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THE ROLE OF CAPABILITIES IN INNOVATION ADOPTION DECISIONS

A Dissertation Presented

By

KEVIN M. SNYDER

Submitted to the Graduate School of the
University of Massachusetts Amherst in the partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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Isenberg School of Management

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THE ROLE OF CAPABILITIES IN INNOVATION ADOPTION DECISIONS

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KEVIN MICHAEL SNYDER

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DEDICATION

To my family and friends

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ABSTRACT

THE ROLE OF CAPABILITIES IN INNOVATION ADOPTION DECISIONS

FEBRUARY 2013

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Successful innovations have been assumed by prior literature to ultimately be adopted by all competitors within an industry based on social explanations or economic rationale specific to the efficiency of the innovation. However, capabilities possessed by a firm can enhance or inhibit the adoption based upon their similarity to those used in the innovation. In categorizing a firm's capabilities as complementary, substitutive, or neutralizing to the innovation, this study provides an economic explanation for the role of internal capabilities in adoption decisions.

Using a sample of professional football teams adopting the West Coast Offense, I find that capabilities influence the decision process in favor of adopting for organizations with complementary and substitutive capabilities. Knowledge from the innovator is highlighted in adopting the innovation, but fails to moderate the relationship between adoption and firm performance. I also illustrate how adopting firms with complementary capabilities outperform those organizations with similar capabilities that elect not to adopt. Finally, I demonstrate that firms with neutralizing capabilities are better off not adopting the innovation based on comparative performance of adopters and non-adopters. The overall results suggest a greater emphasis on internal capabilities of the firm in

innovation adoption and reconsideration of theories stating that innovations should be adopted throughout an industry.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Innovation has been a major theme of research in strategic management. Innovation has been called the lifeblood of an organization (Kelley, 2005), a driver of competitive advantage (Grant, 1996) and a force to drive the economy (Grossman & Helpman, 2001). Innovation can take the shape of products, services, routines, processes and industries (Rogers, 1995). Scholars and practitioners have long recognized that innovation - the ability to redeploy assets and meet continued customer demands - is an essential function of business. As a facilitator of new ideas and organizational change, innovation allows a firm to continue to grow and thrive within a competitive environment.

Although innovation is frequently connected to invention, the two concepts differ in scale and practice. Invention was a popular topic of study amongst early researchers describing the conditions under which new products created economic benefits (Schumpeter, 1939; Arrow, 1962). The study of how firms utilize new ideas to create economic benefits evolved into the broader term of innovation, used to capture the development of both tangible and intangible ideas. Scholars also begin to differentiate between the two terms, with invention defined as bringing something into being and innovation defined as bringing something into new use (Rogers, 1995).

At this same time, marketers, sociologists, and communications scholars began to examine the flow of ideas (Robertson, 1967; Hull & Hage, 1982; Rogers, 1995). Differing from a strategy perspective, these fields sought the promotion and rapid

diffusion of an innovation for economic and political motivations. As studies of innovation coalesced into one body of literature, theories primarily addressed ways to enhance the information flow due to their profound societal benefits (Tewksbury, et al., 1980). While these theories have been helpful, recent research has suggested a need for more rigorous analysis of an innovation before final adoption, since the extant view on innovation assumes that the product or service will be ultimately accepted (Abrahamson, 1991; Abrahamson & Rosenkopf, 1990; Abrahamson & Rosenkopf, 1993).

Despite these motives, the thorough and well-chronicled research on the spread of innovation has contributed significantly to our understanding of strategy (Rogers, 1995). Beyond simply designing new products and services, the value of imitation has been illustrated as a unique skill to keep firms current (Lieberman & Asaba, 2006). Emerging from this literature are themes that promote the spread of ideas, encourage replication, and accelerate the flow of knowledge from one entity to another. However, in a competitive landscape, an innovator faces the challenge of diffusing their product or service throughout their firm and to customers while simultaneously preventing a rival firm from duplicating the idea (Winter & Szulanski, 2001). This becomes particularly difficult due to the ability to re-engineer products or replicate services in a similar context (Teece & Pisano, 1994). Any advantages derived from the initial innovation disappear if competitors are able to immediately respond with similar offerings. Although legal protections may protect some knowledge creation, ideas are quickly assimilated into the knowledge base of industry (Winter & Szulanski, 2001; Teece & Pisano, 1994).

The exuberance towards innovation has led to a pro-innovation bias that assumes inevitable adoption and benefits flowing to the imitator (Abrahamson, 1991; Abrahamson

& Rosenkopf, 1990). The basis for much of the early innovation research stems from agriculture studies promoting the generation of higher crop yields (Rogers, 1995). In this setting, many farmers were part of a collective, organized to manage the interests of members by sharing knowledge and resources. Much of the current theoretical foundation for innovation also stems from medical research that analyzes adoption of vaccines in third world countries (Rogers, 1995). Research has already proven the effectiveness of these strategies, thus decreasing the uncertainty and increasing the market for the innovation. While research on adoption rates and barriers has been essential, the application of these theories is restricted based on the nature of the innovation. In each of these instances, the creator of the innovation has an incentive to ensure that the innovation is diffused throughout the industry. However, in a competitive environment, organizations do not want their strategies or routines mimicked by others. To date, little research has been able to isolate the competitive effects of innovation diffusion or why firms may intentionally decide not to adopt an innovation.

Why would an organization decide not to adopt a superior innovation? Intentionally rejecting an innovation might initially seem like an ill-fated decision for a manager. Scholars have suggested that the non-adopting firms are simply unfamiliar with the innovation or cannot see the efficiency of the idea. In these instances, firms eventually become late adopters, falling into the long tail of innovation (Rogers, 1995). However, although firms share similar goals, their methods for achieving these may differ based on resources, organizational structure, and types of available knowledge. As the acquisition of these resources becomes path dependent (Dierickx & Cool, 1989), organizations lock themselves into strategies and resources that prohibit an easy shift into

new territories. Commitment towards a strategy and resource profile is necessary for a firm to develop core capabilities (Grant, 1996). Successful firms are able to evolve their capabilities into a competitive advantage; however, firms that are unable to adapt become ensnared with "core rigidities" and competency traps (Leonard-Barton, 1992; Levitt & March, 1988).

While lack of adaptation can certainly be harmful to firms, I suggest that organizations that are already proficient in certain capabilities may have different incentives and abilities to adopt or reject an innovation. Recognizing the futility in continually chasing different resources and adopting new innovations, organizations may be able to re-bundle and deploy existing assets in a manner that can substitute for or neutralize the impact of a competitor's innovation. This research will build on our knowledge of innovation diffusion by proposing new theories of how organizations make adoption decisions by analyzing the capabilities and future performance of firms in a competitive environment.

Despite the prevalence of innovation within academic research, few studies have examined how relative capability strength in comparison to the innovator. Even fewer have sought to explain how a firm could succeed after rejecting a superior innovation. Many of the early studies on the topic were biased case-studies of new technology, selected due to the familiarity of the innovation and the success in diffusion. From this initial work, a pro-innovation bias ensued, with few studies challenging the assertion that adopting is a necessary strategic move. Few studies also investigate how firms fare after their adoption decision. As a result, there are substantial questions that remain regarding how adoption decisions are made and if non-adopters can flourish in these environments.

This dissertation seeks to develop theories relating to the role of capabilities in innovation adoption decisions. In looking at how a competitor would analyze their capabilities with those needed to implement an innovation, I answer four questions regarding how organizations respond to strategic innovations. First, how do capabilities influence adoption decisions? Second, why would an organization intentionally decide not to adopt a superior innovation? Third, how do these strategic non-adopters perform relative to those that do implement the innovation? Finally, does the acquisition of knowledge from the innovator assist in adopting the innovation?

In suggesting that firms may intentionally decide not to adopt an innovation, this study breaks from the pro-innovation bias that is inherent in much of the previous literature. I suggest that lack of adoption may occur for several reasons, including an inability to access key knowledge sources, a lack of congruence with current capabilities and resources, and access to capabilities that can neutralize the success of the innovation. This study seeks to make conceptual and empirical contributions towards an understanding of innovation and an organization's processes regarding adoption. By removing assumptions of firm improvement from current theories, this dissertation contributes by illustrating boundary conditions towards adoption and offers empirical explanations using capabilities as a factor in determining an adoption strategy.

The remainder of the dissertation is structured as described below. Chapter 2 provides a review of the literature related to innovation and diffusion. Within the domain of innovation, I examine the nature of innovation and antecedents towards adoptions. I continue by examining research on the enhancing and inhibiting attributes of firm capabilities. An analysis of the relationship between capabilities and innovation will be

used to explain the adoption patterns within an industry. Finally, literature on other factors that determine the success of adoption will be examined. In Chapter 3, I describe the propositions outlining the research questions previously mentioned. Chapter 4 follows with the methodology used to test the hypotheses. Included is a description of the archival data from the National Football League used to study organizational capabilities, adoption decisions, and the movement of key personnel related to the innovation. In Chapter 5, I explain the results of the empirical analysis that provides support for my hypotheses. Chapter 6 concludes with limitations, future research, and a final discussion of the findings in this paper.

CHAPTER 2

THEORETICAL FOUNDATIONS

The conceptual framework that underlies the development of innovation theory will be explained in the section below. First, I will review prior literature related to innovation, including characteristics of innovations, actions that produce a competitive response, and the process of diffusion. The second section will include analysis of how the transfer of innovation from one organization or department to another is dependent upon firm capabilities. As this is the basis for explaining the integration process inherent to innovation adoption, this analysis will include discussion of how a firm's capabilities relate to the innovation. Finally, I will discuss facilitators of successful adoptions, including firms acquiring knowledge from innovating organizations.

2.1 Nature of Innovation

Despite significant amounts of academic research devoted to innovation, there are still many questions that have yet to be answered. However, the literature paints a picture of the characteristics of an innovation, the types of innovation that diffuse, and how firms make decisions about adopting the innovation. This section will analyze the current state of innovation within the academic literature.

2.1.1 Definition of Innovation

Innovation has been an area of interest to scholars dating back to some of the first studies of economics and organizations. The broad definitions proposed by scholars have

simultaneously broadened our understanding of how firms create new ideas, yet also failed to put boundary conditions on what constitutes innovative activity. Among the challenges of arriving at a single definition for innovation is the fact that many disciplines, including economics, management, sociology, and communications, are actively involved in investigating the phenomenon. Throughout the various literatures, over 60 definitions have been proposed and used in research (Baregheh, et al., 2009). Given the range of firms engaged in innovation, these broad definitions of the phenomenon seek to capture multiple types of ideas, from product invention to process evolution to resource deployment.

Among the first scholars to propose a definition of innovation was Josef Schumpeter. While describing the importance of entrepreneurship and the emergence of new firms, Schumpeter (1934) illustrates innovation as a fundamental attribute that creates capital for firms. Through a process of creative destruction, economies benefit as inefficient products and processes are constantly improved. Schumpeter suggests that these innovation-based rents - entrepreneurial in nature - are generated from changing the rules of competing within the industry. Describing the process of "entrepreneurship," Schumpeter explains that innovation occurs when a firm has "means to combine materials and forces differently" (1934, p.65).

Alternatively, Penrose (1959) identifies innovation as "the use of exactly the same resources, used for different purposes or in different ways in combination with different types of other resources." Additionally, among the most straight forward definitions is Thompson's (1965, p.2) description as "the generation, acceptance and implementation of new ideas, processes, products or services." Further definitions have sought to

differentiate invention from innovation. In defining invention as the creative act, innovation becomes the first employment of an idea by one organization (Becker & Whisler, 1967). These definitions reflect a broadening of the concept of innovation, moving beyond simply invention and entrepreneurship. Later, scholars would include more activities within a definition of innovation to include any recombination of previously held knowledge (Nelson & Winter, 1982). However, some of these definitions include almost all activities related to the operations of a firm, as new knowledge is constantly being incorporated into an organization. Critics of this broad definition have suggested more specific definitions, noting that "it is practically impossible to do things identically" (Hansen & Wakonen, 1997, p.350).

As the study of innovation progressed, definitions emerged to delineate between different types of innovative activity. With unique antecedents towards creation and adoption, definitions of product, process, and service innovation were created to highlight the roles of stakeholders (West & Anderson, 1996), technology (Nord & Tucker, 1987), knowledge (Plessis, 2007), and management (Birkinshaw, et al., 2008). Actions of differentiating innovation versus imitation spurred debate based upon whether the "newness" was specific to the industry or simply to an adopting firm (Birkinshaw, et al., 2008). While many scholars have embraced innovation as "state of the art" (Abrahamson, 1996; Kimberly 1981), others recognize that idea "new to the organization" (Zbaracki, 1998; McCabe, 2002) are an important type of innovative activity.

Recent studies have called for a multidisciplinary definition of the term (Baregheh, et al., 2009). Efforts have also been made to synthesize the research on

innovation in an effort to draw conclusions across fields and highlight pertinent outstanding questions (Crossan & Apaydin, 2010). Though not attempting to create a separate definition, for the purposes of this research, I will approach innovation as an idea that is new to the industry, while recognizing diffusion as the process of firms implementing the idea that is new to their organization. In the creation of the innovation, I recognize the definition to include the novel recombination and creation of resources that can be used by the firm for economic gain.

2.1.2 Environmental Characteristics of Innovation

There are many different characteristics and contexts of innovation that have driven the numerous definitions. The radicalness and complexity of the innovation, degree of competition, and status of the innovator can all impact the success and diffusion of the novel idea (Rogers, 1995; Cossan & Apaydin, 2010). Research in this area examines how the environment can influence the legitimacy and spread, for better or worse, of the innovation. Determining which ideas "new to the organization" get implemented depends on competitive dynamics, similarity to current offerings, and degree of change (Zbaracki, 1998; McCabe, 2002).

Early innovation studies sought to determine macroeconomic factors that impacted a firm's ability to capture new rents. To successfully innovate, Schumpeter argues that firms need low levels of competition so that significant resources can be allocated to research and development (Schumpeter, 1934; Winter, 2006). As innovation can be a risky activity, there must be slack resources that allow the firm to make mistakes in the development of new products. In Schumpeter's theory, market power ensures the

ability of an innovator to commercialize the product, and therefore enables a first mover advantage. This process of "creative destruction" enables entrepreneurs to disrupt a market system and procure a monopolistic position (Schumpeter, 1939). In these low levels of competition, innovations do not diffuse with great regularity until the original innovator has capitalized financially. The monopolistic protections inhibit the flow of information to competitors and other industries.

In contrast, Arrow (1962) proposes that innovation is most suitable to a highly competitive environment where new ideas can provide advantages over their rivals. In comparison to a monopolistic environment, incentives are higher in a competitive market since a firm can obtain a larger market share and thus higher rents through the trade of new ideas. Competition demands that firms take risks to prosper within the marketplace. Whereas a monopolist with high profit margins can be reasonably certain of future success, the firm in a competitive industry knows that their environment is more susceptible to a change in market leader. Arrow also illustrates the paradoxical nature of knowledge trade due to the buyers' lack of familiarity with the information they are acquiring (thus the reason they must make the purchase). With the increased competition, innovation is also risky due to the competitors' ability to imitate, thereby reducing a long term advantage derived from the innovation. However, Arrow's theories illustrate the constant cycle of rapid innovation and diffusion necessary in highly competitive markets.

The debate about environmental conditions for innovation remains among the issues that have arisen amongst scholars in the study of the phenomenon. Schumpeter and Arrow's opposing views on market factors have launched significant attention to

innovation in future studies. Significantly, these studies played a role in recognizing the role of competition within the creation of new ideas. The levels of competition can impact firms' ability to profit from their innovative activities, thus potentially stimulating or stalling diffusion.

The studies of Schumpeter and Arrow also drove progress within the innovation literature, leading to a classification of firms based their likelihood towards the acceptance of innovations. Some of the earliest variables examined include the classification of firms on a continuum between "entrepreneurial" and "conservative" (Miller & Friesen, 1982). Differences in firm structure were suggested as explanations for greater innovative capabilities that impacted a firm's willingness to take risks with new activities through creation or adoption. Bureaucratic control and roles of management dictate how a firm approaches both internal and external ideas. Depending on management's risk tolerance, a high degree of management control may lead to successful implementation (regardless of the origin of the innovation) since a large number of resources are needed to bring an external or internal innovation to market (Zaltman et al., 1973). However, too much control may also suppress ideas from emerging organically (Damanpour, 1991).

Beyond management's risk tolerance, the nature of the innovation, ranging from incremental to radical, can also determine the industry's acceptance of the idea (Dewar & Dutton, 1986). Incremental innovations can be seen as reinforcing current products and services, while radical innovations significantly transform existing products and services or design entirely new ones (Subramaniam & Youndt, 2005). The number of organizational processes involved in the innovation is also a reflection of the radicalness

of an innovation. Even though the change to a product or service may seem slight, if a firm must redesign the entire scope of their operations to meet the new standard, an innovation can be declared radical (Damanpour, 1991). Given the increased complexity and information asymmetry of a radical innovation, these ideas tend to encounter more resistance in the diffusion process. The degree to which an innovation changes or creates an industry impacts the likelihood of adoption.

Just as the degree of centralization and management control can influence the development of new ideas, the same features can impact the likelihood of adopting radical innovations. Regardless of an idea's origin (internal or external to the firm), successful implementation seems to necessitate high levels of firm control and formalization. The paradox of needing low managerial control to innovate but high control to implement suggests that not all firms are going to be capable of capitalizing on new ideas (Damanpour, 1991).

Diffusion of an innovation also differs based on the type of processes impacted. Classified as technical or administrative, differing types of innovations consist of different antecedents and strategies for implementation (Damanpour, 1991). These differences stem from the fact that technical innovations tend to be related to product development, while administrative changes are closely related to processes. The source of change also differs as product innovations generally occur to capitalize on customer demand and are driven by forces outside the firm. Meanwhile, process innovations improve the efficiency of a firm's operations and are influenced by internal forces within the firm. Based on these characteristics, technical innovations thrive in environments where there are high degrees of professionalism, an informal structure, and low degrees

of centralization. On the other hand, administrative innovations prosper with low levels of professionalism, structured management, and a high amount of centralized control (Daft, 1978; Damanpour, 1991).

The competitive position of the innovator can also be a determining factor in the spread of an innovation. Competitors can be seen as a source of new ideas and additional market knowledge. Firms frequently use groups of competitors as their peer group as they determine strategic direction (Semadeni & Anderson, 2010). Imitation may occur in an attempt to maintain market share and position within the industry. However, radical ideas are viewed with more skepticism, allowing competitors to bear the risk until the innovation has been proven. Since there is unlikely to be a steady stream of information sharing, competitors may shun radical innovations such as to avoid risk and perceptions of holding extreme positions within the market (Semadeni & Anderson, 2010). Imitating a radical idea is also risky due to the high levels of information asymmetry between the innovator and the mimicking firm. Ultimately, organizations measure themselves against competitors based on similarity of product offerings, innovative history, and the desire to maintain competitive parity (Semadeni & Anderson, 2010).

Organizations primarily adopt innovations for either informational or social purposes (Lieberman & Asaba, 2006). Firms adopting based on information are primarily driven by economic means. Based on theories of economics, when information is the primary rationale, firms demand evidence that the new idea will drive economic profits within their organization. As the new idea is proven to be successful, information about the product or service is quickly assimilated into organizations and replicated to help firms maintain their position within the competitive landscape (Lieberman & Asaba,

2006). Rather than invest in research and development or take risks of designing new architectures, companies may also compete based on replication of innovation as a strategy (Winter & Szulanski, 2001). These firms are also highly capable of replicating and transferring their own ideas within multiple locations or branches of their organization. When deciding which innovations to imitate, comparisons are made to like firms with similar resources (Massini, et al, 2005). The search and imitate method of adoption decisions is proposed as the rational efficient model of adoption (Abrahamson & Rosenkopf, 1991). Firms implementing within this model adopt only when economic gain can be reasonably assured.

Other scholars propose isomorphism as an explanation for imitation of an innovation (Lieberman & Adaba, 2006; Greve, 1996). When many firms in one industry compete with similar resources for similar customers, each may feel a social need to adopt the behavior of others. This sociological explanation for adoption suggests that a desire for the appearance of legitimacy influences managerial decision making (March, 1981). Differing from the information based theories of adoption, firms adopting for social reasons may be slow to respond to new information about the efficacy of an innovation. In an effort to maintain their competitive positions, firms may miss opportunities to improve financial performance either through failing to adopt a successful idea or holding onto a costly product or service for too long (Lieberman & Asaba, 2006).

Similar to the sociological explanations, game theories have also been used to explain imitation and adoption (Lieberman & Asaba, 2006). Firms use innovation and adoption to signal shifts in strategy to rivals as a method of competition that seeks to limit

competition (Greve, 1996). While similar to collusion, these strategies primarily exist to minimize risk. Adoption based on rivalry or a social desire to maintain the status quo may lead to the homogenization of resources within an industry, thus exposing all firms to higher levels of risk. If all firms adopt inefficient innovations out of a "follow the leader" mindset, all organizations may suffer from the failure of the idea (Lieberman & Asaba, 2006).

Regardless of the original reasons for adoption, innovations tend to follow similar rates of adoption along the S-curve, from the early adopters to the laggards (Rogers, 1995). The adoption decisions along the S-curve are influenced by a number of factors, including level of codification, ability to experiment with the idea, complexity, comparability, and advantage derived from adopting (Rogers, 1995). As with the social explanation for adoption, organizations are influenced by reference groups and the market position of the innovator (Massini, et al., 2005; Aboulnasr, et al., 2008).

While these studies examine adoption at different points in the lifecycle of the product or service, the assumption is made that firms will ultimately adopt. In addition, these studies fail to take performance into account, instead assuming that a performance increase will automatically accrue through adoption. Whether for economic or social reasons, early or late in the adoption cycle, the literature on innovation diffusion consolidates around firms that do adopt, while assuming that non-adopters lack proper information or are somehow unable to implement the new idea.

2.1.3 Studies of Non-Adoption

In total, research has found several characteristics that influence the diffusion of an innovation. The degree of competition, risk tolerance of management, radicalness of the innovation, area of operations, and market position of the innovator can all impact the acceptance of a new idea. The combination of these variables will lead some organizations to adopt almost immediately, while others wait until further information can be gathered or until they are forced to adopt by market forces (Rogers, 1995). Additionally, rates of adoption are influenced by the relative advantage provided, compatibility with the innovation, complexity, ability to sample the idea, and the observability of the idea (Rogers, 1995). Although innovation diffusion has made significant progress, current research is unable to answer many questions surrounding the non-adoption of innovations. This section will address research on non-adopters and illustrate the rational efficient and fad models of diffusion. Advantages of these models will be discussed as well as areas where they fail to explain the behaviors of firms.

Born from the early agricultural and medical innovation studies, the rational efficient model suggests that firms will adopt the innovation once they believe that the innovation can be efficiently integrated into their organization and will produce greater returns than currently receiving (Rogers, 1995; March, 1981). In this theory, firms have access to the complete set of information necessary to make decisions and always make rational decisions. Organizations can independently choose whether or not to adopt a particular innovation because their goals are certain and the outcomes of their actions are predictable (Abrahamson, 1991). As more firms adopt the innovation, information becomes more prevalent and the cost of accessing this information decreases, thus

leading to more adoptions (Mansfield, 1961). Returns from the innovation decrease over time and the competitive advantage erodes, thereby leaving first movers with the most benefits.

Many of the studies in this paradigm assume groups of firms with similar goals. This implies that firms can narrow gaps in performance between their organization and market leaders by adopting similar strategies. Economic analysis suggests competing explanations for the performance gaps, including external environmental factors driving performance, as well as internal advancements that create gaps among competitors. External factors, such as organizations exerting political influence, may also mandate adoption or rejection of an innovation. These specific situations are worthy of note, but lack theoretical implications here. Rational efficient models explain non-adoption through an assumption of differing goals within an industry or the inability of the innovation to close the performance gap due to environmental changes.

Support for this model grew from the goals of the early innovation literature. As in the initial works, as information spreads across a population and provides evidence of greater efficiencies, the rational efficient model can be applied. Given the ambiguity and uncertainty involved in adopting an innovation, firms must continue to incorporate information about the adoption success of competitors. When an innovation fails to result in success, the spread of this information deters future adopters. Furthering rational explanations of diffusion, organizations recognize the failure of others and are able to make productive adoption decisions based on this information (Greve, 2011). Rather than simply following the pack, firms have demonstrated an ability to change course after processing more current information.

Diffusion has also been explained through fashions and fads (Abrahamson, 1991; Lieberman & Asaba, 2006). The central theorem of this social perspective suggests that organizations adopt an innovation simply because a competitor does. Unlike the rational efficient model, information about the efficiency of an innovation is unnecessary. Pressures to adopt can arise internally from a firm's fear of losing a place in the market or externally from influential "opinion leaders" (Mahajan & Peterson, 1985; Abrahamson, 1991). The impact of the innovation is less relevant than concerns of industry legitimacy and internal support. Although the potential returns may decrease over time, firms are unconcerned with acquiring these benefits, but rather with being seen as out of touch. Scholars have analyzed this phenomenon from the perspective of social networks (Carroll & Hannon, 1989), market signaling (Abrahamson & Rosenkopf, 1990), and accessibility of the knowledge (Rogers, 1995). Pressures are exerted from internal and external sources that promote inefficient decisions to adopt the innovation. This can also occur as an industry simultaneously rejects a potentially efficient innovation (Abrahamson & Rosenkopf, 1993).

Scholars of fad models introduce the psychological component of decision making processes. Recognizing that rational choices include more than economic motives, managers may follow the competition to protect their job, influence stock prices, or attempt to acquire market power (Abrahamson, 1991). Building from this literature are bandwagon theories of management suggesting that firms mimic those who are similar in industry, geography, or communication network (Abrahamson, 1991). As such, adoption decisions are linked to industry and organizational norms. In highly competitive industries, firms may feel compelled to match the offerings of competitors

for fear of losing market share. The threat of this industry behavior can also serve as a barrier for new entry, deterring start-up firms from launching new initiatives. Adoption is understood based on the degree of conformity to industry norms. Rejecting the innovation is a factor of non-conformity or insusceptibility to the norms. While these behaviors may have consequences beyond the future of the innovation, scholars have used them as an explanation for non-adoption. Bandwagon theory has also been given as an explanation for failing to follow bandwagon behaviors. Counter-bandwagons may be formed by sects within an industry as a way of differentiating themselves from firms with lower reputations (Abrahamson, 1991). As primarily an external factor influencing diffusion, explanation of this phenomenon is limited to the understanding of the pressures driving bandwagon decisions and how bandwagon behaviors are stopped.

Both the rational efficient and fad model of innovation diffusion assume that the technologically superior innovation should ultimately be adopted by all competing firms within the industry. Failure to select the most efficient strategy, whether consideration is given to the proposed innovation or another technological path, is explained through social norms or incompetent management. Although both can be highly influential, these explanations fail to consider the firm which never finds implementation to be an efficient strategy, nor the firm that is able to avoid the pressures from stakeholders or competitors and effectively analyze the impacts of their decision. Ironically, as both of these theories are grounded in the assumption that managers make rational choices, neither considers non-adoption to be a rational choice. Even amongst firms with similar goals, there may be multiple efficient combinations of resource deployment and bundling that generate high returns for the firm. Although several scholars have lobbied for a more balanced

literature, these theories contain similar biases towards innovation and flaws as the original studies.

2.2 Enhancers and Inhibitors of Innovation Adoption

2.2.1 Capabilities of the Firm

As innovation grew in popularity as a topic of strategic management research, the shift to a resource based view of organizations (Barney, 1991; Penrose, 1959) led scholars to look inside of an organization - rather than the competitive environment - for sources of innovative activity. Within the firm, organizational capabilities have been proposed as a source of competitive advantage due to specialist knowledge held by the firm (Grant, 1996). An organizational capability can be defined as "a firm's ability to perform repeatedly a productive task which relates either directly or indirectly to a firm's capacity for creating value through effecting the transformation of inputs into outputs" (Grant, 1996: p.4). Similarly, Winter (2002) also defines organizational capabilities as "a high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type" (Winter, 2002: p.1). In this paper, a capability will be considered a repeatable, high-level firm process that utilizes numerous resources to reliably produce value for the organization. Importantly, capabilities require the recognition and deployment by management for the firm to fully capture their value. Capabilities can evolve through the creation or acquisition of products, processes, and knowledge. Capabilities influence not only what a firm is currently capable of doing, but also serve as a platform and threat for entry into other areas (Zander & Kogut, 1995).

Even when a firm aspires to imitate an innovation, mimicking the new ideas is dependent upon the imitator's organizational capabilities. The speed by which an idea is transferred throughout an industry is dependent upon the number of competitors engaged in a similar trade, the ease by which an innovation can be understood, and the degree of improvement (Zander & Kogut, 1995; Teece, 1977). While two firms may be rivals, a lack of capabilities in a given area decreases the likelihood of imitation. Even with motivation to mimic a peer organization and a similar product profile, a firm may be unable to imitate due to the combinative process of innovation (Zander & Kogut, 1995; Kogut & Zander, 1992). An analysis and comparison of capabilities provides insight into the likelihood of adoption and can serve as a predictor of post-adoption success.

As new capabilities are developed, competitors familiar with the landscape may attempt to mimic the innovative capabilities. Although the innovation literature primarily assumes eventual adoption by all competitors within the industry, firms may intentionally decide not to adopt these strategic innovations based on the capabilities that they have developed. Differing from myopia or inertia (Levinthal & March, 1993; Hannan & Freeman, 1983), these firms may find their capabilities as complementary (Teece, 1986), substitutive (Hess & Rothaermel, 2011; Rothaermel & Hess, 2007), or neutralizing (Barney, 1991; Porter, 1980) to the innovation. Each classification has implications for managerial decision-making in regards to how an innovation would be integrated into the new firm.

Recognizing the type of capability each firm has developed can impact managerial decision-making around which innovations to try and mimic. Analogous to prior research suggesting that firms follow their industry's market leader (Absoulnasr, et

al 2008), capability classification provides managers a more direct comparison to competitors. Imitating dissimilar capabilities may not be logical even when a competitor holds a similar market position given the current bundling and deployment of resources.

As illustrated by Teece (1986), firms with capabilities complementary to the innovation have the greatest ability to commercialize the idea. These organizations can integrate the innovation into their routines with relative ease and can recognize greater economic benefits when these resources are bundled and deployed together. These assets may be held throughout multiple firms within an industry and have frequently been used by imitators to find more success with an innovation than the originator (Teece, 1986; Zander & Kogut, 1995). While the resources present might not be identical, the strategic bundling and deployment of resources is designed to accomplish the same goals. For firms with complementary routines, adoption is a possibility since the imitator could seek the necessary resources with minimal disruption to their operations. The level of risk is low since few resources need to be acquired and the same assets can be used. If the organization experiences a decrease in performance, these same assets can be redeployed in the previous manner without significant cost.

In contrast to firms with complementary capabilities, firms with substitutive capabilities utilize different resources to achieve the same goal (Hess & Rothaermel, 2011; Rothaermel & Hess, 2007). Firms with substitutive capabilities differ from those with complementary capabilities in that they lack the specific resources needed to adopt the innovation. While the firm is currently oriented towards the same strategic objective, resources must be bought on the open market, leading to a higher degree of risk in adoption. Reverting back to the previous deployment is not a simple proposition as the

substitutive resources would have been exchanged for the adoption-specific needs. For example, in healthcare, two treatment plans may be substitutes for each other, depending on the patient's needs. For the patient's treatment plans, this may involve differing levels of inpatient versus outpatient care. Equivalent nurses and doctors would be involved in caring for the patient, but using different routines and procedures for diagnosis and treatment. For this hospital to adopt an innovation, additional training of medical staff would be required. First, the organization would have to bring knowledge of the innovation to the hospital, either through reengineering or hiring. The resources may have to be redeployed, including personnel and medical equipment. None of this would ensure success as the hospital may experience a disruption in services. Although the organization may not need a total makeover, the firm is accepting a higher level of risk than those with complementary resources.

Due to the path dependent nature of resource acquisition, firms that have neutralizing capabilities may be less likely to take note of an opposing innovation (Dierickx & Cool, 1989). Neutralizing capabilities can be seen as those which neutralize the competitive threat posed by the innovation by reducing the market value of the idea (Barney, 1991; Porter, 1980). As capabilities are developed based on the available resources, firms with a resource acquisition strategy that differs from the innovator may be deterred from pursuing the innovation. If a firm with neutralizing capabilities were to try to adopt, they must overcome not only the inertia of their current strategic deployment but also must convince internal and external personnel that the new direction is superior. If the firm is currently successful, this strategic shift is highly risky with no guarantee that the appropriate resources can be acquired, and without previous knowledge about how to

bundle and deploy these resources. Although knowledge can be acquired on the market, sourcing of this manner is expensive and would require a reconfiguration of the entire organization. This eliminates any previously held advantages derived from knowledge stocks, current routines, actors, and activities.

The high levels of agency and improvisation inherent to capabilities lead to a high degree of individual and group tacit knowledge within an organization's routines and capabilities (Berman, et al., 2002; Winter & Szulanski, 2001; Feldman & Pentland, 2003). Since management and actors within a routine seek to maximize efficiency, changing the structure eliminates the previous gains and resets the clock on building a competitive advantage. Moreover, these firms are behind the first mover and potentially others in the industry as they develop a capability to accomplish similar goals. When compared to other capabilities, firms operating neutralizing capabilities and considering adoption would find duplication to be highly difficult and may elect not to adjust their routines to the innovation.

The classification of capabilities does not suggest that all firms possess particular capabilities in relation to the innovation. The new idea may be in an area of secondary interest to a competitor or a market in which an organization does not compete. Additionally, a firm may compete in an area without having any distinct capabilities at all. While these firms are unlikely to be successful, managers may use current innovations as a model by which to imitate. By viewing the innovators as market leaders, managers in this firm may elect to adopt, thus increasing competition for resources. Little research exists on firms with weak or nonexistent capabilities as these organizations are apt to perish due to their competitive struggles.

2.2.2 Bundling and Deployment of Resources

Discerning the type of capability possessed may not be an easy task for a manager. In determining the proper course of action, a manager must consider the current bundling and deployment of resources. While each type of capability may either enhance or inhibit the adoption of an innovation, the manager may be able to bundle or deploy the asset groupings in a different manner that allows for the creation of a different type of capability.

For many firms, the modification of routines is the primary innovative activity. With the exception of technology firms possessing large research and development budgets, innovation occurs in the daily re-bundling and re-deployment of actors within a routine. Changing these components helps generate new knowledge at the individual, social, and organizational level (Subramanian &Youndt, 2005; Holcolm, et al., 2009). Although this type of innovation may seem mundane, firms that are able to constantly imitate and improve routines can create significant amounts of new knowledge. This "hidden," intangible innovation is difficult to measure and quantify, but has led to significant advantages for those firms with capabilities in this area.

As the core set of repeated firm activities, capabilities can also serve as a major function in innovation and organizational change. While not all bundling and deployment constitutes innovation, the implementation of new ideas is seen through the routines in which the innovation is packaged. New strategies emerge and new knowledge is formed as a result of this recombination. The development of a successful series of

routines can evolve into an organizational capability, which can be seen as the strategic innovation.

Academic research has focused on the usage of resources and the contexts in which bundling and deployment can create a competitive advantage. Sirmon, et al. (2008) noted that the influence of managers is greater when resource stocks are similar. Grant (1996) argues that the primary capability of a firm is the ability to integrate knowledge (through bundling and deployment), specifically by using routines that capture tacit knowledge. The success of this is partially dependent upon common knowledge (organizational), the frequency and variability of task performance (bundling), and structure (deployment) (Grant, 1996).

2.3 Facilitators of Diffusion

Whether developing new products or services, innovative companies can be seen as knowledge creating (Nonaka & Takeuchi, 1995). For this knowledge to be used, firms must find strategies for transferring the knowledge amongst their organization and to the marketplace. Before an innovation can be marketed and ultimately replicated by competitors, the idea must pass through several levels of a firm, often times being transferred from one division to another. In this manner, knowledge can serve as a facilitator of diffusion. This section will explore the role of knowledge, both from the innovator and imitator, as a facilitator of diffusion.

2.3.1 Codified Knowledge

The nature of the knowledge being transferred has been found to have an impact on diffusion throughout a firm and industry. Knowledge defined as "sticky" can be seen as having high costs of acquisition, transfer, and use (von Hippel, 1994). As these costs increase, transferring the knowledge becomes more difficult due to ties to a given location. The knowledge may be inseparable from an individual or group of people or may require greater knowledge to understand the nuances of the idea. This can simultaneously present challenges in bringing the innovation to market but provide advantages in preventing competitors from adopting a similar product or service. When "sticky" information is encountered, firms tend to break up the knowledge into smaller pieces so that transfer is eased and information can be shared across different sites (von Hippel, 1994). As the firm attempts to "break up" the knowledge, the codification process changes much of the knowledge from tacit to explicit. Codifying the knowledge reduces the "stickiness" and facilitates transfer (Zander & Kogut, 1995). Costs of stickiness can also be reduced through changes in causal ambiguity, an increase in the recipient's absorptive capacity, a cooperative relationship between the knowledge holder and recipient, and prior success with the knowledge (Szulanski, 1996).

Knowledge transfer can be seen as a separate and dyadic exchange rather than a steady flow of information spreading across a firm or industry. As the knowledge is replicated, the transfer becomes a replication of an organizational routine rather than information incorporated into the knowledge base of a firm (Winter, 1995). In using the innovator's template, the imitator must replicate the business model and the non-observable components of the innovation (Winter & Szulanski, 2001). Even with both

components available, high levels of causal ambiguity may make duplication impossible. For this reason, firms with similar characteristics tend to mimic each other and learn from peer groups of allies and competitors (Darr & Kurtzberg, 2000). Ironically, firms may have a difficult time recognizing when knowledge has been transferred from outside the organization and often fail to identify the sources of acquired knowledge (Argote & Ingram, 2000).

Despite the "stickiness" of the knowledge, firms may not be able to imitate another (or even themselves) due to the contextual facets of organizational capabilities (Teece, 1976). Capabilities may be combinations of routines, actors, and processes that interact in such a manner that even the original firm cannot replicate the capability in different locations (Lippman & Rumelt, 1992). The interaction of the capability-forming processes creates very specific circumstances under which knowledge creation and product output can occur. Further, separating these routines can reduce the value of the entire capability (Teece & Pisano, 1994). Ultimately, imitation and mimicry are risky processes requiring significant amounts of tacit knowledge, typically held by employees at the originating location.

2.3.2 Adoption through hiring

Previous studies have analyzed methods of knowledge transfer through mimicry and imitation. However, where information asymmetry and incentives to protect the knowledge are high, duplicating another firm's knowledge structures may not be possible. In this situation, many organizations have sought to tap into a firm's knowledge through hiring employees from the innovator. These individuals have first-hand

knowledge of the routines, processes, and strategies implemented to make the innovation a success. While exact replication may not be possible, having access to the thought processes behind the innovation allows a firm the ability to tailor knowledge to their needs while simultaneously weakening a competitor.

Being able to recognize the value of an innovation, integrate it into an organization, and extrapolate profits are crucial skills for a firm (Cohen & Levinthal, 1990). Although many innovations may not originate within a firm, the ability to use knowledge from others can allow a firm to remain competitive without devoting significant resources to innovation or taking unnecessary risks. This exploitation of outside knowledge has been described as a firm's absorptive capacity (Cohen & Levinthal, 1990). Similar to the borrowing of information from others (March & Simon, 1958), absorptive capacity suggests that firms are better able to integrate new innovations if they have a broad base of related knowledge (Cohen & Levinthal, 1990). An organization's broad foundation of knowledge is developed through an assimilation of diverse individual capabilities (Nelson & Winter, 1982; Cohen & Levinthal, 1990).

As a firm seems to build absorptive capacity or integrate new knowledge, they frequently look to hire outside employees that possess related capabilities to their own. When the source of the innovation lies in the heads of key employees, buying this knowledge through an employee transfer can help overcome network or implementation weaknesses (Rao & Drazin, 2002). Recruitment of key employees can facilitate the exchange of new ideas (Baty et al., 1971) and reduce competitive advantage (Aime et al, 2010). This can help overcome challenges where the success of the innovation is

causally ambiguous or highly tacit (Barney, 1991). New talent can also facilitate strategic changes and transition into new markets (Cohen & Levinthal, 1990).

Dependent upon a firm's needs, different types of knowledge can be sought from competitors. Organizations seek to hire technical expertise when they seek to extend their current knowledge base in a non-core area (Song, et al., 2003). This type of hire is also made to compensate for low quality resources in the area of technical expertise. In this manner, the location of the new employee may signal the type of knowledge the imitator is seeking to access. Technical learning through hiring is typical of a firm seeking to expand their horizons (Song, et al., 2003). This is also thought to expand an organization's absorptive capacity and serves as slack resources that enable the firm to take risks.

Managers may also be hired if a competitor believes the individual is a source of the rival's competitive advantage. Research indicates that hiring a manager from a competitor can improve a firm's performance vis-à-vis the competitor (Aime et al., 2010). Advantages can be reduced by removing a key source of a competitor's knowledge, as well as through the replication of previously successful routines. Learning by managerial hiring can also lead to the diffusion of an innovation by sharing previously protected knowledge with competitors. However, this may lead to parity throughout the industry as advantages may not fully accrue to the hiring firm and may also be reduced by additional firms pursuing the same strategy.

As illustrated by Aime, et al. (2010), hiring from a competitor can be beneficial when the talent acquiring firm is able to successfully pair the new manager with similar routines. Through an analysis of coaches hired by NFL teams, the authors were able to

demonstrate how socially complex routines became unstable after the departure of key employees and how advantages transferred to competitors who were able to matching their routines to newly hired personnel (Aime, et al., 2010). While the authors did not differentiate between hiring with an intent to adopt an innovation, the transfer of knowledge is highlighted as a key component to routine stability and success.

Unfortunately, little research is devoted to the transfer of lower level employees throughout organizations. While these workers are charged with implementing innovations and interacting with key stakeholders, scant attention has been given to the impact of their departure or arrival. Research is also unclear about firm performance upon hiring from competitors. Although some findings indicate that a hiring firm will improve performance relative to the firm losing the manager, there is little evidence about a firm's ability to increase market share or profitability based on these strategies. Further, studies have only looked at the hiring of one key employee and have scant empirical evidence to illustrate the effects of hiring multiple people. Despite these open areas, hiring key technical experts or managers can help a firm gain additional knowledge at a faster rate than if they were to replicate the information on their own. As a primary method of knowledge transfer and diffusion, firms continue to pursue this strategy to boost their knowledge stocks and shift market positions.

2.3.3 Development of Capabilities

While capabilities lead to increased efficiency and repetition, excessive stability of capabilities has been linked to inertia (Hannan & Freeman, 1983) and competency traps (March, 1991; Levitt & March, 1988). To prevent these problems from arising,

firms routinely evaluate and change key processes and actors. As a function that encourages organizational learning (Levitt & March, 1988), this new knowledge that is integrated into firms may eventually lead an organization to develop additional capabilities and expertise. Further, employees often change jobs and earn promotions, thus necessitating increased investment in capability development. Thus the evolutionary aspect of replacing employees creates an opportunity to integrate new knowledge.

Firms that are consistently able to develop capabilities that create new products and processes to account for changing market conditions may have dynamic capabilities (Teece & Pisano, 1994). Dynamic capabilities are the "adapting, integrating, and re-configuring of internal and external organizational skills, resources, and functional competences towards the changing environment" (Teece & Pisano, 1994; p.1). Dynamic capabilities can enhance a firm's ability to adopt an innovation through the higher-order skill of facilitating change within the organization (Winter, 2002). Organizations that possess dynamic capabilities respond favorably to radical innovations and can quickly adapt to the new competitive environment.

Dynamic capabilities also help firms avoid becoming myopic in response to environmental changes (Teece & Pisano, 1994; Levinthal & March, 1993). Firms capable of acting quickly to market forces can avoid becoming path dependent upon their own resources. By assimilating new information into the firm, management is able to deploy resources in numerous configurations that enhance the value of each asset. Successful development of dynamic capabilities must occur at the managerial level due to

the impact that an environmental change may have on the entire firm's routines and capabilities (Teece & Pisano, 1994).

CHAPTER 3

HYPOTHESES DEVELOPMENT

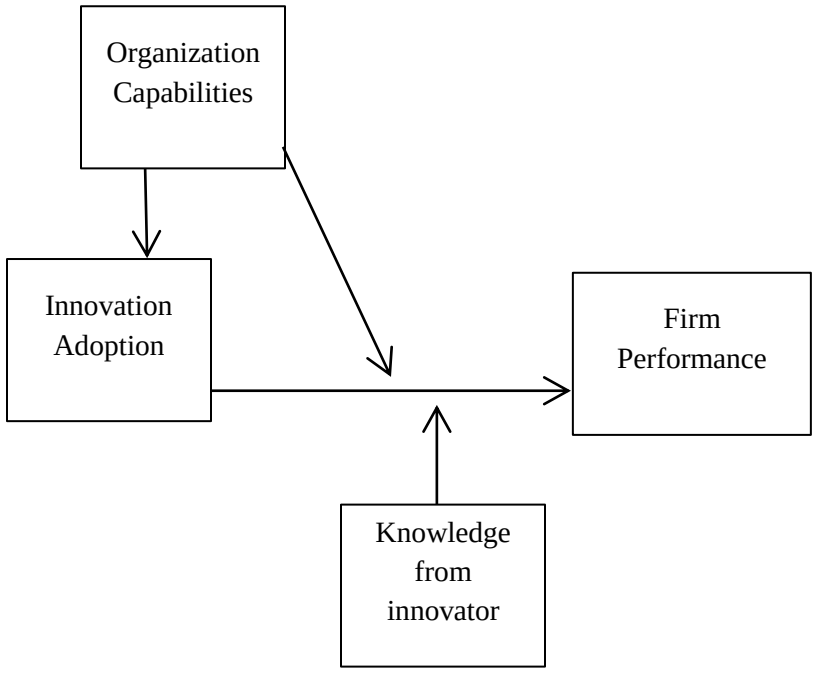
This chapter outlines a proposed theoretical model of the strategic non-adoption of innovation. A conceptual model is provided based on the given definitions of innovation, organizational capabilities, and knowledge transfer. Then an outline of the theoretical arguments supporting the model is provided. Finally, a set of testable hypotheses is included to explain the relationship between organizational capabilities, knowledge from the innovator, and firm performance.

3.1 Hypotheses and Theoretical Model

3.1.1 Empirical Model

The model of innovation decision proposed by this study can be seen in Figure 1 below:

Figure 1: Conceptual model of innovation adoption



The conceptual model illustrates the relationships between organizational capabilities, adoption of the innovation, knowledge from the innovator, and firm performance. As highlighted, organizational capabilities will influence adoption decisions and moderate the relationship between adoption and firm performance. Adoption will lead to increased performance, but will be moderated by knowledge from the innovator. Organizations that do not adopt will find their firm performance to be determined by the quality of their capabilities that do not directly relate to the innovation.

Following previous definitions of innovation, this model assumes an innovation to be a "recombination of previously held knowledge" in a manner that is different from how the resources had been used by the innovator or competitors. An organizational capability is defined as "a firm's ability to perform repeatedly a productive task which relates either directly or indirectly to a firm's capacity for creating value through effecting the transformation of inputs into outputs" (Grant, 1996: p. 377). In this model, capabilities are the manifestation of a repeated, successful series of routines. Knowledge from the innovator is conceptualized as the direct acquisition of knowledge about the innovation through the hiring of an individual with specific, tacit knowledge that could lead to the implementation of the innovation. These definitions are used with the standard usage of firm performance to complete the model.

3.2 Hypotheses on Adoption, Knowledge Transfer, and Performance

As previously stated, innovation adoption decisions are driven by both internal and external forces, as firms commit once the economic or social benefits are perceived

to exceed the organization's current position. In this section, I suggest organizational capabilities as a unit of analysis for adoption decisions and propose that some firms should reject the innovation based on their current capabilities.

Due to the benefits associated with innovation, prior literature has assumed adoption based on perceived economic and social gains (Rogers, 1995; Abrahamson, 1991; Greve, 2011). As firms weigh the efficacy of an innovation, they rationally adopt once the idea has proven to be profitable and the necessary resources can be acquired to implement the knowledge into their firm. For firms that do adopt, these rational decisions have been explained by comparison to a reference group (Massini, et al, 2005), fads and fashions (Abrahamson, 1991; Abrahamson & Rosenkopf, 1990; Abrahamson & Rosenkopf; 1993), risk aversion (Lieberman & Asaba, 2006), and robust social networks (Greve, 1998). However, despite greater emphasis being placed on looking inside of the firm (Barney, 1991; Sirmon et al, 2007; Penrose, 1959), little research has explored how a firm makes adoption decisions based on their resources and capabilities.

The unit of analysis for the following hypotheses is the firm capabilities, measured in relation to the innovation. Only those capabilities that are pertinent to the implementation of the innovation will be considered. As illustrated in the model above, once adoption decisions are made, firm performance is compared and moderated by the strength of the capabilities and the ability to access knowledge from the innovator.

Although several studies have illustrated capability development in innovation and knowledge integration, most tend to assume that firms have the ability to bundle and deploy firm resources in a manner that produces a successful adoption (Kogut & Zander, 1995). Although this may be the case, this excludes the cost of shifting resources and

developing new capabilities and disregards the possibility that a firm may find greater success by rejecting in the innovation. Embedded in these capabilities is the need for various resources, actors, and activities (Teece & Pisano, 1994; Winter 2000; Winter, 2002). The ability to adopt the innovation will be dependent upon the adopting firm's current knowledge stocks, capabilities, and desired outcomes.

Capabilities can both enhance or inhibit the adoption of an innovation. Recognizing that numerous capabilities were needed to commercialize an innovation, Teece (1986) illustrates the need to possess complementary capabilities. A complementary capability is an asset whose presence is needed to fully capitalize on the value of another (Teece, 1986; Winter 2006; Milgrom & Roberts, 1995). The presence of the complementary capability increases the marginal value of the original asset (Rothaermel & Hess, 2007). Although these can be other parts to a larger system, complementary capabilities can frequently be found in support areas such as marketing, sales support or technical support. Complementary capabilities tend to be specialized in nature, as generic assets do not need to be tailored to support the innovation (Teece, 1986).

Firms with these complementary capabilities may provide an imitating firm with the ability to capture the advantages derived from another's innovation (Teece, 1986; Winter, 2006). Although one firm may possess greater innovative capabilities, the ability to commercialize the idea may be limited by the organization's assets. These assets can be technical or social but help facilitate the ability to distribute and market the product.

The supply of complementary capabilities cannot be assumed to be universal (Winter, 2006). Since firms cannot know in advance what innovations will be produced,

either by their organization or competitors, competition ensues for the imitative and complementary assets. In some cases, the innovator will already possess several of the complementary capabilities and is thus afforded the opportunity to limit the market for this knowledge (Winter, 2006; Teece, 1986). However, the knowledge protecting these capabilities may be subject to patent or other legal protection, thereby limiting the accessibility of both the innovation and the necessary complements. If the innovator does not possess the needed capabilities, increased competition will exist for both resources, potentially leaving the innovator without financial gain for their efforts (Teece, 1986; Winter 2006). For these reasons, hypothesis 1 is given below:

H1: The adoption of the innovation will be positively correlated with complementary capabilities.

In an environment where competition is fierce for innovative and complementary capabilities, organizations may turn to substitutive capabilities for support. Whereas complementary capabilities work in conjunction with different processes and functions within a firm, substitutive capabilities replace different links within the commercialization process (Hess & Rothaermel, 2011; Arora & Ceccagnoli, 2006; Cassiman & Veugelers, 2006). Due to the substitution effects, the replacing of one capability must marginally decrease the overall productivity when compared to a complementary capability (Hess & Rothaermel, 2011). However, the overall combination of assets and capabilities allows the firm to successfully imitate an innovation, bringing to market an idea that benefits the organization.

Substitutive capabilities can be seen in many industries through traditional make or buy decisions. In the pharmaceutical industry, organizations have chosen differing methods of creating advantages in the development of medicine. Merck has taken the approach of developing research capabilities internally, investing in scientists and equipment to produce their own patented drug. In contrast, Eli Lilly has approached the same goal through acquisition of and alliances with competitors (Rothaermel & Hess, 2007). As a substitutive capability to research, Eli Lilly has developed an ability to integrate outside knowledge into a broader organizational structure. Each company also possesses complementary capabilities that enable the respective strategies to exist. However, in regards to pharmaceutical innovation, the two firms have substitutive capabilities (Rothaermel & Hess, 2007).

Firms with substitutive capabilities have the potential to adopt an innovation but do so with greater risk. By using currently held capabilities, the organization is removed from competition for complementary assets, but must compete with assets whose marginal value is lower (Rothaermel & Hess, 2007). Firms with substitutive capabilities are unlikely to be early adopters of an innovation, but still find efficacy in implementing the new idea (Rogers, 1995). The decreased potential to profit deters immediate imitation from substitution, though firms are not faced with the same market pressures to adopt as those employing complementary capabilities (Arora & Ceccagnoli, 2006; Cassiman & Veugelers, 2006). However, despite the challenges, firms with substitutive capabilities can still benefit from adoption by using similar assets to accomplish the outcomes of the innovation. Oriented in the same direction as firms with complementary

capabilities, these organizations are still able to absorb the risk of redeploying assets. Due to the potential for usage of substitutive capabilities:

H2: Adoption of the innovation will be positively correlated with firms possessing substitutive capabilities.

Differing strategic decisions and resources may lead a firm to possess neutralizing capabilities in relation to the innovation. As Barney (1991) explains, resources can create value through their ability to neutralize a threat within the firm's environment. In some cases, this ability is more valuable or rare than those that exploit market opportunities. If the threat is persistent, the development of these threat neutralizing resources can lead to a neutralizing capability. As an innovation is, by definition, a threat to the status quo of competition, neutralizing capabilities can be effective in negating the effects of an innovation (Schumpeter, 1939; Porter, 1980).

Just as back office functions can serve to complement the commercialization of an innovation, they can also allow competitors to neutralize the threat. Capabilities in marketing, customer service and information technology can thwart an innovation through direct interaction with customers, suppliers, or competitors.

The development of capabilities includes many managerial decisions over time as firms build resources towards the pursuit of a given strategy. As time progresses, future choices become path dependent upon the available resources and the high costs of reacquiring and deploying new asset groups (Dierickx & Cool, 1989). As firms acquire knowledge and capabilities, they become locked into the advantages and disadvantages

that these assets provide. This can both help and hinder a firm's ability to adapt to changes in the competitive environment. Organizations are able to derive advantages from their capabilities through constant usage and learn from repetition of the routines and processes (Levitt & March, 1988). As an innovation disrupts the competitive environment, firms are incentivized to incorporate the new idea into their current capabilities. However, a superior innovation in one firm may not be advantageous in others. This is due to the difficulty in replicating resources and bundling knowledge in a repeatable fashion (Teece & Pisano, 1994). Further, adopting an innovation may cause a firm to withdraw from an advantageous position obtained from their current bundling and deployment of resources. Due to the high risks of adoption and the necessity to acquire a different set of capabilities:

H3: Firms with neutralizing capabilities to those of an innovator will be less likely to adopt the innovation than those who possess substitutive and complementary capabilities.

Due to the role of improvisation and determination of decision points within a routine, an adopting organization will find difficulty in reverse engineering the innovative capabilities (Teece & Pisano, 1994; Winter, 2002; Winter & Szulanski, 2001; Feldman & Pentland, 2003). The costs of investigating where decision points lie and what the potential options may be will be prohibitive of imitation and developing a capability without accessing direct knowledge of the innovation (Rao & Drazin, 2002; Baty, et al., 1971; Aime, et al., 2010). The scarcity of this information is another factor that firms

considering imitation might consider. Firms that are able to access this information will benefit from a streamlined implementation and greater performance.

In an attempt to bypass the difficulties with reengineering the innovation, firms may elect to access knowledge of the idea through hiring key employees from the innovator (Hess & Rothaermel, 2011; Rothaermel & Hess, 2007). These employees bring the tacit knowledge necessary to pass along to assist in an adoption decision. Firms may also hire key innovator employees to gain access to the innovation in an attempt to further develop neutralizing routines. While these employees may be in high demand, the benefits from accessing their knowledge are explained below:

H4: Due to the complex nature of strategic innovations, knowledge from the originating firm will moderate the relationship between adoption of the innovation and firm performance for firms with complementary and substitutive capabilities.

Since direct knowledge of the innovation is scarce and expensive, firms with neutralizing capabilities may better served by continuing to devote resources to their current capabilities rather than pursuing the innovation. Despite previous theories of inevitable adoption, non-adopting firms with capabilities that neutralize the strategic innovation have the potential to achieve higher performance outcomes than similar firms that do adopt. However, firms that possess complementary or substitutive capabilities represent a class of capabilities that are typically defined as eventual adopters. In the meantime, performance of non-adopters with neutralizing capabilities will exceed that of the other non-adopters.

Despite the potential for neutralizing threats to serve as a slack resource while the firm gathers the necessary resources to adopt, market competition dictates that the resources may shift to where they provide the most value (Finkelstein & Hambrick, 1990; Rottenberg, 1956; Coase, 1960). For this reason, knowledge of the innovation will tend to shift towards firms intent on immediate adoption. Although firms with neutralizing capabilities can still bid for these resources, they may have to pay a premium, while simultaneously diverting attention from areas in which they have superior capabilities.

The development and deployment of neutralizing capabilities can eliminate the need for adoption. Firms that do not adopt the innovation may be devoting resources to the development of neutralizing capabilities. Instead of seeking a homogenous set of resources, these firms bundle and deploy resources in a manner that reduces the innovation's advantage. However, the efficiency of the innovation will gradually reduce the benefits from complementary and substitutive capabilities. Firms will be forced to develop capabilities that capitalize on neutralizing resources or integrate elements of the adoption into their organization. The usage and success of these neutralizing capabilities will be sustainable as long as the quality of the resources does not depreciate. There will not be a need to adopt the innovation. Due to the use of complementary and substitutive capabilities, as well as the increased ability of neutralizing capability firms to access capability strengthening resources:

H5a: Adopting firms with complementary capabilities will achieve greater performance than non-adopting firms with complementary capabilities.

H5b: Adopting firms with substitutive capabilities will achieve greater performance than non-adopting firms with substitutive capabilities.

H5c: Non-adopting firms with neutralizing capabilities will achieve greater performance than adopting firms with neutralizing capabilities.

CHAPTER 4

DATA AND ANALYSIS METHODOLOGY

In this chapter, I present the methodology that was used to test the hypotheses listed in Chapter 3 and provide answers to the previously stated research questions. First, I will explain the sample used in the analysis and highlight why this represents an important innovation. I then define the variables and end with a discussion of the regression equations used to test the hypotheses.

4.1 Research Sample

The innovation diffusing pattern selected for this dissertation is the West Coast Offense in the National Football League (NFL), which has been identified as one the most influential innovations in professional football (Jaworski, 2010). The combination of plays and decision points within the offense can be seen as a routine. Credited to former San Francisco 49ers head coach Bill Walsh, the offense was revolutionary in the creation of a routine that involved a passing attack with the ability to negate the defense's pressure on the quarterback and consolidate defenders around the scrimmage line. Other key contributions of this innovation include changing the attributes necessary to play quarterback and wide receiver, opening up the positions to allow players with a variety of different skills to succeed through the system. The offense was also innovative through the combination of plays using a horizontal passing game that spread the defense from one sideline to another as well as through the length of the field (Jaworski, 2010). As the head coach, Walsh and his staff developed these sets of plays, or routines, by bundling

and deploying similar resources in a different manner. Through repetition and constant evaluation, the 49ers developed a capability in implementing the West Coast Offense.

While running Walsh's system, the San Francisco 49ers had the best record of any team in the National Football League and won five Super Bowl championships. The endurance of the West Coast Offense's success is illustrated by the number of organizations currently running the system. Ten NFL teams currently run the offense, including two of the previous four Super Bowl champions (Green Bay Packers, 2010; New Orleans Saints 2009).

The sample population for this study was drawn from all professional football teams starting with the 1980 season. This is one year after Bill Walsh began coaching in San Francisco, thus representing the first opportunity competitors would have had to imitate the success of the offense. While the San Francisco 49ers did not achieve high levels of team success until 1981, other teams could have already identified routine patterns and combinations. The sample continues through the conclusion of the 2011 season, the most recent completed season when data analysis commenced. In total, this represents 32 years of data with between 28 and 32 teams competing in each season. The total number of team seasons represented in the sample is 981. These data signify the entirety of professional football organizations and performances since the creation of the West Coast Offense. However, while this is an entire population, the analysis will be conducted as a sample since the theory and conclusions attempt to generalize to larger populations of innovations and firms in other industries.

Data for performance variables was obtained through the website www.pro-football-reference.com for team performance variables. The website is a database of

statistics tracked by team, player, and season. Data is available for every single game, coach, and player in NFL history. To ensure accuracy of recording, statistics were downloaded directly from the website. No statistical information was manually recorded. Prior to conducting analysis, figures were rechecked to ensure accurate transfer from the website. Standard deviations and other performance metrics were then calculated to provide a deeper look at team output over time.

Information about imitation and implementation of the West Coast Offense was obtained primarily through research of the NFL archives at the Professional Football Hall of Fame in Canton, OH. With assistance from full-time researchers at the Hall of Fame, historical records were examined including media guides, newspaper articles, team and league publications, books, and biographies of key personnel involved in this era of football. Based on information found in these sources, as well as conversations with the research staff, team strategies and routines were identified and classified as an imitator of the West Coast Offense. Classification was made based on direct comments by team personnel stating an intention to run the offense, references to the coach's desire for a "west coast" system, descriptions of routines and similar resource deployment, the usage of "west coast" terminology in describing routines, and the background or coaching philosophy of the staff. The final list of teams running the West Coast Offense was given to the Hall of Fame research staff for a final review. The researchers cross-verified the teams and found teams all on the list to be accurately categorized as adopters or non-adopters of the West Coast Offense.

Although the 49ers' team performance is included in the annual statistical calculations, 49er offenses were not considered to be part of the sample given that they

were an innovator rather than imitator. As the team moved to a different system in 2004, these squads were included in the non-adopter category. Excluding these San Francisco teams, the sample includes a total of 254 team seasons where the West Coast Offense was implemented.

Although there are many individuals within a professional football firm that may help dictate the on-field strategy and routines, the primary responsibility lies with the head coach. The owner and general manager may elect to hire a coach due to their familiarity with a given strategy (and therefore expect that the strategy be implemented) but these executives are removed from the teaching and designing of the system. The head coach is in charge of hiring assistant coaches, typically specific to a unit of players (offense, defense, special teams) or position (linebackers, offensive line, running backs, etc.). At times, a head coach may delegate strategic responsibilities to an assistant coach with more expertise in a given area. For the purposes of this study, the background of the head coach and offensive coordinator were examined to determine prior experience and knowledge with the West Coast Offense.

This type of sample provides distinct advantages for strategy research. First, the longitudinal nature of the dataset allows for analysis over time at the firm and industry level. Additionally, the specificity of firm performance data allows for firms and their personnel to be accurately measured over time. The importance of the coach and the easily identifiable skills of players (evidenced through playing statistics) create discernible start and end dates to the implementation of various strategies. Second, unlike many other innovation studies, adoption and non-adoption of strategies can be easily identified. From this, performance can be compared and resources measured to

reveal influences of managerial decision making. As all firms within this study are single service producers, firm boundaries are fixed and impact of adoption on other units can be ignored. This group of firms is also relatively stable over the course of the sample set, with only four firms being added to the league and zero firms being removed. While there are a handful of organizations that relocate during the thirty year time period, the primary employees (coaches, players, executives) relocated with the team and maintained their positions in the new city. Finally, the consistency of seasons and strategic decisions allows for natural time intervals within the data set. Changing routines and strategic direction are activities pursued by teams during the offseason through coaching and player changes. The importance of the NFL draft and free agency in acquiring players provides an opportunity to reassess routines. Although coaching changes are made in the middle of a season, these interim coaches are typically not given the authority (nor is time available) to redesign the organizational routines. Each offseason teams evaluate the performance of their strategic routines and can change based on the hiring or firing of the head coach, assistant coaches, or players. This creates a distinct point of innovation adoption that is supported through statistics and observation of the routines.

In addition to the characteristics listed above, the usage of sport samples leads to several other advantages in measurement and theory development. Other scholars have found similar sport samples to be useful in assessing group tacit knowledge (Berman, et al. 2002), managerial deployment of resources (Sirmon, et al, 2009), and strategic human resources (Wright, et al. 1995). These samples are valuable due to the resource homogeneity of the firms and the similarity of firm goals. As rosters are limited to the same number of players across all of professional football, advantages of size can be

disregarded. Further, financial advantages are limited due to the high degree of revenue sharing stemming from national television contracts and gate receipts (Borland & Macdonald, 2003). The objectivity of performance data (winning football games) indicates that all firms are proceeding towards the same goal, absent of any complicating factors.

As a laboratory for innovation research, the context is particularly interesting due to the availability of information competitors receive about resources and strategy. With each contest being televised to a national audience, including consumers and competitors, information about strategic innovations is freely available for all to see. The quality of the strategy is immediately apparent, while reverse engineering of the strategy is possible through viewing the implementation. Further, innovation research in a professional sport setting is enhanced through the zero sum game inherent to sporting contests. Since not all firms within an industry can achieve high performance, the competitive dynamics provide significant incentives promoting innovation and quickly adopting successful strategies. These characteristics have led many to conclude that the NFL is a "copycat league" (Jaworski, 2010).

4.2 Professional Football

Professional football is an American game featuring distinct units of eleven offensive and defensive players competing at a time. The goal of the game is to advance the ball from one end of the field to another, crossing a goal line or kicking the ball through uprights to earn points. Teams are allowed to advance the ball by running or throwing the ball, with the opposing team stopping the advancement through a tackle or

an incomplete pass. Each tackle or incomplete pass ends the play and the teams are required to set up and try again. Possession of the ball is exchanged when a team loses the ball through a fumble or interception or when failing in four plays to advance the ball a total distance of ten yards. As such, offense and defense play an equal role with teams having the option to devote resources in any manner necessary to each. Players typically compete either on the offensive or defensive "unit," with little to no crossover between the two. Skills are highly specialized, such that individuals are assigned one position and typically do not drift to other roles. The game is played in a series of "downs" where each team is allowed to decide personnel and set up a formation consistent with the goals of the down.

Football is a valuable setting for understanding numerous theories of strategic management and has been used to examine resources and explain transfer of key employees (Smart & Wolfe, 2000; Wolfe, et al, 2005; Aime, et al, 2010). The study of innovation within football is particularly valuable given the structure of the game. With a coach (i.e. manager) installing and choosing plays, the strategic decisions are made at the broad level (i.e. what strategies to adopt) and at the tactical level (which plays to run against a given opponent). The role of a football coach is similar to that of a manager of a large professional service firm, as the primary role is to determine the appropriate bundling and deployment of resources given various constraints. Throughout the history of the sport, numerous innovations have radically changed the game including the toss sweep, the vertical passing game, the Cover 2 defense, the zone blitz, and the West Coast Offense (Jaworski, 2010).

4.3 Innovation of the West Coast Offense

In 1978, the year before Walsh was hired in San Francisco, two rule changes by the NFL paved the way for greater influence of the passing game. First, rules were modified to prevent defensive backs from making contact with receivers beyond the first five yards of the play. This made utilization of receiver's skills a more palatable strategic option since offenses no longer had to worry about receivers being bumped off their route before the ball could be thrown. The second rule change allowed offensive linemen greater latitude in using their hands in pass blocking. This change allowed blockers to extend their arms and use their hands to keep defenders away from the quarterback. With these new guidelines, linemen were able to give their quarterbacks more time and space to scan the field and decide where to throw the football (NFL Rulebook).

As the most popular passing-centric offense of the era, the vertical game credited to Don Coryell was significantly more aggressive than the West Coast Offense. In this system, quarterbacks were coached to attempt risky passes in an effort to score on a big play and not to be concerned about incomplete passes (Layden, 2011). In contrast, the West Coast Offense sought to complete a high percentage of short throws in an effort to control the ball and flow of the game. The conservatism of this strategy prevented the opponent from hitting the quarterback and forcing substitutions of reserve players. Walsh's system also provided the quarterback with a series of progressions that were designed to produce uncertainty within the defense as to where the ball would be thrown. Since the quarterback would have multiple options on a given play, the defense had to respect the abilities of all potential receivers. Further, the West Coast Offense was the first to institute a "hot" receiver or one that was sent to the voided area by a blitzing

linebacker (Layden, 2011). This combination of decision points was highly innovative for the time period and many of the innovations are incorporated into most current NFL offenses. While the talents of the players are certainly a factor in both offenses, Walsh's system required a different set of skills to be successful.

The capabilities involved in the West Coast Offense also differ from other offenses in the number of decision points where players must make simultaneous, coordinated movements. As opposed to other offenses of the era, the West Coast Offense featured greater degrees of improvisation as each team lines up to begin a play. Depending on how the defense is aligned, each of the eleven offensive players must make adjustments to blocking schemes, pass routes, and the direction of the play. Although the quarterback is in charge of calling out the play, this set of routines also dictates that players make autonomous decisions during the play based on defensive movements. The coordination of this process requires significant amounts of practice and knowledge co-created by the coaches and players. Inherent in the knowledge requirements for running the offense is a high degree of individual and group tacit knowledge. This can only be obtained through exposure to the philosophies and repetition gained through practice. The introduction of greater in-play improvisation created the demand for strategy specific tacit knowledge and is, perhaps, the most significant contribution from the West Coast Offense. As a result of increasing the number of decision points, teams would also begin increasing the amount of responsibility given to defenders to improvise before and during plays. The effect of greater improvisation and increasing decision points is a set of routines that is more difficult to defend and imitate. Each of these attributes helped give

the 49ers a sustained competitive advantage in running the West Coast Offense under Bill Walsh and his successors.

Despite the increasing popularity of passing offenses, the performance of the San Francisco 49ers while utilizing the West Coast Offense was remarkable. While one of the worst performing organizations in the decade of the 1970s, the team won the Super Bowl (league championship) a total of five times after implementing the system. The 49ers possessed the NFL's best record during this time period, spanning almost a quarter century (Pro Football Reference). The core of the first several championship teams was built by Walsh under severe constraints due to a lack of high draft picks forfeited to other teams in ill-fated trades prior to his tenure. Anecdotally and empirically, the West Coast Offense proved to be a revolutionary method of scoring points and constructing a team. Over the course of the sample, teams running the West Coast Offense possess a statistically significant difference from all other offenses in the number of points scored per game. See Table 1 below for further information:

Table 1: Points scored by offense categorization

	West Coast Offense Teams	Non-WCO Teams	F-Stat
Points Scored	349.57	321.02	28.267*

* Difference in offensive production is significant at the 0.000 level

Assessments on the payroll of teams across the entirety of the sample cannot be known given the privately held information and lack of salary cap until the early 1990s. However, the vast majority of the adoption occurred after the cap was implemented and

free agency began. While teams may have had incentive to significantly boost their payroll during adoption, the lack of adoption prior to the salary limitations suggests that few teams pursued this option. Additionally, when the 49ers created the innovation, they were handicapped by a lack of draft picks as a result of ill-fated trades made by previous team managers. As a result, they were developing the new system without one avenue to access talented players.

During the evolution of the West Coast Offense, the National Football League had many restrictions in place that prevented the flow of resources from one team to another. Among the most basic restriction is a limit in the roster size. Since the early 1980's, football rosters have been capped at between 45 and 47 players who are eligible to play in a given game. To account for injuries and player development, up to 53 players are allowed to be under contract. This prevents the hoarding of resources and requires team architects to balance resource acquisition amongst offensive, defensive, and special team players. Since the game requires equal numbers of offensive and defensive players, a roster may have higher quality resources in one area but would be forced to commit roster spots to lesser talented players in other areas.

The primary means of acquiring new assets is the amateur draft. Held each year, the draft allows each team to select first year players from the amateur ranks based on the prior year's order of finish. The lowest performing teams receive the first choices of amateurs. The length of the draft has varied over time, ranging from the average distribution of between 7 and 12 new players per team. Once drafted, players are only able to play for the team that selects them. The first purpose in using this structure is to allocate new talent amongst the teams. The second purpose is to decrease competition,

and therefore compensation, for new resources. As teams possess exclusive negotiating rights and other top professional football leagues do not exist, market power shifts to the teams who thereby, pay below a market rate to acquire new talent. Draft strategies include selection of players with specific talents, those who are familiar with a given philosophy or system, and based on the reputation of their college or university.

The other method of acquiring new resources is through free agency. This system is included in collective bargaining between the players' union and management and failed to exist prior to the 1993 season. Up until this point, teams retained exclusive control of the player's ability to play in the National Football League. Unless the team relinquished that control by cutting the player from their roster, the player could not choose his preferred team. The end result is that high quality resources were rarely subjected to the market and did not move from one organization to another. While this helped to maintain competitive advantages, as with the amateur draft, another benefit for management was the depression of salaries. If a team was successful in acquiring and developing talent, there was no concern that the talent would depart to become employed by a competitor.

Although the NFL has changed over the past 32 years, the West Coast offense has stood the test of time. In comparison to other strategies of the era, the West Coast Offense is truly revolutionary for the usage of spacing, timing and improvisation. These two elements can be seen in much of the present day schemes in most offenses and defenses. As the system has modernized, these elements have evolved as well, such that the West Coast Offense is still an effective attack. The system of routines efficiently advances the ball down the field, while allowing for a conservative passing game. High

quality resources still provide advantages with this offense, but individuals with less value in other systems can prosper in the West Coast Offense if they are able to master the design concepts.

4.4 Measurement of Research Variables

The following outline describes the type and definition of variables that will be analyzed in this study:

4.4.1 Dependent Variables

Innovation Adoption. The adoption of the West Coast Offense was measured through a binary variable recording whether or not the team implemented the innovation during a given season. At the end of each season, teams assess the effectiveness of their strategies, create new ones, and adopt successful strategies and capabilities from other organizations. As coaching staffs and players move amongst teams, knowledge about different tactics and strategies diffuses throughout the league. With this knowledge shifting constantly, adoption of the West Coast Offense is measurable on an annual basis. Each team's adoption classification was dependent upon a review of the organization's annual media guide, historical books, newspaper clippings, coaching staff, playing personnel, analysis of plays, and discussions with staff at the Professional Football Hall of Fame. Support for each classification was corroborated through a multiple of the sources previously listed.

Organizational Performance. Success of organizations was measured by the point differential for each season. This variable has been used in numerous management

studies as a measure of team quality (Berman, et al, 2002; Holcomb, et al, 2009; Wolfe, et al, 2005). This figure, representing the difference between points scored and points allowed, is a better representation of team quality than win-loss record based on the small number of games in a season (16), the degree of luck involved in winning a close game, and the difference in schedule strength amongst teams. Point differential also possesses more variance, thus allowing for a more accurate differentiation amongst teams. This spread is also consistent over time, with similar point differentials suggesting teams of equivalent strength, beyond year-specific trends in scoring or defense. Further, this variable has a mean value of zero for a given season, allowing for simple comparisons across organizations. Playoff games were not considered in the dataset due to the varying number completed by each team.

The usage of point differentials considers the deployment of resources throughout the organization, rather than simply on the offensive side of the ball. In comparison to simply using points scored, point differential more fairly represents the realities of team construction. While the innovation specifically refers to offense, adopting and contributing resources at the expense of the defense would decrease overall team performance, thus negating any advantages gained. Finally, competition in professional football represents a zero sum game, where an advantage gained by one organization results in an equal and opposite disadvantage to a competitor. This increases the incentives to adopt an innovation or create a new system.

4.4.2 Independent Variables

Complementary Capabilities. Complementary routines are defined as those that are similar to the innovation in question. For a professional football team, passing routines would be complementary to the West Coast Offense. Although several passing strategies were prevalent at the onset of Walsh's offense, passing teams possessed the key resources to adopt the innovation. Strategically, other passing offenses may be riskier or designed around different talents; however, the shift from this strategy is closer than any other construction of a football team. For these organizations, the routines may differ, but the team resources and philosophy are similar. The measurement of complementary capabilities was the team's number of passing yards accumulated during the season. This statistical measure of a team's passing performance was measured as the number of standard deviations from the league leader in passing yards.

Substitutive Capabilities. Organizations with substitutive capabilities are those whose routines seek to accomplish the same task as competitors but with different links in the process. Applying this definition to professional football, teams that have a routine strength in running the football are defined as having a substitutive routine. As teams develop offensive schemes, the option to run or pass is substitutive as only one can be performed on each play. The goal of each is the exact same, that is, to advance the ball down the field and score points. All things being equal, a team would be indifferent as to running or passing. However, each requires a different set of routines and skills to be successful. A running team would place greater reliance on larger and stronger offensive linemen and tight ends, with fewer resources devoted to a quarterback or wide receivers.

Running capabilities are considered to be equal and opposite of those found in the West Coast Offense. Although teams can succeed at both running and passing, organizations primarily construct routines with the strength of one in mind. The running capabilities of NFL teams was measured through the number of rushing yards accumulated during the season. To account for long term, league-wide trends, the unit of analysis used was the team's number of standard deviations from the league leader in rushing.

Neutralizing Capabilities. In contrast, neutralizing capabilities are those that reduce the value created by the innovation. In the context of professional football, a defensive strength represents a set of strategic capabilities that mitigate an offense's ability to score points. Other neutralizing capabilities consist of an organization's ability to change the value proposition of a product or service in a manner that emphasizes their capability strength. If a team has a neutralizing capability (a strong defense) they may be less inclined to adopt the West Coast Offense if they believe that their defense (or others that are similar) has the ability to eliminate advantages derived from the system. Organizations in this position may perceive the potential for gains from adoption to be lower based on knowledge of their resource deployments. Neutralizing capabilities were measured through the strength of the defense, as demonstrated by the number of yards allowed during a season. Statistics were evaluated in relation to the league leader, with the distance in standard deviations being the quantification of this variable.

To measure each of the independent variables listed below, data was compiled for each team in a given season. Standard deviations were calculated based on the distance from league leaders each season. As deviations are calculated to measure the strength of

teams, the number of standard deviations from the league leader is used to represent the relative performance of each team with regards to the rest of the league. League leaders are used to represent how an organization would perceive their resources and strengths relative to competitors.

To ensure that the league schedule and injuries do not impact the classification of a team's strength, a three year weighted lag was recorded for each organization. To replicate an organization's adoption decision, the previous year is given a weight of one, two years prior are weighted at .667 and three years prior at .333. Three years represents the average tenure of a player over the length of the dataset. As players are the key resource that executes the routines, significant turnover in player personnel could have a dramatic impact on an organization's routine strength and ability to pursue a given strategy.

A central issue for predicting the adoption of innovative routines, including the West Coast Offense, is recognizing where the team's strengths lie. Offensive and defensive strengths can be evaluated based on the relative strength of each unit within one team and in comparison to other teams. Within an offense, a team can be successful by either running or passing the ball. As each play represents a tradeoff between these two options, strategies are devised to take advantage of an offense's talents at each. Therefore, strong offensive teams can be classified as those with a running or passing strength. Conversely, defenses are reactive in nature to what the opposing offense runs. Teams do not have the freedom of choice to strategically specialize in defending the run or pass, as an opponent will simply revert to the other in an attempt to advance the ball. With these three scenarios, a given team's strength was identified by the standard

deviation closest to the league leader. Exceptional teams are likely to have all three areas above the league average, but only one area is recognized due to its strategic importance. Just as a firm may have multiple successful product lines, only one is typically perceived as the organization's strength.

As organizations make decisions about adopting new strategies and innovations, they are likely to consider the strength of the team both currently and over recent history. If an organization has been successful using their current routines, they may view a change in routines as a risky proposition. Player performance and talent is captured through the number of deviations from the league leader in a given area. Given these factors, a team was identified as having a strength in running, passing, or defense based on being in the top quartile of standard deviations from the league leader over the three year period (though not necessarily in each of the three). This is consistent with previous studies that suggest that firms look to a reference group when making adoption decisions (Massini, et al., 2005). Within professional football, all organizations are approximately the same size and all have a similar goal, thus the league leader within a particular capability serves as the reference group. Taking the top quartile is a conservative measurement to ensure that all teams with potential strengths in each area are considered. Teams beyond this demarcation are not perceived as having a unit strong enough to influence the adoption of an innovation. Organizations were defined as having a complementary, substitutive, or neutralizing routine based on the set of routines that performed the best relative to competitors. For example, an organization registering 0.5 standard deviations from the league leader in passing and 0.25 deviations in defense is

said to have strength in neutralizing routines. In total, this method represents a snapshot of how management would view the team's ability to adopt an innovation.

Knowledge Acquisition from the Innovator. Given the high number of decision points and variation in bundling and deployment of the strategy, recreating the innovation without input from the original source may be difficult. Direct knowledge of the innovation may help mitigate these problems. Within professional football, direct knowledge is held by offensive coaches that directly worked for the San Francisco 49ers while the team ran the West Coast Offense and were considered to have access to the original innovation. This was recorded as a binary variable of having access or no access to information about the innovation. Although players would have access to similar knowledge, they would not be in charge of making strategic decisions about which system to deploy or how to bundle resources. Further, they would only be exposed to the decision points of their position, rather than the entire offense. While hiring players with knowledge of the West Coast Offense could help an organization adopt the innovation, their knowledge would not be sufficient to instruct the other coaches and players on the entirety of the strategy.

Knowledge is also used as a control variable in the adoption analysis. Since the presence of innovation-specific knowledge may make an organization more likely to adopt, this variable is used as a control.

4.4.3 Control Variables

Control variables were considered in the analysis to account for factors that could impact an organization's decision to adopt. In addition to the primary variables previously described, four control variables listed below have been included in the analysis.

Pre/Post Free Agency. Over the course of the sample, players were awarded a path to free agency based on the results of a court decision and collective bargaining. This provided access to players with direct knowledge of the 49ers West Coast Offense. Prior to this development, players were only free to sign with a different team if they were released by the original organization. Based on this, skilled players rarely became free agents prior to 1993. Just as the NFL rule changes in 1978 opened the door for more passing, the change in free agency allowed for greater player movement and thus an easier access to information about the West Coast Offense. Using binary coding, this variable was recorded based on whether the team season was before or after the advent of free agency in the NFL.

Division. Prior innovation research has noted that geographic proximity to the innovation can be an influential factor in diffusion (Abrahamson, 1991). As the competitor may have greater knowledge about the efficiency of the innovation, they would recognize the benefits before those in other areas. In the NFL, teams in the same division play 2 games against each other during the season. Teams are bunched into divisions based primarily on geography, thus necessitating a control variable for teams in the same division as the San Francisco 49ers. The 49ers competed in the NFC West over the duration of the sample. However, due to expansion, the NFL modified the teams in

each division in 2002. Although the 49ers divisional opponents change, a binary variable was used to note teams in the same division as the 49ers while they were running the West Coast Offense.

Coaching Turnover. The hiring of a new coach may be indicative of a change in routines or desire to adopt an innovation. Turnover at the management level implies that the organization is moving in a different direction for the future, possibly to include adopting new routines, innovations, or practices. For this study, coaching turnover is included as an alternate explanation as a path to or reason for adopting the innovation. Organizations may replace a coach when performing poorly or when the previous coach takes a job with a different team. When the head coach is replaced, most of the assistant coaches are also supplanted as they work for both the general manager and the head coach. Coaching turnover will be measured as a binary variable indicating whether or not a given season was the first under a new head coach.

In addition to the measured control variables above, policies of the National Football League also serve as a control within the study. For example, professional football teams share approximately 70% of revenue with each other, thereby reducing the financial advantages that may exist from one organization to another. Additionally, the number of players on a roster is restricted to 53 with 8 players allowed on a practice squad. This prevents teams from stockpiling talent and limiting competitors' access. Teams in the NFL also operate within the boundaries of a salary cap and salary floor. Generally, throughout the sample the floor was set at 80% of the cap, reducing the possibility of teams buying the best players. As a result of these policies, teams are all

approximately the same size, with similar levels of revenue and expense. Although variation exists, the differences here are primarily due to market size and represent an industry where firms are significantly alike.

Guaranteed revenues may act as a disincentive for innovation adoption (Fort, 1995); however, firms are still able to capture financial rewards from winning despite the requirement of sharing the incremental revenue. As a further deterrent, the single largest revenue stream in the NFL is derived from a centrally negotiated television contract. The prevalence of revenues generated outside of the team's management may also create a disincentive to develop local revenue streams or talented teams. However, many organizations have invested significantly in facilities and other assets. Support for this investment is illustrated through academic studies identifying a link between winning and revenues (Irwin, et al., 1999; Barajas, et al., 2005). Additionally, other academic studies have used similar sport samples when testing for firm performance (Berman, et al., 2002; Aime, et al., 2011). Finally, the results from the NFL seasons dispute the notion that teams have incentive to collect revenue sharing checks without attempting to win. If firms were engaged in this behavior, the same teams would continually finish near the bottom of the standings. Since there is frequent variation in the best and worst teams in the league, this concern is alleviated for the purposes of this study.

CHAPTER 5

RESULTS

Using the variables and methods defined in Chapter 4, I now discuss the results of the analysis. I begin by describing the regression formulas used and proceed by discussing the combined results from the first three hypotheses surrounding adoption of the innovation. Continuing with the fourth hypothesis, I discuss the role of knowledge in the adoption process before concluding with fifth hypothesis and the results of firm performance after the adoption decisions are made.

5.1 Analysis

The model described below was tested using regression analysis, conducted in SPSS. As the dependent variable is binary, logistic regression was used. The following regression equation served as the foundation for the analysis of the first three hypotheses:

$$y = \text{PassLag}(x_1) + \text{RunLag}(x_2) + \text{DefLag}(x_3) + \text{FreeAgency}(x_4) + \text{Division}(x_5) + \text{Knowledge}(x_6) + \text{CoachChange}(x_7) + \text{Team1}(x_8) + \ldots + \text{Team32}(x_{39}) + \text{error}$$

The model was estimated using panel methodology through logistic regression with fixed effects for teams (Wooldridge, 2002). The fixed effects model was selected for two primary reasons. First, this method accounts for any potential endogeneity created by the capability estimations and the inherent longitudinal characteristics of the cross-sectional panel data. This methodology mitigates biases of using similar capability measurements

for different years. Second, the explanatory variables in question (capabilities) are attributed to the resources held by the organization. Due to the relative consistency of routines within a team, there is less variance over time. Since these routines, inclusive of players and coaches, are held by a team, each team was included as a control variable within the analysis of H1, H2 and H3. This distinguishes between the impact of the hypothesized capabilities and other team specific factors.

Model estimations were created using the two step approach, starting with the control variables and adding in independent variables to determine an increase in explanatory power. In a binary logistic regression as illustrated above, the R^2 term is unable to accurately represent the power of the model. In this case, the Cox and Snell R^2 and Nagelkerke R^2 will be used as a substitute. Support for the capabilities hypotheses (H1, H2, H3) was gauged through the significance of the respective beta coefficients. Moderation of knowledge from the innovator was tested using a binary variable for knowledge. This variable was tested using the following regression equation:

y = PassLag(x1) + Knowledge(x2) + (PassLag)(Knowledge)(x3) + FreeAgency(x4) + Division(x5) + error

y = RushLag(x1) + Knowledge(x2) + (RushLag)(Knowledge)(x3) + FreeAgency(x4) + Division(x5) + error

The resulting significance of the regression's beta coefficient was used to evaluate the merit of Hypothesis 4. Wald coefficients were used to assist in the interpretation of the model's results.

Hypotheses 5a, 5b, and 5c were tested using regression with a dependent variable of point differential, an independent variable of innovation adoption, and free agency and division as control variables. For each capability (complementary, substitutive, and neutralizing), only those firms that have been classified as such were included in the testing. As these firms were infrequently categorized as excelling in a capability classification for consecutive years, a fixed effects model is not needed for this analysis. Classification was based on the quality of each set of processes (passing, running, and defense) when compared to each other and across the league. The best process was defined as the team strength, and a team is said to have a capability in an area if their best unit, or strength, is within the top quartile of the league. Significance was measured at the .05 level. The regression equation for each capability is listed below:

$$y = \text{Adoption}(x1) + \text{Division}(x2) + \text{FreeAgency}(x3) + \text{error}$$

5.2 Hypotheses Regarding Adoption and Non-Adoption of the Innovation

I begin by presenting the descriptive statistics and correlations associated with the variables considered in the analysis. This information can be found in Tables 2 and 3 below:

Table 2: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Dev.
Adoption	897	0	1	.2252	.4179
Point Diff	897	-265	315	0	97.9425
Pass Lag	897	-5.227	0	-2.416	1.1058
Run Lag	897	-4.793	0	-2.152	1.0371
Def Lag	897	-5.147	0	-2.172	1.0171
Knowledge	897	0	1	.3066	.4458
Division	897	0	1	.1115	.3149
Free Agent	897	0	1	.6566	.4751
PY Point Diff	897	-265	315	0	97.812
CoachChg	897	0	1	.2051	.4040

Table 3: Correlations

	Adoption	PointDif	PassLag	RushLag	DefLag	Knowledge	Division	FA	CoachChg	PYPtDif
Adoption	1									
PointDiff	0.051	1								
PassLag	.147**	0.177**	1							
RushLag	0.061	0.212**	-.178**	1						
DefLag	0.005	0.302**	-0.015	0.361**	1					
Knowledge	.527**	0.005	0.093**	0.037	-0.072	1				
Division	0.021	-.089**	-.071*	-.095**	0.006	0.069**	1			
FA	.300**	0	0.269**	-0.023	.097**	0.138**	0.182**	1		
CoachChg	0.004	-.152**	-.089**	-.107**	-.10**	0.036	-0.013	0.013	1	
PYPtDif	-0.012	-0.004	-0.044	0.064	0.032	0.032	0.01	0	0	1

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 4 (located below) displays the results of the logistic regression. Inclusion of the independent variables increases the significance of the model when compared to the model of only control variables. Support for this increase of explanatory power is found

through the increase of the Cox & Snell R^2 and Nagelkerke R^2. The full model is significant and provides support for the adoption hypotheses. This suggests that firms do consider the quality and type of their resources when making adoption decisions. Interestingly, but perhaps not surprisingly, the advent of free agency was significant as a control variable. This is consistent with other research that suggests market constraints can have an impact on firm behaviors. By decreasing the mobility of resources, this knowledge was restricted to the source and unavailable to competitors. Once these market restrictions were removed, knowledge and resources could freely flow to where they are most valued, thereby allowing more organizations to adopt the innovation (Rottenberg, 1956; Coase, 1960).

While free agency provides some explanation for adoption, this connection may be better explained by the departure of coaches working under Bill Walsh. Most adopting teams, particularly early adopters, acquired knowledge from the innovator. While Walsh was still coaching in the 1980's, there was little turnover on the staff. However, after the retirement of Walsh in 1989, the 49ers began to slowly lose a few staff member. George Seifert, Walsh's successor, did retain the majority of the staff and coaches elected to take jobs as opportunities arose over the following years. This correlates very closely in the sample with the advent of free agency. NFL free agency rules still ensure that top players (those around whom an adoption decision could be made) remain with their original teams. The combination of player availability and coaching departure from the 49ers staff provide an alternate explanation of the significance of the free agency control variable. As such, the model was run and interpreted without the variable. Results can be found in Table 5.

While free agency was significant, the control variable of organization location, tracked through division, did not provide any noteworthy predictive power to the model. Unlike in some technical industries, specific knowledge to this innovation is not concentrated in a particular region. The free flow of knowledge in the free agent NFL helped diffuse the innovation throughout the industry.

Table 4: Regression Model for H1, H2, and H3 – With Free Agency

	Model 1		Model 2	
	Coef./Exp(B)	Std. Err.	Coef./Exp(B)	Std. Err.
PassLag			1.527**	.145
RunLag			1.365 *	.148
DefLag			1.308	.159
Division	.547	.565	.618	.587
Free Agent	15.838**	.382	13.173**	.402
Knowledge	32.088**	.369	28.109**	.363
Coach Change	.814	.292	.978	.303
Constant	-23.394	6946.026	-21.210	6891.927
N	897		897	
Wald chi-square	581.568**		599.794**	
Cox & Snell	.477		.488	
Nagelkerke	.708		.723	
df	35		38	

** $p < 0.01$; * $p < 0.05$

Table 5: Regression Model for H1, H2, and H3 – Without Free Agency

	Model 1		Model 2	
	Coef./Exp(B)	Std. Err.	Coef./Exp(B)	Std. Err.
PassLag			1.963**	.135
RunLag			1.469**	.140
DefLag			1.249	.149
Division	1.511	.518	1.609	.548
Knowledge	26.253**	.310	23.906**	.318
Coach Change	.888	.276	1.133	.289
Constant	0	7337.030	-18.671	7168.253
N	897		897	
Wald chi-square	506.344**		544.322**	
Cox & Snell	.431		.455	
Nagelkerke	.640		.675	
df	34		37	

** $p < 0.01$; * $p < 0.05$

5.2.1 Hypothesis One – Complementary Capabilities and Adoption

In Hypothesis 1, I proposed that there will be a positive correlation between firms with complementary capabilities and adoption of the innovation. The logistic regression models presented above show a positive and significant relationship between the two variables as identified through the beta coefficient in the Model 2 ($p = .004$, SE = .145 with free agency; $p = .000$, SE = .135 without free agency). Through interpreting the odds ratios in the analysis, these results suggest that for every one unit increase in standard deviation (closer to the industry leader) for capabilities complementary to the innovation, organizations are approximately 53% more likely (96% without free agency as a control) to adopt the innovation. This result is found for all organizations within the sample, regardless of their relative capabilities at the start of the decision process. As the capabilities of competitors evolve closer to that of those needed to implement the innovation, firms become more likely to adopt. Thus Hypothesis 1 is supported.

5.2.2 Hypothesis Two – Substitutive Capabilities and Adoption

As hypothesized in Chapter 3, firms with capabilities that may be substitutive of those used in the innovation will also be more likely to adopt the innovation. The results of the analysis, illustrated above in Table 3, provide support at the 0.05 level for this hypothesis ($p = .035$, $SE = .148$ with free agency; $p = .006$, $SE = .140$ without free agency). The data and analysis suggest that an ability to substitute capabilities can influence adoption decisions. For every one unit increase in standard deviation (closer to the industry leader) for capabilities substitutive to the innovation, organizations are approximately 37% more likely (47% without free agency as a control) to adopt the innovation. While this suggests that substitutive capabilities may be less likely to lead to adoption than complementary capabilities, the difference in coefficients of substitutive and complementary capabilities is non-significant. Although this difference is small, the result may be due to a greater variance in levels of complementary capabilities in the early years of the sample.

5.2.3 Hypothesis Three – Neutralizing Capabilities and Adoption

For Hypothesis 3, I theorized that firms with neutralizing capabilities will be less likely to adopt the innovation than firms with complementary or substitutive capabilities. Given that these organizations possess resources that decrease the value of the innovation, adopting the innovation would require a complete bundling and redeployment of the current resources. Therefore, organizations with these capabilities would be less likely to adopt the innovation. While predictions of adoption cannot be made based on the possession of neutralizing capabilities ($p = .091$, $SE = .159$ with free agency; $p =$

.134, SE = .149 without free agency), comparing the beta estimates to complementary and substitutive capabilities can provide insight into how these resources are viewed. Parameter testing is used to determine significant differences between betas for Hypothesis 3. Significance between complementary capabilities and neutralizing capabilities is found in the model without free agency. In comparing the beta for neutralizing capabilities to the beta for complementary capabilities, the test statistic of 1.7217 is significant at the 0.01 level ($p = .004$). This result is not replicated for substitutive capabilities (F-stat = .9612, $p = .5381$). Further, significant differences are not found in the model inclusive of free agency as a control variable (complementary and neutralizing F-Stat = .8057, substitutive and neutralizing F-Stat = .2680). Surprisingly, the coefficient for neutralizing capabilities is positive and non-significant. This may be partially explained by the number of teams with strong performance across all three capabilities. While the presence of neutralizing capabilities may not predict adoption, there is partial evidence that neutralizing capabilities are less of a factor in adoption decisions than substitutive or complementary capabilities. As such, partial support is found for Hypothesis 3.

5.3 Hypotheses Regarding the Role of Knowledge

As proposed in Chapter 3 and 4, the presence of complementary or substitutive capabilities alone may not be enough to achieve high levels of performance after adopting the innovation. The complexity of the innovation, particularly in regards to the number of decision points and roles of actors, may necessitate acquisition of direct knowledge from the innovator. For this analysis, a test of moderation was conducted

using adoption of the innovation, knowledge from the innovator, capability strength, and firm performance. Results of the moderation test can be found in Tables 6 and 7 below.

Table 6 – Complementary Capabilities and Knowledge

	Model 1		Model 2		Model 3	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff	Std. Err.
Division	-20.289	42.951	-9.722	45.072	-9.995	45.696
PassLag			8.941	25.085	16.090	59.315
Knowledge			-23.990	32.072	-29.114	50.309
Know*PassLag					-8.756	65.642
R^2	0.005	90.285	0.026	91.590	0.027	92.766
Change in R^2				0.021		0.001

Note: Free Agency was included in the analysis but is omitted above due to all adopting firms with complementary capabilities falling after players earned this right after 1993.

Table 7 – Substitutive Capabilities and Knowledge

	Model 1		Model 2		Model 3	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff	Std. Err.
FA	35.519	39.698	47.617	39.305	48.021	39.681
RushLag			53.714	26.733	-101.343	250.958
Knowledge			0.648	67.294	108.253	185.996
Know*RushLag					156.871	252.421
R^2	0.022	94.576	0.129	91.937	0.139	92.804
Change in R^2				0.107		0.010

*$p < 0.05$

Note: All teams were in different divisions as San Francisco, thus division is omitted

5.3.1 Hypothesis Four – Knowledge as Moderator

In Hypothesis 4, I suggest that knowledge from the innovator will moderate the relationship between innovation adoption and firm performance for firms with complementary or substitutive capabilities. First, adopters of the innovation were identified and included for this analysis. Second, from this group, firms with substitutive or complementary capabilities were identified by determining each organization's strength and classifying those within the top quartile of the industry leader as having a capability in this area. In total, 80 firms were identified and included in this analysis. With this sample set, and illustrated through the table above, the inclusion of knowledge does not create a moderating effect, thus failing to provide support for the hypothesis.

There are a few reasons for the lack of support for the proposed hypothesis. The primary reason is that most organizations did indeed have knowledge from the innovator. Of the 80 firms included in the analysis, 67 had hired a former Bill Walsh assistant. Of those organizations that did not, all were since 2001 and only one organization did not employ knowledge from the innovator immediately prior to the given season. The role of knowledge appears to be equally important to adoption of this complex system even 32 years after initial implementation. Despite significant knowledge available to firms, they still seem to prefer to hire an expert in the routines. While this does not leave a verifiable sample, professional football teams imply through hiring practices that knowledge of an innovation is essential to adopting.

There were no significant results in the entire model including independent and interaction variables. The other control variables were also found to have no impact on firm performance. Another potential reason for this is the high performance of most

firms within the sample. Adopting firms with complementary capabilities had a positive point differential of over 61 points, while firms with substitutive capabilities scored over 31 points more than their opponents. A wide range of performance still exists amongst these organizations; however, the distribution of teams centers on a point differential significantly higher than the mean for an entire season. Combined with the high number of adopters with knowledge, this aspect of the sample limits the ability to accurately determine the impact of knowledge on the performance of adopters.

5.4 – Hypotheses Regarding Performance

As previously described, I have proposed that adoption decisions based on organizational capabilities will have predictable impacts on firm performance. Firms were classified as having complementary, substitutive, or neutralizing capabilities as described in Chapter 4 and in the previous section. From the entire population of professional football teams since 1979, I use a sample of 155 organizations with complementary capabilities, 164 with substitutive capabilities, and 140 with neutralizing capabilities. These groups were used to examine the performance of innovation adopters and non-adopters. The means listed in Table 8 below were used in the testing of the hypotheses.

Table 8 – Mean Point Differentials by Capability Types

	Adopters	Non-Adopters
Complementary	61.930	8.045
Substitutive	31.514	19.732
Neutralizing	-9.394	28.907

5.4.1 – Hypothesis 5a –Complementary Capabilities and Performance

In Hypothesis 5a, I suggest that adopters with complementary capabilities will achieve higher levels of performance than those that do not adopt. Given the similarity in capabilities, these organizations have the appropriate resources to quickly bring in the necessary knowledge and adopt the innovation. Through the regression listed below, the hypothesis is supported (t-stat = 2.833, p = 0.005). The analysis suggests a positive and significant relationship between the two at the 0.05 level. See Table 9 below for further details.

Table 9 – Regression for Complementary Capabilities

	Model 1		Model 2	
	Coeff.	Std. Err.	Coeff.	Std. Err.
FA	35.935*	17.326	16.458	18.281
Division	-60.831*	30.211	-66.788*	29.611
Adoption			51.755*	18.281
R^2	0.047	95.934	0.095	93.792
Change in R^2			0.048	

* $p < 0.05$

5.4.2 – Hypothesis 5b – Substitutive Capabilities and Performance

Hypothesis 5b states that adopting organizations with substitutive capabilities will outperform those that do not adopt the innovation. As the group without a distinct similarity or difference to the innovation, these firms would be better suited to acquire the necessary resources and adopt. However, the analysis did not provide support for this hypothesis. There is not statistical evidence of increased performance from either adopting or not adopting the innovation. See Table 10 below for further details.

Table 10 – Regression for Substitutive Capabilities

	Model 1		Model 2	
	Coeff.	Std. Err.	Coeff.	Std. Err.
FA	-9.589	14.393	-13.228	14.678
Division	37.853	24.976	42.255	25.249
Adoption			19.665	17.214
R^2	0.018	89.111	0.026	89.027
Change in R^2			0.008	

5.4.3 – Hypothesis 5c – Neutralizing Capabilities and Performance

In Hypothesis 5c, I propose that organizations with neutralizing capabilities should not adopt the innovation and that non-adopters will achieve greater performance that firms that do adopt. Through these neutralizing capabilities, these organizations have the ability to decrease the value of the innovation. To adopt may require forfeiting the current advantages possessed by the firm. This hypothesis is supported (t-stat = -2.342, p = .021). The analysis of variance suggests a significant and positive difference between these two groups. See Table 11 below for further details.

Table 11 – Regression for Neutralizing Capabilities

	Model 1		Model 2	
	Coeff.	Std. Err.	Coeff.	Std. Err.
FA	-2.123	16.388	9.779	16.908
Division	29.441	24.569	35.981	24.337
Adoption			-44.795*	19.126
R2	0.01	92.451	0.05	91.189
Change in R2			0.04	

* $p < 0.05$

In total, the combination of adoption and capability categorization provided predictability for firm performance for organizations with complementary and neutralizing capabilities.

For firms with complementary capabilities, adoption led to greater performance. Meanwhile, non-adopters fared significantly better for organizations with neutralizing capabilities. Given that no support in either direction was found for firms with substitutive capabilities, performance within these organizations is determined by additional factors not included in this analysis. See Table 12 below for a summary of all hypotheses.

Table 12 – Summary of Results by Hypothesis

Hypothesis 1	Supported
Hypothesis 2	Supported
Hypothesis 3	Partially Supported
Hypothesis 4	Not Supported
Hypothesis 5a	Supported
Hypothesis 5b	Not supported
Hypothesis 5c	Supported

CHAPTER 6

DISCUSSION AND CONCLUSION

6.1 Discussion

In this section, I discuss and interpret the results that were presented in the previous section. This dissertation sought to answer questions about how capabilities impact adoption decisions and how these decisions impact firm performance. The role of knowledge acquisition for adopters and non-adopters was also questioned as complex, industry-changing ideas are not easily imitated. I find that adoption is guided by the organization's capabilities, though the role of knowledge is undefined. Firms with complementary and substitutive capabilities are more likely to adopt the innovation due to the similarity of resources and less risk absorbed in the process of redeploying assets. Adoption benefits the firms with complementary capabilities as they achieve higher levels of performance after their decision than firms that do not adopt; however, adopting organizations with substitutive capabilities have no statistical difference in performance compared to non-adopters. In contrast, neutralizing capabilities are not a predictor of an organization's likelihood of adoption. Interestingly, non-adopting firms with neutralizing capabilities outperform organizations with the same capability type that have implemented the innovation. Although support was not found for knowledge as a moderating factor, the vast majority of adopters acquired knowledge in their adoption process.

The remainder of the section is divided into three parts. I first discuss the hypotheses that are related to adoption of the innovation. Next, the post-decision

performance is discussed. The final section covers the importance of adopting through acquiring knowledge from the innovator.

6.1.1 Discussion of Results Regarding Adoption

In Hypotheses 1, 2, and 3, I suggested that adoption decisions would be influenced by the type of capabilities that a firm has in relation to those necessary to implement the innovation. The rationale for these hypotheses is supported by the literature on both innovation and capability development. Complementary capabilities have been recognized as vital to the commercialization process and are used as an explanation for why competitors often prosper from advancements made at other firms (Teece, 1983). Logically, the idea that capabilities can be substituted for one another in pursuit of the same goal suggests that firms with the ability to use alternative but similar capabilities in the commercialization of a competitor's innovation would also benefit from adoption. However, building on Porter's (1980) theory of competition and threat neutralization, firms with these types of resources are able to create advantages through rejecting the innovation and reducing the value of competitor's capabilities.

The first two hypotheses regarding adoption based on capability categorization were supported and significant ($p < 0.05$), while partial support was found for the third hypothesis. The regression analysis considered all firms in the industry and all years completed since the innovation. As such, the inclusion of data on capability strength for all firms served as a control for each other. Organizations may be strong in multiple areas, but the design of this analysis was able to simultaneously control for the relative strength and weakness of all capabilities. In addition, controls were provided for other

explanations for adoption provided in the literature, including geographic proximity to the innovator, managerial change, access to knowledge specific to the innovation, and organization specific factors.

In addition to the variables previously described, a number of other variables were considered for inclusion in the model. Variables related to players were reviewed, including players acquired from the 49ers, draft results (categorized by capability), and average draft pick (talent). These variables were not used due to the usage of coaching change better capturing a shift in strategic resources. As mentioned previously, the majority of player movement involves average or below average talent. The controls offered by these measures are better captured in the selected variables. Further, hypothesis testing was conducted using different permutations of the described variables. Inclusion of any of the listed control variables did not change the significance of the results on any of the hypotheses.

The results suggest that organizations take an internal look at their abilities and resources before making adoption decisions. Using this study to build on prior research, adoption decisions can be conceptualized as a two-by-two matrix with focus of the analysis (internal v. external to the firm) and rationale of the decision (economic v. social) on the axes. See Table 13 below.

Table 13 – Matrix of Innovation Research

Economic	Organization Capabilities	Innovation-specific research
Social	Fad/Fashion influence from own firm	Fad/Fashion influence from industry
	Internal	External

The results can be seen as suggesting an economic and internal rationale. Prior literature on the economic justification for adoption focused on the effectiveness and efficiency of the innovation. As soon as firms can assess the efficacy of a new product or service, this line of research proposes that they adopt the innovation. Using a highly successful innovation, the results from the first three hypotheses suggest that firms also consider their own capabilities in assessing adoption decisions.

The results from the preceding analysis are consistent with other economic justifications for adoption. When a firm recognizes the potential for economic benefit (considering risk), adoption occurs. However, previous economic models had primarily considered macro-conditions and those specific to the innovation. This study recognizes the internal economic factors necessary in the adoption process. Although testing for social models was not a component of this study, the importance of social networks in professional football (Fast & Jensen, 2006) suggests that some of the adopters may have been influenced in this manner.

Taken together, the results from the first three hypotheses provide an answer to the question of how firms use current capabilities in innovation adoption decisions. Rather than following the crowd or the latest trend, adopters are able to recognize congruence between their own resources and previously developed capabilities. Having similar capabilities, or complementary resources, allows the firms to understand how to maximize return on the investments (from either the cost of new knowledge or adaptation to current resources) needed to adopt the innovation. Likewise, non-adopters understand that innovation would not be successful using the assets possessed by their firm. For this reason, firms with neutralizing capabilities are less likely to adopt the innovation. The accumulation of resources and the building of routines in areas that neutralize competitor's innovations is a viable alternative to pursuing novel resource recombination. In comparison to the innovation, the competitors use their own capabilities to assess the likelihood of future performance should the innovation be adopted. Organizations with complementary or substitutive capabilities are likely to adopt, while those with neutralizing capabilities are likely to reject the innovation.

The time frame considered in this study (over 30 years) helps to illustrate how the non-adopters can continue with their decision long into the diffusion process. Another important characteristic of this population is the frequent changes in quality of resources. Over the 32 year sample, the industry leader in each of the three measured classes of capabilities fluctuated significantly. Of the 32 organizations participating in professional football, 15 were the industry leader in passing for at least one season, 16 led in rushing, and 16 led in defense. Further, during the sample period, 29 of the 32 organizations led in at least one category (of the 3 that did not, one only participated for 17 of the seasons

and another only for 29 seasons). Fifteen of the organizations were the industry leader at two different categories over the sample period. This variation suggests that each firm possessed differing capabilities and would have had different motivations to adopt, and that many of the non-adoption decisions were made with high quality resources. Further, with one exception, every other organization employed a coach that had previously worked with the innovator at some point in the sample. Additionally, the variation in performance suggests that implementing a new innovation into an organization is a very complex process, one that involves a high degree of risk and knowledge.

With most adoption coming from organizations with high quality resources, firms with limited capabilities must first develop their assets before adopting. Low quality resources will typically lead to low quality results, even with an innovative deployment. Many of the organizations in the sample lacked a distinct capability in any area. Some of these firms did adopt the innovation, but found that their performance continued to lag behind industry leaders. Imitating innovation cannot make up for poor resources in a firm; however, if these resources can be brought to a competitive level, adopting can provide performance benefits.

This information provides greater depth to the traditional S-Curve of innovation proposed by Rogers (1995). Adopters at each stage appear to be those who have similar capabilities to the innovator. Those with access to the originator's knowledge are more likely to become early adopters. However, as time moves on and the information about an innovation spreads throughout the industry, the innovation becomes part of the core set of knowledge available to firms wishing to match assets to capabilities. When these assets are highly mobile and change frequently, firms can regularly bundle and deploy

resources in differing combinations. These decisions are further enabled when the cost of divestiture is low. Although time was not a variable considered in this analysis, further research may consider when holders of each capability type adopt the innovation. The late adopters described by Rogers may hold a particular type of capability or they may have low quality resources across the spectrum. Additional research may also lend insight into the decision process for firms with comparatively poor quality assets. These firms, as well as those with neutralizing capabilities, are typically not discussed in the diffusion literature. These hypotheses and subsequent analyses provide empirical evidence of adoption patterns and begin to create the basis for theories that link capabilities, adoption, and performance.

Beyond the S-Curve, this analysis also supports and extends Teece's (1983) theory of complementary capabilities. In verifying adoption decisions based on resources needed to commercialize the innovation, this dissertation supports the argument that innovation alone is not enough to achieve high levels of performance. The analysis also extends Teece's argument to other capability types with support for how firms perceive the potential success of implementation.

Given the significant results of substitutive capabilities, firms appear to perceive these as delivering the same benefits as complementary capabilities in the adoption process. However, the actual benefits for adopters with substitutive capabilities seem questionable. Teece (1983) was very specific in explaining the role of complementary resources in the commercialization of an idea. Prior scholars have also commented on the need for routines and systems in place to fully maximize the potential of the innovation (Schumpeter, 1934; Teece, 1983; Rogers, 1995; Cassiman & Veugelers,

2006). The findings in this dissertation suggest that firms consider these other resources, but may overstate their capacity to substitute one resource for another. Although this behavior is only statistically significant for firms with substitutive and complementary capabilities, the number of adopting firms possessing neutralizing capabilities suggests that some of these organizations may be trying to re-bundle these resources into different roles.

One interesting result concerns the decisions of firms with neutralizing resources. Possession of these resources does not constitute immediate rejection of the innovation. Many of these firms adopt the innovation even while possessing resources that may render the innovation useless. There may be several reasons for this result. First, organizations with neutralizing capabilities may feel that their future ability to replicate performance with current resources is lower than their ability to achieve similar performance by adopting the innovation. Additionally, these organizations may represent fad and fashion explanations for adoption. Finally, firms with neutralizing capabilities may acquire knowledge from the innovator as a defensive maneuver to prevent competitors from adopting. This notion is supported in the numerous examples of firms with neutralizing capabilities hiring key employees from the innovator and subsequently not adopting the innovation.

Although only included as a control variable, the statistical significance of free agency may highlight an important ability to acquire knowledge assets both at the managerial and staff/player levels. Significant market restraints still exist within professional football, but the loosening of player mobility restrictions opened the door for the acquisition of players in adoption decisions. Another factor tied to this period in the

sample is the retirement of Bill Walsh, innovator of the West Coast Offense. As he left the San Francisco 49ers, coaches may have sought opportunities out of concern for their long term employment. Competing firms may also have sensed a chance to acquire key knowledge at a lower price. The 49ers had high levels of coaching stability throughout Walsh's tenure and maintained most of the staff even after his departure. The strong performance of the organization in the years after Walsh can be tied to the continued success of the innovation and the talent throughout the organization at the coaching and playing levels. As the departure of key 49ers coaches overlaps with the advent of free agency, a conclusion about the impact of free agency is undetermined. The combination of these events led to an increased amount of adoption consistent with Hypotheses 1, 2, and 3.

6.1.2 Discussion of Results Regarding Knowledge Acquisition

In Hypothesis 4, I hypothesized that knowledge would moderate the relationship between innovation adoption and firm performance. Grounded in the theories of innovation and knowledge transfer, this hypothesis seeks to illustrate how adopters handle the complexity of the idea and need to understand the visible and invisible components. Adopting firms with strengths in complementary or substitutive capabilities were included in the analysis as this hypothesis only dealt directly with these organizations. The hypothesis was not significant in regards to firms with both complementary and substitutive capabilities.

Among the reasons for non-significance is the near exclusive list of adopting innovations utilizing knowledge from the innovator. With the high number of firms

utilizing the innovator's knowledge, testing the impacts of "adopting through hiring" versus "adopting through mimicry" becomes difficult. Further, as time progresses, fewer individuals remain in the NFL from Bill Walsh's staffs. Many of these coaches have retired, thus leaving firms that wish to adopt to obtain knowledge one or two steps removed from the innovator. Firms may also prefer to hire from an organization currently using the innovation if they perceive this knowledge to be inclusive of the original innovation plus new wrinkles added by the adopting organization. The innovation is still successful but now adopting organizations must seek knowledge one step removed from the originator.

The increased prevalence of passing offenses is a long term outcome of the West Coast Offense's development. Not only did adopters often achieve success over an extended period of time, they also shifted the way that firms compete within this industry. In 1979, when the West Coast Offense debuted, teams threw the ball on approximately 46% of plays. The most recently completed season, 2011, saw teams throw the ball almost 56% of the time. In short, professional football offenses have completely reversed themselves in the ratio of passing to running. This shift had a major impact on the number of adopting teams and capability quality throughout the sample. For example, in 2011, the league-leading New Orleans Saints passed for over 5300 yards. In comparison, 1979's leader, the San Diego Chargers, only threw for about 3900, a figure that would not have been in the top third in 2011. Firms were forced to continually develop capabilities complementary to the West Coast Offense, with or without direct knowledge of the innovation. The overall improvement of complementary capabilities is evidence of significant diffusion of the ideas embedded in the series of routines.

Although not hypothesized in this study, there were a number of firms that acquired knowledge from the innovator but did not adopt the innovation. Although each firm would have a different rationale for their decision, the role of the individual with innovation knowledge may impact the overall outcome. As this knowledge holder may not be in a position to make the decision, other managers may have legitimate reasons for not adopting. In this case, the organization may have had tremendous success with different routines and be hesitant to risk losing this advantage. Further, the cost of the knowledge does not include acquisition of other resources needed to implement the innovation. These assets may require additional investment that the firm is not willing to make. Instead of acquiring several new pieces, these non-adopters may be attempting to adapt the innovation to their resources. The adaptation process may be time consuming, with the benefits not accruing until years later. For the purposes of this sample, coaches are fired and players retire, thus yielding different results that cannot be captured in this analysis. Further studies could investigate a setting where resources are given longer to adapt. Additionally, research could help understand how innovation-specific knowledge is used if the idea is not adopted.

For firms that did adopt, this sample contains many interesting characteristics that strengthen the argument for direct knowledge. Complex innovations, typically based on knowledge of the routine's actors, can be difficult to break apart into the many decision points. In the case of the innovation being tested in this analysis, each competitor had visual, recorded evidence of how the actors processed the knowledge and executed the idea. Despite the public documentation of the innovation, firms still felt the need to acquire direct knowledge before adopting. Although curious at first, this behavior is

supported by theory. Research has found that firms frequently hire from competitors in an attempt to build their own knowledge stocks and reduce the competitive advantage held by rivals (Song, et al., 2003; Aime, et al., 2010). Firms in this sample appear to follow specifications in these academic theories as most have included knowledge from the innovator as a prerequisite for adoption.

Previously, I posed the research question: does the acquisition of knowledge from the innovator assist in adopting the innovation? Although the test for moderation was non-significant, the behavior of firms suggests that they indeed feel that their performance will be higher if they adopt through acquiring knowledge from the innovator. In an industry where knowledge of competitor routines is readily available and worker mobility is high, firms acquire knowledge of the innovation through hiring to assist in deconstructing and implementing the innovation. Not only is this knowledge acquired in the vast majority of the adoptions, but firms value this knowledge to such a degree that very few attempt to deconstruct the innovation themselves without first acquiring direct knowledge of the innovation. Of the adopters without knowledge from the innovator, almost all organizations had previously employed an individual with access to the idea. As time progressed, the information became incorporated into the new firm's knowledge stocks and organizational capital. At some point in the future, the employee's market value to the adopter decreased and was no longer worth the resources to maintain the link to the innovator. One step removed from the innovation, these firms become sources of knowledge for future adopters as they possess a new and important type of information – the ability to successfully transition an organization to the innovation.

The dynamic nature of the diffusion process decreases the need for long time adopters to possess direct knowledge of the innovation. This also provides justification for firms that move away from routines specific to the advancement before returning to the innovation. While an organization cannot maintain links to an idea indefinitely, exploring ideas may prove to be beneficial, particularly if other resources are in flux. Future empirical research on how firms cycle between new and old ideas may provide insight into the duration of information within the firm's organizational capital.

Many innovative ideas involve the development of a new business model that derives different asset values than recognized by the market. Using the innovation in this analysis as an example, the understanding of capabilities becomes vital in these instances. Innovative structures inherently change the value of assets and often neutralize the value of previous capabilities. This study continues by illustrating how resources devalued by the innovation can still remain significant if properly deployed.

6.1.3 Discussion of Results on Firm Performance and Adoption

Building on the previous discussion of adoption of innovation and knowledge acquisition, I will examine the hypotheses related to firm performance after these decisions are made. The hypotheses are broken out by capability and compare adopters and non-adopters.

Hypothesis 5a suggests that amongst firms with complementary capabilities, adopters will achieve higher levels of performance than non-adopters. This hypothesis was positive and significant at the 0.05 level (t-stat = 2.833). This finding supports the idea that firms with complementary capabilities should adopt the innovation due to the

ability to create better firm performance by using the novel ideas. As discussed in the previous section, these firms frequently adopt through hiring an individual(s) with direct knowledge of the innovation. The combination of this knowledge, the complementary capabilities, and adoption of the innovation creates an advantage in the marketplace for these organizations.

Despite the success generated by this deployment of resources, only 27.74% (43 out of 155) of firms with complementary capabilities adopted the innovation. While the exact reasons for non-adoption are unknown, prior literature on fads and fashions may provide some explanation here. If the social pressures were such that the innovation was derided (as evidenced by competitor comments about the innovation as "gimmicky" or "soft"), organizations may have incentive to reject the innovation despite evidence of success. Firms may also have failed to adopt due to the high cost of acquiring knowledge. However, the performance difference implies that the cost of foregoing this opportunity appears to outweigh the incremental cost of knowledge. Firms with these capabilities are the best positioned to capitalize on their good fortune.

These results speak to the importance of recognizing capability strengths and the necessary resources to implement innovative routines. As an empirical test consistent with and confirming Teece's definition of complementary capabilities, the increase of performance by adopters highlights the value of these assets. The surprise of the result comes not from the consistency with prior theory, but in the failure of application at the practitioner level.

For firms with substitutive capabilities, I hypothesized that adopters would also achieve higher performance that those who did not adopt. However, H5b was not

supported. There were not statistically significant differences in the performance of adopters and non-adopters with substitutive capabilities. With a t-stat of 1.142 and p-value of 0.255, the performance of these organizations appears to be governed by other factors beyond adoption of the innovation or quality of the substitutive capability. This hypothesis was based on the premise that firms had enough flexibility in their resources to ask the routine actors to play different roles. However, these individuals may not be capable of performing at the necessary level or may decide to seek employment at a different firm where their familiar skill sets are utilized.

The challenge with substitutive capabilities lies in how the resources are replaced. Despite the correlation between substitutive capabilities and adoption, the decision to change course is most difficult for these organizations. Unlike firms with complementary capabilities, there is a greater degree of re-deployment of resources and likely a need to acquire significant amounts of new knowledge. If the chasm between currently held resources and those needed to implement the innovation is too wide, firms will struggle due to the misappropriation of strategy and assets.

While much of the current resources could be repurposed, this inherently risky process involves asking individuals to complete different tasks with differing levels of comfort. Given that these individuals have excelled at their previous task (thus developing the capability), asking them to stand out in a new area may be difficult. For this reason only about 22% of firms with substitutive capabilities adopted the innovation (37 out of 165). In general, all classifications of firms with substitutive capabilities performed at a near average level, while adopting firms with complementary capabilities and non-adopting firms with neutralizing capabilities were well above the mean. The

point differential for substitutive capability teams represents less than one win per season (or a less than 5% increase in total performance) between adopters and non-adopters. Represented in wins and losses, this difference is almost 2.4 wins, or approximately a 30% increase in performance) for the other capability classifications (Schatz, 2003). As with the complementary capabilities, almost all of the adopters utilized knowledge from the innovator. The three organizations that did not had previously employed an individual with this direct knowledge and had been utilizing the innovation for a number of years.

Firms with substitutive capabilities that struggle may also lack strategic clarity or be experiences aversion to change. Prior literature has recognized the significant organizational commitment needed to implement novel ideas (Damanpour, 1991; Tidd, et al., 2005). As high-performing individuals are being asked to modify their skills towards a different area, they may be resistant and leave the organization. To combat this, organizations may compromise on the degree to which new skills are needed. When differences persist between the adopter and innovator's routines, the adopting firm will struggle to achieve the full benefits of the new system. The results indicate that many of the organizations with substitutive capabilities found themselves with this dilemma.

Non-adopting firms with substitutive capabilities faced similar decisions but failed to increase performance. Once an industry discovers a more efficient way to complete a task, firms that continue to operate with less efficient processes will be at a disadvantage (Rogers, 1995). Short of combating the innovation with a new idea or reducing its value through other capabilities, firms that utilize older ideas have greater obstacles to overcome. Although the data indicates that some of these firms were

successful, the performance seems to be due to the relative quality of the resources rather than the deployment. In these instances, managers may have taken advantage of dominant resources rather than risk new combinations of deployment. Understanding the sustainability of this performance would be a fruitful avenue for future research.

Adoption theories based on substitutive capabilities are complex. In many ways, managers of these firms face the most difficult decisions as clear benefits do not accrue from adopting or rejecting the innovation. However, this dissertation contributes to the literature on substitutive capabilities by exploring how these decisions have impacted performance. Although a specific recommendation is unavailable, these organizations should recognize that non-adoption is a viable route, depending on the quality of their resources and the availability of knowledge. Resource flexibility and skill diversity contribute to an ability to re-deploy current assets. This research provides a greater understanding of the adoption decisions faced by managers of organizations with substitutive capabilities.

In Hypothesis 5c, I proposed that non-adopting firms with neutralizing capabilities would achieve higher levels of performance than adopters with similar capabilities. This hypothesis was supported at the 0.05 level (t-stat=-2.342, p-value = 0.021), suggesting that organizations with neutralizing capabilities should not adopt the innovation. In contrast to the previous literature on adoption, this distinct set of organizations not only lacks the necessary resources to adopt, but lower performance is demonstrated by firms that attempt to do so.

When compared to other capability types, a smaller percentage of neutralizing capability firms decided to adopt. Out of 141 organizations, only 33 adopted the

innovation (23.57%), despite the fact that 43 of the firms had knowledge from the innovator. Only 20 of the 43 firms with knowledge adopted the innovation. Thus, the rate of adoption by firms with neutralizing capabilities and knowledge from the innovator is approximately 46%. In comparison, 61% (30/49 teams) of firms with complementary capabilities and knowledge adopted, as did 70% (35/50 teams) of organizations with substitutive capabilities and knowledge from the innovator. This indicates that some organizations were hesitant to implement the innovation even with the knowledge and that firms may have acquired the knowledge for reasons other than adoption.

Why would a firm intentionally decide not to adopt a high performing innovation? This research question is addressed through the results of this analysis. Firms would reject an innovation if they have neutralizing resources and could expect to perform better than peers that do adopt. Further, this decision appears to be sustainable as several firms have achieved success without ever adopting over the 30 years since the innovation was born. Unlike the previous literature that proposes full diffusion throughout an industry, this analysis illustrates how capabilities play a more significant role in adoption decisions and post-decision performance. The development of neutralizing capabilities remains a viable option to adopting the innovation.

Given the path dependence of resource acquisition (Dierickx & Cool, 1989), some firms may possess more organizational capital in areas unrelated to the innovation. Beyond the initial decision, evidence suggests that firms can continue to develop capabilities in the area of their expertise. Since no statistical performance differences exist between complementary adopters and neutralizing non-adopters, firms need not immediately move towards acquiring innovation-specific resources. Resources still

maintain similar values even after revolutionary innovations. Proper deployment of the resources appears to be the driving factor of success.

Strategy scholars have previously recognized the importance of the managers' role in asset deployment (Sirmon, et al., 2008). This research extends the understanding of deploying assets in relation to innovation adoption decisions. Recognizing that there is an appropriate capability mix needed to mimic a competitor, this dissertation outlines how mangers should respond to revolutionary innovation. This dissertation suggests that performance is driven by the capabilities analyzed and deployed by managers in adoption decisions. As other research has examined the importance of the manager's abilities (Sirmon, et al., 2008), support is provided here that takes a broader look at the organization's capacity to compete.

6.2 Conclusion

This dissertation sought to explore how capabilities influence adoption processes, as well as post-decision performance. In contrast to previous literature within strategic management and other disciplines, I suggest that capabilities are a primary driver of innovation adoption decisions and illustrate how firms may have a sound, economic rationale for not adopting an innovation. Through an investigation of firm capabilities and knowledge acquisition, I examined how the combination of these assets impacted adoption decisions and firm performance.

The results suggest that firms with capabilities complementary or substitutive to the innovation are likely to adopt the innovation, while those with neutralizing capabilities are less likely to adopt due to consideration of other factors in the decision

process. Adopters almost always seek knowledge specific to the originator before implementing the idea in their organization. This helps overcome the information asymmetry between competing organizations and leads to successful outcomes. While the impact of knowledge acquisition is difficult to assess from the preceding analysis, organizations seemed to give direct knowledge significant weight in the decision process. Interestingly, firms with neutralizing capabilities are more successful when they do not adopt the innovation. This helps explain why firms can continue to succeed despite failing to adopt innovations that have proven to be successful throughout the industry. The results of this dissertation have significant implications for practice and research. I continue with a discussion of both areas and conclude by discussing the limitations of this study, along with extensions for future research.

6.2.1 Implications for Research

The results have several implications for strategic management research. Most of the literature focuses on characteristics of innovation, the speed of diffusion, or how firms innovate. The emphasis on entrepreneurship and statements about innovation as the lifeblood of organizations detract from some of the most difficult decisions firms make. This research attempts to re-position the discussion by taking a broader view on the overall capabilities of a firm. Although this dissertation represents an initial look at why firms may intentionally reject an innovation, the area presents numerous areas to extend the current knowledge base.

First, this dissertation challenges the assumption that innovations can benefit all firms within an industry. Through an examination of non-adopting firms, I extend the

work of scholars who have called for research free from the pro-innovation bias present in much of the previous work (Abrahamson, 1991; Abrahamson, 1996; Rogers, 1995). Differing from literature born from marketing, communications, or sociology, this work also considers an innovation created to benefit one organization. As opposed to studies of vaccines or crop yields, this research was targeted towards knowledge that an organization intends to hold rather than distribute. By taking a strategic perspective, I find specific scenarios where non-adoption is a superior strategy.

Additionally, this dissertation builds on the categorization of capabilities by explicitly defining three different types of capabilities. This dissertation spotlights the centrality of these capabilities in innovation adoption decisions. These definitions can help conceptualize how capabilities can be deployed when compared to an innovation or competitor. As an extension of Teece's work on complementary capabilities, I contribute to the literature by illustrating how firms can develop these types of capabilities by bundling and deploying different packages of resources. I also illustrate how capabilities limit the bundling and deployment options. Over time firms can adjust their capabilities by bringing in new assets; however, as demonstrated in the analysis, capabilities dictate how an organization should respond to revolutionary innovations. Scholars may find benefit from continuing to study how capabilities both enhance and limit the strategic direction of the firm.

Contributions from this paper help explain innovation diffusion patterns. By noting that firms may have incentive to reject an innovation, the discussion of adoption shifts from a question of "when" to "if" or "how." Building on the literature of non-adoption (Greve, 2011, Abrahamson, 1991), this dissertation introduces an economic

rationale for rejecting an innovation. Instead of an inefficient innovation or social pressures, firms may lack the necessary capabilities to capitalize on the new idea. In this instance, a firm may find greater efficacy in developing neutralizing resources than risking a re-bundling of inferior assets or paying market wages for in-demand talent. Although social connections and concerns can influence strategic decisions, I suggest that firms need not rely on patterns of competitor behavior to succeed. This project also suggests that additional economic analysis on non-adoption could benefit our understanding of routines and the flexibility of capabilities.

Finally, this paper links adoption decisions to performance. By isolating the impact of an adoption decision, this work is able to measure post-decision performance while simultaneously controlling for the quality of other resources. This paper utilizes a professional football sample of 32 organizations with the same goals, number of employees, and with similar resources to minimize the other variables that could impact decisions. As firm performance represents a central tenant of strategic management research, this paper provides boundary conditions to the benefits derived from innovation. Hopefully, this study will inspire further research on the boundaries of diffusion.

6.2.2 Implications for Practice

This research has many significant implications for managers. As diffusion theories illustrate how firms consider peers and characteristics of the innovation before adoption, this dissertation suggests that firms can be successful even if they do not adopt the latest ideas. Despite the temptation to always follow the market leader or adopt the

latest trend, managers should consider their current capabilities before making a key strategic decision. A key takeaway for managers is to recognize the value of your own resources. As resources are distributed unevenly throughout most industries, the ability to recognize and exploit the benefits accrued from a firm's assets should remain a focus of managers, especially when considering divergent strategies. Comparing capabilities to competitors, and more specifically the innovation, can illustrate the different ways to compete within a marketplace.

As managers are specifically tasked with bundling and deploying assets, this dissertation highlights the importance of matching routines with resources. In the development of new routines, performance is impacted by both the quality and deployment of resources. Options are available to managers that involve continuing to deploy resources in the current manner or risking a decrease in performance through re-bundling. Firms with substitutive resources may experience the most challenging decisions based on how similar the current routines match the innovation. Innovating firms may also consider the ability of competitors to replicate the new ideas. Firms in industries where many competitors possess similar resources may want to consider whether other organizations would be able to competently bundle current resources to match the innovation.

6.3 Limitations and Areas of Future Research

In this dissertation, I have attempted to address specific research questions in a manner that allows for generalizability across multiple industries and organizations. In doing so, there are potential areas of difference between those firms included in the

analysis and how other industries may operate. I will address the limitations of this study that evolve from these facts. I also propose future areas of research that have arisen through the process of developing the theories, methodology, and analysis that are included in this dissertation.

The primary units within this analysis are the organizational capabilities. Defining the routines and resources of an organization in the previously described manner is limiting in several ways. One concern is the necessity of defining who has or does not have a capability in a given area. Organizations are inherently more familiar with their resources than can be inferred from statistical analysis. In this manner, adoption decisions are made by organizations based on how they project these resources to perform in the future. Since all of the capabilities are defined by the performance of individuals, managers may have more knowledge of ability and quality than are noted in this study. As such, firms may perceive their capabilities (or lack thereof) differently. This is a particular limitation when a firm appears to have similar capabilities in multiple areas.

Another important limitation of this dissertation is the reliance on archival data to test the propositions. Given that the research considers decisions over a thirty year time frame, surveying decision makers is not possible. While the measures included in the work represent adoption considerations of managers, a more direct method of accessing this information could provide more nuanced explanations for the surprising number of firms that made theoretically unsound decisions.

The data examined in this study represent the entire population of professional football teams since the innovation. The use of this population eliminates some problems

that could arise through sampling and allows for more specific claims to be made about the results. However, as the non-adoption theory is drawn from and extended to other industries, the primary limitations are based on the nuances of the industry.

Analysis of adoption decisions and performance in multiple industries could also strengthen the findings of this dissertation. Although empirically sound, the idiosyncrasies of professional football may distort the realties faced by organizations in other fields. For example, knowledge from the innovator may play a different role in a field where strategies and performance are not directly observed by competitors. Since this project was designed to develop theories of non-adoption, the specifics of professional football are less relevant than the overall behaviors. Future research in other industries, using different methods and analytics, could provide deeper theoretical insights into adoption decisions.

Although useful for empirical analysis, most industries do not have the parity represented in this sample. Prior research has found that firms tend to follow larger and more influential competitors within an industry (Aboulnasr, et al., 2008). These diffusion patterns may change based on the centralization of resources within an industry. One firm may hold all of the necessary assets required to develop neutralizing capabilities, thus driving higher rates of adoption.

Future research should examine the flexibility of resources in different routines. Actors within routines are frequently asked to process information at different decision points. The ability to play multiple roles within a routine or to improve upon routines could impact an organization's willingness to adopt an innovation. Flexibility increases a manager's deployment options and allows a firm to respond faster to environmental

changes. Exploring how these resources impact adoption decisions could provide a strong avenue of theoretical development for the future.

Finally, understanding how knowledge from the innovator is used by adopters would be a natural extension of this research. This is particularly interesting for firms that possess substitutive or neutralizing resources. Previous research has illustrated the difficulty of transferring knowledge. This paper presents several examples of successful and unsuccessful transfer – explaining what led to these performance differences could assist in our understanding of the communication and acquisition of knowledge. Theory related to each capability type or the depth of the knowledge would be tremendously valuable for academics and practitioners.

This dissertation has built on the work of the diffusion of innovation, organizational capabilities, and knowledge acquisition. While my goal was to introduce and attempt to answer questions related to capabilities and innovation adoption decisions, I hope that the results from this work inspire future research around innovation and the strategic development of capabilities. As innovation continues to receive attention from firms and researchers, I hope that this study encourages others to create new theories and explanations for adoption and diffusion.

Bibliography

Aboulnasr, K., Narasimhan, O., Blair, E., & Chandy, R. 2008. Competitive response to radical innovation. *Journal of Marketing*, 72: 94-110.

Abrahamson, E. & Rosenkopf, L. 1990. When do bandwagon diffusions roll? How far do they go? And when do they roll backwards: a computer simulation. *Academy of Management Best Paper Proceedings:* 155-159

Abrahamson, E. & Rosenkopf, L. 1993. Institutional and competitive bandwagons: using mathematical modeling as a tool to explore innovation diffusion. *Academy of Management Review,* 18: 487-517.

Abrahamson, E. 1991. Managerial fads and fashions: The diffusion and rejection of innovations. *Academy of Management Review.* 16:586-612.

Abrahamson, E. 1996. Management fashion. *Academy of Management Review,* 21: 254-285.

Aime, F., Johnson, S., Ridge, J., & Hill, A. 2010. The routine may be stable but the advantage is not: Competitive implications of key employee mobility. *Strategic Management Journal.* 31:75-87.

Argote, L. & Ingram, P. 2000. Knowledge transfer: A basis for competitive advantage in firms. *Organizational Behavior and Human Decision Processes.* 82: 150-169.

Arora, A. & Ceccagnoli, M. 2006. Patent protection, complementary assets, and firm' incentives for technology licensing. *Management Science,* 52: 293-318.

Arrow, K.J. 1962. In: Nelson, R. (Ed.), Economic Welfare and the Allocation of Resources for Invention. The Rate and Direction of Inventive Activity. Princeton University Press, Princeton, NJ, pp. 609-625.

Barajas, A., Fernandez-Jardon, C., & Crolley, L. 2005. Does sport performance influence revenues and economic results in Spanish football? Accessed through Munich Personal RePEc Archive on June 4, 2012 at http://mpra.ub.uni-muenchen.de/3234/1/MPRA_paper_3234.pdf.

Baregheh, A., Rowley, J., & Sambrook, S. 2009. Towards a multidisciplinary definition of innovation. *Management Decision,* 47: 1323-1339.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17: 99-120.

Baty, G.B., Evans, M.W., & Rothermel, T.W. 1971. Personnel flows as interorganizational relations. *Administrative Science Quarterly,* 36: 187-218.

Becker, S. & Whisler, T. 1967. The innovative organization: a selective review of current theory and research. *Journal of Business,* 40: 462-469.

Berman, S.L., Down, J., & Hill, C. 2002. Tacit knowledge as a source of competitive advantage in the National Basketball Association. *Academy of Management Journal.* 45: 13-31.

Birkinshaw, J., Hamel, G., & Mol, M. 2008. Management innovation. *Academy of Management Journal,* 33: 825-845.

Borland, J. & Macdonald, R. 2003. Demand for sport. *Oxford Review of Economic Policy.* 19: 478-502.

Carroll, G. & Hannan, M. 1989. Density delay in the evolution of organizational populations: a model and five empirical tests. *Administrative Science Quarterly,* 34: 411-430.

Cassiman, B. & Veugelers, R. 2006. In search of complementarity in innovation strategy: internal R&D and external knowledge acquisition. *Management Science,* 52: 68-82.

Coase, R. 1960. The problem of social cost. *The Journal of Law and Economics,* 3: 1-44.

Cohen, W. & Levinthal, D. 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly,* 35: 128-152.

Crossan, M. & Apaydin, M. 2010. A multi-dimensional framework of organizational innovation: a systematic review of the literature. *Journal of Management Studies,* 47: 1154-1191.

Daft, R. 1978. A dual-core model of organizational innovation. *Academy of Management Journal,* 21: 193-210.

Damanour, F. 1991. Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal,* 34: 555-590.

Darr, E. & Kurtzberg, T. 2000. An investigation of partner similarity dimensions on knowledge transfer. *Organizational Behavior and Human Decision Processes,* 82: 28-44.

Dewar, R. & Dutton, J. 1986. The adoption of radical and incremental innovations: an empirical analysis. *Management Science,* 32: 1422-1433.

Dierickx, I. & Cool, K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science,* 35: 1504-1511.

Fast, A. & Jensen, D. 2006. The NFL coaching network: analysis of the social network among professional football coaches. AAAI Fall Symposium on Capturing and Using Patterns for Evidence Detection.

Feldman, M. & Pentland, B. 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly,* 48: 94-118.

Finkelstein, S. & Hambrick, D. 1990. Top-management-team tenure and organizational outcomes: the moderating role of managerial discretion. *Administrative Science Quarterly,* 35: 484-503.

Fort, R. 1995. Cross-subsidation, incentives, and outcomes in professional sport leagues, *Journal of Economic Literature,* 33: 1265-1299.

Grant, R. 1996. Prospering in dynamically-competitive environments: organizational capability as knowledge integration. *Organization Science,* 7: 375-387.

Grant, R. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal,* 17: 109-122.

Greve, H. 1996. Patterns of competition: the diffusion of a market position in radio broadcasting. *Administrative Science Quarterly,* 41: 29-60.

Greve, H. 1998. Managerial cognition and the mimetic adoption of market positions: what you see is what you do. *Strategic Management Journal,* 19: 967-988.

Greve, H. 2011. Fast and expensive: the diffusion of a disappointing innovation. *Strategic Management Journal,* 32: 949-968.

Grossman, G. & Helpman, E. 2001. *Innovation and growth in the global economy*. Cambridge, MA: Massachusetts Institute of Technology Publishing.

Hannan, M. & Freeman, J. 1983. Structural inertia and organizational change. *American Sociological Review,* 49: 149-164.

Hansen, S. & Wakonon, J. 1997. Innovation, a winning solution? *International Journal of Technology Management,* 13: 345-358.

Hess, A. & Rothaermel, F. 2011. When are assets complementary? Star scientists, strategic alliances, and innovation in the pharmaceutical industry. *Strategic Management Journal,* 32: 895-909.

Holcomb, T., Holmes, Jr., R., & Connelly, B. 2009. Making the most of what you have: managerial ability as a source of resource value creation. *Strategic Management Journal,* 30: 457-485.

Hull, F. & Hage, J. 1982. Organizing for innovation: beyond Burns and Stalker's organic type, *Sociology,* 16: 564-577.

Irwin, R., Zwick, D., & Sutton, W. 1999. Assessing organizational attributes contributing to marketing excellence in American professional sport franchises. *European Journal of Marketing,* 33: 314-327.

Jaworski, R. 2010. *The games that changed the game: the evolution of the NFL in seven Sundays.* New York: Ballantine Books, ESPN.

Kelly, T. 2005. *The Ten Faces of Innovation.* New York: Doubleday.

Kimberly, J. & Evanisko, M. 1981. Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal,* 24: 689-713.

Kogut, B. & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science,* 3: 383-397.

Layden, T. 2011. *Blood, sweat, and chalk: how the great coaches built today's game.* New York: Time Home Entertainment, Sports Illustrated.

Leonard-Barton, D. 1992. Core capabilities and core rigidities: a paradox in managing new product development. *Strategic Management Journal,* 13: 111-125.

Levinthal, D. & March, J. 1993. The myopia of learning. *Strategic Management Journal,* 14: 95-112.

Levitt, B. & March, J. 1988. Organizational learning. *Annual Review of Sociology.* 14: 319-340.

Lieberman, M. & Asaba, S. 2006. Why do firms imitate each other? *Academy of Management Review.* 31: 366-385.

Lippman, S. & Rumelt, R. 1992. Demand uncertainty, capital specificity, and industry evolution. *Industrial and Corporate Change,* 1: 235-262.

Mahajan, V. & Peterson, R. 1985. *Models for innovation diffusion.* Beverly Hills, CA: Sage.

Mansfield, E. 1961. Technical change and the rate of imitation. *Econometrica.* 61: 741-766.

March, J. & Simon, H. 1958. *Organizations.* New York: Wiley.

March, J. 1981. Decision in organizations and theories of choice. In A.H. Van de Ven & W.F. Joyce (Eds.), *Perspectives on organization design and behavior:* 205-244. New York: Wiley.

March, J. 1991. Exploration and exploitation in organizational learning. *Organization Science.* 2: 71-87.

Massini, S., Lewin, A., & Greve, H. 2005. Innovators and imitators: organizational reference groups and adoption of organizational routines. *Research Policy.* 34: 1550-1569.

McCabe, D. 2002. "Waiting for dead men's shoes": towards a cultural understanding of management innovation. *Human Relations,* 55: 505-536.

Milgrom, P. & Roberts, J. 1995. Complementaries and fit strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics,* 19: 179-208.

Miller, D. & Friesen, P. 1982. Innovation in conservative and entrepreneurial firms: two models of strategic momentum. *Strategic Management Journal,* 3: 1-25.

Nelson, R. & Winter, S. 1982. *An evolutionary theory of economic change.* Cambridge, MA: Belknap Press.

NFL Rulebook. 2012. National Football League. 26 Feb. 2012 <http://www.nfl.com/rulebook>.

Nonaka, I. & Takeuchi, H. 1995. *The knowledge-creating company: how Japanese companies create the dynamics of innovation.* New York: Oxford Press.

Nord, W. & Tucker, S. 1987. *Implementing Routine and Radical Innovations.* Lexington, MA: Lexington Books.

Penrose, E. 1959. *The theory of the growth of the firm.* New York: John Wiley & Sons.

Plessis, M. 2007. The role of knowledge management in innovation. *Journal of Knowledge Management,* 11: 20-29.

Porter, M. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* New York: Free Press.

Pro Football Reference. 2012. Sports Reference LLC. 26 Feb. 2012 <http://www.pro-football-reference.com>.

Rao, H. & Drazin, R. 2002. Overcoming resource constraints on product innovation by recruiting talent from rivals: a study of the mutual fund industry, 1986-1994. *Academy of Management Journal.* 45: 491-508.

Robertson, T. 1967. The process of innovation and the diffusion of innovation. *Journal of Marketing.* 31: 14-19.

Rogers, E. 1995. *Diffusion of innovations.* New York: Free Press.

Rothaermel, F. & Hess, A. 2007. Building dynamic capabilities: innovation driven by individual-, firm-, and network-level effects. *Organization Science,* 18: 898-921.

Rottenberg, S. 1956. The baseball players' labor market. *Journal of Political Economy,* 64: 242-258.

Schumpeter, J. 1934. *The theory of economic development.* Cambridge, MA: Harvard University Press.

Schumpeter, J. 1939. *Business cycles: a theoretical, historical, and statistical analysis of the capitalist process.* Two volumes, New York: McGraw Hill Book Co.

Semadeni, M. & Anderson, B. 2010. The follower's dilemma: innovation and imitation in the professional services industry. *Academy of Management Journal.* 53: 1175-1193.

Shatz, A. 2003. Pythagoras on the gridiron. In *Football Outsiders.* Retrieved June 4, 2012 from http://www.footballoutsiders.com/stat-analysis/2003/pythagoras-gridiron.

Sirmon, D., Gove, S., & Hitt, M. 2008. Resource management in the dyadic competitive rivalry: the effects of resource bundling and deployment. *Academy of Management Journal.* 51: 919-935.

Smart, D. & Wolfe, R. 2000. Examining sustainable competitive advantage in intercollegiate athletics: a resource-based view, *Journal of Sport Management.* 14, 133-153.

Song, J., Almeida, P., & Wu, G. 2003. Learning-by-hiring: when is mobility more likely to facilitate interfirm knowledge transfer? *Management Science.* 49: 351-365.

Subramaniam, M. & Youndt, M. 2005. The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal.* 48: 450-463.

Szulanski, G. 1996. Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal.* 17: 27-43.

Tidd, J., Bessant, J.R., & Pavitt, K. 2005. *Managing Innovation: Integrating Technical, Market, and Organizational Change.* West Sussex, England: John Wiley & Sons.

Teece, D. & Pissano, G. 1994. The dynamic capabilities of firms: an introduction. *Industrial and Corporate Change,* 3: 537-556.

Teece, D. 1976. *The Multinational Corporation and the Resource Cost of International Technology Transfer.* Cambridge, MA: Ballinger.

Teece, D. 1977. Technology transfer by multinational firms: the resources cost of transferring technical know-how. *The Economic Journal,* 87: 242-261.

Teece, D. 1983. Technological and organizational factors in the theory of multinational enterprise, in: Mark Casson ed., Growth of international business. London: Allen and Unwin. p. 51-62.

Teece, D. 1986. Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy. *Research Policy,* 15: 285-305.

Tewksbury, J., Crandall, M., & Crane, W. 1980. Measuring the societal benefits of innovation. *Science,* 209: 658-662.

Thompson, V. 1965. Bureaucracy and innovation, *Administrative Science Quarterly,* 10: 1-20.

von Hippel, E. 1994. "Sticky information" and the locus of problem solving: implications for innovation. *Management Science,* 40: 429-439.

West, M. & Anderson, N. 1996. Innovation in top management teams. *Journal of Applied Psychology,* 81: 680-693.

Winter, S. & Szulanski, G. 2001. Replication as strategy. *Organizational Science.* 12: 730-743.

Winter, S. 1995. Four R's of profitability: rents, resources, routines and replication. *Resource-based and Evolutionary Theories of the Firm: Towards a Synthesis.* C.A. Montgomery. Norwell, MA: Kluwer Academic Publishers: 147-178.

Winter, S. 2002. Understanding dynamic capabilities. *Strategic Management Journal,* 24: 991-995.

Winter, S. 2006. The logic of appropriability: from Schumpeter to Arrow to Teece. *Research Policy.* 35: 1100-1106.

Wolfe, R., Weick, K., Usher, J., Terborg, T., Poppo, L., Murrell, A., Dukerich, J., Core, D., Dickson, K., & Jourdan, J. 2005. Sport and organization studies: exploring synergy, *Journal of Management Inquiry.* 14: 182-210.

Wooldridge, J. M. 2002. *Econometric Analysis of Cross Section and Panel Data.* MIT Press: Cambridge, MA.

Wright, P., Smart, D., & McMahan, G. 1995. Matches between human resources and strategy among NCAA basketball teams. *Academy of Management Journal.* 38: 1052-1074.

Zaltman, G., Duncan, R., & Holbek, J. 1973. *Innovations and Organizations*. New York: Wiley.

Zander, U. & Kogut, B. 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test. *Management Science,* 6: 76-92.

Zbaracki, M. 1998. The rhetoric and reality of total quality management, *Administrative Science Quarterly,* 43: 602-638.