

COMPETENCIES AND FIRM PERFORMANCE: EXAMINING THE CAUSAL AMBIGUITY PARADOX

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Resource-based theory argues that resources must be valuable, rare, inimitable, and lack substitutes to confer competitive advantage. Inimitability is a lynchpin of resource-based theory and central to understanding the sustainability of competitive advantage.

Although scholars recognize a positive relationship between causal ambiguity and inimitability, the relationship among critical resources called competencies, causal ambiguity, and firm performance remains an unresolved conundrum. One perspective suggests that causal ambiguity regarding competencies and performance is necessary among internal and external managers for sustainable competitive advantage because it severely limits imitation. Causal ambiguity, therefore, enhances firm performance. Another view holds that causal ambiguity places a constraint on the transfer and leveraging of these competencies within a firm. In this case, causal ambiguity may adversely influence firm performance.

This paper takes a resource-based view to develop and test hypotheses that relate managers' perceptions of causal ambiguity to their firm's performance. The hypotheses examine relationships between firm performance and (1) causal ambiguity regarding the link between competencies and competitive advantage, and (2) causally ambiguous characteristics of competencies. Research involving 224 executives in 17 organizations provides valuable insights into the relationships between causal ambiguity and firm performance. A model is then developed based on these findings. Particular consideration is given to the differing ways top and middle managers in a firm may experience causal ambiguity and to how these differences may be understood and managed. Copyright © 2001 John Wiley & Sons, Ltd.

Resource-based theory emphasizes the critical importance of internal resources for sustainable competitive advantage. This perspective argues that firm performance is a function of how well managers build their organizations around resources that are valuable, rare, inimitable, and lack substitutes (Barney, 1991). Inimitability is a lynchpin of resource-based theory (Godfrey and Hill, 1995) and central to understanding the sus-

tainability of competitive advantage (Dierickx and Cool, 1989; Spender and Grant, 1996).

Resources may be protected from imitation in a variety of ways. History-dependent factors (Barney, 1991), such as a head start in a market with time compression diseconomies (Dierickx and Cool, 1989) and the ownership of enforceable property rights (Porter, 1980; Lippman and Rumelt, 1982), protect valuable resources from competitive imitation. Socially complex resources, such as a good reputation and trust (Dierickx and Cool, 1989; Barney, 1991), are time-consuming and expensive to imitate. Finally, causal ambiguity, which is ambiguity about the link between firm resources and sustained competitive advan-

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tage (Reed and DeFillippi, 1990; Barney, 1991), protects resources from competitive imitation (Lippman and Rumelt, 1982; Barney, 1986; Dierickx and Cool, 1989; Reed and DeFillippi, 1990; Barney, 1991).

The rewards of history-dependent factors and socially complex resources for sustaining valuable resources are straightforward. If a market is characterized by time compression diseconomies, a manager tends to prefer more, not less, valuable experience. Given the choice to possess cost-effective property rights or not, a manager prefers the former. Similarly, a rational manager tends to prefer a superior reputation to an inferior one.

The rewards of causal ambiguity, however, are more complicated. The benefits of causal ambiguity arise if causal ambiguity exists among all firms, *including the focal firm*, regarding the sources of sustainable advantage for the focal firm (Lippman and Rumelt, 1982; Barney, 1991). Although Reed and DeFillippi (1990) dismiss causal ambiguity among managers at the focal firm as an 'extreme' example, causal ambiguity among internal managers is quite plausible given the complexity and messiness of managing strategic resources (Barney, 1991). As Lippman and Rumelt (1982: 421) argue, 'management is far from an exact science, and the ambiguity surrounding the linkage between action and performance in large firms virtually guarantees the existence of substantial uncertain imitability.'

Clearly, causal ambiguity among competitors protects a focal firm because competitors cannot imitate valuable competencies if they do not understand the relationship between these resources and competitive advantage. However, causal ambiguity among managers at the focal firm is also necessary. If the understanding of causal relationships is packaged and mobile *within* an organization (low causal ambiguity), it may be difficult or impossible to keep this understanding embedded within the firm (Badaracco, 1991), and this knowledge may disseminate. Competitors can achieve a focal firm's level of causal ambiguity by hiring managers at the focal firm or through corporate espionage (Barney, 1991).

Causal ambiguity among managers at a focal firm leads to an interesting and unresolved paradox surrounding the relationship between competencies, causal ambiguity, and sustainable competitive advantage. The crux of the causal

ambiguity paradox is that 'ambiguity as to what factors are responsible for superior (or inferior) performance acts as a powerful block on both imitation and factor mobility' (Lippman and Rumelt, 1982: 420). On the one hand, causal ambiguity among managers benefits a firm because it protects a firm's competitive advantage from imitation. On the other hand, causal ambiguity may impede imitation of valuable resources *within* the boundaries of the firm; this factor immobility *limits* managers' abilities to leverage resources for competitive advantage (Reed and DeFillippi, 1990). The risks of causal ambiguity are particularly acute regarding knowledge-based resources because, unlike physical assets, competencies are increasing returns resources (Arthur, 1996) that lose value if they are not applied and shared (Prahalad and Hamel, 1990). Managers must share an understanding of these critical resources in order to make strategic decisions that develop, integrate, and utilize competencies for competitive advantage; failure to recognize the value of competencies may seriously damage a firm's ability to compete (Cohen and Levinthal, 1990; Bettis, Bradley, and Hamel, 1992).

Research to date has not adequately resolved this paradox. In the editor's comments for Mosakowski (1997), Barney remarks that 'causal ambiguity has been a concept in the strategic management and organization theory literatures for some time. However, the full implications of this concept have remained largely undeveloped.' Previous research has operationalized firm-level causal ambiguity using random variables in economic modeling (Lippman and Rumelt, 1982), decreasing function of a firm's age (Mosakowski, 1997), and two-item survey responses by a single senior-level executive within an organization (Simonin, 1999). At the conclusion of her study, Mosakowski (1997) points to 'the need to examine how a firm actually experiences causal ambiguity. Is causal ambiguity confined primarily to the corporate board members dealing with complex strategic issues, or is it the domain of operational personnel struggling with day-to-day realities?' Our study develops the concept of causal ambiguity in two ways. First, it clarifies causal ambiguity by explicating two previously unspecified dimensions: linkage ambiguity and characteristic ambiguity. Second, it measures organization-level causal ambiguity along these dimensions based on responses by top and middle managers

within a range of organizations. These approaches help to develop interesting theoretical and managerial implications.

To explore the causal ambiguity paradox from a managerial perspective, strategic researchers and managers must be able to identify and describe the resources or competencies that are associated with superior performance. Competencies are defined as 'knowledge-set[s] that distinguish [the firm] and provide competitive advantage' (Leonard-Barton, 1992: 113). Consistent with this perspective, the resource-based view of the firm recognizes knowledge as a key intangible resource that drives competitive advantage and superior firm performance (Barney, 1991; Collis and Montgomery, 1995; Bierly and Chakrabarti, 1996; Conner and Prahalad, 1996; Liebeskind, 1996; Spender and Grant, 1996). Competencies are a function of individual firm strategies and the industry in which an organization competes (Hitt and Ireland, 1985; Collis and Montgomery, 1995). Examples of textile competencies are a firm's expertise in managing international divisions or in developing innovative manufacturing processes. Competencies may be described using a wide range of characteristics that reflect how a competency is known. Determining whether a particular competency is characterized as socially complex, history-dependent, or causally ambiguous reveals insights into the inimitability of that competency. For example, a competency that is characterized as 'protected by enforceable property rights' is more difficult to imitate than the same competency that is not characterized this way.

Causal ambiguity has been examined in the literature in two different ways, but the distinction in these approaches has not been clearly explicated. First, *linkage ambiguity* is ambiguity among decision-makers about the link between competency and competitive advantage (e.g., Lippman and Rumelt, 1982; Barney, 1991). Second, *characteristic ambiguity* focuses on the 'characteristics of competencies ... that can be simultaneous sources of advantage and ambiguity' (Reed and DeFillippi, 1990). Characteristic ambiguity is ambiguity inherent to the resource itself. Tacitness is one causally ambiguous characteristic (Reed and DeFillippi, 1990; Barney, 1992; Godfrey and Hill, 1995; Hart, 1995; Szulanski, 1996; Inkpen and Dinur, 1998; Simonin, 1999). Tacitness reflects the extent that a competency is

'intuitive, non-verbalized and yet unarticulated' (Polanyi, 1969; Hedlund and Nonaka, 1993: 118). Tacit knowledge is inherently more ambiguous than articulated knowledge (Winter, 1987; Reed and DeFillippi, 1990; Kogut and Zander, 1992; Zander and Kogut, 1995). Competencies are also characterized as causally ambiguous when they reside in organizational culture and values (Mosakowski, 1997) because they may be more uncertain and less mobile than knowledge that resides in an individual or small group of individuals (Barney, 1986; Reed and DeFillippi, 1990; Barney, 1991).

Key decision-makers' perceptions are essential to capturing and understanding linkage ambiguity and characteristic ambiguity. Top managers must be considered because the time and attention of top management are critical resource filters and constraints for an organization (Hambrick and Mason, 1984; Dutton and Ashford, 1993). Middle managers must be solicited because they play essential and underrecognized strategic roles (Burgelman, 1983; Guth and MacMillan, 1986; Wooldridge and Floyd, 1990), particularly in managing knowledge-based resources such as competencies for competitive advantage (Floyd and Wooldridge, 1994; Nonaka and Takeuchi, 1995). Middle managers face the difficult task of resolving 'the contradiction between the visionary but abstract concepts of top management and the experience-grounded concepts originating on the shop floor' (Nonaka and Takeuchi, 1995: 9). Westley (1990) cites a number of empirical studies that indicate that middle managers' perceptions of strategic situations can vary dramatically from top managers' perceptions. Separate assessment of top and middle managers' perceptions of competencies, therefore, is necessary to understand how firms experience causal ambiguity and gain insight into the causal ambiguity paradox.

HYPOTHESES

Linkage ambiguity is high when managers differ in their beliefs about the contribution of a competency to their firm's competitive advantage. Linkage ambiguity protects a firm's competitive advantage from imitation. Because internal managers are uncertain of the competencies that lead to competitive advantage, it is more difficult for competitors to appropriate value (Lippman and

Rumelt, 1982: 420). This protection from imitation helps sustain competitive advantage and may have positive performance implications for the firm. In addition, linkage ambiguity within a firm may help sustain competitive advantage by providing access to new conversations, new perspectives, and new experiments that engender valuable emergent strategies (Hamel, 1998). An abundance of research supports the strategic value of disagreement among key decision-makers. For example, Prahalad and Bettis (1986) suggest that multiple dominant logics increase the likelihood that a firm can perceive relevant alternatives in order to 'respond appropriately' and quickly to unfamiliar situations. Competency traps (Levitt and March, 1988), core rigidities (Leonard-Barton, 1992), and group-think (Janis, 1972) are similar risks that face firms of like-minded individuals. Similarly, the principle of complementarity (Bohr, 1950; Bartunek, Gordon, and Weathersby, 1983) proposes that a variety of perspectives is necessary for understanding and representing most complicated phenomena. High linkage ambiguity, therefore, may provide the organization with a better toolkit to recognize, shape, and respond to a wider range of challenges, and it would have positive performance implications for a firm.

The perceptions of both top and middle managers should be considered to determine how a firm experiences causal ambiguity (Mosakowski, 1997). Because middle managers' perceptions of strategic situations can vary considerably from top managers' perceptions (Westley, 1990), these two groups are considered separately.

Therefore, the following hypotheses are suggested:

Hypothesis 1: High linkage ambiguity among the top management team (TMT) is positively associated with firm performance.

Hypothesis 2: High linkage ambiguity among middle managers is positively associated with firm performance.

Previous research, however, indicates that shared beliefs by key organizational decision-makers are necessary for basic sense making (Weick, 1979; Lyles and Schwenk, 1992). These shared beliefs play an essential role in framing interpretations of complicated events, which include almost all

strategic issues (Daft and Weick, 1984; Hambrick and Mason, 1984). High linkage ambiguity, therefore, may threaten organizational success. As Reed and DeFillippi suggest, 'where ambiguity is so great that managers do not understand intra-firm causal relationships, or factor immobility exists, it may be impossible to utilize competencies for advantage' (Reed and DeFillippi, 1990: 90–91). Whether this misunderstanding is found among top managers who allocate scarce organizational resources or among the middle managers who are responsible for the day-to-day management of these competencies, the negative implications for an organization are considerable. Senior managers may make strategic decisions that are inconsistent with important competencies, or they may fail to invest in the development and maintenance necessary to sustain competitive advantage (Hunt and Morgan, 1995). Middle managers may not leverage these competencies appropriately, undermining their competitive advantage. Therefore, the following alternative hypotheses are offered:

Hypothesis 1a: High linkage ambiguity among the TMT is negatively associated with firm performance.

Hypothesis 2a: High linkage ambiguity among middle managers is negatively associated with firm performance.

Hamel argues that the key issue in managing competencies is 'to focus senior management's attention on those competencies that lie at the center, rather than the periphery, of competitive success' (Hamel, 1994: 13). Ambiguity regarding competencies that provide a firm with significant competitive advantage, therefore, may be more closely associated with firm performance than ambiguity regarding all competencies.

Although linkage ambiguity may have a positive or a negative relationship with firm performance, the intensity of this association may vary depending on the competitive advantage that competencies provide a firm. The risks of imitation and the rewards of factor mobility may be greatest when competencies provide high levels of competitive advantage. If linkage ambiguity has a positive impact on performance, high linkage ambiguity regarding these competencies may be especially important to protect a firm from imi-

tation where competitors can neutralize competitive advantage most efficiently. Alternatively, if linkage ambiguity has a negative impact on performance, low linkage ambiguity regarding these competencies may allow a focal firm to leverage its efforts most efficiently to improve and sustain competitive advantage. Because the competitive advantage of competencies may intensify the linkage ambiguity–firm performance relationships, the following hypothesis is presented:

Hypothesis 3: Competitive advantage moderates the linkage ambiguity–firm performance relationship.

As with linkage ambiguity, characteristic ambiguity may have a paradoxical effect regarding competitive imitation, factor mobility, and firm performance. Reed and DeFillippi suggest that ‘when an advantage is based on competencies that have causally ambiguous characteristics, then it will be difficult for competitors to overcome the advantage by imitation’ (Reed and DeFillippi, 1990: 88–89). Resource-based scholars argue that tacitness and location in a firm’s culture are two causally ambiguous characteristics that increase a competency’s potential to confer competitive advantage (Reed and DeFillippi, 1990; Hart, 1995). Tacit competencies are more opaque and inherently more difficult to imitate than articulated knowledge (Winter, 1987; Dierickx and Cool, 1989; Reed and DeFillippi, 1990; Kogut and Zander, 1992). As a result, tacitness limits the level of *ex post* competition (Peteraf, 1993). Competencies that reside in organizational culture and values (Leonard-Barton, 1995) are characterized as causally ambiguous (Mosakowski, 1997). They are better protected from acquisition or imitation by competitors, and, therefore, may provide a superior source of competitive advantage (Barney, 1986; Reed and DeFillippi, 1990; Badaracco, 1991).

Therefore, the following hypothesis is offered:

Hypothesis 4: Organizations with managers who characterize competencies as causally ambiguous (high characteristic ambiguity) are positively associated with firm performance.

A concurrent risk, however, is associated with characteristic ambiguity. Causally ambiguous characteristics may impede mobility of com-

petencies within an organization, obstructing efforts to sustain competitive advantage (Matusik and Hill, 1998). Knowledge characterized as tacit is difficult to transfer among organization members (Grant, 1996); Szulanski (1996) found that causally ambiguous knowledge characteristics, including tacitness, erected significant barriers to the transfer of best practices within organizations. These barriers would obstruct an organization’s ability to transfer and leverage competencies for sustained competitive advantage.

Therefore, the following alternative hypothesis is offered:

Hypothesis 4a: Organizations with managers who characterize competencies as causally ambiguous (high characteristic ambiguity) are negatively associated with firm performance.

METHODS

To explore the critical relationships among causal ambiguity, competencies, and firm performance, competencies must be specified in usable ways. Competency is an often used but poorly defined and measured concept (Schendel, 1996: 3). Managers cannot refer to objective accounting data or market valuations; valuable resources such as competencies must be considered within limited industry and temporal contexts (Collis and Montgomery, 1995: 120; Glazer, 1998). A crucial step, therefore, was to identify competencies and measure causal ambiguity within these relevant contexts.

New approaches to data collection and analysis are required to examine the causal ambiguity paradox. The key methodological challenges were: (1) selection of the appropriate industry and organizational samples; (2) identification of a comprehensive range of competencies; (3) development and testing of measures of causal ambiguity; and (4) quantitative and qualitative tests to explore key relationships.

Sample selection

This study examines multiple firms in two industries. Exploring causal ambiguity as managers experience it requires a focus on managers’ perceptions of the characteristics of these competencies, as well as their perceptions of relation-

ships between competencies and competitive advantage. Many competencies are inextricably tied to an 'industry recipe... this body of knowledge which everyone who knows this industry understands' (Spender, 1989: 6). Multiple respondents per industry, combined with the insight of outside experts in each industry, provide valuable opportunities for triangulation about competencies in that industry. Comparison within industries also provides a compelling context for gauging relative levels of causal ambiguity. In addition, analysis of two industries allows for limited, but important, comparison across subsamples for insight into systematic differences and similarities between industries.

Data, therefore, were drawn from 17 organizations in two industries: textile manufacturing and hospitals. The choice of industries was driven by several considerations. First, these industries offer contrasts on a number of dimensions, including firm input (capital-intensive vs. labor-intensive) (Starbuck, 1992) and output (product vs. service), prototypical organizational form (bureaucracy vs. craft), relative scope of markets (global vs. local), the role of government regulation, and environmental munificence (Dess and Beard, 1984). Second, each industry is undergoing a tremendous amount of change, increasing the likelihood that interviews in firms within an industry would reveal a wide variety and range of competencies within each industry. Third, despite the major environmental changes facing textile firms and hospitals, organizations within each industry share enough similarities that all participants within the industry could evaluate an identified set of competencies. Fourth, potential for access to the CEO and other top and mid-level executives was very good. This criterion was nontrivial, given the time demands of the data collection to the participating organizations (1- to 2-hour interviews with the CEO; detailed 30- to 45-minute questionnaires with the others).

Textile firms were chosen from a total universe of 52 publicly traded firms that have a 22 primary SIC designation as textile mill products (COMPUSTAT 1994 data). The hospital sample selection was restricted to the 117 community hospitals in the state of North Carolina. An analysis of North Carolina hospitals on key structural characteristics (Graeff, 1980) demonstrated that they are comparable to U.S. community hospitals.

To gain access to at least eight organizations in each industry, 16 textile firms and 12 hospitals were solicited to participate in the study. Each sample was selected to cover a wide range of performance in the industry. The CEO of each organization was sent a letter describing the project and requesting an interview. Once eight organizations agreed to participate, the researchers contacted the CEOs who were undecided and informed them that the study sample was complete. A ninth textile firm was added to the sample when a CEO who initially agreed to limited participation committed his entire firm to the research project. Within each industry, *t*-tests conducted on the most recent performance data indicated no significant differences among: (1) the sample universe, (2) the final sample selected for the study, (3) the firms that refused to participate, and (4) a combination of the firms that refused to participate and the organizations that were undecided regarding participation.

Data collection

On-site interviews were held with the chief executive of each organization in the sample to generate a comprehensive list of specific and timely competencies for each industry. Both researchers conducted these interviews (with four exceptions); each interview lasted between 1 and 2 hours. The interviewers took extensive notes. Following each interview, they compared their notes for content, tone, and accuracy. In addition, tape recordings were made of interviews with seven of the textile CEOs and all of the hospital executive directors. These tapes were later transcribed and compared to the interviewers' notes.¹

A protocol of open-ended questions was used to identify a range of competencies. All CEOs expressed great interest in the topic, and they were anxious to learn the perspectives of their managers regarding the organization's competencies. The conclusions of the researchers regarding the organization's competencies were subsequently confirmed in writing with each CEO. Based on these interviews, 37 different competencies were identified in the textile indus-

¹ Although the transcripts added additional richness to the notes that had already been compiled, no major discrepancies were found between the interviewers' notes and the transcripts, increasing the interviewers' confidence in their notes.

try, and 32 were identified in the hospital industry. In addition, the researchers explored the characteristics of one or two key competencies. Table 1 provides examples of competencies and characteristics revealed in these interviews.

Each CEO also supplied the researchers with the names of all TMT members (the CEO and all direct reports) and seven to nine middle managers, whose responsibilities placed them approximately midway between the CEO and the lowest-level managers.

Surveys were sent to all identified managers. A total of 224 usable surveys were returned. Overall response to the survey was outstanding: 92 percent for the textile industry and 88 percent for the hospital industry. Response rate by organization ranged from 73 percent to 100 percent. A copy of the survey is available from the researchers. Table 2 provides an overview of the seasoned senior industry executives who participated in the surveys.

Linkage ambiguity

One hundred and twenty-eight textile executives and 96 hospital executives evaluated competencies.² Each executive indicated, on a +3 to -3 scale, whether his or her organization was at an advantage or disadvantage with respect to its competition for each competency.³ Participants were not informed about the perceptions of the CEO regarding their own organization's competencies.

Prior research provides a theoretical rationale for the existence of competency categories (Porter, 1985; Henderson and Cockburn, 1994; McGrath, MacMillan, and Venkataraman, 1995; Miller and Shamsie, 1996). Following the survey, therefore, principal component analysis was conducted on the scaled responses in each industry

to aggregate managers' perceptions of competencies into categories or types of competencies. Bartlett's test of sphericity for each sample (textile firms and hospitals) displayed levels of correlations indicating that a factor model was appropriate ($p < 0.001$) (Norusis, 1994: 50). In addition, each sample exceeded the acceptable level (0.6) on the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy: textiles with a 0.81 and hospitals with a 0.74.

Varimax rotation was used to identify a set of factors that were uncorrelated with each other. Both the textile industry and hospital industry surveys revealed categories or types of competencies that were logical and fit with past categorizations. The Appendix contains examples of factors for each industry.⁴ Factor scores were assigned to each respondent. A factor score measured each respondent's perception of the importance of each factor in contributing to the relative competitive advantage of his or her organization.

To measure linkage ambiguity, average Euclidean squared distance (henceforth called Euclidean distance) among members of a team was used. Euclidean distance, an accepted measure in the literature (Walsh, Henderson, and Deighton, 1988), begins with the calculation of distances between each pair of individuals within a designated group. For a dyad, distance is measured by summing the squared differences between individual responses to an identified set of questions. A high distance score regarding competencies implies high linkage ambiguity among members of that organization.⁵ A team score is then derived

² In the hospital industry, two provisional competencies—'emergency room and/or 'drop-in' primary care' and 'personalized care in the obstetrics department'—were included despite questions raised during the pretests regarding these competencies' level of specificity *vis à vis* other competencies. In the subsequent analysis, these two competencies were not included. In the textile industry one competency—'using CAD/CAM technology to enhance product development ...'—was eliminated following calls by four respondents for clarification on this question. (This was the only question that initiated any calls from respondents.)

³ Separately, each executive was asked to indicate the three competencies believed to be most important for the firm's success.

⁴ The complete list of competency factors and interpretations of these factors are available from the authors.

⁵ During the interview (competency identification) stage, the authors often probed for organizational initiatives or incentives that were specifically linked to particular competencies and whether these efforts may skew an organization's results. Consistently, CEOs were unconcerned. They expressed confidence that their organizations' incentive structures were adequately designed to reward organization level, vs. business unit or functional level, success. For example, one textile CEO dismissed this question, commenting, '70% of incentives for division heads and two levels below were tied to working together' rather than individual competencies. Another executive suggested that his hospital incentives were designed to help people 'keep current, share knowledge, blend together' rather than have particular units 'hoard' particular competencies. Our limited number of middle-manager interviews and organization-level data analysis support this perspective. These indicate that our measure of linkage ambiguity is more likely to capture true differences in managers' perceptions of the competitive advantage of competencies, as opposed to differences based on incentives or political positioning.

Table 1. Competency and characteristics examples

Description	Key question	Examples from interviews with hospital and textile executives
Competency	What is the knowledge that provides your organization with competitive advantage?	Hospital: <ul style="list-style-type: none"> ● attracting and retaining top physicians ● managing external (political and or media) relationships ● knowledge and skills necessary to succeed in an environment of capitation Textile: <ul style="list-style-type: none"> ● managing customer partnerships ● flexible manufacturing through quick changeovers ● understanding the needs of end users of our products
Characteristic: tacit vs. articulated	Is this competency codified or articulated?	<ul style="list-style-type: none"> ● 'I don't think there is any way this could be written down; it's all in people's heads and the way people do things' ● 'We have developed a book—a measurement system—of specific criteria that must be met to do these jobs well'
Characteristic: location	Where does this competency reside in the organization?	<ul style="list-style-type: none"> ● 'If Becky (the head nurse) and her staff left, we'd lose this competency' ● 'If a competitor could copy our information systems regarding this competency, we would lose much of its competitive advantage' ● 'We have incentive systems that are critical in encouraging development of this competency' ● 'It's completely enmeshed into our culture and mission'

Table 2. Demographics on respondents

Firm	Textile industry averages				Hospital industry averages				
	Top managers		Middle managers		Top managers		Middle managers		
	Age	Company tenure	Years in industry	Age	Company tenure	Years in industry	Age	Company tenure	Years in industry
TA	52.9	24.2	26.5	50.3	18.9	19.6	48.9	14.4	22.0
TB	50.0	23.5	24.3	43.4	11.5	18.4	42.4	14.9	17.7
TC	51.5	17.0	28.5	39.2	8.6	15.8	44.7	12.1	21.0
TD	53.6	13.8	29.6	48.7	15.2	24.1	49.6	14.9	28.4
TE	49.7	9.6	26.0	43.0	8.0	18.6	45.0	6.2	14.2
TF	48.3	9.3	24.7	46.6	19.0	25.6	40.4	11.0	18.5
TG	50.6	12.2	23.6	44.1	10.9	21.0	40.0	11.1	17.9
TH	45.2	14.7	16.5	43.1	14.3	18.8	46.9	10.7	19.7
TI	53.0	25.0	28.8	48.0	12.1	19.9	43.7	8.3	18.0
HA	52.7	16.5	27.5	48.9	14.4	22.0	48.9	14.4	22.0
HB	54.0	15.4	16.8	42.4	14.9	17.7	42.4	14.9	17.7
HC	45.2	12.5	15.7	44.7	12.1	21.0	44.7	12.1	21.0
HD	48.2	15.4	22.6	49.6	14.9	28.4	49.6	14.9	28.4
HE	41.7	5.5	15.2	45.0	6.2	14.2	45.0	6.2	14.2
HF	49.2	16.0	24.7	40.4	11.0	18.5	40.4	11.0	18.5
HG	46.9	7.0	19.1	40.0	11.1	17.9	40.0	11.1	17.9
HH	43.7	8.3	18.0	46.0	10.7	19.7	46.0	10.7	19.7



by summing the distances between each unique dyad within a team and dividing the sum by the number of unique dyads.

Linkage ambiguity was measured based on distances derived from all competency factor scores for that industry (seven in the hospital industry; eight in the textile industry). The level of ambiguity was assessed relative to other organizations in the industry and was assessed at two levels: among top managers and among middle managers.

Characteristic ambiguity

Characteristic ambiguity was measured using responses to questions from a modified scale by Zander and Kogut (1995) and a newly developed measure of knowledge location based on Leonard-Barton (1995). To measure tacitness and culture location, managers in each industry were asked a set of questions about two individual competencies. Each manager answered questions regarding the competency that he/she considered most important to the firm's current success. In addition, each manager answered the same set of questions regarding the competency of 'cost containment' (hospital industry) or 'managing costs' (textile industry).⁶ These competencies were selected because they were very similar across industries and because interviews and other research prior to the finalization of the survey indicated that these competencies were critical for success in each industry.⁷

Tacitness

With regard to the competency in question, managers were asked to assess four statements, modified from Zander and Kogut (1995), on a 7-point scale. Principal component analysis was then conducted on these four items, revealing two stable two-item factors that were consistent with Winter's (1987) dimensions of tacitness. The first factor represents managers' perceptions that the

competency has been articulated. The second factor represents managers' perceptions that the competency is articulable. Table 3 provides a summary of the instructions, questions, and factors that the ambiguity characteristic measures.

Knowledge location

Competency culture was measured using a forced-choice question based on Leonard-Barton's (1995) framework. Managers were asked to allocate 100 points to one of four locations: (1) employee knowledge and skill; (2) physical systems such as computer data bases, equipment, and software programs; (3) carefully designed education and incentive systems that support and reinforce knowledge growth; and (4) organizational mission, culture, or values that screen and encourage different kinds of knowledge. These responses were rescaled. All responses were divided by 25 so that each respondent's mean score was one.

Control variables

This study included three control variables: industry, organization size, and team size. Industry was a necessary control variable given the systematic differences between competencies and competency factors in the hospital and textile industries. Industry was controlled by assigning different binary scores to firms in the textile and hospital industries.

Organization size is a powerful explanatory variable regarding organization performance (Weiner and Mahoney, 1981; Wernerfelt and Montgomery, 1988). In addition, Blau (1970) established that organization size plays an important role in organization information processing. By definition, middle managers in this study have responsibilities that fall approximately midway between the CEO and the lowest-level managers. The level of information and knowledge sharing between top and middle managers, which influences causal ambiguity, may be a direct function of organization size. Organization size was a relative measure based on industry. In the textile industry, size was based on organization sales. In the hospital industry, size was based on the number of licensed beds.

Finally, team or group size may be an important factor in considering causal ambiguity. Large TMTs may be able to manage a wider

⁶ In cases where a manager indicated that 'cost containment' or 'managing costs' was the most important competency, he/she was asked to answer questions regarding the competency perceived as second most important for the firm.

⁷ The survey responses supported this approach, as cost containment and managing costs were the most frequently mentioned responses to the question, 'What are the three most important competencies to your firm's current success?'

Table 3. Characteristic ambiguity measures. Tacitness instructions, questions, and factor matrices
 Instructions: Please circle the number from 1 to 7 which describes how much you agree with each statement: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Neither Agree nor Disagree; 5 = Slightly Agree; 6 = Agree; 7 = Strongly Agree.
 1. In my hospital (firm), extensive employee training is offered specifically regarding this competency. (TRAINING)
 2. There is extensive written documentation of this competency in my hospital (firm). (WRITDOC)
 3. A useful manual or handbook to describe the knowledge necessary for this competency could be written. (MANUAL)
 4. A competitor could acquire this competency by analyzing trade or other publicly available publications. (TRADEPUB)

	Hospital (94) A-Most Important		Hospital (94) B-Cost Containment		Textile (127) A-Most Important		Textiles (125) B-Managing Costs	
	Factor 1 ^a	Factor 2 ^a	Factor 1 ^a	Factor 2 ^a	Factor 1 ^a	Factor 2 ^a	Factor 1 ^a	Factor 2 ^a
	WRITDOC	0.928	0.126	0.921	0.004	0.868	0.149	0.915
TRAINING	0.923	0.029	0.903	0.145	0.893	-0.082	0.851	-0.347
TRADEPUB	-0.101	0.885	-0.066	0.894	-0.104	0.907	0.146	0.807
MANUAL	0.301	0.802	0.228	0.846	0.484	0.583	0.353	0.737
Eigenvalue	1.98	1.28	1.91	1.34	1.88	1.10	1.71	1.32
Cumulative percent variance explained	49.5	81.4	47.8	81.4	47.1	74.7	42.7	75.7

^aFactor 1 captures whether the knowledge is articulated; Factor 2 captures whether it is articulable.

Knowledge location (culture) questions: Valuable competencies can be located in a variety of places in the hospital (firm). Please take a moment to review four 'places' that we have listed. With regard to this competency at your hospital, please distribute 100 points among the four places to indicate where this competitive advantage is located at your hospital (firm).

- _____ points employee knowledge and skill
 - _____ points physical systems such as computer data bases, equipment, and software programs
 - _____ points education and incentive systems that support and reinforce knowledge growth
 - _____ points organizational mission, culture, or values that screen and encourage different types of knowledge
- 100 points



variety of organization competencies and tolerate a wider range of viewpoints. Conversely, inclusion of, or responses by, relatively large numbers of middle managers may indicate an infrastructure of communication and inclusivity that facilitates shared knowledge among and between levels outside the TMT. The number of managers in each group, therefore, was included as a control variable.

Dependent variable

The dependent variable in the model is firm performance. A rich and long tradition operationalizes firm performance based on financial data from secondary sources, such as return on assets (ROA), return on invested capital, and return on sales (Rumelt, 1974; Bettis, 1981; Christensen and Montgomery, 1981).⁸ ROA presented several advantages as a measure of performance. Hill, Hitt, and Hoskisson (1992) argue that this measure provides superior relative year-to-year stability *vis à vis* other measures. ROA continues to be accepted in the current literature (Wiersema and Bantel, 1993; Baliga, Moyer, and Rao, 1996), and, in particular, in multiple industry studies involving the hospital and textile industries (Judge and Zeithaml, 1992) and studies regarding knowledge strategies (Bierly and Chakrabarti, 1996).

Measures of association

Relationships were tested using Pearson correlations with controls. Correlation relationships with a *p*-value of less than 0.10 were considered significant in this analysis. This significance level was consistent with other empirical studies of complex organization-level issues that used similar methodologies (Wooldridge and Floyd, 1990).

Moderating influence of competency competitive advantage

The competencies that managers believe provide a firm with a 'clear competitive advantage ... relative to members of a strategic group' may be

more important to a firm than those that provide less competitive advantage (Hamel, 1994; Duncan, Ginter, and Swayne, 1998: 12). To measure this competitive advantage, *average* responses for each individual competency (36 in the textile industry, 30 in the hospital industry) were calculated by managerial level in each organization.⁹ High scores indicate that managers believe this competency provides their firm superior competitive advantage; low scores indicate that managers believe that this firm's competency is competitively inferior.

Each textile firm has 36 data points, and each hospital has 30 data points. At each firm, tests were conducted among top managers and among middle managers to explore for patterns regarding competitive advantage and linkage ambiguity. Within a firm, each data point evaluated an individual competency based on two group-level measures: the firm managers' *average* response regarding a competency (*competency competitive advantage*, which ranged from -3 to +3) and the *dissimilarity* of these managers' responses (Euclidean distance, or *competency linkage ambiguity*). First-order regression tests reveal if causal ambiguity tends to vary monotonically with competitive advantage at that organization. For example, a significant negative relationship indicates that managers in a firm tend to exhibit less linkage ambiguity on competencies that these managers rate as providing more competitive advantage for their firm. A significant positive relationship indicates higher linkage ambiguity regarding competitively superior competencies. Second-order tests were also conducted to reveal if a curvilinear pattern better profiles the relationship. A significant curvilinear relationship reveals that managers demonstrate higher (or lower) levels of linkage ambiguity for competencies that provide relatively high competitive advantage *and* the competencies that place their firm at a competitive disadvantage. The results of these tests were then evaluated to determine if these patterns added insights into the linkage ambiguity-performance relationship.

⁸ While alternative measures based on stock market valuations may provide additional insights into a firm's success as viewed by the capital markets (Lubatkin and Shrieves, 1986), the use of community hospitals in this study precluded their additional consideration.

⁹ The competencies that were dropped following completion of the survey were not included in this analysis. However, the same set of tests was run including these competencies (two additional competencies in the hospital industry, one in the textile industry) and there were no significant changes in the results.

RESULTS

Hypothesis 1 asserts that linkage ambiguity among the TMT is positively related to firm performance. Tests, however, revealed marginal support ($p < 0.10$) for the alternative hypothesis, Hypothesis 1a, indicating that higher-performing firms tended to exhibit low levels of linkage ambiguity. Top managers in higher-performing organizations were more likely to agree on the competencies that contribute to competitive advantage than top managers in lower performing organizations.

Hypothesis 2 predicts that middle-management linkage ambiguity is positively related to firm performance. Again, the findings revealed support for the alternative hypothesis. Hypothesis 2a was supported ($p < 0.05$), indicating that low linkage ambiguity among middle managers is associated with higher firm performance. Table 4 summarizes the correlation results for these hypotheses.

In sum, the empirical results revealed consistent evidence regarding the first two hypotheses. Support was found for the assertion that linkage ambiguity is negatively related to firm performance at the TMT and middle-management levels. These findings contradict the rationale of the primary hypotheses, which maintains that high levels of linkage ambiguity among internal managers are necessary to sustain competitive advantage. In other words, with regard to linkage ambiguity, the *advantages* of factor mobility appear

to outweigh the *disadvantages* of increased risks of imitation.

Hypothesis 3 suggests that competitive advantage moderates the linkage ambiguity–firm performance relationship. The firm-level profiles that test this hypothesis reveal intriguing insights. No consistent patterns emerged in these correlations among top managers. Patterns did emerge, however, among middle managers: firms that reflected decreasing linkage ambiguity with increasing competency advantage tended to perform better than would have been expected based on overall levels of linkage ambiguity. Figure 1 graphically demonstrates this relationship for the exceptional performer and a below-average performer in each industry. Table 5 presents the middle managers' results for every organization, which indicate that competency competitive advantage may moderate the linkage ambiguity–performance relationship. This pattern is evident in several top and average performers, and strongly evident in the most exceptional performers in each industry. This pattern does not appear at all in lower performers in either industry.

Only two organizations—one hospital and one textile firm—demonstrate a significant second-order, or inverse U, fit in the relationship between linkage ambiguity and competency competitive advantage (see Figure 1 and Table 5). This relationship reveals a pattern of low linkage ambiguity with respect to competitively superior competencies *and* competitively inferior competencies. The evidence is quite limited, but it

Table 4. Hypotheses 1, 2 and 4: summary and results

Hypothesis N = 17	Correlation	Interpretation
H1a) High linkage ambiguity among the TMT is <i>negatively</i> associated with firm performance	0.3730*	H1a supported (marginal)
H2a) High linkage ambiguity among middle managers is <i>negatively</i> associated with firm performance	0.4545**	H2a supported
H4) Organizations with managers who characterize competencies as causally ambiguous (high characteristic ambiguity) are <i>positively</i> associated with firm performance		
● Tacitness among TMT	0.4473**	H4 supported
● Tacitness among middle managers	0.4648**	H4 supported
● Culture location among TMT	0.2473	Not supported
● Culture location among middle managers	0.3716*	H4 supported (marginal)

** $p < 0.05$; * $p < 0.10$

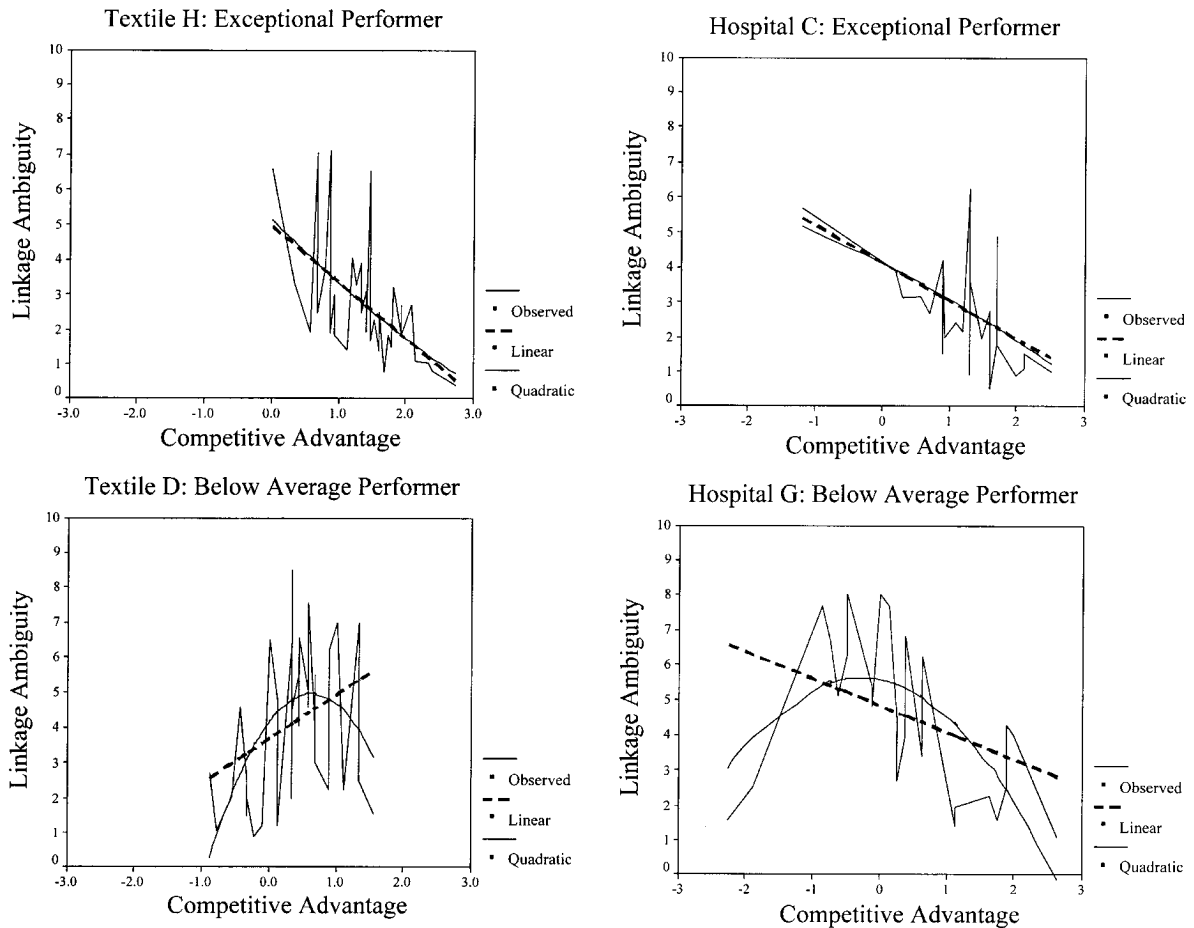


Figure 1. Examples of patterns in linkage ambiguity and competitive advantage

suggests that low ambiguity regarding inferior competencies has a negative moderating effect, as both firms that exhibited this pattern were below-average performers. This observation also introduces a previously unexplored issue regarding causal ambiguity: low linkage ambiguity regarding competencies for which the firm is at a competitive disadvantage places the firm at risk of competitive exploitation of a weakness, rather than competitive imitation of a strength.

Hypothesis 4 proposed that firms in which important decision-makers characterize key competencies as causally ambiguous are associated with high firm performance. With regard to tacitness, support was found at both the TMT and middle-management levels ($p < 0.05$). As predicted, TMT members and middle managers in higher-performing organizations described their competencies as more tacit than managers from

lower-performing organizations. (Table 3 summarizes these findings.)

With regard to culture location, the hypothesis was marginally supported at the mid-level manager level ($p < 0.10$). However, findings at the TMT level were not significant. Contrary to the findings regarding linkage ambiguity, no support was found for the alternative hypothesis, that low levels of ambiguity are related to firm performance.

In sum, low linkage ambiguity, particularly among middle managers on competitively superior competencies, is positively related to firm performance. In addition, middle managers in higher-performing organizations characterize their competencies as more tacit and more likely to be located in an organization's culture when compared to middle managers in lower-performing organizations. Top managers in higher-performing

Table 5. Middle managers' perceptions, linkage ambiguity and competency competitive advantage (36 competencies in textile industry; 30 in hospital industry)

Company	Shape and significance	Adj. R ²	Slope	Middle managers' linkage ambiguity (overall)	Expected performance (overall ambiguity)	Actual firm performance	Actual vs. expected performance	Consistent with moderating relationship?
Textile H	Linear***	0.30	-0.57	Low	High	Exceptional	No difference/ Better	Yes
Hospital C	Linear**	0.26	-0.53	Average	Average	Exceptional	Better	Yes
Textile B	Linear*	0.11	-0.37	Average	Average	High	Better	Yes
Hospital B	N.S.			Low	High	High	No difference	Yes
Hospital E	N.S.			Low	High	High	No difference	Yes
Textile A	Linear***	0.34	-0.60	Low	High	Average	Worse	No
Textile G	Linear**	0.21	-0.47	High	Low	Average	Better	Yes
Hospital A	Linear*	0.11	-0.37	High	Low	Average	Better	Yes
Textile F	N.S.			Average	Average	Average	No difference	Yes
Hospital H	N.S.			Low	High	Average	Worse	Yes
Textile C	N.S.			Low	High	Average	Worse	Yes
Hospital G	Quadratic***	0.40	-0.20/-0.57	High	Low	Low	No difference	Yes
Textile D	Quadratic**	0.21	0.67/-0.51	High	Low	Low	No difference	Yes
Hospital D	N.S.			High	Low	Low	No difference	Yes
Textile I	N.S.			High	Low	Low	No difference	Yes
Hospital F	N.S.			Average	Average	Low	Worse	Yes
Textile E	N.S.			Average	Average	Low	Worse	Yes

***<0.001; **<0.01; *<0.05

Graphs of the firms in bold are depicted in Figure 1.



organizations tend to characterize their organization's competencies as more tacit. Results did not reveal that TMT perceptions of culture location were related, either positively or negatively, to firm performance.

DISCUSSION

The results reveal that the dominating influence in the paradox depends on the causal ambiguity lens that is applied. The first lens, linkage ambiguity, focuses on managers' perceptions of the link between resources and competitive advantage. The second lens, characteristic ambiguity, focuses on managers' perceptions of the resources themselves. Consideration of both lenses is both theoretically and practically important. The implications of each, and their possible interrelationships, need to be examined and incorporated into a framework for understanding competencies, inimitability, and firm performance.

These results contest arguments that linkage ambiguity is necessary to sustain competitive advantage. Instead, the findings suggest that low linkage ambiguity, particularly by middle managers on the 'core' competencies (Prahalad and Hamel, 1990; Leonard-Barton, 1995), may provide a firm with great abilities to recognize, appropriate, and transfer competencies for competitive advantage (Cohen and Levinthal, 1990; Garud and Nayyar, 1994). The potential factor mobility associated with low linkage ambiguity may sustain the competitive advantage derived from competencies because knowledge may be assimilated and transferred among internal managers for use throughout an organization. Management consensus on competencies (low linkage ambiguity) may indicate an established base of related knowledge. This base provides a valuable platform for sustaining competitive advantage by recognizing, importing, sharing, and exploiting external and internal knowledge throughout the organization.

In particular, the results suggest that middle managers may be the most direct catalysts for factor mobility of key competencies within a firm. Middle managers are engaged in the challenging process of developing and exploiting competencies. When these managers agree on the competencies that contribute to firm success, they are better prepared to exploit key competencies,

to assimilate and share new knowledge, and, therefore, to contribute to the success of a firm (Floyd and Wooldridge, 1994: 47).

The findings also suggest that firms risk exposure when middle managers agree on the competencies that make their firm competitively vulnerable. Because the transfer and exploitation of inferior competencies do not lead to competitive advantage, low linkage ambiguity on these competencies offers only risks of exploitation by competitors. Strategic attention and action are necessary to address the vulnerabilities exposed when middle managers agree on the competencies for which the firm is at a disadvantage.

Experienced managers may anticipate these findings. After a decade of 'restructuring, delayering, and retrenching' (Bartlett and Ghoshal, 1994), top managers increasingly recognize that 'a company can survive everything but the defection of its middle managers' (Grove, on 'Marketplace,' National Public Radio, 5 February 1996). During interviews, CEOs expressed particular curiosity about the perceptions of middle managers. As one textile CEO said, 'We are evolving from a top-down hierarchical organization to a broader frame of reference. I am curious about whether there is agreement—that's why I am interested in the study. I feel comfortable that my top people will agree, but I feel less comfortable as you go down to lower levels.'

Monitoring middle managers' perceptions about key resources is more easily said than done. The number and geographic dispersion of middle managers make them more difficult to track than the TMT. Recent models of knowledge management (Hedlund, 1994; Nonaka and Takeuchi, 1995; Sherman, 1996) focus on middle managers, and particularly on the role that they play in transferring and leveraging knowledge throughout the organization. Empirical strategic research, however, continues to marginalize middle managers as valuable strategic decision-makers. By considering the roles of top and middle managers in terms of the causal ambiguity paradox (factor mobility vs. inimitability), the findings of this study provide a new perspective, and important empirical support, for middle managers as critical managers of competencies, and factor mobility, in an organization.

This study also extends the understanding of the relationship between causally ambiguous characteristics and firm performance. Based on

survey results and the analysis of CEO interviews, middle and top managers may experience causal ambiguity differently in some circumstances.

Empirical evidence consistently supports a relationship between managers' perceptions of competency tacitness and firm performance. Both top and middle managers in successful firms are more likely to believe that their organizations' important competencies are tacit than managers in less successful firms. These findings are consistent with previous research. Spender (1993) maintains that competitive advantage originates from tacit knowledge. In ethnographic studies, Brown and Duguid observed that organizational value is created and sustained from knowledge communicated in 'communities-of-practice' that 'usually differ fundamentally from the ways organizations describe that work in manuals, training programs, organizational charts, and job descriptions' (Brown and Duguid, 1991: 40). Although previous theory and ethnographic observation indicated the importance of the tacit characteristic to organizational success, this research is the first to reveal empirically the relationship between managers' perceptions of tacitness regarding organization-level competencies and firm performance. While tacitness may impede the speed of transfer of competencies in an organization, it appears that the advantages of competitive inimitability outweigh the disadvantages to factor mobility.

The results regarding organizational culture, however, differed by managerial level; additional insights into differences in the types of responsibilities between middle and top managers may explain these findings. Analysis of the CEO interviews revealed three key themes regarding these top managers' perceptions of culture, inimitability, and sustainable competitive advantage. First, CEOs recognize the critical role that culture plays in creating and sustaining competitive advantage. Many CEOs spent considerable time in interviews articulating the distinctiveness of their organizations' culture among competitors, and how this culture carved a difficult-to-imitate position that sustained competencies in the firm. These cultures were described in ways that ranged from 'boy-scout' (textile firm) to 'mutually supportive and inclusive' (hospital) to 'aggressive and tough ... [where] we don't have time for cheerleading meetings because everyone has a job and a half to do' (textile), to 'business-

oriented' (hospital). Second, CEOs recognize that they are accountable for shaping and managing organizational culture. Top-level initiatives, particularly major changes in organization structure, were consistently mentioned as actions necessary to make organizational culture more responsive to the competitive environment. (See Table 6 for examples of CEO initiatives in the textile industry.) Third, many CEOs articulated the tremendous challenge in managing organizational culture in ways that sustain value in the face of major environmental changes. Several CEOs discussed the significant time and resources spent prodding their organizations' cultures to respond to the tremendous environmental changes in their competitive arena. The comments by the CEO of Textile Firm G reflect these themes that emerged in many interviews.

The organization, if you really think about it, is 50 years old and probably up to the past five or six years, has been run in a very similar way. Then all of a sudden in the last five years, there's chaos. So, we're changing everything. We're changing the promotion systems; we're reengineering the business. We're looking how we operate differently. We're expanding the global markets. We're trying to figure out strategically where we are going with our apparel business [and] where we're going with our cottons. So all of a sudden, we've got people who cannot work in a changing culture.

[Previous management] really did not view a culture change of how to run the business now that it's a 600 million dollar business and running differently. They kind of functioned like they always functioned. You must remember, that's my job. My job is to tell people this is where we're going and this is why we're going, and to try to get the culture that we need here to accomplish the goals.

An insignificant relationship between culture location and firm performance among top managers may reveal an ongoing tension top managers face. Top managers of successful organizations may recognize that building competencies that reside in organization culture helps build and sustain competitive advantage. Changes in the environment, however, put the value of competencies that reside in organization culture at risk. Successful top managers often assume responsibility for continually scanning the competitive environment to ensure that current organizational resources add value in the face of environmental change (Hambrick, 1982; Ham-

Table 6. Excerpts of CEO interviews regarding initiatives to change organizational culture

Textile A

'We are very decentralized. And we hadn't always been that way and I look at some of our competition out there that isn't and I love it. 'Cause let me tell you what, to move in this world today, and to be in the fashion value-added business which is what we're in, you better get those decisions as close to the marketplace as you possibly can, and we are there.'

'We used to be very much a functionally oriented company. We had manufacturing that was very, very strong with the company. [Southern City] was the manufacturing headquarters and the administrative headquarters. The merchandising headquarters was in New York. We have just completely changed that. We don't have a functionally oriented manufacturing person. Every manufacturing person in this company reports to a business head. There's no functional manufacturer.'

Textile C

'But one of the best things we did is a couple of years ago, we divided into four different business units. We did a lot of team training, and we've put people in charge of each of these business units... We empowered these people to run the business. And when we empowered them, ... we transferred the knowledge that we had. And now these folks are in essence, running their own business. We don't have a president of the business unit. We've got four people that work together. It's been a real interesting study. How did we transfer the knowledge? Well, we just raised hell with them. We told them they had to work together and the ones that didn't work together left. It was also through [constant] interaction. We met with them; we met every month with them. We travel with them. These people have been with us, all have been with us 15-16 years. They grew up with the culture and they knew the business. And we transferred the knowledge. And that has freed me up to help us grow the business in other areas ... And we meet with them every month and we have a set agenda, where we sit down with every business unit each month. And that we say, 'What are you doing?' And that when we tell them, 'Hey, we're not happy with what you're doing here. And you should be doing more. Because we know the market.'

Textile E

'It's a forgone conclusion by all of us in the business that [a portion of the business that makes up the bulk of today's revenues] is a gone industry in the United States. That's sad but it's dying ... So we've been shutting mills down, we've been consolidating mills. We've been redefining marketplaces. We've been changing culture. This is how we'll compete in the twenty-first century.'

brick and Mason, 1984; Daft, Sormunen, and Parks, 1988). Top managers who engage in a 'process of gently upsetting preconceptions of what the organization is doing' (March and Olsen, 1976: 80) help ensure that organizational solutions change with the environment and organizational imperatives. Top managers, therefore, may continually question the organization culture, particularly in industries such as textiles and hospitals that are undergoing substantial change.

Managing organizational culture, however, is considered outside the purview of middle managers. Middle managers instead are engaged in the challenging process of developing and exploiting competencies. Middle managers in successful firms tend to describe competencies as more firmly embedded in a difficult-to-imitate

company culture. This knowledge is not only more difficult to imitate because of its complexity, but also is better protected from imitation due to moral hazard, 'because individuals, such as a star ... performer, cannot hold the firm for ransom so readily' (Spender, 1993: 39). These perceptions may provide middle managers with psychological protection, allowing them to take risks and make commitments necessary to exploit and sustain competencies (Schein, 1984; Hirschhorn, 1990). Organizations, therefore, may be more successful when middle managers operate in an environment where their confidence in a competency's causal ambiguity to competitors encourages them to share knowledge and exploit competencies. These actions, in turn, help sustain competitive advantage of these competencies.

TOWARD A MODEL OF CHARACTERISTIC INIMITABILITY, LINKAGE AMBIGUITY, AND FIRM PERFORMANCE

The linkage ambiguity findings challenge previous theory (Lippman and Rumelt, 1982) regarding the risks firms face when managers clearly understand the link between resources and competitive advantage. Characteristic ambiguity may help explain these findings. The paradox, therefore, may be resolved by explicating the implications of linkage ambiguity, characteristic ambiguity, and competitive advantage by managers at a focal firm. Barney suggests this approach when he outlines the steps by which causal ambiguity is related to sustainable competitive advantage: 'If a firm with a competitive advantage understands the link between the resources it controls and its advantage, then other firms can also learn about the link, acquire necessary resources (*assuming they are not imperfectly imitable for other reasons*), and implement the relevant strategies' (Barney, 1991: 109, italics added). This research is the first to explore the implications of the link (linkage ambiguity) and the 'other reasons' (characteristic ambiguity) from the perspective of managers at a focal firm. Based on previous research and the findings reported here, a model is developed indicating that linkage ambiguity plays a partial mediating role (James and Brett, 1984) in the relationship between resource characteristics and firm performance.

Characteristic inimitability and firm performance

This research revealed that causally ambiguous characteristics regarding key competencies were associated with higher firm performance. The findings, particularly with regard to tacitness, indicate a significant, positive relationship between causally ambiguous characteristics and firm performance. Consistent with this and previous theory, the model expands the findings and suggests that all characteristics that protect competencies from imitation, such as enforceable property rights (Porter, 1980; Lippman and Rumelt, 1982) and reputation (Dierickx and Cool, 1989; Barney, 1991), sustain value to a firm.

Linkage ambiguity and firm performance

The linkage ambiguity findings revealed a consistent pattern that low linkage ambiguity is associated with higher firm performance. The risk of competitive imitation appears modest even if the link between competencies and their advantage is quite clear among key managers.

These findings appear quite robust, as linkage ambiguity did not differ between industries despite significant differences with regard to imitation pressures. For example, competition among community hospitals is relatively benign. This phenomenon may result from a primary goal involving community service. Key stakeholders, such as local governments who control resources, often decide that overcapacity and predatory competition lead to poor utilization of resources and do not serve community health care needs. In one extreme example, a hospital manager shared that, 'We have established good ground rules with [the hospital's closest competitor] and the major research hospitals: "We don't steal your doctors, employees, patients and you don't steal ours." We also have made conscious choices not to advertise in [nearby cities served by closest competitors] and they don't advertise here.'

In contrast, the textile industry provides an archetypal example of an industry competing in an environment with low munificence. It is plagued with overcapacity, and it has been flooded with foreign competition (Dickerson, 1995). Sales and employment are decreasing, and stock market valuations are dismal. One CEO even referred to the U.S. textile industry as a 'sunset industry.'

Consistent with Staw and Szwajkowski's (1975) findings that organizations that compete in less munificent environments are more likely to commit illegal acts (Dess and Beard, 1984), several textile CEOs mentioned the rampant use of subtle to blatant corporate espionage throughout the industry. Examples ranged from supplier pressure to hiring individuals who falsify academic or press credentials to gain access to competitors' ideas. As one CEO stated, 'The textile industry is the happiest espionage industry you have ever seen in your life, in the world. I have infiltration to my competitors like there is no tomorrow, okay? Fact of life.'

Despite these significant environmental differences in pressure to imitate, levels of linkage ambiguity did not differ across industries in the

sample. These findings indicate that efforts to decrease linkage ambiguity among key decision-makers, and particularly middle managers, offer greater reward than risk despite imitation pressures.

These findings may be explained if linkage ambiguity acts as a mediator in a relationship between competency characteristics and firm performance. In other words, the outcome of the linkage ambiguity paradox may be determined by the inimitability characteristics of the competency in question. If characteristic inimitability is high and linkage ambiguity is low (managers clearly understand the link between competencies and performance), competitors may not be able to imitate these competencies due to the characteristics of these competencies (Barney, 1991). Competitive advantage, therefore, is sustained. If competencies are not characterized in ways that protect them from imitation (which may include not only causally ambiguous characteristics, but also other characteristics such as legally protected property rights), high linkage ambiguity provides the only possibility for inimitability. In these circumstances, linkage ambiguity sustains competitive advantage and contributes to firm performance. Considering both linkage and characteristic ambiguity, therefore, elucidates the causal ambiguity paradox.

Competitive advantage

Finally, the value added of inimitability (and factor mobility) is a function of the competitive advantage of the resource (Barney, 1991); the issue of imitation and transfer is moot if knowledge is not valuable within a competitive context (Kogut and Zander, 1992). This research explicitly considered industry context in the selection of organizations and in the definition of the competencies that were used to explore causal ambiguity. Rather than drawing from 'lists of universal variables' that lead to 'resounding non-findings' (West and Schwenk, 1996), this research identified key knowledge resources called competencies by focusing on two industries within a limited time frame. This approach is consistent with Collis and Montgomery's resource-based argument that 'resources cannot be evaluated in isolation, because their value is determined in the interplay with market forces. A resource that is valuable in a particular industry or at a particular

time might fail to have the same value in a different industry or chronological context' (Collis and Montgomery, 1995: 120). This research defined competencies within an industry context and narrowed the question of causal ambiguity to a range of competencies that are most likely to add value. Naturally, these competencies are also the competencies that are most vulnerable to risk by competitive imitation. While data limitations precluded tests of varying levels of competitive advantage with regard to characteristic ambiguity and firm performance, the findings reveal that competitive advantage moderates linkage ambiguity–firm performance relationship. In this model, we extend these findings to suggest that competitive advantage moderates the characteristic inimitability–firm performance relationship.

Figure 2 presents the tested and the hypothesized relationships among characteristic inimitability, linkage ambiguity, and firm performance.

Implications

This research helps clarify the concept of causal ambiguity by explicating the dimensions of linkage and characteristic ambiguity. It explores these dimensions of ambiguity as senior managers experience them and builds a model that captures these dimensions and key relationships. This model suggests that senior executives should work to develop resources that have high characteristic ambiguity and low linkage ambiguity.

This study reveals that managers may experience causal ambiguity differently. On the one hand, middle managers, whose responsibilities are more focused on the transfer and execution of key competencies, may require stability and confidence in the value of key competencies. The results indicate that managers in high-performing organizations, particularly middle managers, understand the relationship between their actions and competitive advantage (i.e., low causal ambiguity). They agree on the competencies that lead to competitive advantage, suggesting that senior managers want middle managers to appreciate, to share, and to exploit consciously these competencies. The benefits of this factor mobility appear to offset the potential harm associated with imitation. In fact, a relatively clear understanding of important competencies may encourage middle managers to refine and to

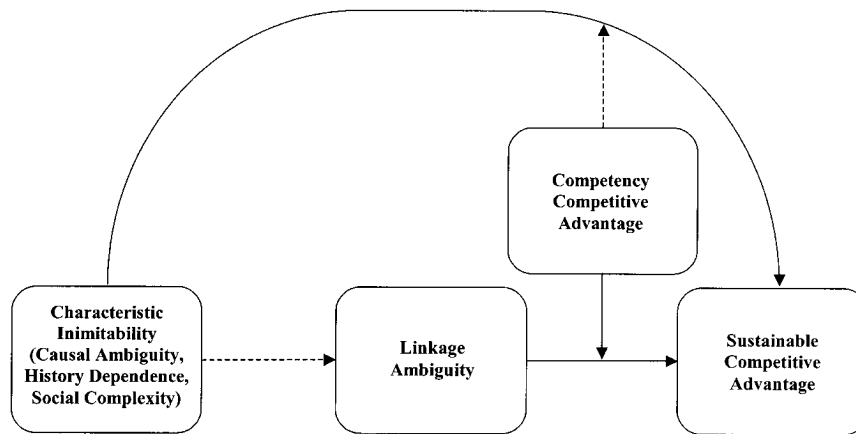


Figure 2. Characteristic inimitability, linkage ambiguity, and sustainable competitive advantage

extend the execution of these competencies in ways that make imitation more difficult.

On the other hand, top managers may take primary responsibility for allocating resources to support current competencies and providing a vision for future competencies. The results suggest that senior managers want to encourage the development of competencies that are tacit and located in an organization's culture. Although the results regarding TMT perceptions of culture location and firm performance were not significant, middle managers believe that competitive advantage is derived from competencies that are difficult to articulate and embedded within the culture. Interviews with CEOs also suggest that culture is an important and challenging characteristic to manage in the face of changing competitive environments. Over time, a determined organizational focus on critical competencies may allow managers to understand them and share them, but it may be difficult, if not impossible, to replicate this environment outside the organization, thereby limiting the potential for imitation. Managing culture, therefore, involves an ongoing tension in efforts to embed knowledge within an organization in ways that protect competencies from imitation (Badaracco, 1991), and efforts to ensure that the knowledge has value in a changing environment.

At the TMT level, the weaker support for an association between low linkage ambiguity and firm performance may suggest a more complex relationship between causal ambiguity, factor mobility, and performance. Two explanations may address the differences in these findings between

top and middle managers, and they merit future exploration. First, top and middle managers may focus on different issues. Middle managers are more involved with the execution of key competencies (Nonaka and Takeuchi, 1995) and may require low linkage ambiguity to exploit and sustain that competency. Second, top and middle managers may interact differently. Eisenhardt, Kahwajy, and Bourgeois (1997a; 1997b) argue that frequent and intense interactions facilitate value-creating disagreement within a team. TMTs have more opportunity to communicate intensely, and, therefore, they may be able to tolerate more linkage ambiguity than middle managers. Additional analysis requiring data on interaction by team level, therefore, is required to understand this phenomenon.

Finally, this study suggests that linkage ambiguity paradox may be explained by deeper understanding of inimitability characteristics of the underlying competencies. These relationships were not tested, however, and merit further exploration. In addition, further insights into *interactions* between characteristic ambiguity and linkage ambiguity are warranted. For example, does the low linkage ambiguity revealed in this study lead to creation of systems and processes that contribute to high characteristic ambiguity? Separately, how may high characteristic ambiguity influence managers' abilities to achieve consensus on the link between competencies and competitive advantage, and therefore linkage ambiguity? Research directed to these issues and others will continue to inform our understanding of these important relationships.

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APPENDIX: EXAMPLES OF HOSPITAL AND TEXTILE FACTORS

Examples of hospital factors

Human Resource Knowledge

- Measuring and tracking individual knowledge and skills throughout the organization
- Managing a wide range of perspectives within the hospital (internal relationships within the hospital)
- Attracting and retaining top nursing and support staff
- Understanding and managing the appropriate mix of nursing and support staff
- Training and education programs to develop employees
- Understanding and managing the appropriate investments in technology
- Understanding and managing the appropriate mix of physicians
- Making difficult decisions among investment alternatives (i.e., technology, staffing, and capital investments)

Clinical Speciality Knowledge

- Clinical capability of physicians
- Attracting and retaining top physicians
- Clinical capability of the nursing and support staff
- Outpatient services
- Outpatient surgery
- Specialized areas of clinical expertise

Knowledge about Critical Factors for Success

- Knowledge and skills necessary to succeed in an environment of managed care
- Knowledge and skills necessary to succeed in an environment of capitation
- Cost containment
- Negotiating managed care contracts

Examples of textile factors

Knowledge to Compete in a Global Marketplace

- Managing international joint ventures
- Managing international acquisitions
- Marketing products globally
- Managing manufacturing operations outside the US
- Managing global customer relationships
- Global sourcing of materials and labor

Internal Integration Knowledge

- Making decisions quickly
- Making difficult decisions among investment alternatives (i.e., technology, staffing, and capital investments)
- Managing a decentralized organization structure to encourage individual accountability and empower decision-making
- Managing vertical integration between units at different stages of the value chain (raw materials to finished goods)
- Maintaining a corporate-wide 'sense of urgency'
- Sharing knowledge across functional areas (i.e., sales, production, R&D)
- Managing domestic acquisitions

Knowledge of External Constituencies

- Understanding our suppliers' cost structures
 - Understanding our suppliers' needs and goals
 - Understanding our customers' cost structures
 - Understanding our customers' needs and goals
 - Understanding the needs of end users of our products
-