

# ***The Impact of Knowledge Resources on New Venture Performance***

by G. Page West III and Terry W. Noel

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*A new venture's strategy—and thus its performance—is based upon the knowledge the firm has about its market, its opportunity in that market, and its appropriate conduct to take advantage of that opportunity. Resource-based theory underscores knowledge as a type of resource that confers competitive advantage and the potential for sustainability, two factors that are critical for start-ups. Three types of procedural knowledge are considered to be important at start-up: (1) about the industry in which the venture competes; (2) about the type of business approach the venture is pursuing; and (3) about creating, building, and harvesting new ventures. Knowledge useful to the new venture is developed either through relevant personal experiences or by accessing relevant knowledge possessed by others. Hypotheses are developed regarding the impact on the performance of new ventures as a result of these sources of knowledge, and these relationships are explored in a study of new technology-based firms.*

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## ***Introduction***

In order to be successful, new ventures need various types of resources, including financial, social, technological, physical, and human resources (Brush, Greene, and Hart 2001; Lichtenstein and Brush 2001; Greene and Brown 1997). It has been suggested that local communi-

ties can assist start-ups in their provision of such resources (e.g., Malecki 1997). However, the historical context and unique characteristics of communities that actively support entrepreneurship lead to inconsistent findings about the importance of community-assisted resource development. New venture founders must often acquire or develop

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resources independent of those provided at the community level. This is largely because the resource needs of each new venture are idiosyncratic (Lichtenstein and Brush 2001), even when they are started up in the same geographic location by the same founders (Brush, Greene, and Hart 2001).

According to the resource-based view of the firm, higher performance may result from idiosyncratic resource positions in new firms (Alvarez and Barney 2004; Alvarez and Busenitz 2001; Penrose 1959). Typically, these resource positions are internally developed as opposed to externally procured. The resource view provides the conceptual means to understand how a new venture may insulate itself from competition, but it is not particularly helpful in providing guidance on the proper sequencing or staging of resource development efforts. Thus, a growing body of research seeks to identify ways in which new ventures develop or accumulate resources (Haber and Reichel 2007; Lichtenstein and Brush 2001), which types of resources are relatively more valuable than others, and at what stage of venture development must certain resources be in place (Gilbert, McDougall, and Audretsch 2006; Baker and Nelson 2005).

The present article focuses on a particular type of resource in new ventures—knowledge. Knowledge resources include the understanding of how to start up new organizations, how to manage people and processes, how to attain growth and competitive position, and how to stage technology and new product development (Brush, Greene, and Hart 2001; Wiklund and Shepherd 2003). They are critical in new ventures

because they are the first type of resource that any successful new venture accumulates. Both Schumpeter (1934) and Penrose (1959) characterized entrepreneurship, or entrepreneurial management, as the understanding of new possibilities. Before a new venture begins to hire staff, purchase equipment, create alliances, or sell its products or services, the founders must have a rationale or logic in mind for taking these steps. The founders will have developed some understanding of the opportunity space for a competitive position in the marketplace that ultimately leads to such actions.<sup>1</sup> Likewise, before new venture founders begin to seek or develop additional resources that will facilitate going to market or provide competitive insulation, they must have some understanding of the types and configurations of resources that the opportunity calls for. Thus, new ventures rely on whatever knowledge resources are brought to the table by the founders (Brush, Greene, and Hart 2001). In contrast, a “shoot first, aim later” approach, taking actions without sufficient knowledge about an opportunity, often results in misdirection and a waste of resources. Many of the dot.com start-ups of the late 1990s and early 2000s suffered this fate.

The accumulation of knowledge resources at its inception also lays a foundation for the new venture’s sustainability. Having accumulated knowledge through their own idiosyncratic experiences and processes, founders will have a unique view of opportunity in the market that cannot be appropriated by potential competitors. Thus, knowledge can be described using the language of the resource-based view—such as rare,

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<sup>1</sup>Some researchers have argued that opportunities exist in the market (e.g., Shane and Venkataraman 2000) while others hold that entrepreneurs enact opportunity and shape its nature (Gartner, Carter, and Hills 2003). In either case, the ability of individuals to find new ventures depends on prior knowledge or appreciation of the competitive context so that they can discern new opportunity when others would not.

inimitable, nontradable—and exhibits characteristics that confer sustainable advantage (Barney 1991). The knowledge view therefore has implications not only for new venture start-up performance, but also for longer-term growth.

We investigate the relationship between new venture performance and types of knowledge that come into play in the start-up process. Three types of procedural knowledge<sup>2</sup> are important (Wiklund and Shepherd 2003): knowledge about the industry, knowledge about the type of business, and knowledge about starting up new ventures. The first two are peculiar to a particular industry or business type, whereas the latter is applicable to a wide variety of businesses. These types of knowledge are derived from different sources. We investigate the relationship between knowledge sources and new venture performance in a study of technology-based firms where, in the face of dynamically changing competitive circumstances, relevant knowledge development may be particularly challenging. The study yields unexpected findings about the sources of knowledge and the strength of the knowledge–performance relationship.

## ***Resource-Based View and Knowledge in New Ventures***

The resource view of the firm attempts to define fundamental factors within organizations that create sustainable competitive advantage (Dierickx and Cool 1989; Barney 1986; Wernerfelt 1984; Penrose 1959). Wernerfelt (1984) describes resource strengths tied semi-permanently to firms and equates sus-

tainable advantage with the creation of resource position barriers. Critical to the theory is the assumption that resources are heterogeneous among firms and that competitive advantage depends upon that heterogeneity. The most important characteristic of a resource that affords the possibility of competitive advantage—that it is valuable (Barney 2001)—speaks to the essential fit that must exist between the type of resource and the competitive context in which the firm finds itself. As firms confront ever-changing contexts, their resource positions must dynamically develop to fit the situation. This is consistent with the way we think about sustainable competitive advantage in new ventures. New ventures seek to carve out unique positions that are not assailable by incumbents or imitable by other new ventures. And as their circumstances change (e.g., life cycle stage changes or the advent of new competition), they must seek to create the proper resource fit with the circumstances (Chandler and Hanks 1994).

Most research about resource-based theory has focused on large, established firms, where the challenges of resource acquisition and development are significantly different—both quantitatively and qualitatively—from what occurs in new ventures. West and DeCastro (2001) point out the unique enigma that the new venture faces in somehow moving from a position of zero resources to possession of competitively insulating resources. Few new ventures spring into action with a fully developed resource of any variety (financial, human, organizational, technological, etc.), much less an entire set of complementary resources. New ventures come into being as only the crystallization of an idea

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<sup>2</sup>Procedural knowledge is the knowledge exercised in the performance of some task and cannot be easily articulated by the individual as it typically involves tacit dimensions. It is the knowledge of how something works and how (or especially how best) to perform some task (Stillings et al. 1995).

about a potential market opportunity and they generally possess little of anything described in the resource-based literature.

Recently, researchers have turned their attention to the question of how new ventures develop resource positions, but these studies have significant limitations. For example, some studies examine the relationship between new venture performance and firm resources such as human capital (Haber and Reichel 2007) or financial capital (Cooper, Gimeno-Gascon, and Woo 1994) without attention to how or where those resource positions were developed. Other studies have begun to look more carefully at the process of attracting and acquiring resources in new ventures (Brush, Greene, and Hart 2001; Lichtenstein and Brush 2001), but these are qualitative case studies examining a small number of firms well beyond the start-up phase. Lastly, studies often gauge performance with absolute measures such as survival or sales growth (Delmar and Shane 2006), whereas the resource-based view addresses performance relative to competition.

A perspective finding currency within the resource-based view is that a firm's competitive advantage arises from managerial knowledge. Penrose (1959) explicitly mentions entrepreneurial capabilities of management as key to understanding how the firm attains growth and competitive position. Management's key role is to identify and evaluate resources (Barney 1991), and then decide which resources to invest in and how to utilize them (Castanias and Helfat 1991). To the extent that managers are more adept in organizing and integrating underlying resources, firms will be able to compete more effectively (Kogut and Zander 1992). Intangible resources such as human capital (Amit and Schoemaker 1993), routines, and knowledge (Grant 1996) have been linked to enhanced firm performance. Cooper, Gimeno-Gascon,

and Woo (1994) link relevant knowledge to new venture survival or failure. More recently, Alvarez and Busenitz (2001) describe entrepreneurial knowledge as "abstract knowledge of where and how to obtain . . . resources" (p. 762), heterogeneously organized to create and take advantage of opportunity.

The various terms used to describe this constellation of resources—managerial capabilities, organizing principles, human capital, and routines—all fundamentally refer to different types of managerial or entrepreneurial knowledge. To be successful, Malecki (1997) argues, entrepreneurs must know how to integrate scientific knowledge, facts, and management techniques with contextual experience. Knowledge about how to manage the complex array of activities involved in a start-up is a type of procedural knowledge that represents a significant resource for the new venture (Wiklund and Shepherd 2003). In studying technology firms, Ranft and Lord (2000) describe employee skills, managerial systems, and processes as socially complex knowledge-based capabilities that exist at the core of the firms. Similarly, innovative entrepreneurship has been characterized by the complexity and tacitness of knowledge that is central to the process (Zander and Kogut 1995).

Knowledge resources are seminal for new ventures, for two reasons. First, knowledge resources provide the initial foundation for competitive advantage. At the outset, an entrepreneur possesses only his or her ideas about a possible opportunity that could lead to the founding of a new venture. Through a variety of information-processing activities, the entrepreneur develops asymmetric knowledge about the opportunity's real potential (West 2003). Through systematic information search (Fiet 1996) and by accessing both social and business networks (Dubini and Aldrich 1991; Birley 1985), the prospective entrepreneur

neur is able to investigate and refine a potential idea. The receipt of any one new piece of qualifying information or any one exchange with others, by itself, is not critical in this process. Instead, the synthesis of all such received pieces of information about the idea helps to reveal the idea's scope and potential in the marketplace. As the first fundamental expression of the relationship between the market opportunity and a new venture's behavior, this new understanding thus provides the strategic foundation for moving forward with the new venture idea. Moreover, the synthesis is extremely idiosyncratic because it depends on the unique constellation of information sources and contacts accessed by the entrepreneur. The synthetic view of the opportunity developed then exhibits all the characteristics described by the body of resource-based theory (valuable, rare, inimitable, nontradable, nonsubstitutable) that provide *ex ante* and *ex post* limits to competition (Alvarez and Busenitz 2001; Peteraf 1993).

Second, knowledge resources in new ventures lead to the development of other important resources, one of the greatest challenges confronted by new companies (Gilbert, McDougall, and Audretsch 2006). For example, the discrete sharing of selected bits of understanding about the nature of the refined opportunity enables entrepreneurs to attract engineers to join technology firms, recruit top managers to leave established positions elsewhere to join the management team, convince suppliers that it makes sense to collaborate, or attract financial investments from providers of capital. Brush, Greene, and Hart (2001) examine the start-ups of both Palm Computing and Handspring and find precisely this type of resource development cycle. In both cases, the complex, intangible knowledge resources possessed by founders Jeff Hawkins and Donna Dubinski were

instrumental in acquiring other tangible resources (such as financial and physical capital).

Where does knowledge reside in a start-up venture? For larger, more established firms, knowledge may exist in many locations. Some of these would include the presence of other key executives (Cross and Sproull 2004), through formalized relationships with suppliers and customers, and in boundary-spanning systems and procedures. Established organizations are also able to make explicit (in the form of policies and guidelines) what was previously tacit, and routines often become established as manifestations of knowledge about how to most effectively conduct best practices (Winter 1987).

New ventures, however, exist in stark contrast to the larger incumbents in an industry. For new ventures, it is the CEO who wields the greatest influence on strategy and direction (Gilbert, McDougall, and Audretsch 2006; Colombo and Grilli 2005; Johnson and Bishop 2002; Morone 1993; Eisenhardt 1989). Before the top management team has ever been assembled, the knowledge which guides further resource acquisition and the development of the venture must reside largely in the mind of the founder. New ventures have not had the chance to accumulate slack (Bourgeois 1985) allowing them to articulate best practices, develop highly effective routines, or devote effort to activities that are not mission-critical to successful launching (Gong, Baker, and Miner 2005). Brush, Greene, and Hart (2001) conclude that one of the biggest challenges facing new ventures is transforming the founder CEO's personal knowledge of the industry, market, and product into organizational resources.

The founder CEO's knowledge presents unique challenges for the development of sustainable competitive advantage in technology-based new ventures. On the one hand, it is the founder

CEO's unique insight and understanding about opportunity in the marketplace that leads to the start-up of a new technology venture in the first place. They ordinarily have technical knowledge based upon previous experience, enabling them to appreciate the interface between what new technology can accomplish and unmet needs in the market. On the other hand, a technical mindset can sometimes lead to significant organizational problems as the new venture develops. The founder CEO may focus myopically on the science and disregard recommendations of top managers recruited to help run the business (Meyer and Dean 1990). In addition, the rapid pace of change in technology environments may shorten the useful life of previously developed technical knowledge, making the management challenge for these start-ups even greater. These circumstances emphasize the balance that must exist in technology-based firms between the CEO's technical knowledge and managerial knowledge (whether or not the CEO is also the founder), a point we will return to later.

Though we recognize that new ventures often involve top management teams, we focus the remaining discussion on sources of knowledge for the founder CEO. In part, this reflects the influential position, which the founder CEO holds in any new venture (Gilbert, McDougall, and Audretsch 2006; West and Meyer 1998). Previous research has suggested that the resource-based view of new firm formation is best explored with reference to process and activities executed at the individual level (Newbert 2005).

### ***Sources of Knowledge for Founder CEOs***

Research has occasionally examined a range of characteristics thought to contribute to a founder CEO's knowledge, but which are not *idiosyncratically* important to the new venture or appro-

priate to the specific circumstances of the new venture. These include, for example, the age of the founder and the founder's educational background. Presumably, the older and more educated the founder, the greater the founder's knowledge. Although previous research has examined the relationship between these types of dimensions and aspects of new venture performance, the resource-based view would argue that both are characteristics shared by many other founders and CEOs, and are therefore neither rare, inimitable, nonsubstitutable, or nontradable. Although age and education may be valuable founder characteristics for new ventures, they could not possibly be sources of sustainable competitive advantage. We choose to focus instead on types of knowledge that might be generative of sustainable competitive advantage.

There are three types of procedural knowledge (Wiklund and Shepherd 2003) important to new venture founders. The three types of knowledge are (1) knowledge about the specific industry in which the new venture will compete; (2) knowledge about the type of strategic or business approach that the new venture might take within the industry; and (3) knowledge about creating and starting up new ventures. On the surface, it is not apparent that any of these knowledge types would meet any of the resource-based criteria. After all, industry experience or experience with a certain type of strategy may be reasonably widespread. However, past research investigating these dimensions for new venture CEOs have not addressed these resource view criteria explicitly. As we will argue, it is not simply the length of industry or business experience that is critical but the relatedness of that experience to the new venture that affords uniqueness and inimitability.

There are three sources for the types of knowledge already outlined. In a straightforward sense, both industry and

business knowledge are acquired through previous work experience. Similarly, knowledge about starting up companies is usually acquired by having actually participated in previous start-ups. But knowledge about industries, business, and new venture start-up may also be developed or acquired by accessing other information sources, in order to gain insights and new information to supplement one's own personal experiences.

### **Relatedness of Experience**

It is often assumed implicitly that the kind of knowledge important to new venture success is knowledge about a particular industry or particular kind of business. Typically, research which investigates industry or business knowledge of founder CEOs or their top managers has focused on their years of experience (e.g., Delmar and Shane 2006; Eisenhardt 1989). However, gross measures of years of experience may be misleading, especially in industries characterized by fuzzy boundaries and in which may exist broad strategic variety. Within the "software" industry, for example the U.S. Department of Commerce lists 11 separate NAICS entries for different types of software-related businesses. Even within the one designation for "packaged software publishers," there are 12 additional subcategories representing a range covering applications software, games, operating systems, utilities, etc. These industry subcategories vary considerably in dimensions that are important to new ventures, such as size, growth, ease of entry, and level of competition. Research that captures length of experience in the "software industry" will not necessarily capture experience that is entirely relevant to the new venture with which a founder is now associated.

The same logic may be applied to business or functional-level experience. Length of experience managing strategy

may not adequately reflect the relevance of that experience for the new venture with which the founder is now associated. Several years ago, Pepsi CEO John Sculley left the company to take a job as Apple Computer's CEO. Sculley was renowned for his strategic accomplishments over the years in the food sector, however, that experience did not translate effectively to the technology sector. Even similar roles within highly related types of industries might not be helpful to the new venture. Netflix and Blockbuster both compete in the video rental business; however, their strategic approaches are considerably different. Whereas Blockbuster's strategy has focused on market coverage through a real estate model that necessitates driving customers into stores and increasing the level of each checkout transaction, Netflix has focused on online distribution, membership development, a user-friendly website, and efficient operations. Had Netflix recruited a strategy person from Blockbuster when it started up, that experience would probably not have been particularly helpful.

It makes a difference how related a manager's prior industry and business experiences are to the industry of the new venture and the type of strategic approach the new venture must adopt. Wiklund and Shepherd (2003) describe procedural knowledge in new ventures as arising from experience with similar past situations. Others are more specific, describing forms of "knowledge relatedness" as constituent elements in effective enterprise management. For example, Chandler (1996) discovered that the similarity between the "previous job or business" and the "current venture" can be described by two factors he called "task environment" and "skills/abilities." "Task environment" refers to suppliers, competitors, and customers, suggesting industry relatedness. "Skills and abilities" refers to managerial duties, functional

duties, and tasks, suggesting relatedness of the internal functioning of the business. Capron, Dussauge, and Mitchell (1998) highlight how firm performance responds favorably when related managerial capabilities developed in other companies are brought to bear in new situations. Tanriverdi and Venkatraman (2005) also find that the simultaneous application of product, customer and managerial knowledge relatedness across different business units improves the market performance of multibusiness companies. The simultaneity finding in this latter research supports the resource-based view that a fundamental challenge of businesses is to integrate many different types of knowledge (Grant 1996). High levels of knowledge relatedness can benefit in starting up and operating small businesses (Wiklund and Shepherd 2003) at the same time it affords barriers to competitive imitation.

In the most straightforward case, employees of existing companies may decide to become entrepreneurs, striking out on their own to create companies that build usefully upon the specific knowledge they have acquired by working in their industry and company. Despite having gathered as much information as possible in order to frame the nature of the opportunity, uncertainty still exists for any potential entrepreneur. And so the relatedness of their new endeavor to their previous experiences should be useful in managing uncertainties that remain. The entrepreneur must make assumptions about the new market, customers, and suppliers, but previous experience with customers, suppliers, and competitors should improve the quality of decisions.

The entrepreneur must also make assumptions about the effectiveness of strategic choices within the market, and about the organization of activities within the firm that supports a particular type of strategy. Familiarity with a similar kind of strategic approach and internal

organization should also improve the quality of decisions. Thus, where the type of knowledge that is required for the new venture is highly related to the previous experience of the entrepreneur, the venture should have a higher probability of success. On the other hand, where an entrepreneur brings knowledge to a new venture that is unrelated to that necessary for the venture, there should be a higher risk of failure. Thus,

*H1a: The relatedness of the industry of the new venture to the new venture CEO's previous industry experience is positively associated with the new venture's performance.*

*H1b: The relatedness of the business of the new venture to the new venture CEO's previous business experience is positively associated with the new venture's performance.*

It is reasonable to expect that when both related industry and related business experience are brought to bear on the new venture, new venture performance should be enhanced. Juan Rodriguez cofounded Storage Technology in the tape drive backup industry, after having previously been involved in the same type of business in the very same industry when employed previously with IBM. Not only did he understand technology trajectories across the industry, competitive dynamics, and customer needs, he also brought a highly related understanding of successful strategic recipes and internal organization that could take advantage of the market opportunity (Rodriguez 1994). Storage Technology was launched successfully and subsequently joined the ranks of the Fortune 500. We expect to find an interaction between industry and business experience.

*H1c: The interaction between industry relatedness and business relatedness of the new venture to the new venture*



*CEO's previous industry and business experience is positively associated with the new venture's performance.*

### **Depth of Start-Up Experience**

New venture performance also requires more broadly applicable knowledge about organizing something from nothing, planning where none had been done before, and motivating brand new employees and stakeholders. In other words, new venture development may be enhanced by knowledge gained through previous experience in new ventures. This source of knowledge is illustrated by the case of someone who has already been an entrepreneur creating, building, and harvesting a business, and who now sets out to start another business. In this case it is reasonable to think that knowledge about the challenges and management issues that are peculiar to start-ups would be useful and applicable in the new venture setting.

Logically, the entrepreneur or CEO who has previous start-up experience would understand what steps to take in order to maximize the new venture's potential (Westhead, Ucbasaran, and Wright 2005). He or she would also understand what pitfalls may lie ahead, and thus, what steps not to take (e.g., Brush, Greene, and Hart 2001). This may include significant organizational problems associated with the staged development and growth of new ventures (e.g., Kazanjian 1988), as well as more pragmatic issues such as negotiating space leases with realtors or lines of credits with banks. The previous start-up experience of both Hawkins and Dubinski enabled them to more easily navigate start-up resource acquisition issues at Handspring, such as selecting venture capitalists and raising financial capital. Their previous experience at Palm also enabled them to more easily set up new supply chain relations and internal customer service operations (Brush, Greene, and Hart 2001). In the start-up of his

second new venture (Exabyte) following the previous Storage Technology start-up, Juan Rodriguez commented "I not only knew what do to, I also understood what not to do" (Rodriguez 1994).

Though intuitively appealing, previous research on this question has been equivocal at best (Newbert 2005). Wright, Robbie, and Ennew (1997b) find that the assets of entrepreneurs exceed their liabilities in serial start-up activity, but that their performance is no better than novice entrepreneurs in venture capital-backed firms. Other studies have pointed out the benefits of previous start-up experience (Cowe 1998; Wright, Robbie, and Ennew 1997a). Still others have found previous experience to be a detriment after radical industry changes due to less seeking of information from critics (Audia, Locke, and Smith 2000).

Previous start-up experience by itself may not fulfill the criteria suggested by the resource-based view. With the growth of first-time entrepreneurial start-up activity (Reynolds et al. 2000), an ever-increasing proportion of the general population can claim previous start-up experience. What should make a difference in the nature of this experience from the resource view is its depth. Serial entrepreneurs are far more rare in the population and the knowledge that accrues to an individual from having participated in several start-ups can establish a knowledge foundation that is also valuable, inimitable, nontradable, and nonsubstitutable.

*H2: New venture performance is positively associated with the extent of previous start-up experience of the new venture's CEO.*

### **Networking**

Finally, entrepreneurs may supplement any industry, business, or previous start-up knowledge they have gained through experience with additional knowledge gained through networking

(e.g., Johannisson 2000; Dubini and Aldrich 1991; Aldrich and Zimmer 1986; Birley 1985). In order to resolve uncertainty owners of young firms rely more heavily on external networks than do managers of older firms (McGee and Sawyer 2003), which is generative of both tacit and explicit knowledge that is helpful for the venture (Chrisman and McMullen 2004). Network theory places particular importance on the connections between different social groups as particularly salient in the diffusion of new information (Rogers 1983; Rogers and Kincaid 1981; Granovetter 1973). The information benefits to individuals who bridge “structural holes” between different network clusters (i.e., who have strong relations with other network clusters possessing very different information) are especially valuable (Burt 1997; Rogers and Kincaid 1981). Thus, information networks are most valuable when they provide access to individuals who possess relevant knowledge that the entrepreneurs cannot gain through their experiences or customary personal contacts. By bridging structural holes and communicating with members of other groups, new and more valuable information is provided to entrepreneurs and this information may assist them in their efforts to start, manage, and grow the company.

The entrepreneur’s behavior within external networks may also affect the care with which a new opportunity is evaluated resulting in more complete knowledge about the opportunity. Much has been written about entrepreneurial alertness (Kirzner, 1979) leading to opportunity recognition (de Koning 1999; Singh et al. 1999). Individuals who are more comfortable in and have a propensity for networking may be more successful at generating flows of unique information through their networking and other information gathering behavior. Such individuals may then be more successful in carefully refining

and defining the nature of the opportunity. They may also be more successful in attracting human and capital resources for their firm start-up by successfully “brokering” their unique information and knowledge to appropriate parties (Hilmy 1992).

Together, these arguments lead to the following hypotheses:

*H3a: New venture performance is positively associated with the new venture CEO’s networking activity that generates new information.*

*H3b: New venture performance is positively associated with the frequency of the new venture CEO’s networking activity.*

Finally, given that we have identified three potential sources of knowledge for entrepreneurs starting up new businesses, a question that begs to be asked is “which source of knowledge is more important in the start-up process?” Resource-based theory contends that knowledge resources are of primary importance to start-ups. It also provides a rationale that knowledge gained through networking would be highly idiosyncratic, dependent upon the unique constellation of members in the entrepreneur’s network, the media or means through which communications take place, and the frequency of such communications. Whoever the entrepreneur makes the contacts, and the interpretations or meanings that the entrepreneur develops as a result of this process (West 2003) are all unique to that entrepreneur. Networking can thus produce a type of knowledge that is valuable, rare, inimitable, nontradable, and nonsubstitutable. In contrast, knowledge gained through industry and business experience or through previous start-up experience, though valuable, is not necessarily as unique and rare.

*H4: Networking activity by new venture CEOs will bear a stronger positive relationship to new venture performance than will the relatedness of industry and business experience or the extent of previous start-up experience.*

## **Method**

This study was conducted among new ventures in a region whose economy had historically relied on traditional manufacturing industries. A total of 177 start-up firms were identified through the local chambers of commerce, local entrepreneurship networking organizations, and Dun & Bradstreet as being in information technology, biotechnology, and medical or pharmaceutical technology areas. We elected to focus on technology-based new ventures in this study because technology industries are highly competitive and experience dynamic change. Consequently, the importance of knowledge currency for any new venture should be profound. Surveys were sent to the CEOs of the new ventures requesting participation in a study of technology firms. A total of 83 CEOs responded to the survey request, for a 47 percent response rate. Because of nonresponse on some items and eliminations due to outliers, the effective sample size is somewhat lower in some of the analyses. Through Dun & Bradstreet and the chambers of commerce, we collected data for all 177 firms on age, employment size, changes in employment over previous years, and legal form. Chi-squared and *t*-tests were conducted to compare responding to nonresponding firms, and no significant differences were observed.

On average, the responding firms were less than five years old and had 36 employees. Life cycle data collected from the respondents indicates that these technology companies were in the early stage of development. Using Kazanjian's (1988) scale, the responding firms were on average between the commercializa-

tion and growth stages in their development. Eighty-eight percent of the responding CEOs were founders of their companies. Forty-seven percent of the entire CEO sample and 52 percent of the founder CEOs, had previous start-up experience. Just over 20 percent of the entire CEO sample had been involved in more than one start-up previously.

## **Variables and Measures**

*Knowledge Relatedness.* CEO respondents were asked to indicate how related their present company was to that of the previous company where they worked. Two dimensions of relatedness were sought. For industry relatedness the survey asked the CEO to rate "the extent to which your present company operates in the same or very similar industry." For business relatedness, the survey asked the CEO to rate "the extent to which your present company's products, services, or overall approach (e.g., strategy, R&D effort, operations, marketing, sales, etc.) are the same or very similar." Following the method used in previous studies (Tanriverdi and Venkatraman 2005; Capron, Dussauge, and Mitchell 1998), respondents evaluated each relatedness dimension using a five-point scale, where 1 represented "extremely unrelated; not the same in any respect" and 5 represented "extremely related; the same or very close to it."

*Previous Start-up Experience.* The respondents were asked if they had founded or worked in other start-up companies previously. Respondents reported the number of start-up companies they had worked in previously.

*Networking.* The respondents were asked to identify each individual outside the company "who provided especially important information or advice to you at the time you started or joined your present company. By 'especially important' is meant information or advice you

believe was critical to your success in starting up and/or developing this company.” Each respondent was asked to rate the communication frequency with each individual named in this self-generated roster, and the “newness” of information provided by each person named. A five-point rating scale was used for each dimension. For communication frequency, the scale ranged from 1 for “very infrequent” to 5 for “very frequent”; for newness of information and advice the scale ranged from 1 for “not at all” to 5 for “to a very great extent.” These methods have been used previously in research on networking in new ventures (West and Meyer 1997) and on networking in general (e.g., Scott 1991).

*New Venture Performance.* Reflecting the concern that absolute measures of performance (such as sales or net income) do not appropriately capture the strategy and resource-based view focusing on competitive advantage (Gilbert, McDougall, and Audretsch 2006), this study used a dependent variable that focused on performance relative to competition. Wiklund and Shepherd (2003) previously employed a similar approach to assess performance relative to competitors, reflecting the theoretical focus of the resource-based view. The participating companies were privately held; therefore, detailed financial information was not available. Firm performance was measured by the subjective assessment of the respondent, using the ratings of three performance-related question items. One item, based on Dess and Robinson (1984), asked for an assessment of the percent of ideal performance being achieved, where ideal performance equated to 100 percent. Two other items build on the tradition of strategy as competitive advantage leading to enhanced performance. These items assessed growth and overall performance “relative to other companies facing similar business development challenges or who are

in the same business.” Each of these relative assessments used a seven-point agreement scale, and the score on each was then interpolated into a 0-to-100 range equivalent. The overall measure of performance used for the firm is the average of the three items described here, expressed as a percent. The composite measure at the firm level has a Cronbach’s alpha coefficient of 0.84. A substantially similar scale has been reliably used in other research on private new ventures, and represents an effective proxy for objective measures of performance (Lumpkin and Dess 1995).

Because of concerns of possible common method bias due to self-report data from a single source, data collected in the surveys were compared to identical data collected independently on the responding companies from Dun & Bradstreet and the local chambers of commerce. Correlations between these different sources included 0.97 for company age, 0.93 for employment size, and 0.83 for changes in employment (all  $p < .001$ ), indicating that common method bias is not an issue.

*Control Variables.* Performance is often correlated with firm size, and so a measure of firm size is used as a control variable. Number of employees, log-transformed to a normal distribution, served as a proxy for firm size. New venture performance is also especially sensitive to firm age, due to liabilities of newness (Stinchcombe 1965), so firm age is also used as a control variable.

## **Results**

Table 1 presents descriptive statistics and bivariate correlations among the variables in this study. The responding firms were performing on average at a level of 71 percent, relative to the individual performance benchmarks suggested by the survey. The CEOs in this survey had an average of just under one start-up experience in their background

**Table 1**  
**Correlations Among Variable**

	Mean	S.D.	1	2	3	4	5	6	7	8
1 Firm Performance	71.24	16.50	1.000							
2 Industry Relatedness	3.44	1.44	-0.086	1.000						
3 Business Relatedness	3.43	1.26	0.019	0.651**	1.000					
4 Start-Up Experience	0.80	1.03	0.191	0.067	-0.070	1.000				
5 Network new info	3.67	0.64	0.162	-0.108	-0.110	0.050	1.000			
6 Network Frequency	3.63	0.75	0.393**	-0.034	0.070	0.110	0.098	1.000		
7 Size (Log Employees)	2.55	1.44	0.116	-0.064	-0.165	-0.044	-0.123	0.361**	1.000	
8 Firm Age	4.77	3.57	-0.051	-0.040	-0.150	-0.310**	-0.097	0.041	0.409**	1.000

\*\* $p < .01$ .

before working for their present company. Consistent with prior work, it appears as if the majority of these new ventures bore some relationship to both the previous industry and previous business model experienced by the CEO, as both measures of relatedness were above the midpoint on the scales used. Usage of networks by the CEOs appears fairly robust, on average involving frequent contact and the provision of new information. Network frequency of use is positively correlated with both performance and size of the company. As the individuals named in the networking roster were external to the company, it may suggest that advice network use grows as the company size grows and as the need for new understanding also increases.

The theory development section of this article focused on founder CEOs. As described earlier, a very high percentage of respondents in this study were founder CEOs. The hypotheses tests that follow use the entire survey response base, which includes nine CEOs who were not also founders. Duplicate *post hoc* regression analyses were run using founder CEO as a dummy control variable, in order to discern if any different relationships emerged when considering only founder CEOs. All of the duplicate regressions produced almost identical results as the full, unmoderated tests reported in the succeeding discussions.

Table 2 presents the results of the hypothesis tests. In Model 1, new venture performance is regressed on the combination of industry and business relatedness, controlling for firm size and age. An interaction term is included in this model in order to partial out interaction effects (Cohen 1978) of the two variables, and because H1c suggests a specific relationship between performance and this interaction. As the two independent variables exhibit reasonably strong bivariate correlation of 0.65 (Table 1), variance inflation factors were

**Table 2**  
**Regression on New Venture Performance (Standardized**  
**Beta Coefficients Listed)**

	Model 1	Model 2	Model 3	Full Model
Control variables				
Firm Size	0.332**	0.086	0.208	0.182
Firm Age	-0.108	-0.072	-0.063	-0.005
Independent Variables				
Industry Relatedness	-0.248			-0.175
Business Relatedness	0.417**			0.345*
Industry × Business Relatedness	0.213			0.189
Previous Start-Up Experience		0.130		0.062
Networking Frequency			0.394***	0.329**
Networking Information Newness			0.283**	0.319**
<i>F</i>	2.417**	0.686	5.502***	2.959**
<i>df</i>	5, 58	3, 65	4, 44	8, 39
Adj. <i>R</i> <sup>2</sup>	0.101	-0.014	0.273	0.250
Change in <i>R</i> <sup>2</sup>	0.078	0.015	0.245***	0.301**
Effect Size	0.21	n/a	0.50	0.61
Power	0.77		0.96	0.92

\**p* < .10

\*\**p* < .05

\*\*\**p* < .01

consulted to assess the possibility of multicollinearity. VIFs for both variables are below 10, indicating this is not an issue (Tabachnik and Fidell 1989). However, the introduction of the interaction term does increase the threat of multicollinearity. A recommended solution is to center the independent variables before creating the interaction term (Jaccard, Turrisi, and Wan 1990). This approach was followed in the models containing the interaction term.

Model 1 predicts firm performance at a significant level ( $F = 2.417$ ,  $p < .05$ ), although the predictor variables in combination are not significant (change  $R^2 = 0.078$ , n.s.). In the full model industry relatedness is not a significant predictor. Business relatedness is significant in the model in the direction hypothesized,

meaning that greater business relatedness is predictive of improved performance. The interaction between industry relatedness and business relatedness is also not significant. Therefore, H1a and H1c are not supported, whereas H1b finds support. We also report effect size and power. The effect size of this model is at a “medium” level (Cohen 1988), however, power is slightly below the usually accepted threshold of 0.80 (Tabachnik and Fidell 1989). The non-significance of industry relatedness–performance relationship must be treated with some caution as in this model there is roughly a 1-in-5 chance of Type II error.

Model 2 presents the results of the regression of performance on previous CEO start-up experience. The model is

not significant, nor is the variable measuring previous start-up experience of the CEO. In a separate post hoc test that was not originally suggested in the hypothesis development section, performance was also regressed against the square of previous start experience. This would reveal whether there may be some critical threshold of previous experience, beyond which new venture performance would be enhanced (Delmar and Shane 2006). However, the results of this test (not shown in Table 2) were also not significant. These results do not support H2.

Model 3 presents the results of the regression of performance on networking activity of the CEO. The overall regression is highly significant, controlling for firm size ( $F = 7.841, p < .01$ ). The networking variables are both individually significant, and in combination significantly explain performance (change  $R^2 = 0.245, p < .01$ ). Together with the strong bivariate correlation between network frequency and performance, shown in Table 1, H3a and H3b find a strong measure of support.

The full Model 4 in Table 2 presents the results of the regression of performance on all the independent variables simultaneously. The full model is also significant on an overall basis ( $F = 2.959, p < .05$ ), and is significant after controlling for the effects of firm size and firm age (change  $R^2 = .301, p < .05$ ). In this model, we see that industry relatedness is again not significant, whereas business relatedness is again significant and positive. This model has a “large” effect size with significant power (Cohen 1988). Therefore, this model provides stronger support for H1b, while increasing confidence that the rejection of H1a and H1c are not Type II errors.

Among the independent variables, the two networking variables are significant and positively related to performance, as is business relatedness. Table 3 displays the partial correlations for each indepen-

**Table 3**  
**Partial Correlations in Full Model**

<b>Independent Variables</b>	<b>Partial Correlation</b>
Industry Relatedness	-0.070
Business Relatedness	0.086
Industry × Business Relatedness	0.084
Previous Start-Up Experience	0.157
Networking Frequency	0.354
Networking Information Newness	0.429

dent variable in the full model, which indicates each variable’s unique correlation with performance while controlling for the effects of all other variables. Both networking variables have much higher partial correlations than any other variable in the full model. H4 is strongly supported.

### **Discussion**

This article applies a resource-based theory perspective to the examination of technology-based new ventures. Though previous research on new ventures has yielded rich findings about the start-up process, the application of resource-based theory provides a more refined view of the conditions that lead to superior performance and sustainability of new ventures. We argue that knowledge resources are the first to express themselves in new ventures, and that knowledge resources can instrumentally lead to the development and acquisition of other types of resources that are important for further venture development. The empirical study examines three different sources of knowledge resources for new venture CEOs, including related industry and business experience, previ-

ous experience in start-up situations, and knowledge gained through networking.

At the outset, we need to qualify the nature of the results observed in this study. The sample of firms is drawn from a subset of categories in the technology sector. Consequently, the dynamic nature of change in technology-based fields, which impacts these companies, is likely to be greater than would be the case in nontechnology industries. The results witnessed in this study may not hold for nontechnology new ventures. These firms are also not located in the geographic technology clusters—such as Silicon Valley or Boston’s Route 128—that are often the focus of technology studies, nor do they spring from incubators which have also been studied recently. The geography of the sample firms reduces the impact of potential knowledge spillovers that exist in clusters (e.g., DeCarolis and Deeds 1999; Poudar and St. John 1996) or the potential benefits of assistance through incubation (Peters, Rice, and Sundararajan 2004), which might affect the nature of the knowledge relatedness relationships and the external networking identified here. We have also not accounted for the aspirations of the new venture or its CEO. Some firms may be seeking far greater growth (such as multiple product lines) or far broader markets (such as international) than others, and such aspirations might impact the types and sources of knowledge that are important. Finally, the size of the sample is relatively small, and so, the results should be interpreted in the context of the reported significance, power and effect size statistics.

The results of this study do not find a relationship between new venture performance and the relatedness of industry knowledge gained through previous experiences of the CEO. This challenges past research that extols previous industry experience. One explanation for this unexpected result may be that the

dynamic nature of technology industries means that the value of knowledge gained from previous industry experiences erodes very quickly (Newbert 2005). As technology advances and competition changes, the nature of competition and industry key success factors (Porter 1979) that characterized the past may no longer be relevant in the present. This is consistent with Tanriverdi and Venkatraman’s (2005) claim that existing knowledge “constrains a firm’s ability to operate in new businesses” (p. 104). It is also consistent with the detrimental effects of strategic persistence (Audia, Locke, and Smith 2000).

Another possible explanation is that a finer-grained view of industry context may be in order. Past research on knowledge brought into technology ventures in the form of top managers with related experience has often been situated in well-developed communities like Silicon Valley (e.g., Eisenhardt and Schoonhoven 1990; Eisenhardt 1989). The stage of development of both the start-up companies and the economic communities in which they are located may provide a context in which such “knowledge transfers” can be more effective. In Silicon Valley or the North Carolina Research Triangle, clustered development in technological fields tends to occur and start-ups tend to build off the infrastructures and commonly shared knowledge bases that characterize these areas (Marshall 1949). In the present study conducted in a region with far less technology-based entrepreneurial development, previous related industry experience may not be as helpful because the interaction of that knowledge with locally available infrastructures is not possible. In addition, it is possible that new companies locate in less well-developed communities because they seek to operate on the cutting edge of their respective technological regimes (Anderson and Tushman 1990), relying less on past trends and



successes in their respective industries. If true, then highly developed knowledge about industry conditions in the past may inhibit the development of these types of new firms.

On the other hand, this study does find that business relatedness is positively associated with performance. Reflecting the resource-based view, high levels of business relatedness are valuable, rare, and not easily attained, and should thus favorably impact how the new business is managed. The implications are that, though depth of experience in an industry is not particularly helpful, depth of experience in the same type of strategic approach that the new venture is pursuing can make a difference. Earlier research has invoked the ideas of expertise (Chi, Glaser, and Rees 1982) and pattern recognition (Ronstadt 1988) in describing the benefits of depth of experience. As Simon (1986) described years ago in his chess grandmasters experiments, expertise develops through significant apprenticeship and experience. It enables both the immediate grasp of complex situations when they are first presented, the ability to more easily understand cause-effect relationships, and the ability to project into the future the possible directions that any immediate actions might trigger. These are all provinces of the effective strategist as well.

The findings on industry and business relatedness have implications for the staffing practices in new businesses. Ruef, Aldrich, and Carter (2003) have already discovered that founder team composition often results in a relatively homogeneous group. Presumably, this occurs because of the intuitively appealing idea that previous industry experience is valuable to the new venture, the validity of which is challenged by the findings here. On the other hand, as business relatedness appears to be important, the founder CEOs must assess whether the specific strategy and busi-

ness strengths that they bring to the table make sense for the venture or whether it would be more appropriate for them to step aside so that someone with more focused and related experience can step in. This is a particular challenge for technology-based new ventures, as documented in previous studies. Though this study did not evaluate the backgrounds of top management team members, it is reasonable to assume that the business relatedness finding may have particular relevance for staffing these positions. Where a new venture calls for a particular type of strategic approach, for instance, top managers with previous experience in executing that type of strategy may enable the new venture to achieve greater internal consistency of action as well as greater effectiveness in the marketplace. Future research might investigate how the resource-based view impacts the nature of top management team composition.

That the present study finds no relationship between previous start-up experience and new venture performance simply adds to the continuing debate that surrounds what would seem to be an intuitively obvious connection. Reuber and Fischer (1999) differentiate between stocks of experience and streams of experience that founders acquire when they start up new businesses, where "stock" represents the depth and breadth of experience and "stream" relates to the entrepreneurial process of experimenting and learning. The present study sought to relate stocks of experience to new venture performance. In contrast, Westhead, Ucbasaran, and Wright (2005) investigated the effects of differences in streams of experience on *individual* performance. More research is needed to understand the relationships between stocks, streams, individual performance, and firm performance. For new ventures that are only at the start-up phase, too, the opportunity to have experimented and learned is quite limited because this

process takes time. Thus, the stock concept would still seem to be most appropriate to investigate at start-up, and more work is needed here.

The strongest finding in this study is that networking activity designed to infuse the venture frequently with new information is a strong predictor of performance. The analyses suggest that individual entrepreneurs may have greater knowledge assets at their disposal than they think. The networks that founders or CEOs draw upon for advice and consultation appear to be critically important. That communication skills appear to be important in the start-up process should prompt educators to consider means to enhance these behavioral skills among people learning about entrepreneurship. This finding should also prompt economic development authorities to consider effective methods for building and sponsoring local networks that entrepreneurs can tap into.

This study also provides strong support for the notion that innovation and new business activity are associated with the bridging of structural holes in information networks. Connecting with people who have different perspectives and understandings can yield important knowledge unaccounted for by past industry, business, or managerial experiences that entrepreneurs bring with them. Future research should seek to identify the characteristics and types of new knowledge that start-up company CEOs find most useful in their networking efforts.

Returning to the entrepreneurial resource problem identified at the outset of this article, the results of this study provide insight on how new ventures move from a position of no resources to an insulating resource position. Here, it is apparent that behavior by the individual can generate knowledge resources that can be used productively for the benefit of the firm. Unique knowledge created by entrepreneurs, especially

through their idiosyncratic information-gathering behaviors, might be used to attract others to become involved in their effort, to build effective organizations, and to attract financial capital. Thus, this study provides empirical support for previous qualitative findings and speculation about entrepreneurial resource development (Brush, Greene, and Hart 2001), and responds to the comment by Gilbert, McDougall, and Audretsch (2006) that one of the greatest challenges is understanding how new ventures overcome perceived risk in order to attract and build resource positions. The perspective advanced here is that knowledge resources provide the foundation for this building process.

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