

# DISENTANGLING INTERFIRM AND INTRAFIRM CAUSAL AMBIGUITY: A CONCEPTUAL MODEL OF CAUSAL AMBIGUITY AND SUSTAINABLE COMPETITIVE ADVANTAGE

ADELAIDE WILCOX KING  
University of Virginia

Causal ambiguity is a well-established construct in the strategy literature. Theorists have yet to differentiate and fully refine the construct in ways that clearly demonstrate its influence on sustainable competitive advantage. To address this limitation, I develop a theoretical model that partitions causal ambiguity based on firm boundaries and specifies the organizational implications of this distinction. This model deepens our understanding of causal ambiguity and provides guidance about promising avenues for future research.

Life is a perpetual instruction in cause and effect  
(Ralph Waldo Emerson).

Organizations are untidy. Each day, managers must draw conclusions and make commitments based on insufficient, unclear, or conflicting inputs. Causal ambiguity is a continuum that describes the degree to which decision makers understand the relationships between organizational inputs and results (Lippman & Rumelt, 1982). Because strategic issues are intrinsically messy and managers boundedly rational, almost all conclusions regarding strategic resources and their outcomes are causally ambiguous.

Although the terminology about knowledge and learning in organizations varies, there is little question that a firm's performance depends significantly on what an organization comes to know (Argote & Ingram, 2000: 156; Spender & Grant, 1996). Consistent with previous research on causal ambiguity (e.g., King & Zeithaml, 2001; Reed & DeFillippi, 1990), I use the term *competency* to describe the resources, knowledge, or capabilities that differentiate a firm in ways that may lead to competitive advantage. Competence-based perspectives on strategic management (Foss, 1996; Williamson, 1999) treat causal ambiguity as an important construct. Causal ambiguity is most notably

central to the resource-based view ([RBV] Barney, 1991; King & Zeithaml, 2001; Mosakowski, 1997; Rumelt, 1984), but it also is relevant to the behavioral theory of the firm (Cyert & March, 1963), evolutionary economics (Nelson & Winter, 1982), and the organizational learning (Baum & Ingram, 1998; Darr, Argote, & Epple, 1995; Levitt & March, 1988; March & Olsen, 1982) and dynamic capabilities literature (Kogut & Zander, 1992; Teece, Pisano, & Shuen, 1997, 2000; Zollo & Winter, 2002). Even scholars who are highly critical of the RBV acknowledge its descriptive and prescriptive relevance (Priem & Butler, 2001: 35) because causal ambiguity about key competencies generates strategically significant consequences. Causal ambiguity has been linked to interfirm differences in profitability (Lippman & Rumelt, 1982), knowledge transfer (Simonin, 1999; Szulanski, 1996), and speed of diversification events (Mosakowski, 1997).

Despite significant attention and progress, there remains considerable ambiguity about causal ambiguity. The purpose of this paper is to clarify, deepen, and extend our theoretical understanding of causal ambiguity and its relationship to a defining organizational outcome in strategic management—sustainable competitive advantage (e.g., Barney, 1991; Dierickx & Cool, 1989; Porter, 1985; Reed & DeFillippi, 1990). In doing so, I aim to substantiate the construct within the strategic management literature and offer direction for organizational scholars.

I first examine research on competencies, competitive advantage, and causal ambiguity. I

---

I am deeply indebted to Annette Ranft, who provided invaluable guidance and ideas for the first iteration of this paper. Ming-Jer Chen, Rich Makadok, Sarah Marsh, and Ellen Whitener also generously shared their insights.

then develop a theoretical model that partitions causal ambiguity based on firm boundaries, distinguishing interfirm and intrafirm causal ambiguity and specifying the outcome implications that this distinction makes clear. I further specify the model to include antecedents and moderators that affect and distinguish interfirm and intrafirm causal ambiguity. A discussion of the theoretical and practical implications of these insights follows.

## THEORETICAL BACKGROUND

Competence-based views of organizations seek to explain interfirm differences in rents through analysis of internal elements of organizations. Proponents of these perspectives assume that a firm is an amalgamation of internal resources and capabilities, that resources are heterogeneously distributed across competitors in an industry, and that interfirm differences in resources and rents endure (Barney, 1991; Eisenhardt & Martin, 2000; Lippman & Rumelt, 1982).

The fundamental premise of the RBV is that successful firms possess internal resources and capabilities that are valuable, rare, and inimitable and lack substitutes (Barney, 1991). RBV research largely treats value creation as exogenous and focuses on incremental opportunities to sustain competitive advantage and defensive measures to impede the deterioration of competitive advantage. An example is the concept of isolating mechanisms (Mahoney & Pandian, 1992; Rumelt, 1984) as barriers to deter potential competitors' attempts to enter a market or to decrease the new competitors' likelihood of success (Dierickx & Cool, 1989; Liebeskind, 1997; Lippman & Rumelt, 1982; Spender & Grant, 1996).

Research on organizational learning examines underlying processes that affect an organizational unit's potential to develop competencies based on its own and others' experience (Argote, 1999; Levitt & March, 1988). This literature and related research on technological innovation and dynamic capabilities, which addresses how firms sustain advantage by spawning new competencies and by developing existing competencies more effectively than competitors, have deepened competence-based inquiry into value creation through voluntary transfer (e.g., Argote, Beckman, & Epple, 1990; Epple, Argote, & Murphy, 1996; Kogut & Zander, 1992; Zander, 1991; Zander & Kogut, 1995) and

replication of competencies (Teece et al., 1997, 2000; Winter & Szulanski, 2001).<sup>1</sup>

Organization scholars have long recognized that causal ambiguity plays a role in explaining enduring interfirm differences in rents (e.g., Barney, 1991; Lippman & Rumelt, 1982; Peteraf, 1993; Zander, 1991). A spate of recent in-depth articles that focus on causal ambiguity has advanced, both theoretically and empirically, our understanding of the construct and its place in the strategic management literature. In the following paragraphs, I examine existing research in order to specify further the constitutive elements of the causal ambiguity construct and related constructs and to reveal coherence and discrepancies.

A thorough search of the literature identified thirteen studies on causal ambiguity. Although not exhaustive, these studies represent a comprehensive review of management articles that focus on causal ambiguity. Table 1 summarizes these studies from five perspectives: (1) definition of causal ambiguity, (2) the dependent variable, (3) decision maker domain or assumptions with regard to focal agents experiencing causal ambiguity, (4) antecedents and correlates to causal ambiguity, and (5) key findings or conclusions regarding causal ambiguity. Below I review, integrate, and critique the research to date.

### Causal Ambiguity As a Cognitive and Strategic Construct

Throughout the literature, causal ambiguity is conceptualized as a cognitive and strategic construct that describes decision makers' understanding of the relationship between a competency and its organizational outcomes. This is consistent with the long-standing view of causality as a mental construct (Hume, 1978; quoted in White, 1990: 4). Descriptions such as "inability to fully specify factors" (Dierickx & Cool, 1989: 1509), "when the link . . . is not understood or [is] understood only very imperfectly" (Barney, 1991: 108–109), and "absence of know-why: why something is done, and why a given action results in a given outcome" (Szulanski, 1993: 50) reveal

<sup>1</sup> See Teece et al. (1997, 2000), Argote (1999), Eisenhardt and Martin (2000), and Makadok (2001) for comprehensive reviews and comparisons of organizational learning, dynamic capabilities, and the RBV.

**TABLE 1**  
**Conceptual Issues About Causal Ambiguity**

Authors	Definition of Causal Ambiguity	Dependent Variable	Decision Maker Domain	Related Constructs	Key Findings/Conclusions
Lippman & Rumelt (1982)	"Ambiguity as to what factors are responsible for superior (or inferior) performance" (p. 420) or "ambiguity surrounding the linkage between action and performance" (p. 421)	The origin and persistence of interfirm differences in profitability	Prospective new entrants in an industry		Causal ambiguity increases the chance that very efficient competitors will appear (p. 423)
Dierickx & Cool (1989)	"Inability to fully specify the factors that play a role in the asset accumulation process" (p. 1509) "Stochastic nature of the accumulation process may stem from our inability to identify some of the relevant variables as well as our inability to control them" (p. 1509)	Sustainable competitive advantage	Firms that own the asset stocks and "other firms"		Causal ambiguity helps determine imitability
Reed & DeFillippi (1990)	"Ambiguity as to what factors are responsible for superior (or inferior) performance" (p. 90; citing Lippman & Rumelt, 1982: 420) "The level of the competitor's understanding of the sources of advantage" (p. 100)	Sustainability of competency-based competitive advantage	Competitors	Tacitness, complexity, specificity	Tacitness, complexity, and specificity can be simultaneous sources of advantage and ambiguity, as can interaction effects among these characteristics Reinvestment in causally ambiguous competency characteristics is necessary to sustain performance
Barney (1991)	"Causal ambiguity exists when the link between the resources controlled by a firm and a firm's sustained competitive advantage is not understood or [is] understood only very imperfectly" (pp. 108-109)	Sustainable competitive advantage	All competing firms (p. 109)	Complex, interdependent, implicit (tacit)	"In order for causal ambiguity to be a source of sustained competitive advantage, all competing firms [including the focal firm] must have an imperfect understanding of the link between the resources controlled by a firm and a firm's competitive advantage" (p. 109)

(Continued)

**TABLE 1**  
(Continued)

Authors	Definition of Causal Ambiguity	Dependent Variable	Decision Maker Domain	Related Constructs	Key Findings/Conclusions
Peteraf (1993)	"Uncertainty regarding the causes of efficiency differences among firms" (p. 182)	Limits competition for established rent stream	"Would-be-imitators" (p. 182)	Tacitness and social complexity	Causal ambiguity is a barrier to competitive imitation and efforts inside a firm to leverage resources
Szulanski (1993, 1996)	"Causal ambiguity signals the absence of know-why: why something is done, and why a given action results in a given outcome" (1993: 50) "Ambiguity about what the factors of production are and how they interact during production" (1996: 30)	Stickiness of intrafirm transfer of best practice, both outcome and process	"Source units," "recipient units," and "third parties" involved in best practice transfer	Tacitness, complexity, robustness (negative), and incompleteness (1993) "Imperfectly understood idiosyncratic features of the new context in which knowledge is being put to use" (1996: 31)	Causal ambiguity is a key barrier to the transfer of best practice Causal ambiguity is correlated with (1) sources who (a) lack motivation and (b) are not perceived as reliable (2) recipients who (a) lack motivation, (b) lack absorptive capacity, and (c) lack retentive capacity (3) contexts (a) that are barren and (b) that reflect arduous relationships
Coff (1997)	"Uncertainty about which factors contribute to success" (p. 376)	Management information dilemmas	"Employees, management, or researchers" (p. 377)	Asset specificity For human assets, social and cognitive processes	Causal ambiguity specifies some fundamental challenges in managing human asset-intensive firms
Mosakowski (1997)	"The level of causal ambiguity refers to 'the number of distributions that are not ruled out by one's knowledge of the situation' (Einhorn & Hogarth, 1986: S229)" (p. 415); one form of "causal ambiguity involves uncertainty surrounding the model specification that links the inputs and outcomes, whereas a second form involves uncertainty concerning the value of inputs fed into the model" (p. 416)	Speed of diversification events	Focuses on shared causal ambiguity, experienced by all firms Describes alternative of asymmetric causal ambiguity		Causal ambiguity positively affects the rate of experimental diversification

(Continued)

**TABLE 1**  
(Continued)

Authors	Definition of Causal Ambiguity	Dependent Variable	Decision Maker Domain	Related Constructs	Key Findings/Conclusions
Coff (1999)	An "attribute of strategic assets" (p. 120) that "may make it hard to identify desired skills" (p. 125)	Observable rent in performance measures—rent accruing to shareholders	Management negotiating with stakeholders		Causal ambiguity positively influences rent generation and stakeholder bargaining power
Simonin (1999)	A "lack of understanding of the logical linkages between actions and outcomes, inputs and outputs, and causes and effects that are related to technological or process know-how" (p. 597)	Knowledge transfer, defined as "chances of effectively repatriating and absorbing the competence" in the context of strategic alliances (p. 597)	Top executives who "focused on the technological expertise of their [alliance] partner and on the technological aspects of the alliance activities" (p. 605)	Tacitness, specificity, complexity, experience, partner protectiveness, cultural distance, and organizational distance	The effect of tacitness on ambiguity is consistently significant across analyses Causal ambiguity is a full mediator of tacitness, experience, complexity, and cultural and organizational distance on knowledge transfer in international strategic alliances Learning capacity and collaborative know-how moderate the relationship between characteristic antecedents and causal ambiguity
McEvily, Das, & McCabe (2000)	"Ambiguity about which performance criteria are valuable and how to achieve them, or which contingencies affect implementation" (p. 295)	Firm profitability	Competitors and firm decision makers (p. 294)	Complexity, tacitness, or specificity	Causal ambiguity hinders learning and therefore performance Reducing causal ambiguity can help increase barriers to substitution and therefore sustain competitive advantage (Continued)

TABLE 1  
(Continued)

Authors	Definition of Causal Ambiguity	Dependent Variable	Decision Maker Domain	Related Constructs	Key Findings/Conclusions
King & Zeithaml (2001)	"Linkage ambiguity is ambiguity among decision makers about the link between a competency and competitive advantage. . . . Characteristic ambiguity is inherent to the resource itself" (p. 77)	Firm profitability (ROA)	Top management team and multiple middle managers within a firm	Tacitness, knowledge, location (culture)	Characteristic ambiguity is positively correlated with firm performance Linkage ambiguity, particularly among middle managers, is negatively correlated with firm performance
Zollo & Winter (2002)	"Understanding of the causal linkages between the actions it takes and the performance outcomes it attains" (p. 340) "How easy it is to derive clear indications as to what should or should not be done in the execution of the task" (p. 347)	Development of dynamic capabilities	Firm decision makers	"Higher-level cognitive efforts and a more deliberate collective focus on the learning" (negative) (p. 342) "The number and degree of interdependence of subtasks [and the] degree of simultaneity among the subtasks" (p. 348)	The higher the degree of causal ambiguity, the higher the likelihood that explicit articulation and codification mechanisms (versus tacit accumulation) will improve effectiveness in developing dynamic capabilities (p. 348)



similarities in defining causal ambiguity as subjects' (organizational decision makers') lack of certainty in judging objects (competencies and their performance outcomes).

Causal ambiguity scholars seek to link the construct to firm-level performance; dependent variables include the sustainability of competence-based advantage (e.g., Barney, 1991; Dierickx & Cool, 1989; Peteraf, 1993; Reed & DeFillippi, 1990) and firm profitability (King & Zeithaml, 2001; Lippman & Rumelt, 1982; McEvily, Das, & McCabe, 2000). In other studies researchers focus on organizational constructs that explicitly or implicitly mediate the relationship between causal ambiguity and firm performance outcomes. These variables include knowledge transfer and development (Coff, 1997; Simonin, 1999; Szulanski, 1996; Zollo & Winter, 2002) and the speed of diversification events (Mosakowski, 1997).

With regard to the role of firm boundaries, these scholars use three approaches to define the scope of decision-making units and to address the significance of causal ambiguity disparities among decision makers. One approach conceptualizes causal ambiguity as shared among all decision makers, both inside and outside an organization (Barney, 1991; McEvily et al., 2000; Mosakowski, 1997). From this perspective, frictions that generate variations in levels of causal ambiguity among decision makers either are absent or are eliminated so rapidly that they are irrelevant. Barney treats this perspective as an immutable theoretical claim, arguing that

in order for causal ambiguity to be a source of sustained competitive advantage, all competing firms must have an imperfect understanding of the link between the resources controlled by a firm and a firm's competitive advantages. If one competing firm understands this link, and no others do, in the long run this information will be diffused through all competitors, thus eliminating causal ambiguity (1991: 109).

In contrast, a central assumption of other studies is that causal ambiguity levels differ between internal decision makers and competitors. These researchers examine situations where outsiders' causal ambiguity is greater than a focal firm's, and they dismiss situations of intrafirm causal ambiguity, which they claim "leave little room for strategy" (Peteraf, 1993: 187; see also Reed & DeFillippi, 1990).

In a third approach researchers isolate causal ambiguity to a narrow scope of decision makers and ignore causal ambiguity experienced by others outside this domain. Studies have examined the implications of (1) interfirm causal ambiguity experienced among industry competitors (Dierickx & Cool, 1989; Lippman & Rumelt, 1982), (2) intrafirm causal ambiguity among managers in a focal firm (King & Zeithaml, 2001; Zollo & Winter, 2002), and (3) causal ambiguity experienced by senior managers in one firm with regard to their alliance partners' competencies (Simonin, 1999).

### Related Variables and Levels of Analysis

Other related constructs describe the characteristics of the competencies, or *what* is ambiguous, and properties of the relevant decision makers, or *whose* experiences of causal ambiguity matter. Reed and DeFillippi provide the seminal work in describing inherent characteristics that imbue a competency with ambiguity, arguing that firms must reinvest in "sources of ambiguity: defined as tacitness, complexity, and asset specificity" (1990: 100). Characteristic ambiguity is an umbrella descriptor of these intrinsic competency attributes (King & Zeithaml, 2001). A high degree of tacitness, which describes the noncodifiable accumulation of knowledge and skills often gained from practice, tends to increase the challenges of understanding the link between a competency and its outcome (Reed & DeFillippi, 1990; Simonin, 1999; Szulanski, 1996). High competency complexity—in which the competency involves a large number of interrelated technologies, resources, and individuals—also increases this cognitive challenge (Barney, 1991; Mosakowski, 1997; Reed & DeFillippi, 1990; Simonin, 1999; Zollo & Winter, 2002). Other examples of competency characteristics associated with causal ambiguity include the interdependence of a competency with idiosyncratic activities of an organization (McEvily et al., 2000; Reed & DeFillippi, 1990; Winter, 1987) and the simultaneity among subtasks (Zollo & Winter, 2002: 348).

With regard to the "who" question, understanding causal ambiguity requires insight into the *properties of* and *relationships among* decision-making units. These attributes have been examined with regard to decision-making units at multiple levels. While variation in choices of

decision-making units implies some unsettling issues with regard to construct development, research on causal ambiguity has progressed significantly by tying causal ambiguity to specific organization members.

All organization-level cognition researchers face the inherent and difficult conundrum of recognizing and reconciling level-of-analysis issues.<sup>2</sup> For a long time, causal ambiguity researchers ignored the idea that organizations consist of multiple actors whose interests often diverge (Cyert & March, 1963) and skirted the tricky business of individual, group, and organizational levels of analysis. In early studies scholars neither addressed nor related the multilevel nature of the construct but, instead, implied a cohesive set of decision makers whose understanding of competencies represents a firm (e.g., Barney, 1991, quote above). For example, Lippman and Rumelt (1982) introduced the construct of causal ambiguity but did not specify its sources (Rivkin, 2000). No published studies measured the construct for over a decade after Lippman and Rumelt (1982) first operationalized causal ambiguity as a random distribution variable.

Zander and Kogut's research on international voluntary and involuntary transfer of novel technological competencies (Kogut & Zander, 1992; Zander, 1991; Zander & Kogut, 1995) marked a turning point for competency and causal ambiguity research. Drawing on Winter's (1987) taxonomy of knowledge resources, these scholars measured a firm decision maker's assessments of particular technological practices, thereby providing a foundation for organizational competency research that puts a face on (and a mind in) relevant decision makers.

Over the past decade, conceptual and empirical causal ambiguity research has advanced in making clear ties between competencies and a set of stakeholders. At the individual level, Zollo and Winter (2002) have explicitly considered the role that individual effort and organizational focus may have in determining levels of causal ambiguity. At a dyad level, Szulanski's (1996) study has revealed significant zero-order corre-

lations between causal ambiguity and behavioral and cognitive variables, including motivation and learning capacities. At the firm level, Simonin's (1999) findings have revealed that an organization's lack of experience with a competency generates ambiguity.

Research also has revealed insights based on relationships among decision-making units. Between alliance partners, Simonin (1999) examined the relationship between the competency source and the intended recipient. Empirical findings ascribe increases in causal ambiguity to increased distance between the two firms' organizational cultures and national cultures. Within organizations, Szulanski's (1996) research shows that an arduous relationship between source and recipient is correlated with causal ambiguity. Coff (1997) argues that differences among firm stakeholders in causal ambiguity make shareholders more vulnerable to moral hazard, because individuals take more credit for their role in positive outcomes than is merited.

### Measuring Causal Ambiguity

In survey-based causal ambiguity studies, researchers have examined a range of organizational contexts and decision makers, including best practices (Szulanski, 1993, 1996), competency transfer between strategic alliance partners (Simonin, 1999), and organizational competencies as viewed by top and middle managers in single-business organizations (King & Zeithaml, 2001). These researchers have measured competencies that not only were specifically tied to a set of relevant decision makers but also met the important criterion of being valuable to an organization and therefore grounded in a competitive context (Barney, 2001). Organizational informants, not researchers, identified the "best practice" (Szulanski, 1996), selected the alliance partner whose technology/process know-how was analyzed (Simonin, 1999), and generated industry-specific competencies (King & Zeithaml, 2001). In addition, Szulanski's research advanced Kogut and Zander's empirical analysis of single informants by aggregating responses by source, recipient, and third-party informants. Table 2 presents detailed descriptions of empirical measures of causal ambiguity.

<sup>2</sup> In-depth inquiries have examined multilevel cognition constructs, including organization learning (Crossan, Lane, & White, 1999), organizational knowledge (Nonaka & Takeuchi, 1995), organization memory (Walsh & Ungson, 1991), and organizational intelligence (Glynn, 1996).



**TABLE 2**  
**Empirical Measures of Causal Ambiguity**

Study	Data Analysis	Operationalized As	Methodology, Sample, and Organizational Informants
Lippman & Rumelt (1982)	Economic modeling	"The irreducible uncertainty in post-entry performance" (p. 421) modeled by "letting X, the entrant's total cost at full capacity output, be a random variable with distribution F and density f" (p. 424)	Economic modeling
Szulanski (1996)	Survey scale Key: Y! = yes! Y = yes, but O = no opinion N = no, not really N! = no!	The limits of the <practice> are fully specified With the <practice> we know why a given action results in a given outcome When a problem surfaced with the <practice>, the precise reasons for failure could not be articulated even after the event There is a precise list of the skills, resources, and prerequisites necessary for successfully performing the <practice> It is well known how the components of that list interact to produce <practice>'s output Operating procedures for the <practice> are available Useful manuals for the <practice> are available Existing work manuals and operating procedures describe precisely what people working in the <practice> actually do	Survey administered to individuals involved in intrafirm best practice transfer; 271 individuals spanning 122 transfers of 38 practices in 8 large organizations
Mosakowski (1997)	Event history study	Monotonically decreasing function of a firm's age	63 diversification events from a sample of 122 computer firms that had recently gone public; causal ambiguity operationalized as monotonically decreasing function of a firm's age
Simonin (1999)	Survey scale	The technology/process know-how held by your partner is easily transferable back to your company The association between causes and effects, inputs and outputs, and actions and outcomes related to the technology/process know-how held by your partner is clear	Surveys administered to senior executive in 147 medium and large organizations involved in international strategic alliances

(Continued)

**TABLE 2**  
**(Continued)**

Study	Data Analysis	Operationalized As	Methodology, Sample, and Organizational Informants
King & Zeithaml (2001)	Survey	<p>Linkage ambiguity</p> <p>Individuals evaluated a set of (30+) industry-specific competencies, indicating on a +3 to -3 scale whether their organization was at a competitive advantage or disadvantage for each competency; linkage ambiguity was measured by averaging the sum of the squared differences among the multiple decision makers within each firm and comparing this average to other industry competitors</p> <p>Characteristic ambiguity</p> <p>Tacitness scale</p> <p>In my firm, extensive employee training is offered specifically regarding this competency</p> <p>There is extensive written documentation of this competency in my firm</p> <p>A useful manual or handbook to describe the knowledge necessary for this competency could be written</p> <p>A competitor could acquire this competency by analyzing trade or other publicly available publications</p> <p>Complexity—measured as the average among organizational respondents of points assigned to 4<sup>th</sup> "location" below (organizational mission...)</p> <p>Directions: Valuable competencies can be located in a variety of places in the firm. Please take a moment to review four places that we have listed. With regard to this competency at your firm, please distribute 100 points among the four places to indicate whether the competitive advantage is located at your firm.</p> <p>— employee knowledge and skill</p> <p>— physical systems such as computer data bases, equipment, and software programs</p> <p>— education and incentive systems that support and reinforce knowledge growth</p> <p>— organizational mission, culture, or values that screen and encourage different types of knowledge</p>	<p>Survey administered to 227 top and middle managers in 9 textile firms and 8 hospitals; linkage ambiguity measured by lack of consensus among decision makers on the value of competencies; characteristic ambiguity measured by evaluations of two competencies</p>

Simonin's (1999) study provides important conceptual and empirical development by extending causal ambiguity to an alliance context and examining simultaneous effects of ambiguity and multiple correlates. In addition, this study initiated the use of senior executives as informants, which is consistent with the view that senior executives formulate a firm's interpretation (Daft & Weick, 1984) and with the perspectives of several studies examining management response to causal ambiguity (Coff, 1999: 125; McEvily et al., 2000; Mosakowski, 1997). Subsequent research by King and Zeithaml (2001) has revealed differences among senior and middle managers in levels of causal ambiguity and in the strength of the relationship between causal ambiguity and firm performance.

King and Zeithaml (2001) measured intrafirm causal ambiguity across multiple organizations in two industries. This research contributed measures that captured group differences across competitors in an industry on a broad set of industry-level competencies. In addition, King and Zeithaml examined causal ambiguity about competitive vulnerabilities as well as competencies, revealing that overall intrafirm causal ambiguity among managers in poorly performing firms was higher than among managers in successful firms.

### Shortcomings of Existing Causal Ambiguity Research

Research to date reveals significant progress and illuminates the critical importance of specifying assumptions about key elements of causal ambiguity. In addition, the review of existing studies explicitly considering causal ambiguity reveals some noteworthy shortcomings. One is longitudinal analysis: each of the survey-based studies is cross-sectional. Given the importance of the dynamic nature of competition and the long-term, evolving nature of distinctive competencies and capabilities (Teece et al., 2000: 352), the lack of longitudinal research on causal ambiguity is significant.

Another concern is empirical benchmarking. Each study measures causal ambiguity as a *relative* construct within the research sample; no studies provide guidance for determining a standard by which causal ambiguity could be measured across different studies. In addition, current research does not indicate whether

causal ambiguity is a smooth or "lumpy" construct, or even what levels of causal ambiguity are required to make something causally ambiguous.

These challenges point to a third limitation to studies that focus on causal ambiguity: a general failure to integrate potentially relevant advancements in organizational learning (e.g., Argote, 1999). The organizational learning literature is anchored in assumptions that intrafirm knowledge transfer is likely to sustain competitive advantage and that the transfer of valuable knowledge outside the firm deteriorates competitive advantage (Argote & Ingram, 2000). Rigorous theoretical and empirical studies have examined issues that impede or promote learning about competencies in multiple interfirm and intrafirm contexts—within organizations, across organizations, and among units of "interconnected" organizational forms (Argote, Ingram, Levine, & Moreland, 2000), such as fast food franchises (Darr et al., 1995) and hotel chains (Baum & Ingram, 1998). Organizational learning inquiry has advanced from theory to data utilizing longitudinal performance-based measures (Argote & Ingram, 2000), such as production learning curves and organizational survival (Baum & Ingram, 1998; Darr et al., 1995; Epple, Argote, & Devadas, 1991; Kalnins & Mayer, 2004) to quantify effects of experience on interunit and intraunit learning. Although these studies do not measure organization members' assessments of their firms' competencies, organizational learning studies incorporate important behavioral factors regarding organizational actors, such as worker turnover and management ownership structures, within competitive contexts that can provide foundations for theoretical and empirical insights into causal ambiguity.

The next section builds on the foundation of the literature review and explicitly integrates insights from organizational learning studies to develop a model that examines direct and moderating relationships that influence causal ambiguity and sustainable competitive advantage.

### A MODEL OF CAUSAL AMBIGUITY, FIRM BOUNDARIES, AND SUSTAINABLE COMPETITIVE ADVANTAGE

The dependent variable of the model is the sustainability of a focal firm's competitive ad-

vantage; antecedents and moderators to causal ambiguity include (1) the intrinsic characteristics of competencies, (2) the cues about the causal links between competencies and performance, or cues to causality, (3) the properties of interfirm differences, and (4) the properties of decision-making units.

I begin by disentangling the organizational outcomes of causal ambiguity among a firm's managers from those of causal ambiguity among a firm's competitors. As evidenced in past research, the domain of relevant decision makers can be scoped and parsed in multiple ways. At a basic level, I limit the domain to organization members whose increased understanding of a competency, at either an individual or a group level, will likely be translated into a competitive advantage for their own firm. Therefore, relevant individuals may be decision makers in an organization who are responsible for a competency or individuals at other firms who seek to acquire this competency. Competitors may be decision makers associated with a firm that is a current competitor or a potential competitor, including suppliers and buyers.

Partitioning decision makers' causal ambiguity based on firm boundaries has important consequences. To examine these consequences, I label causal ambiguity among a focal firm's decision makers as *intrafirm ambiguity* (e.g., King & Zeithaml, 2001; Szulanski, 1996; Zollo & Winter, 2002). I define *interfirm ambiguity* as causal ambiguity among competitors (e.g., Dierickx & Cool, 1989; Lippman & Rumelt, 1982). For conceptual clarity, I use the model to consider interfirm causal ambiguity between a focal firm and a single competitor. This is consistent with Kogut and Zander's argument (1992: 392) that the threat of imitation is posed by the most capable competitor. Previous competence-based research has established that competitive engagement takes place at the dyad level (Chen, Smith, & Grimm, 1992), and it has validated examination of interfirm rivalry, resource similarity, and resource asymmetry between a pair of firms (Chen, 1996).

It is valuable to acknowledge hybrid organizational contexts. First are situations where interfirm and intrafirm ambiguity may exist. The motivation to partner with or acquire a firm may be a competitor's recognition that interfirm causal ambiguity about that firm's competencies is irreducible (Ahuja & Katila, 2001; Ranft &

Lord, 2002). During mergers and acquisitions, a focal firm's perspective changes from interfirm causal ambiguity in the negotiation and due diligence phases to intrafirm causal ambiguity during the postmerger integration phase (Ranft & King, 2004). In addition, the permeability of firm boundaries in interorganizational partnerships may vary based on the structure of the partnership and its duration. Finally, drawing the lines between interfirm and intrafirm decision makers within the context of interconnected organizational forms such as franchises (Argote et al., 2000) can introduce more nuanced considerations, such as differentiating franchised stores that share common ownership from those with separate owners (Darr et al., 1995). (See Figure 1.)

### Interfirm Causal Ambiguity

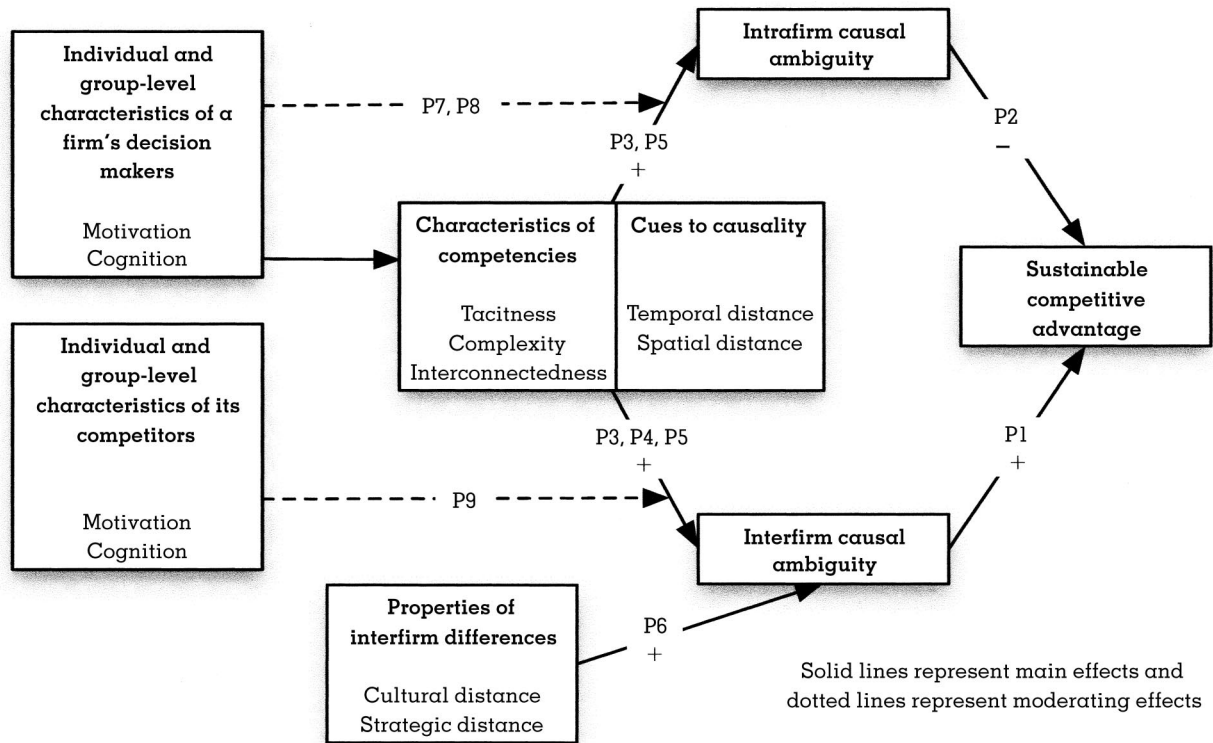
Interfirm causal ambiguity raises the barriers to competitive imitation (e.g., Barney, 1986, 1991; Dierickx & Cool, 1989; Lippman & Rumelt, 1982; McEvily et al., 2000; Reed & DeFillippi, 1990).<sup>3</sup> A competitor's failure to identify or understand how a focal firm uses a key competency severely limits that competitor's options for closing the gap with regard to that competency.

Interfirm ambiguity may deter a competitor from even attempting to imitate a competency because decision makers may fail to recognize the value of the competency (Lippman & Rumelt, 1982) or, in recognizing its value, may choose not to imitate it because of the risk involved in attempting to do what they recognize they do not know (Lado, Boyd, & Hanlon, 1997). Firms that attempt to imitate a competency with high levels of interfirm ambiguity face heightened barriers to successful imitation. Indeed, some scholars argue that, at extreme levels of interfirm causal ambiguity, imitation may only be achieved by luck (Barney, 1986) or through random events (Mosakowski, 1997). Therefore, I offer the following.

*Proposition 1: Ceteris paribus, higher levels of interfirm causal ambiguity are more likely to sustain competitive*

<sup>3</sup> Other barriers to imitation include competencies that are subject to mass efficiencies, history dependence, or legal protection (Barney, 1991; Dierickx & Cool, 1989; Lippman & Rumelt, 1982).

**FIGURE 1**  
**A Model of Interfirm and Intrafirm Causal Ambiguity**



advantage because they (a) deter competitive imitation efforts and (b) decrease the likelihood of successful imitation.

### Intrafirm Causal Ambiguity

While the impact of interfirm causal ambiguity on a focal firm's competitive advantage appears positive, the same may not be said regarding intrafirm causal ambiguity. King and Zeithaml (2001) found a robust inverse relationship between intrafirm ambiguity and firm performance: managers in poorly performing firms exhibited higher levels of causal ambiguity on key competencies than managers in successful firms.

Intrafirm causal ambiguity impedes successful reinvestment in a competency with regard to current opportunities in other parts of the firm or, over time, as new opportunities develop. Failure to understand the link between a competency and its performance outcomes blocks internal managers' ability to learn about and adapt that competency (McEvily et al., 2000;

Reed & DeFillippi, 1990; Winter & Szulanski, 2001). Intrafirm ambiguity may inappropriately limit the options that decision makers consider and, therefore, may lead to poor decision making (Coff, 1997; Simon, 1976). In dynamic business environments, failure to understand the link between a firm's success and its possibilities in the changing market can transform key competencies into rigidities (Ingram & Baum, 1997; Leonard-Barton, 1992; Teece et al., 1997, 2000). In addition, prohibitive information search costs in the face of causal ambiguity are more likely to deter firm managers' attempts to make effective reinvestment decisions (Mosakowski, 1997).

*Proposition 2a: Ceteris paribus, higher levels of intrafirm causal ambiguity are less likely to sustain competitive advantage because they decrease the likelihood of successful reinvestment in the competencies.*

It is difficult for managers to reuse or transfer a competency when they are uncertain of its outcomes. Reed and DeFillippi stated that



"where ambiguity is so great that managers do not understand intra-firm causal relationships, or [where] factor immobility exists, it may be impossible to utilize competencies for advantage" (1990: 91). Firms can create value when competencies are replicated to develop and exploit geographic and product line opportunities and process improvements (Argote, 1999; Teece et al., 2000: 350). Empirical research reveals that innovation increases when a unit's opportunities for competency mobility increase (Tasi, 2001).

Competency mobility allows a firm to leverage a competency. Intrafirm causal ambiguity impedes mobility of a competency within the firm across multiple levels of decision makers (e.g., Lippman & Rumelt, 1982; Reed & DeFillippi, 1990). Empirical evidence supports this claim. Szulanski's (1996) research reveals an association between causal ambiguity and the lack of mobility of best practices in the large organizations he studied.

*Proposition 2b: Ceteris paribus, higher levels of intrafirm causal ambiguity are less likely to sustain competitive advantage because they increase barriers to competency transfer within the firm.*

### Competency Characteristics and Cues to Causality

The next step in model development is to examine direct and moderating relationships that influence interfirm and intrafirm causal ambiguity. Research suggests that causal ambiguity in organizations is related to characteristics of competencies and competency-outcome relationships, as well as characteristics of and relationships among decision-making units.

In the following sections I argue that characteristics of the competency and the competency-outcome relationship directly affect both interfirm and intrafirm causal ambiguity and that the relationship between a focal firm and its competitor directly affects interfirm causal ambiguity. I then discuss behavioral factors that moderate the relationship between causal ambiguity and related constructs.

**Competencies.** As discussed in the literature review, Reed and DeFillippi (1990) have proposed that certain intrinsic characteristics of

competencies are associated with causal ambiguity, and several studies support and extend this argument (e.g., Barney, 1991; King & Zeithaml, 2001; Simonin, 1999; Szulanski, 1996). Theoretical and empirical research suggests that three characteristics of competencies—complex versus simple, tacit versus articulated, and interconnected versus independent (Garud & Nayyar, 1994; Winter, 1987)—affect levels of causal ambiguity at a firm.

Complex competencies strain decision makers' cognitive limits and generate causal ambiguity (Reed & DeFillippi, 1990; Rivkin, 2000, 2001; Simonin, 1999). Complex competencies can be as inscrutable to managers inside a firm as they are to competitors (Makadok & Barney, 2001). As Barney argues, "In complex, highly interdependent human or technological systems, the causes of success and failure are often difficult to assign . . . [and] the establishment of cause-effect relationships can be very difficult" (1985, quoted in Reed & DeFillippi, 1990: 92). Reed and DeFillippi (1990) argue that the effect of complexity on interfirm causal ambiguity is curvilinear because of the geometric growth in interaction effects as complexity increases.

In addition, tacitness affects both the firm's and a competitor's understanding of causal relationships; when a competency is highly tacit, even a skilled person responsible for the competency may be unaware of the actions involved (Nelson & Winter, 1982; Reed & DeFillippi, 1990). Empirical evidence shows significant relationships between the characteristic of tacitness and both intrafirm (King & Zeithaml, 2001) and interfirm (Simonin, 1999) causal ambiguity.

*Proposition 3: The greater the complexity and tacitness of competencies, the greater the levels of interfirm and intrafirm causal ambiguity.*

Dierickx and Cool (1989) argue that, over time, a firm's capacity to accumulate valuable resources is a function of the interconnectedness of the firm's existing resources with the targeted resources. Systemic competencies that are embedded in interactions within a firm are difficult for outsiders to understand and duplicate (Argote & Ingram, 2000; Garud & Nayyar, 1994; Teece et al., 1997; Winter, 1987). According to Reed and DeFillippi, when competencies are "highly specific and interdependent with the firm . . . these relationships, skill and resource



deployments can remain ambiguous to the competition" (1990: 92). For example, valuable production and service competencies transfer more effectively across organizational units that are embedded in superordinate franchise or chain relationships than across independent units (Baum & Ingram, 1998; Darr et al., 1995). Competencies that are interconnected with idiosyncratic elements of an organization, therefore, may increase interfirm causal ambiguity.

*Proposition 4: The greater the interconnectedness of a firm's competencies, the greater the level of interfirm causal ambiguity.*

**Cues to causality.** Philosophers, psychologists, and organization scholars argue that patterns of cause-effect relationships explain variance in people's abilities to assess causality (e.g., Amit & Schoemaker, 1993: 41; Einhorn & Hogarth, 1986; Hume, 1978). For example, the challenge of assessing causality decreases with spatial and temporal contiguity between an input and its output (Hume, 1978). These "cues to causality" (Einhorn & Hogarth, 1986) are potentially relevant to decision makers who wish to assess the causal relationship between competencies and organizational outcomes.

The inability to observe a competency in use is an obstacle to effective decision making about that competency (Epple et al., 1996; Rivkin, 2001; Winter, 1987). A firm's capacity to evoke a competency is associated with the frequency, recency, and proximity of its use (Garud & Nayyar, 1994; Levitt & March, 1988; Nerkar, 2003). Differences in exposure to outputs from learning, therefore, may influence the levels and success of learning efforts (Nelson & Winter, 1982; Winter, 2000: 991-992).

In recent organizational literature, scholars have considered the relevance of spatial distance to interfirm and intrafirm knowledge diffusion (e.g., Ingram & Baum, 1997; Tallman, Jenkins, & Henry, 2004; Winter & Szulanski, 2001; Zollo & Winter, 2002). A competency and its outcome are spatially contiguous when the outcome occurs in physical proximity to the competency. A small firm's competency in logistics that is embodied in on-site decisions by a local logistics manager is spatially contiguous to its outcome. Another firm's competency in logistics, executed through a large information technology system administered by corporate head-

quarters, reflects a lower level of spatial contiguity. Firms may choose to protect competencies by geographically separating production functions, although this isolation restricts competency transfer within the firm as well as to competitors (Argote et al., 1990; Epple et al., 1991; Liebeskind, 1997).

Temporal contiguity reflects the length of time between when a competency is executed and when the evidence of that resource's value added is revealed. For example, a business school's competency in delivering marketable executive education programs is more temporally contiguous to its effect on organizational performance than that school's competency in developing undergraduate students who are future business leaders. Time lags between the development of technology competencies and ensuing market introductions present significant demands and uncertainties for firms (Garud & Nayyar, 1994). Organizational decision makers' understanding of causal relationships distorts and deteriorates quickly over time (Walsh & Ungson, 1991: 68). Because managers can learn from their firm's and competitors' failures (Ingram & Baum, 1997; Sitkin, 1992), causal ambiguity likely will be higher when a long interval between a competency's execution and its outcome limits opportunities for performance assessment. In addition, longer time gaps may raise decision makers' propensity to engage in self-serving attributions (Miller & Ross, 1975) that can distort more accurate assessments of competency-performance relationships.

It is reasonable to extend the literature on causality and organizational learning to argue that increased spatial or temporal distance between a competency and its performance outcome increases the challenge faced by decision makers who seek to understand this relationship, regardless of who the decision makers may be.

*Proposition 5: The greater the spatial or temporal distance between a competency and firm performance, the greater the levels of interfirm and intrafirm causal ambiguity.*

### **Interfirm Differences That Influence Interfirm Causal Ambiguity**

Interfirm resource heterogeneity is a necessary condition of competence-based perspec-

tives. Interorganizational learning about heterogeneous resources (e.g., a competitor's increased understanding of the relationship between a focal firm's competency and its outcomes) is influenced by similarities and differences between the competitive firm and the focal firm, such as similarities between their knowledge bases (Darr et al., 1995; Ingram & Baum, 1997; Lane & Lubatkin, 1998; Teece, 1986). Hence, interfirm causal ambiguity may be generated by differences between a firm and a competitor.

Causal ambiguity research suggests that additional interfirm organizational properties influence interfirm causal ambiguity. In his study of causal ambiguity between alliance partners, Simonin (1999) found that one partner's ambiguity about the other partner's technology/process competencies was positively related to organizational and cultural distance between partners. Organizational distance was operationalized as differences in business practices and organizational culture. Cultural distance was operationalized as differences in the national culture and language. Similarly, Darr and Kurtzberg (2000) found that successful knowledge transfer was more likely when independent pizza stores were strategically similar (expansionist versus cost cutter).

*Proposition 6: The greater the interfirm strategic and cultural differences, the greater the level of interfirm causal ambiguity.*

### Properties of the Decision-Making Units

The constructs of interfirm and intrafirm causal ambiguity distinguish ambiguity by the decision makers' organizational affiliations. The final constructs included in the model describe characteristics of these decision-making units.

Including both the characteristics of the focal firm's decision makers and the characteristics of the competitive firm's decision makers contributes to the model in two ways. First, decision maker characteristics directly relate to key antecedents to causal ambiguity. In the model, the direct relationships between decision maker characteristics and causal ambiguity sources are supported by a long stream of research demonstrating that decision makers influence an organization's strategic choices (Hambrick &

Mason, 1984), specifically the content and characteristics of organizational competencies (e.g., Mahoney & Pandian, 1992; Reed & DeFillippi, 1990; Verona, 1999).

Second, these constructs act as moderators in the model. As March suggests, "The ambiguities of knowledge and desires reflect partly the cognitive limitations of individuals and organizations" (1996: 285). Specifically, the relative influence of sources of causal ambiguity on causal ambiguity among a given set of decision makers depends on the individual and contextual properties of those decision makers. Causal ambiguity is a cognitive concept describing decision makers' understanding of competencies and their organizational outcomes. Properties that capture individual-level and organization-level capacities help explain differences in causal ambiguity across decision-making units (Argote & Ingram, 2000; Mosakowski, 1997; Simon, 1973). The most useful constructs (1) differentially influence levels of intrafirm and interfirm causal ambiguity and (2) resist quick equilibration of intrafirm and interfirm ambiguity through such acts as defection of a single informant or systematic analysis of the competency.

When internal decision makers' skills and interests match the demands of a firm's valuable competencies, it is likely that intrafirm causal ambiguity will be lower (Argote & Ingram, 2000; Darr et al., 1995). In addition, individuals' characteristics may provide insights into patterns regarding organization members who are more or less effective in managing ambiguity. Rumelt argues that "because isolating mechanisms act to protect the first successful mover, speed is critical despite (and, in fact, because of) high levels of ambiguity. Good strategy is not necessarily enacted with a high level of initial confidence" (1984: 569). Internal managers who are proactive (Bateman & Crant, 1993) or who have a high tolerance for ambiguity (Bhagat, Kedia, Harveston, & Triandis, 2002; Ghosh & Ray, 1992) may be more likely to take actions that decrease intrafirm causal ambiguity, for they may be more eager to seek information and draw conclusions based on highly ambiguous knowledge.

*Proposition 7: Firm decision makers' characteristics influence the relationships between intrafirm causal ambiguity and its antecedents. The effects of (a) the characteristics of a competency or (b) the cues to causality on*

*intrafirm causal ambiguity are significantly smaller in the presence of firm decision makers who are proactive or have a high tolerance for ambiguity.*

Motivation matters (March & Olsen, 1982). Szulanski (1996) found that higher levels of causal ambiguity are associated with decision-making units that lack motivation. Motivation is a strong predictor of interfirm competitive actions (Chen, 1996; Chen & Miller, 1994) and intrafirm causal ambiguity: firms that encourage and reward competition between organizational units are less successful in transferring competencies across units (Argote, 1999). In this model, motivation is critical, because a fundamental difference between decision makers at a focal firm and those of a competitor is their organizations' goals with regard to causal ambiguity about a focal firm's competencies. Competitors seek to decrease interfirm causal ambiguity. Rational decision makers at a focal firm seek to decrease intrafirm ambiguity while preserving interfirm ambiguity. Executives have successfully redesigned their organizations' architectures to this end. One example is Jack Welch's "boundary-less" initiative at GE, which tied executive development and compensation to an individual's demonstrated abilities to procure knowledge from competitors, as well as share insights within GE (Welch, 2001).

Mindful reflection and purposeful collective effort can reduce ambiguity (Zollo & Winter, 2002). Aligned motivations may help explain findings that pizza franchises sharing common ownership transfer knowledge more effectively than franchises with different owners (Darr et al., 1995). Properties that capture decision makers' motivations to make choices consistent with their organization's goals may explain differences in causal ambiguity among decision makers (Rivkin, 2001). Individual and organizational incentives that encourage actions consistent with the organization's goals toward causal ambiguity can influence intrafirm and interfirm causal ambiguity.

*Proposition 8: A firm's organization-level characteristics influence the relationships between intrafirm causal ambiguity and its antecedents. Specifically, the effects of (a) the competency characteristics or (b) the cues to causality on intrafirm causal ambiguity are significantly smaller when a*

*firm's incentives reward intrafirm ambiguity reduction than when they do not.*

*Proposition 9: A competitor's organization-level characteristics influence the relationships between interfirm causal ambiguity and its antecedents. Specifically, the effects of (a) the competency characteristics or (b) the cues to causality on interfirm causal ambiguity are significantly smaller when a competitor's incentives reward interfirm ambiguity reduction than when they do not.*

## DISCUSSION

Schoemaker (1990) has called for research that recognizes both the "rationality" of competitive profit pressures and the individual and group behavioral friction forces that obstruct assumptions of reaching perfect competition. In this paper I attempt to address this challenge. Specifically, I delve deeply into causal ambiguity and seek to describe and explain more clearly how causal ambiguity acts as a friction force to both build and erode competitive advantage. In addition, I attempt to map and extend our understanding of the sources of causal ambiguity and provide guidance about promising avenues for future research.

Research on causal ambiguity has advanced significantly in the past decade. Still, many possibilities remain for developing our understanding of its opportunities and challenges more fully. Precisely because organizational issues are intrinsically messy, any model that organizes and simplifies causal ambiguity has the power to deepen our understanding of strategic issues and to strengthen our recommendations for managing causal ambiguity.

One contribution of this paper is the presentation of constructs and propositions that clearly indicate the implications of understanding the domain of decision makers and causal ambiguity. In a provocative interview, Aldrich (Murrmann, Aldrich, Levinthal, & Winter, 2003) put forth the idea that "if we truly focused on routines, competencies, practices, and so on, we would NOT follow people anymore in our research. Instead we should follow how competencies spread, replicate, and insinuate themselves into organizations. People would disappear

from the equation" (2003: 27). This paper makes clear that if people disappear, so does causal ambiguity, because causal ambiguity about competencies is inextricably bound to organizational decision makers.

The model calls attention to the importance of directly associating decision makers with a competency. Competencies, particularly tacit and socially complex competencies, are "invisible assets" (Itami, 1987) that may be embedded deep within a firm. To truly assess and understand causal ambiguity, one must identify "who is in charge" of significant competencies. Causal ambiguity among a range of organizational decision makers influences how well competencies are executed, transferred, developed, and adapted to new uses and to changing business environments.

For example, reinvestment in a competency is a function of firm members' understanding (low intrafirm ambiguity) and resource access (Rivkin, 2001). No matter how clear organization members are regarding a competency's value, if they cannot obtain resources to invest in it, the competency will lose value just as surely as if members had not recognized what to do. Causal ambiguity among senior executives influences their effectiveness in choosing which competencies to focus on and which to let go, in deciding the level of organizational commitment to important competencies, and in garnering complementary and essential resources to develop competencies. King and Zeithaml (2001) found that intrafirm causal ambiguity among middle managers is more highly correlated with (poor) firm performance than is causal ambiguity among top managers. This finding is consistent with organizational learning research, which suggests that "higher level managers rely more upon ambiguous information . . . than do lower level managers" (Levitt & March, 1988: 327; Daft & Lengel, 1984). It also, however, reveals a theoretical (and empirical) challenge in understanding causal ambiguity. To help scholars continue to develop, validate, and measure the construct, Table 3 provides a template for a potentially fruitful research agenda.

For example, future researchers will need to manage several trade-offs in deciding the scope of competencies to analyze. Measuring causal ambiguity becomes increasingly complicated as inquiry moves from technology transfer and relatively static resources to the realm of higher-

order competencies and dynamic capabilities. The logic of measuring causal ambiguity among engineers, technical managers, and production workers (Darr et al., 1995; Kogut & Zander, 1992; Szulanski, 1996) is compelling when the competency can be narrowed to specific technologies and best practices. Narrow domains (e.g., a best practice) may provide opportunities for longitudinal analysis (e.g., Argote, 1999; Darr et al., 1995) and increase confidence in both the identification of relevant decision makers and the reliability of informants' responses; narrow definitions also may miss more encompassing and valuable competencies or dynamic capabilities on which strategic value is built and sustained.

A related issue is the potential analysis of multiple competencies. Because firms typically rely on several or many related competencies, a multicompetency approach is conceptually sound. However, multicompetency studies also raise several issues that make results difficult to interpret, including weighing the relative importance of competencies and dealing with the implications of including competitive rigidities or vulnerabilities in the portfolio of competencies. Although they do not exploit the prospect, King and Zeithaml (2001) appear to offer the opportunity to examine systematic differences in the content of multiple competencies among firms in the same industry. However, despite a sample of over 225 managers, the organizational sample size of 17 significantly limits the power to test multiple variables.

Testing of this model will require a multicompetitor sample, similar to that of King and Zeithaml's (2001), with additional measures of decision-making unit properties (e.g., Simonin, 1999; Szulanski, 1996) and dyadic assessments of interfirm causal ambiguity. Analyzing competencies across multiple competitors raises similar interpretative issues but also provides opportunities for industry control and the potential to measure important characteristics (e.g., interfirm differences). Achieving a sample size that will allow such measurement—given the additional variables, interaction effects among variables, and potentially greater respondent resistance owing to additional time demands—will undoubtedly require trade-offs.

In addition, issues of time and timing cannot be ignored. Simonin's (1999) elegant approach to addressing the role of time by dividing his sample by alliance duration revealed that the rela-



**TABLE 3**  
**Template for Future Theory Building in Causal Ambiguity**

Key Elements to Specify	Dimensions	Examples
Relevant internal decision makers	Senior executives	Executives (Simonin, 1999)
	Lower-level managers or employees with direct responsibility	Direct responsibility (Argote, 1999; Kogut & Zander, 1992; Szulanski, 1996; Zander, 1991; Zander & Kogut, 1995) Both (King & Zeithaml, 2001)
	Relevant level(s) of analysis—individual, team, firm	Individual and firm (context) (Kogut & Zander, 1992; Simonin, 1999; Szulanski, 1996; Zander, 1991; Zander & Kogut, 1995) Team and firm (Argote, 1999; King & Zeithaml, 2001)
	Primary between-unit concern—lateral or up/down hierarchy	Horizontal (Kogut & Zander, 1992; Szulanski, 1996; Zander, 1991; Zander & Kogut, 1995) Vertical—not tested
Competitive decision makers	Identify key competitor	None
	Senior executives versus lower-level employees	None
	Relevant level(s) of analysis—individual, team, firm	None
Competency/competencies	Specify content/scope of competency	Technological (Kogut & Zander, 1992; Simonin, 1999; Zander, 1991; Zander & Kogut, 1995) Industrial manufacturing productivity (Argote et al., 1990) Fast food service productivity (Darr et al., 1995)
	Focus on single versus multiple competencies	Managerial best practice (Szulanski, 1996) Multiple organizational competencies (broad range) (King & Zeithaml, 2001)
	Define relevant context(s)	Valuable to firm—all Valuable to firms in an industry (Argote et al., 1990; Darr et al., 1995; King & Zeithaml, 2001)
Competency-based antecedents	Tacitness measures	All survey-based studies
	Social complexity measures	All survey-based studies and Rivkin (2001)
Cues to causality (the causal link between a competency and its performance outcomes)	Temporal distance	Congenital experience (Baum & Ingram, 1998; Kalnins & Mayer, 2004)
	Spatial distance	Zip code (Chung & Kalnins, 2001) Inside/outside defined geographic region (Baum & Ingram, 1998)
Behavioral antecedents—decision makers	Motivation and cognition measures	Kogut & Zander (1992), Simonin (1999), Szulanski (1996), Zander (1991), Zander & Kogut (1995)
Organization-level antecedents	Incentives measures	Shared ownership versus independent franchises (Darr et al., 1995)
	Firm history	Firm age (Mosakowski, 1997)

(Continued)

**TABLE 3**  
(Continued)

Key Elements to Specify	Dimensions	Examples
Time and timing	Experience with competency	Manufacturing and service learning curves (Argote & Eppele, 1990)
	Experience with decision-making group	Tenure (King & Zeithaml, 2001)
	Experience in competitive dyad	Alliance duration (Simonin, 1999)

tionship between competency complexity and causal ambiguity disappears with experience. Survey-based research to date has been cross-sectional, so alternative hypotheses (e.g., high levels of causal ambiguity lead to competencies with causally ambiguous characteristics; interfirm causal ambiguity generates interfirm differences) cannot be ruled out. Combining survey-based methods with longitudinal research methods on learning in chain organizations (Argote, 1999) offers the potential to move beyond correlation to causation in causal ambiguity empirical research. However, there is a fundamental conundrum in extricating causal ambiguity, learning, and experience (March & Olsen, 1982); indeed, Mosakowski (1997) used the inverse of firm age as a proxy for causal ambiguity. The dynamic nature of competition and the long-term, evolving nature of distinctive competencies and capabilities (Teece et al., 2000: 352) limit insights of longitudinal research with the causal ambiguity construct. Causal ambiguity is embedded in a set of decision makers and a dynamic competitive context that stymie comparison over time. While complementary longitudinal metrics that capture changes in narrow competencies (i.e., pizza production) may help address important yet, to date, ignored causal ambiguity issues of job and organization turnover, the inevitable evolution (or transformation) of competencies over time and the resulting changes in relevant decision makers (Garud & Kotha, 1994) will be difficult to control.

This paper maps and extends our understanding of the sources of causal ambiguity. In addition to considering competency characteristics, the model introduces the nature of the competency-performance linkage as a source of causal ambiguity. Although definitions of causal ambiguity often focus on ambiguity about the link between competency and performance, proper-

ties of this link have not been systematically considered. These "cues to causality" can add richness to scholars' exploration of the effects of spatial and temporal proximity on causal ambiguity among firm and competitor decision makers. In addition, organizational learning studies may provide insights into useful metrics for temporal distance (Baum & Ingram, 1998; Kalnins & Mayer, 2004) and spatial distance (Baum & Ingram, 1998; Chung & Kalnins, 2001) for future research on causal ambiguity.

Further analysis of cues to causality also may help identify influential moderators. For example, transformative capacity—a firm's capacity to transfer technology over time (Garud & Nayyar, 1994)—is a function of the maintenance of firms' capacities to choose, maintain, reactivate, and synthesize technology in the face of ambiguity. When temporal distance is the source of causal ambiguity, units with better memory (Walsh & Ungson, 1991) or higher retentive capacities (Szulanski, 1996), because they have superior access to both the inputs and outcomes of competencies, may have lower levels of causal ambiguity (Garud & Nayyar, 1994).

In addition, in-depth examination of these cues to causality may also lead to a more refined view of causal ambiguity. A fundamental assumption of this model is that decreased levels of causal ambiguity allow organization members to make better decisions for their firms. While this assumption is often valid, there may be important exceptions; indeed, Amit and Schoemaker warn that managers' efforts to identify competencies may be biased because "imputations about causality . . . may be overly sensitive to temporal and spatial contiguity" (1993: 41; emphasis added). In future research, therefore, scholars should recognize and explore situations where decreased causal ambiguity may lead decision makers to make less effective decisions.



Finally, this model assumes that the division between interfirm and intrafirm decision makers is clear. One potential direction for future inquiry involves the roles and trade-offs of quasi-related decision makers, such as suppliers and customers (Zander, 1991: 500). Similarly, scholars may build on the organizational learning literature and examine interconnected organizational units where partitioning decision makers is particularly murky, such as the relationships among and between franchisors, and the differences between franchised stores that share common ownership and those with separate owners (Darr et al., 1995). Deeper insights also may be gained by examining situations where interfirm and intrafirm causal ambiguity coexist, such as alliances or mergers and acquisitions (e.g., Ranft & King, 2004).

## REFERENCES

- Ahuja, G., & Katila, R. 2001. Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. *Strategic Management Journal*, 22: 197–220.
- Amit, R., & Schoemaker, P. J. H. 1993. Strategic assets and organizational rent. *Strategic Management Journal*, 14: 33–46.
- Argote, L. 1999. *Organizational learning: Creating, retaining, and transferring knowledge*. Boston: Kluwer.
- Argote, L., Beckman, S. L., & Epple, D. 1990. The persistence and transfer of learning in industrial settings. *Management Science*, 36: 140–154.
- Argote, L., & Epple, D. 1990. Learning curves in manufacturing. *Science*, 247: 920–925.
- Argote, L., & Ingram, P. 2000. Knowledge transfer: A basis for competitive advantage in firms. *Organizational Behavior and Human Decision Processes*, 82: 150–169.
- Argote, L., Ingram, P., Levine, J. M., & Moreland, R. L. 2000. Knowledge transfer in organizations: Learning from the experience of others. *Organizational Behavior and Human Decision Processes*, 82: 1–8.
- Barney, J. B. 1985. Information cost and the governance of economic transactions. In R. D. Nacmali & A. Rugia-dinin (Eds.), *Organizations and markets*: 347–372. Milan: Societa Editrice it Milano.
- Barney, J. B. 1986. Organizational culture: Can it be a source of sustained competitive advantage? *Academy of Management Review*, 11: 656–665.
- Barney, J. B. 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17: 99–120.
- Barney, J. B. 2001. Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management*, 27: 643–650.
- Bateman, T. S., & Crant, J. M. 1993. The proactive component of organizational behavior. *Journal of Organizational Behavior*, 14: 103–118.
- Baum, J. A. C., & Ingram, P. 1998. Survival-enhancing learning in the Manhattan hotel industry, 1898–1980. *Management Science*, 44: 996–1016.
- Bhagat, R. S., Kedia, B. L., Harveston, P. D., & Triandis, H. C. 2002. Cultural variations in the cross-border transfer of organizational knowledge: An integrative framework. *Academy of Management Review*, 27: 204–221.
- Chen, M.-J. 1996. Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review*, 21: 100–134.
- Chen, M.-J., & Miller, D. 1994. Competitive attack, retaliation, and performance: An expectancy-valence framework. *Strategic Management Journal*, 15: 85–102.
- Chen, M.-J., Smith, K. G., & Grimm, C. M. 1992. Action characteristics as predictors of competitive responses. *Management Science*, 38: 439–455.
- Chung, W., & Kalnins, A. 2001. Agglomeration effects and performance: A test of the Texas lodging industry. *Strategic Management Journal*, 22: 969–988.
- Coff, R. 1997. Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Academy of Management Review*, 22: 374–402.
- Coff, R. 1999. When competitive advantage doesn't lead to performance: The resource-based view and stakeholder bargaining power. *Organization Science*, 10: 119–133.
- Crossan, M. M., Lane, H. W., & White, R. E. 1999. An organizational learning framework: From intuition to institution. *Academy of Management Review*, 24: 522–538.
- Cyert, R. M., & March, J. G. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Daft, R. L., & Lengel, R. H. 1984. Information richness: A new approach to managerial behavior and organizational design. *Research in Organizational Behavior*, 6: 191–233.
- Daft, R. L., & Weick, K. E. 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review*, 9: 284–295.
- Darr, E. D., Argote, L., & Epple, D. 1995. The acquisition, transfer and depreciation of knowledge in service organizations: Productivity in franchises. *Management Science*, 41: 1750–1762.
- Darr, E. D., & Kurtzberg, T. R. 2000. An investigation of partner similarity dimensions on knowledge transfer. *Organizational Behavior and Human Decision Processes*, 82: 28–44.
- Dierickx, I., & Cool, K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science*, 35: 1504–1514.
- Einhorn, H. J., & Hogarth, R. M. 1986. Judging probable cause. *Psychological Bulletin*, 99: 3–19.
- Eisenhardt, K. M., & Martin, J. A. 2000. Dynamic capabilities: What are they? *Strategic Management Journal*, 21: 1105–1121.
- Epple, D., Argote, L., & Devadas, R. 1991. Organizational learning curves: A method for investigating intra-plant

- transfer of knowledge acquired through learning by doing. *Organization Science*, 2: 58–70.
- Epple, D., Argote, L., & Murphy, K. 1996. An empirical investigation of the micro structure of knowledge acquisitions and transfer through learning by doing. *Operations Research*, 44: 77–86.
- Foss, N. 1996. Knowledge-based approaches to the theory of the firm: Some critical comments. *Organization Science*, 7: 470–477.
- Garud, R., & Kotha, S. 1994. Using the brain as a metaphor to model flexible production systems. *Academy of Management Review*, 19: 671–698.
- Garud, R., & Nayyar, P. R. 1994. Transformative capacity: Continual structuring by intertemporal technology transfer. *Strategic Management Journal*, 15: 365–386.
- Ghosh, D., & Ray, M. R. 1992. Risk attitude, ambiguity intolerance, and decision making: An exploratory investigation. *Decision Sciences*, 23: 431–444.
- Glynn, M. A. 1996. Innovative genius: A framework for relating individual and organizational intelligences to innovation. *Academy of Management Review*, 21: 1081–1112.
- Hambrick, P., & Mason, D. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9: 193–206.
- Hume, D. 1978. (First published in 1739.) *A treatise of human nature*. Oxford: Oxford University Press.
- Ingram, P., & Baum, J. A. C. 1997. Opportunity and constraint: Organizations' learning from the operating and competitive experience of industries. *Strategic Management Journal*, 18(Summer Special Issue): 75–98.
- Itami, K. 1987. *Mobilizing invisible assets*. Cambridge, MA: Harvard University Press.
- Kalnins, A., & Mayer, K. J. 2004. Franchising, ownership, and experience: A study of pizza restaurant survival. *Management Science*, 50: 1716–1728.
- King, A. W., & Zeithaml, C. P. 2001. Competencies and firm performance: Examining the causal ambiguity paradox. *Strategic Management Journal*, 22: 75–99.
- Kogut, B., & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3: 383–397.
- Lado, A. A., Boyd, N. G., & Hanlon, S. C. 1997. Competition, cooperation, and the search for economic rents: A syncretic model. *Academy of Management Review*, 22: 110–141.
- Lane, P. J., & Lubatkin, M. 1998. Relative absorptive capacity and intraorganizational learning. *Strategic Management Journal*, 19: 461–477.
- Leonard-Barton, D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13: 111–125.
- Levitt, B., & March, J. G. 1988. Organizational learning. *Annual Review of Sociology*, 14: 319–340.
- Liebeskind, J. P. 1997. Keeping organizational secrets: Protective institutional mechanisms and their costs. *Industrial and Corporate Change*, 6: 623–663.
- Lippman, S., & Rumelt, R. 1982. Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics*, 13: 418–438.
- Mahoney, J. T., & Pandian, J. R. 1992. The resource-based view within the conversation of strategic management. *Strategic Management Journal*, 13: 383–380.
- Makadok, R. 2001. Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal*, 22: 387–401.
- Makadok, R., & Barney, J. B. 2001. Strategic factor market intelligence: An application of information economics to strategy formulation and competitor intelligence. *Management Science*, 47: 1621–1638.
- March, J. G. 1996. Continuity and change in theories of organizational action. *Administrative Science Quarterly*, 41: 278–287.
- March, J. G., & Olsen, J. P. 1982. Organizational learning and the ambiguity of the past. In J. G. March & J. P. Olsen (Eds.), *Ambiguity and choice in organizations*: 54–68. Bergen: Universitetsforlaget.
- McEvily, S. K., Das, S., & McCabe, K. 2000. Avoiding competence substitution through knowledge sharing. *Academy of Management Review*, 25: 294–311.
- Miller, S. T., & Ross, M. 1975. Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin*, 82: 93–118.
- Mosakowski, E. 1997. Strategy making under causal ambiguity: Conceptual issues and empirical evidence. *Organization Science*, 8: 414–442.
- Murmann, J. P., Aldrich, H., Levinthal, D., & Winter, S. G. 2003. Evolutionary thought on management and organization theory at the beginning of the new millennium. *Journal of Management Inquiry*, 12: 22–40.
- Nelson, R. R., & Winter, S. G. 1982. *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press of Harvard University Press.
- Nerkar, A. 2003. Old is gold? The value of temporal exploration in the creation of new knowledge. *Management Science*, 49: 211–230.
- Nonaka, I., & Takeuchi, H. 1995. *The knowledge-creating company*. New York: Oxford University Press.
- Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14: 179–192.
- Porter, M. E. 1985. *Competitive advantage: Creating and sustaining superior performance*. New York: Free Press.
- Priem, R. L., & Butler, J. E. 2001. Is the resource-based “view” a useful perspective for strategic management research? *Academy of Management Review*, 26: 22–40.
- Ranft, A. L., & King, A. W. 2004. *Understanding the pace of acquisition integration: Examining resource and expectational ambiguity*. Paper presented at the annual meeting of the Academy of Management, New Orleans.
- Ranft, A. L., & Lord, M. D. 2002. Acquiring new technologies and capabilities: A grounded model of acquisition implementation. *Organization Science*, 13: 420–441.
- Reed, R., & DeFillippi, R. J. 1990. Causal ambiguity, barriers

- to imitation, and sustainable competitive advantage. *Academy of Management Review*, 15: 88–102.
- Rivkin, J. W. 2000. Imitation of complex strategies. *Management Science*, 46: 824–844.
- Rivkin, J. W. 2001. Reproducing knowledge: Replication without imitation at moderate complexity. *Organization Science*, 12: 274–293.
- Rumelt, R. P. 1984. Toward a strategic theory of the firm. In R. Lamb (Ed.), *Competitive strategic management*: 556–570. Englewood Cliffs, NJ: Prentice-Hall.
- Schoemaker, P. J. H. 1990. Strategy, complexity, and economic rent. *Management Science*, 36: 1178–1192.
- Simon, H. A. 1973. The structure of ill-structured problems. *Artificial Intelligence*, 4: 181–201.
- Simon, H. A. 1976. *Administrative behavior: A study of decision-making processes in administrative organization*. New York: Free Press.
- Simonin, B. L. 1999. Ambiguity and the process of knowledge transfer in strategic alliances. *Strategic Management Journal*, 20: 595–624.
- Sitkin, S. B. 1992. Learning through failure: The strategy of small losses. *Research in Organizational Behavior*, 14: 231–266.
- Sponder, J.-C., & Grant, R. M. 1996. Knowledge and the firm: Overview. *Strategic Management Journal*, 17(Winter Special Issue): 5–9.
- Szulanski, G. 1993. Intrafirm transfer of best practice, appropriative capabilities, and organizational barriers to appropriation. *Academy of Management Best Paper Proceedings*: 47–51.
- Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(Winter Special Issue): 27–43.
- Tallman, S., Jenkins, M., & Henry, N. 2004. Knowledge, clusters, and competitive advantage. *Academy of Management Review*, 29: 258–271.
- Tasi, W. 2001. Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44: 996–1004.
- Teece, D. J. 1986. Profiting from technological innovation. *Research Policy*, 15: 286–303.
- Teece, D. J., Pisano, G., & Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18: 509–533.
- Teece, D. J., Pisano, G., & Shuen, A. 2000. Dynamic capabilities and strategic management. In G. Dosi, R. R. Nelson, & S. G. Winter (Eds.), *Nature and dynamics of organizational capabilities*: 334–362. New York: Oxford University Press.
- Verona, G. 1999. A resource-based view of product development. *Academy of Management Review*, 24: 132–142.
- Walsh, J. P., & Ungson, G. R. 1991. Organizational memory. *Academy of Management Review*, 16: 57–91.
- Welch, J. F. 2001. *Straight from the gut*. New York: Warner Business Books.
- White, P. A. 1990. Ideas about causation in philosophy and psychology. *Psychological Bulletin*, 108: 3–18.
- Williamson, O. E. 1999. Strategy research: Governance and competence perspectives. *Strategic Management Journal*, 20: 1087–1108.
- Winter, S. G. 1987. Knowledge and competence as strategic assets. In D. Teece (Ed.), *The competitive challenge: Strategies for industrial innovation and renewal*: 159–184. Cambridge, MA: Ballinger.
- Winter, S. G. 2000. Satisficing and capability learning. *Strategic Management Journal*, 21: 981–996.
- Winter, S. G., & Szulanski, G. 2001. Replication as strategy. *Organization Science*, 12: 730–743.
- Zander, U. 1991. *Exploiting a technological edge—Voluntary and involuntary dissemination of technology*. Stockholm: Stockholm School of Economics.
- Zander, U., & Kogut, B. 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. *Organization Science*, 6: 76–92.
- Zollo, M., & Winter, S. G. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13: 339–351.

**Adelaide Wilcox King** (adelaide@virginia.edu) is associate professor and senior associate dean at the McIntire School of Commerce at the University of Virginia. She received her Ph.D. in strategic management from the University of North Carolina at Chapel Hill. Her research focuses on behavioral decision making, organizational competencies, and competitive advantage.

Copyright of *Academy of Management Review* is the property of Academy of Management and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.