systems, and complexity leadership could help them be more attentive and mindful to their organization's inner workings, helping it perform more efficiently and make the most of its resources.

4. Practice Perturbation

Perturbation is not something practiced by many companies but leads to ambidextrous learning by enlisting exploitative practices in support of explorative learning. For an organization to intentionally perturb its own processes in the hopes of

learning something new would most likely take courage and foresight; it would take a company with the mindset of a learning organization. Practiced by Toyota and a few other innovative organizations, perturbation is used as a way to occasion high-level or general-purpose exploration, exploring new spaces and legitimizing the value of ambidexterity. Practicing perturbation could help organizations avoid entropy and the success trap brought about by cultural and structural inertia towards only exploitative behaviors.

5. Consider an "Educational" Leadership Position within the Corporate Structure

This company's ambidextrous nature and its runaway success as an innovator in its field is no coincidence; it is a direct result of the CEO and the company's educational, learning mindset. Learning to become an ambidextrous CEO, learning ambidextrous leadership or complexity leadership, or developing an educational leadership position within an organization could keep the organization connected to its learning origins.

Summary and Concluding Remarks

Companies with both explorative and exploitative characteristics are known as ambidextrous. The research site showed both of these sides, as discussed in this chapter. Five findings highlighted this dual nature. Specifically, (a) the APD was the company's place to create and explore as well as execute; (b) the company engaged in problemistic search, with numerous positive consequences; (c) the company routinely embraced perturbation to induce learning and increase performance; (d) the company had a legacy of helping others, building machines and relationships, networking, creating goodwill, and learning new skills; and (e) organizational members viewed performance and

learning as equally important. The need for organizations to recognize, validate, and strive to achieve ambidexterity has never been more necessary or important as it is now. Organizations that can both exploit the market for profit, doing what they do best, and at the same time explore it for new innovation will breathe with negative entropy, renewing themselves with fresh and revised ideas and processes, as well as creative and diverse people and products; they will be more resilient, flexible, diverse, and aware in increasingly volatile and technologically and socially changing environments. They will utilize their resources better to include their workforce and have a more sophisticated understanding of complexity and diversity both inside and outside their organizations.

Individuals predisposed neurologically to either left brain or right brain activities will also be likely to find better organizational fit and satisfaction within either the exploitative or explorative side of an ambidextrous organization. Organizations that are ambidextrous must also take on a more active role in learning, becoming learning organizations so that they can realize long-term sustained performance.

Addressing an argument that has been ongoing since 1976, this study has validated the complement school of thought that exploration and exploitation can reside and perform successfully together rather than being at odds. This study clearly supports the view that successful ambidexterity is not accidental, an aberration, or impossible, but instead is a byproduct of superior leadership and administrative capabilities. It is hoped that at least this argument will now be settled for the reader.

It is the opinion of this researcher that successful organizations of the future will need to look and behave much as this one does. Quickly dwindling are the days in which companies will be able to exploit the market indefinitely, only focusing on or refining

one familiar thing while maintaining a prominent place competitively. Gone also will be leaders who only had to focus on exploitation and exploitative performance and practices. Future leaders will also have to consider learning and building learning organizations, and becoming ambidextrous learners themselves.

This important study has moved the current body of research in several ways. First, it has introduced a new way in which to employ and think about problemistic search and perturbation—applying it for the service of others and leveraging the learning experience for one's own organization. Second, it has introduced an organization employing all three kinds of ambidexterity in one organization: structural, temporal, and contextual. Third, it has introduced the notion of a "learning ambidextrous organization," an ambidextrous organization fitting the definition of a learning organization. Finally, it has introduced the profile of an ambidextrous leader and CEO as well as a complexity leader in an ambidextrous organization, one with a graduate-level "educational" degree (the coach) along with strong skills, passion, and experience in mechanical engineering and high technological fields.

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APPENDIX A:

INTERVIEW PROTOCOL

How does an organization achieve and sustain ambidexterity? (Characterized to the interviewee as "How does your company maintain daily performance of its core skills, processes, and products and innovate new skills, processes, and products every year?")

Time of interview: _____

Date: _____

Place: _____

Interviewer: _____

Interviewee: _____

Position of interviewee: _____

Thank you for agreeing to speak with me for the next hour. A pseudonym will be used, and your responses will be kept confidential. With your permission, this interview will be tape recorded for the purposes of transcribing and analyzing the data for use in my dissertation. You can stop the interview at any time for any reason.

To get us started, let me tell you about what I am interested in learning. I'm interested in how organizations maintain daily performance of their core skills, processes, and products and innovate new skills, processes, and products every year. I'll be asking you a series of questions aimed at gaining this information from you.

Exploitive work–based questions

1. How does your company make money and profit?
2. What kinds of processes and work happen here every day?
3. Would you consider yourself a structured person?
4. What kinds of things do you do every day?

Explorative work–based questions

1. Does your company come up with new products, processes, or innovative ideas?
2. Where do new ideas come from in your organization?
3. Who do new ideas come from in your organization?
4. What part of the organization do new ideas come from?
5. Are new ideas rewarded in your organization? How?
6. Are ideas openly shared in your organization? What are the results?
7. Have you ever engaged in brainstorming for new ideas in your organization? Was it formal or informal? Describe the process to me.

APPENDIX B:

PROTOCOL FOR FOCUS GROUP 1

How do organizations do what they do well every day in terms of known skills, processes, and products and also come up with new processes, skills, and innovations every year?

Time of focus group: _____

Date: _____

Place: _____

Interviewer: _____

Interviewees: _____

Positions of interviewees: _____

Thank you for agreeing to speak with me for the next hour. A pseudonym will be used, and your responses will be kept confidential. With your permission, this interview will be tape recorded for the purposes of transcribing and analyzing the data for use in my dissertation. You can stop the interview at any time for any reason.

To get us started, let me tell you about what I am interested in learning. I'm interested in how organizations do what they do well every day in terms of known skills, processes, and products and also come up with new processes, skills, and innovations every year. I'll be asking you three basic questions, starting with a brief role and responsibility question around the room followed by two open discussions about innovation and creativity.

Questions for focus group participants (two 25-minute sessions with a 10-minute break)

1. Briefly, each person tell me your role in the organization and responsibilities.
2. Please share any personal or observed stories or insights regarding company ideas and innovation.
   (10-minute break)
3. This is an open discussion about creativity. Please share any personal or observed company stories or insights regarding internal or external innovation and creativity.

APPENDIX C:

PROTOCOL FOR FOCUS GROUP 2

Participants in the focus group will be asked to provide feedback regarding their personal thoughts about learning and how they think learning disseminates throughout the organization and is used by the organization.

Time of focus group: _____

Date: _____

Place: _____

Interviewer: _____

Interviewees: _____

Positions of interviewees: _____

Thank you for agreeing to speak with me for the next hour. A pseudonym will be used, and your responses will be kept confidential. With your permission, this interview will be tape recorded for the purposes of transcribing and analyzing the data for use in my dissertation. You can stop the interview at any time for any reason.

To get us started, let me tell you about what I am interested in. I'm interested in how organizations experience organizational learning, and I'll be asking you a series of questions aimed at gaining this information from you.

Questions for focus group participants (two 25-minute sessions with a 10-minute break)

1. Briefly, each person please tell me about your role and responsibility in the organization. What are your responsibilities?
2. How does learning happen in your organization?
   (10-minute break)
3. Is learning openly shared? Are there rewards in sharing learning? Are there pitfalls?
4. Would you say information is shared freely throughout your organization, managed, controlled, or concealed? Why?
5. Please share any personal or observed stories or insights regarding learning and work.

APPENDIX D:

OBSERVATION RECORD: INTERACTIONS

Participants (coded): _____

Time/date/location: _____

Purpose of interaction: _____

Content of interaction	Evidence of organizational exploitative behavior and antecedents or moderators	Evidence of organizational explorative behavior and antecedents or moderators	Context of interaction

APPENDIX E:

OBSERVATION RECORD: PHYSICAL SURROUNDINGS

Time/date/location: _____

Object/area of physical surroundings: _____

Description of object/area:

Evidence of artifacts:

Evidence of symbols:

Evidence of espoused values:

Links to identified themes or codes:

APPENDIX F:

DOCUMENTS REVIEWED

1. Company website
2. Company marketing material
3. Company program, education, and learning documents
4. Company human resources manual
5. Floorplan of office space
6. Onboarding notes for managers
7. New hire orientation training materials
8. Company schedules, administrative, and nonsensitive internal documents
9. Company financial records
10. Discovered company documents

APPENDIX G:

INFORMED CONSENT FORM

Informed Consent Form for Interview
Learning Ambidexterity in Organization
IRB #021413

Principal Investigator: Michael Marquardt, Ed.D., 202-994-2473

INTRODUCTION

You are invited to take part in a research study being conducted by Dr. Michael Marquardt and Mr. Eric Zabiegalski, of the George Washington University's Graduate School of Education and Human Development.

You are being asked if you are willing to take part in this study based on your role in the organization or connection with the organization. Please read this form and ask us any questions that will help you decide if you want to be in the study. Taking part is completely voluntary, and even if you initially decide to participate, you can opt out at any time.

You must be at least 18 years old to take part in this study.

PURPOSE

This study will extend current concepts on the subject of organizational ambidexterity, the ability for companies to perform effectively in the marketplace in their existing roles and innovate and explore new opportunities simultaneously. This research is being conducted in order to enable a deeper understanding of the role ambidexterity plays in organizations' performance, success, and sustainment.

Interview questions focus on the practice and sustainment of exploration and exploitation in the organization's practices, processes, innovations, and skills. Questions are focused around why the company is creative, productive, and successful and what behaviors support or hinder such endeavors; additionally, questions focus on what enables the organization to explore and exploit the market for profit and new innovation annually. Specifically, I'm interested in how organizations maintain daily performance of their core skills, processes, and products and innovate new skills, processes, and products every year. I'll be asking you a series of questions aimed at gaining this information from you.

PROCEDURES

The total amount of time you will spend in this study is up to one hour during one day. You will be asked to participate in an individual interview conducted in private during working hours. Interviews will last from 15 to 45 minutes, will be recorded and transcribed, and you will be provided a transcript of the interview to ensure accuracy of the content. A pseudonym will be used for your name, and your responses will be kept confidential. You can stop the interview at any time for any reason.

The specific time and location of the interview will be coordinated with you by the organization's designated point of contact, on a "not to interfere" basis with your

regular duties. For accuracy of data collection, an audio recording of the interview will be made. This audio recording will be collected for the purpose of data collection accuracy; it will be kept secure and confidential, will be destroyed after use, and will be used as a transcription method for converting interview transcripts into study data.

RISKS AND CONFIDENTIALITY

The study has the following risks:

- You may be uncomfortable answering some of the interview questions. You are free to skip any question or terminate the interview at any point.
- There is a slight chance that someone not on our research team could find out that you took part in the study or somehow connect your name with the information we collect from you.

The following steps are being taken to reduce this risk:

- Transcripts and field notes will be made anonymous.
- Data will be saved as password-protected files on an external computer drive.
- All data will be maintained on an external drive that will not be associated with any private or public network.
- Data, to include audio recordings of the interview, will be stored and protected by the researcher, then destroyed upon approval of the completed dissertation report.

Your status or employment in the organization will not be affected in any way whether you choose to participate in this study or not.

BENEFITS

Taking part in this research will not help you directly; however, the benefit to society will be a better understanding of the role organizational ambidexterity plays in a company's sustained performance and continual innovation.

QUESTIONS

Additional questions not answered here can be directed to the research team by contacting the primary research contact for this study, Eric Zabiegalski, at 240-216-6306 or zabba4@comcast.net. The Principal Investigator for this study is Dr. Michael Marquardt at 202-994-2473 or marquard@gwu.edu. For questions regarding your rights as a participant in human research, call the GWU Office of Human Research at 202-994-2715.

Informed Consent Form for Focus Group
Learning Ambidexterity in Organization
IRB #021413

Principal Investigator: Michael Marquardt, Ed.D., 202-994-2473

INTRODUCTION

You are invited to take part in a research study being conducted by Dr. Michael Marquardt and Mr. Eric Zabiegalski, of the George Washington University's Graduate School of Education and Human Development.

You are being asked if you are willing to take part in this study based on your role in the organization. Please read this form and ask us any questions that will help you decide if you want to be in the study. Taking part is completely voluntary and even if you initially decide to participate, you can opt out at any time.

You must be at least 18 years old to take part in this study.

PURPOSE

This study will extend current concepts on the subject of organizational ambidexterity, the ability for companies to perform effectively in the marketplace in their existing roles and innovate and explore new opportunities simultaneously. This research is being conducted in order to enable a deeper understanding of the role ambidexterity plays in organizations' performance, success, and sustainment.

PROCEDURES

The total amount of time you will spend in this study is up to two hours during one of two separate focus group sessions. You will be asked to participate in one or both of these focus groups conducted during working hours. The purpose of these focus groups is to evaluate organizational behavior centered on the group and individual processing of exploration, innovative ideas, and learning. The first focus group will focus on the organization's disposition toward ambidexterity and exploration at the organizational level. In the first 25 minutes, participants will be asked to share and comment on any personal or observed stories or insight regarding company ideas and innovation. This segment will be followed by a 10-minute break; the last 25 minutes will consist of an open discussion about creativity and the barriers to innovation. Participants will be asked to share any personal or observed stories or insights regarding internal or external barriers to innovation.

The second focus group, to be held during a subsequent week of field research, will address organizational learning. In this focus group, participants will be asked to provide feedback regarding their personal thoughts about learning and how they think learning disseminates throughout the organization and is used by the organization.

The specific time and location of the focus groups will be coordinated with you by the organization's designated point of contact, on a "not to interfere" basis with your regular duties. For accuracy of data collection, an audio recording of the focus group session will be made. This audio recording will be collected for the purpose of data collection accuracy; will be kept secure and confidential, will be destroyed after use, and

will be used as a transcription method for converting focus group transcripts into study data.

RISKS AND CONFIDENTIALITY

The study has the following risks:

- You may be uncomfortable answering some of the focus group questions. You are free to skip any question or opt out of participating in the focus group at any point.
- It is likely that someone not participating in the focus group or on our research team will know that you took part in the study and likely connect your name with the information we collect from the focus group sessions.

The following steps are being taken to reduce this risk:

- Transcripts and field notes will be made anonymous and focus groups inputs captured will not be linked to specific individuals.
- Data will be saved as password-protected files on an external computer drive.
- All data will be maintained on an external drive that will not be associated with any private or public network.
- Data, to include audio recordings of the focus groups, will be stored and protected by the researcher, then destroyed upon approval of the completed dissertation report.
- While we cannot guarantee the privacy of the focus group discussion, we request that all present respect the group by not telling anyone outside the group what is said.

Your status or employment in the organization will not be affected in any way whether you choose to participate in this study or not.

BENEFITS

Taking part in this research will not help you directly; however, the benefit to society will be a better understanding of the role organizational ambidexterity plays in a company's sustained performance and continual innovation.

QUESTIONS

Additional questions not answered here can be directed to the research team by contacting the primary research contact for this study, Eric Zabiegalski, at 240-216-6306 or zabba4@comcast.net. The Principal Investigator for this study is Dr. Michael Marquardt at 202-994-2473 or marquard@gwu.edu. For questions regarding your rights as a participant in human research, call the GWU Office of Human Research at 202-994-2715.