INTERNATIONAL EXPANSION BY NEW VENTURE FIRMS: INTERNATIONAL DIVERSITY, MODE OF MARKET ENTRY, TECHNOLOGICAL LEARNING, AND PERFORMANCE

SHAKER A. ZAHRA
Georgia State University

R. DUANE IRELAND
University of Richmond

MICHAEL A. HITT
Arizona State University

An increasing number of new venture firms are internationalizing their business operations early in their life cycles. Previous explanations of this trend have focused on the importance of technological knowledge, skills, and resources for new ventures’ international expansion. However, little is known about how these firms use the technological learning gained through internationalization. This study examined the effects of international expansion, as measured by international diversity and mode of market entry, on a firm’s technological learning and the effects of this learning on the firm’s financial performance.

New venture firms, defined here as companies six years old or younger (Brush, 1995), are moving into international markets early in their life cycles (Oviatt & McDougall, 1994, 1997). Previous research has examined the antecedents (e.g., Oviatt & McDougall, 1997), processes (Oviatt & McDougall, 1995), and performance effects of new ventures’ international operations (Bloodgood, Sapienza, & Almeida, 1996; McDougall & Oviatt, 1996). Prior studies have shown that a combination of institutional factors (for instance, regulations), industry factors (such as competitive forces), and organizational factors fuel international expansion by new venture firms (Brush & Vanderwerf, 1992). Such expansion allows new ventures to achieve growth and positive returns by capitalizing on their unique resources and capabilities. It also facilitates learning, thereby allowing new ventures to both create and exploit knowledge.

The importance of organizational learning for a company’s survival and effective performance has been emphasized in the literature (Barkema & Vermeulen, 1998; Bartlett & Ghoshal, 1987a, 1987b; Hitt, Hoskisson, & Ireland, 1994; Huber, 1991). Even when it has a technologically superior product, a new venture firm must learn other skills to position its product successfully and develop the competencies that are necessary for superior performance (McGrath, MacMillan, & Venkataraman, 1995). International expansion can promote organizational, especially technological, learning (Barkema & Vermeulen, 1998; Ghoshal, 1987), facilitating the development of skills and competencies that help the firm achieve a competitive advantage (Dodgson, 1993).

Although research on the international activities of new venture firms exists, gaps remain. Currently, there is limited (but useful) research on new ventures’ technological learning through international operations. This research, based largely on case studies, suggests that new ventures gain knowledge as they diversify further into international markets. However, little is known about the amount of technological learning that occurs as new venture firms diversify internationally. Similarly, the effect on the firms’ technological learning of their modes of entry into international markets has not been examined systematically.

Knowledge creation through technological learning in international markets can be challenging. Technological learning is a multifaceted, and sometimes chaotic, process yielding knowledge that is often fragmented and unfocused. New ventures...
must manage this process with the intent of integrating the technological learning that has occurred in their international operations (Bartlett & Ghoshal, 1987b; Ghoshal, 1987). Integration is the process by which managers determine what has been learned, evaluate its potential importance, and explore ways in which the new knowledge can be used. Theory suggests that new ventures undertaking such integration achieve greater, deeper, and speedier technological learning from their international operations than those that fail to do so (Grant, 1996a). Thus, knowledge integration moderates the relationship between international expansion and technological learning.

This study makes three contributions. First, we examine the effects of international diversity and international mode of entry on technological learning by new venture firms, a critical relationship suggested by several authors (cf. Bloodgood et al., 1996). Even though the relationship between knowledge creation and performance in international markets has been suggested (e.g., Brown & Garten, 1995; Caves, 1982), little is known about how international diversity and mode of entry affect technological learning in new venture firms. Second, we examine the effect of knowledge integration (such as the development of organizational routines) on the relationship between international expansion activities and technological learning. The need to understand the effect of knowledge integration on the development and exploitation of a competitive advantage by promoting organizational learning has been highlighted in the literature (Leonard-Barton, 1992, 1995; Nonaka & Takeuchi, 1995). Third, we document the effect of technological learning on new venture performance. Technological learning can provide a major foundation for the organizational routines that reinforce existing core competencies or facilitate building new ones (Lei, Hitt, & Bettis, 1996; Teece, Pisano, & Shuen, 1997), processes that can lead to higher new venture performance.

In the presentation of our conceptual model, theory, and hypotheses, we highlight the effects of new venture firms' international expansion activities (that is, international diversity and mode of entry) on their technological learning and the implications of knowledge integration for technological learning gained through international expansion.

THEORY AND HYPOTHESES

International expansion positively influences new ventures' survival, profitability, and growth (Oviatt & McDougall, 1997). By entering international markets, new ventures acquire knowledge that can be used to build additional value-creating skills (Barkema & Vermeulen, 1998; Ghoshal, 1987). New ventures competing in international markets, for instance, draw from multiple knowledge bases in their research and development, manufacturing, and marketing operations to learn new skills that augment current capabilities.

Firms need to harvest and exploit their knowledge to create competitive advantages (Grant, 1996b). Indeed, the ability to manage and cultivate knowledge differentiates success from failure (Nonaka & Takeuchi, 1995). Effective learning is cumulative in nature (Helfat, 1994). Thus, internalizing learning from international operations is important for building a venture’s competencies and achieving high performance (Ghoshal, 1987). The development of new technological knowledge is important for success in international markets (Bartlett & Ghoshal, 1987b). This knowledge influences a venture’s ability to adapt its products to local market conditions (Afuah, 1998), capitalize on market dynamism through rapid new product developments (McCann, 1991), and identify emerging technological changes that can influence firm performance.

Figure 1 presents the study’s model. As shown in the model, a new venture’s international expansion promotes technological learning, which in turn enhances performance. Building on prior work, this study focuses on two key aspects of international expansion: international diversity (as indicated by geographic scope and the technological and cultural diversity of the countries in a firm’s portfolio) and the mode of entry into international markets. International diversity and mode of entry are expected to influence the breadth, depth, and speed of a venture’s technological learning. Breadth denotes the multiple areas in which a venture learns new technological skills (Teece, Rumelt, Dosi, & Winter, 1994). Depth refers to a venture’s mastery of new knowledge, evidenced by an ability to draw new conclusions and find new links among diverse knowledge bases (Huber, 1991). Speed of technological learning describes how rapidly the venture acquires new insights and skills (Doddgson, 1993; Hitt, Keats, & DeMarie, 1998).

Figure 1 also suggests that technological learning is influenced by a venture’s ability to integrate the knowledge it gains through international expansion. Technological learning can be serendipitous and unfocused (Doddgson, 1991a, 1993) and, thus, it should be integrated into the company’s operations (Bartlett & Ghoshal, 1987b). Therefore, knowledge integration moderates the relationship between international expansion activities and technological
learning. In light of past research, we also expected
a positive relationship between international ex-
(pansion and performance. International expansion
not only affects performance through technological
learning, but also can have a direct effect on per-
formance, by allowing a firm to take advantage of
substantial opportunities in international markets
(Hitt, Hoskisson, & Kim, 1997). Finally, technolog-
ical knowledge is expected to enhance new venture
performance.

International Diversity and Technological
Learning

International diversity denotes a firm’s in-
creased reliance on foreign markets as a means of
growth and financial performance improvement.
It refers to the scope of a firm’s foreign operations
(Tallman & Li, 1996). International diversity has
five components: (1) the number of countries in
which a firm has foreign business operations
(Tallman & Li, 1996), (2) the technological diver-
sity of the collection of foreign markets entered
(Kidd & Teramoto, 1995), (3) the number of di-
verse social cultures of the countries in which the
firm operates (Hofstede, 1980), (4) the geographic
diversity of the foreign markets (Sambharya,
1995), and (5) the number of foreign market seg-
ments targeted by the firm (Morrison & Roth,
1992). Diversity therefore reflects the significant
cultural and technological variations across the
countries, markets, and segments in which a new
venture undertakes foreign operations.

Ghoshal (1987) suggested that learning is an im-
portant goal for firms pursuing international diver-
sity. Learning derived from national differences
and economies of scale and/or scope can be a
source of competitive advantage. The diversity of a
venture’s international business environment en-
hances its knowledge stock through learning based
on interactions with local knowledge bases and
exposure to different systems of innovation. The
venture’s access to “soft” resources (such as inter-
organizational relationships) also promotes learn-
ing and innovation. International diversity pro-
vides exposure to new and diverse ideas from
multiple market and cultural perspectives (Hitt et
al., 1997). A venture’s quest for scope economies
also induces learning through sharing the knowl-
edge used to differentiate a product or by pooling

* Dotted lines indicate no relationship was hypothesized.
the knowledge developed in different markets. Countries vary in their cultures (Hofstede, 1980, 1993), technological development (Kogut & Singh, 1988), natural resource endowments and skills, innovativeness, and the organization of industries, markets, and distribution channels (Porter, 1990), each of which affects technological learning.

These arguments suggest that international diversity affects technological learning (Johanson & Vahlne, 1977; Welch & Welch, 1996), as demonstrated by the acquisition of new technological skills (Craig & Douglas, 1996; Kodama, 1995; Regnier, 1993). This is important because, increasingly, new ventures compete in several countries (Shrader, 1996). Variations in competitive, scientific, technological, and regulatory environments can, therefore, influence new ventures’ technological learning (Nakata & Sivakumar, 1996). Consequently, new ventures competing in several countries, with operations in different international regions and targeting multiple market segments, are expected to differ from ventures competing in markets located in only one country or focusing on a single foreign market segment in breadth, depth, and speed of their technological learning.

**Breadth.** A venture that expands internationally by entering markets in several foreign countries is more likely to experience different cultures (Hofstede, 1980) and institutional systems than one that focuses on a single or a few countries (Hitt, Dacin, Tyler, & Park, 1997). Exposure to diverse environments facilitates system openness and promotes technological learning (Kim, 1997). International diversity also fosters involvement in established networks of manufacturers and other technology providers, which in turn increases technological learning. As the geographic dispersion and/or cultural diversity of the countries served by a new venture increases, the breadth of its technological learning is expected to increase. International diversity helps firms accumulate both universal and tacit technical knowledge (Lei et al., 1996). Regional differences also magnify the importance of the venture’s social learning (Sohn, 1994). This learning emerges from understanding and using cultural values in designing and marketing the firm’s products and process technologies. As a firm enters distant markets (that is, markets or segments that differ substantially from its home base), its ability to learn expands (Teece et al., 1994). These arguments suggest:

**Hypothesis 1a.** There is a positive relationship between a new venture firm’s international diversity and the breadth of its technological learning.

**Depth.** International diversity also influences the depth of a new venture’s technological learning. Although learning many concepts or skills can be complex, developing a deep understanding of them is more challenging (Bohn, 1994). The different business settings that are associated with separate countries facilitate deeper technological learning by new venture firms (Makino & Delios, 1996). Exposure to, and direct involvement with, businesses and customers in multiple countries is an important means of “learning by doing” (Dodgson, 1991a), which promotes deeper technological learning (Ganesh, Kumar, & Subramaniam, 1997). Learning by doing helps firms redefine organizational heuristics (Lei et al., 1996). Diverse ideas and capabilities encountered in international business operations produce combinative knowledge (Zander & Kogut, 1995). This knowledge leads to the development of dynamic routines that promote complex problem solving (Lei et al., 1996). This evidence suggests:

**Hypothesis 1b.** There is a positive relationship between a new venture firm’s international diversity and the depth of its technological learning.

**Speed.** Although beneficial to the breadth and depth of technological learning, international diversity has both positive and negative effects on the speed of learning. International diversity can enhance the speed of learning as a firm experiences multiple cultures and markets (Ghoshal, 1987). Early exposure to international markets speeds learning, but continued expansion into more international markets can result in information overload owing to increased transaction costs and cultural diversity. Information overload reduces the speed of technological learning (Hitt et al., 1997; Huber, 1991). As the number of countries and market segments in a firm’s portfolio increase, the venture’s ability to process and internalize all of the potential information from its international activities is tested. The diversity of information gained, therefore, may require managers to sift through large amounts of data to identify patterns or cues. Much of the technological knowledge gained is likely to be tacit in nature (Makino & Delios, 1996), further slowing the identification, interpretation, and articulation of the resulting technological insights. This evidence suggests:

**Hypothesis 1c.** There is a curvilinear relationship between a new venture firm’s international diversity and the speed of technological learning, with the slope positive at lower and
Moderate levels of international diversity and negative at higher levels.

Mode of International Entry and Technological Learning

Internationalization stage theories (Johanson & Vahlne, 1977; Stopford & Wells, 1972) suggest an evolutionary pattern in a firm's international expansion. Usually depicted along a continuum, the choices include exporting, licensing, alliances, and start-ups (Andersen, 1993). However, some new ventures forgo some of these stages and undertake "high-control" transactions (like acquisitions) that require close interactions with multiple international market stakeholders (Oviatt & McDougall, 1994).

International business transactions differ in their risks and payoffs and the experience gained from them (Ghoshal, 1987; Hill, Hwang, & Kim, 1990). In contrast to the high-control transactions characteristic of foreign direct investment (FDI), some low-control transactions (for instance, exporting, licensing) require few interactions with markets, suppliers, and customers. The deep stakeholder involvement associated with high-control transactions exposes a firm to unique knowledge bases and experiences (Kim, 1997). Thus, the extent to which a new venture emphasizes direct and deep involvement modes of entry into international markets affects its ability to acquire new technological skills (Afuah, 1998).

High-control international entry modes may increase the breadth, depth, and speed of technological learning. These modes typically require closeness to a market and its customers, thus increasing the venture's exposure to different information sources. Interactions with alliance partners, for example, provide important insights into other firms' research-in-progress and products being developed for commercialization. Partners' design of products to meet local expectations can also be observed. If a new venture uses FDI, it may gain insights into the product attributes that are the most critical in local markets. Interactions with local suppliers also provide information about the market, customers, and competition (Dodgson, 1991a, 1991b). Additionally, the firm can study possible substitute products to further improve its product offerings. These activities increase a firm's exposure to multiple and varied sources of technological information and serve as a catalyst to technological learning (Leonard-Barton, 1995). These arguments suggest:

Hypothesis 2a. There is a positive relationship between a new venture firm's use of high-control modes of international market entry and the breadth of its technological learning.

A new venture firm using high-control entry modes in international markets is likely to experience more radical learning than those using modes requiring less involvement. High-control entry modes usually promote the firm's experiential learning through close observation of other companies' strategic moves. They also promote learning by doing. New knowledge has a tacit component that can be gained only by doing (Dodgson, 1993). Tacit knowledge cannot be communicated precisely using words, numbers, or pictures and is difficult to codify (Helfat, 1994). Tacit knowledge is the cornerstone of dynamic capabilities that are used to build competitive advantages (Teece et al., 1997). High-control entry modes create the potential for higher-intensity successes and failures. Important insights can be gained from successes and failures in international operations. The use of high-control modes of entry therefore facilitates in-depth technological learning. These arguments suggest:

Hypothesis 2b. There is a positive relationship between a new venture firm's use of high-control modes of international market entry and the depth of its technological learning.

High-control modes of international entry can also increase the speed of a firm's technological learning. One of the advantages of new ventures is their closeness to markets and to customers' needs. Closeness to the market and its customers is conducive to rapid learning (Brown, 1994; Day, 1994; Kim, 1997). By using high-control entry modes that ensure closeness to customers in international markets, a new venture increases the speed of its learning. The venture can thus gather market and competitive data quickly, analyze trends, and rapidly obtain feedback from its customers, suppliers, and other key stakeholders in foreign markets. Immediate feedback promotes learning and expedites the upgrading of existing products, planning new product developments, and/or targeting new market segments. This evidence suggests:

Hypothesis 2c. There is a positive relationship between a new venture's use of high-control modes of international market entry and the speed of its technological learning.

The Moderating Effect of Knowledge Integration

For technological learning to yield an advantage, it must be captured, interpreted, and deployed effectively (Grant, 1991, 1996b, 1997). Hamel and Prahalad (1994) referred to this process as integra-
Knowledge integration makes the information and skills gained from international expansion activities an integral component of the routines that guide the firm’s future strategic actions (Teece et al., 1987).

The acquisition of technological learning does not translate automatically into strong competitive market positions or high performance (McGrath et al., 1995). Some of this knowledge is tacit, making it difficult to use unless it is integrated into the firm’s operations. Technological learning is also fragmented throughout new venture firms, making new knowledge difficult to identify and use. Managers and employees are often unaware of the amount or importance of what they have learned from their firm’s international expansion activities. Integration enables the firm to internalize what it has learned in its international operations. It also permits the firm to capitalize on local knowledge that exists in different parts of its operations. Finally, learning is not always a sequential process (Nonaka, 1994), and managerial attention might be distracted as the firm continues to expand internationally. Integration helps managers to develop shared learning and accumulate knowledge over time (Lei et al., 1996; Teece et al., 1994).

Knowledge can be integrated formally or informally (Grant, 1996). Following the literature (Bartlett & Ghoshal, 1987b; Ghoshal, 1987), in this study we emphasized formal integration, defined as the process by which managers inventory, synthesize, and use the knowledge they have gained from their firm’s international expansion. Inventory refers to managers’ systematic attempts to determine what has been learned and to evaluate its importance. Synthesis denotes managers’ efforts to understand what has been learned and to articulate this knowledge (Nonaka & Takeuchi, 1995). Use refers to management’s efforts to devise ways to competitively exploit the knowledge; this requires diffusion of the knowledge throughout the organization (Ghoshal, 1987).

New ventures can excel at knowledge integration and establish a competitive advantage relative to their well-established rivals. New ventures usually have organic structures that permit speedy and effective flow of knowledge and its subsequent use in new product development activities. These structures encourage the exchange of information and experiences, which promotes learning by managers and employees.

Top-level managers are also actively involved in the ventures’ international operations, which gives them firsthand access to the new knowledge being created as the firm expands and enters new markets. This involvement provides opportunities for learning by doing and synthesizing what has been learned. Consequently, this involvement can be crucial in establishing knowledge integration as a firm-level competence that differentiates the firm from its competitors.

As indicated in Figure 1, knowledge integration is expected to moderate the relationship between international diversity and the breadth of a new venture’s technological learning. Integration makes possible the combination of different insights and skills learned from a firm’s different markets and national systems of innovation (Grant, 1998). New ventures that engage in knowledge integration, therefore, are more likely to recognize the importance of cultivating the diverse technological skills, capabilities, and systems that exist in their different foreign markets into their operations. Thus, knowledge integration facilitates combining new and different technological skills with existing ones, thereby broadening the firm’s technological skill set. Additionally, for new ventures that undertake formal knowledge integration, international diversity is more conducive to broader technological learning.

Knowledge integration also compels managers to consider the skills learned from their diverse international markets and how they can be used to overcome deficiencies in their company’s knowledge base. This process of self-examination provides managers with major insights into the deficits of their firm’s skill base and competencies (Bohn, 1994; Dodgson, 1993). As managers explore ways to overcome these deficits by cultivating the knowledge that resides in their company’s foreign markets, the depth of the new venture’s technological learning increases. Managers are likely to share what they have learned with others in the firm, thereby increasing the depth of technological learning (Huber, 1991). Therefore, we conclude that new ventures undertaking formal knowledge integration and international diversity achieve deeper technological learning.

Integration also encourages managers to recognize and rapidly internalize the technological knowledge gained from their firm’s international diversity. Knowledge integration promotes communication and discussions among managers (Grant, 1996), thereby promoting the quick recognition, inventory, synthesis, and use of the knowledge gained from the firm’s diverse international markets (Stewart, 1998). Consequently, in new ventures that engage in formal knowledge integration, international diversity is more conducive to speedier technological learning.

As indicated in Figure 1, knowledge integration
is also expected to moderate the relationship between the international modes of entry and technological learning. Knowledge integration is an organizational rather than a subunit capability (Grant, 1996, 1998; Leonard-Barton, 1995). A company gains this capability by experimenting with different approaches (Senge, 1990). Experimentation promotes learning by doing (Huber, 1991), which is important for new ventures. Most new ventures have limited prior international experience. As they expand internationally using high-control entry modes, these ventures have to invest a great deal of effort toward building their supply and distribution channels. This process requires understanding and evaluating the skills and capabilities of potential suppliers and distributors, which can broaden the new venture’s learning. The decision to use high-control entry modes also necessitates analysis of potential rivals and their skills. This analysis can also broaden the firm’s exposure to different technological skills.

High-control entry modes (such as FDI) require a stronger commitment to and involvement in foreign markets, thereby providing greater access to the bases of knowledge that exist in these markets. The significant involvement in the markets exposes the firm to and promotes its acquisition of different types of knowledge (Ghoshal, 1987). When this knowledge is formally integrated, the firm also develops deeper understanding of the various foreign markets in which it competes. The rapid dissemination and sharing of information resulting from formal knowledge integration processes increases the speed of technological learning gained from using high-control modes of entry. These arguments suggest:

Hypothesis 3a. The interaction of international diversity and knowledge integration is positively related to the breadth of technological learning.

Hypothesis 3b. The interaction of international diversity and knowledge integration is positively related to the depth of technological learning.

Hypothesis 3c. The interaction of international diversity and knowledge integration is positively related to the speed of technological learning.

Hypothesis 3d. The interaction of high-control modes of international market entry and knowledge integration is positively related to the breadth of technological learning.

Hypothesis 3e. The interaction of high-control modes of international market entry and knowledge integration is positively related to the depth of technological learning.

Hypothesis 3f. The interaction of high-control modes of international market entry and knowledge integration is positively related to the speed of technological learning.

Technological Learning and Performance

As noted in Figure 1, greater breadth, depth, and speed of technological learning is expected to enhance a new venture’s performance. Without technological learning, the firm’s skills become outdated, its products obsolete, and its future uncertain. Technological learning provides a base of knowledge upon which innovations can be developed (Leonard-Barton, 1995). International trade theories suggest that companies need to offer superior products to overcome the liability of foreignness and to achieve competitive advantage (Caves, 1982). The success of international new ventures is explained by their ability to leverage the knowledge gained from foreign operations (McDougall, Shane, & Oviatt, 1994).

The breadth of technological learning is useful in designing new products and upgrading existing ones (Afuah, 1998; Zahra, 1996). The depth of technological learning improves a firm’s ability to redesign its products for ease of use, offer customized applications, or radically change product definitions (Usunier, 1996). These actions help the firm target new markets and earn higher profits (McCann, 1991). Finally, the speed of technological learning improves the venture’s performance by compressing the product development cycle, enabling the firm to gain the benefits associated with being among the first to the market (Dodgson, 1993). This discussion suggests:

Hypothesis 4a. The breadth of technological learning in international markets is positively related to new venture performance.

Hypothesis 4b. The depth of technological learning in international markets is positively related to new venture performance.

Hypothesis 4c. The speed of technological learning in international markets is positively related to new venture performance.

International Diversity, Mode of Entry, and Performance

There is evidence that new ventures with international operations usually outperform those that
are without them (McDougall & Oviatt, 1996). Feeser and Willard (1990) found that higher-growth new ventures gained more revenue from international markets than ventures with lower levels of growth. Likewise, Bloodgood and colleagues (1996) reported a positive association between the intensity of a venture’s internationalization and its operating income. The results reported herein extend prior work by examining the specific links between international diversity, international mode of entry, and new venture performance.

Figure 1 suggests a direct link between international expansion and performance, which is consistent with established theory (Hitt et al., 1994) and recent evidence (Hitt et al., 1997). International expansion provides new market opportunities in which a firm can sell its product innovations. As the firm enters more countries, it can leverage its skills and products over a broader array of markets (Kim, Hwang, & Burgers, 1993), thereby increasing growth and profitability (Geringer, Beamish, & daCosta, 1989). A broad international market scope also stabilizes the firm’s earnings (Caves, 1982) and increases the chances of survival (Hitt et al., 1994). International expansion connects the firm with important constituencies in diverse markets, allowing it to obtain key resources economically. International diversity allows the new venture to enter and profit from beneficial networks (Hitt & Bartkus, 1997). Networks also promote marketing, technological, cultural, and competitive information that increases a firm’s chances of survival (Mohrman & Von Glinow, 1990). Although Hitt, Hoskisson, and Kim (1997) found a curvilinear relationship between international diversity and performance, new ventures are unlikely to have increased their international diversity to the point of decreasing returns. Furthermore, Hitt and his colleagues (1997) discovered that product diversity moderated this relationship: new venture firms are, however, unlikely to offer diversified product lines (Zahra, 1996). All modes of entry, if implemented effectively, should have positive effects on firm performance. Therefore, this evidence suggests:

Hypothesis 5a. International expansion (as measured by international diversity and modes of market entry) is positively related to new venture profitability.

Hypothesis 5b. International expansion (as measured by international diversity and modes of market entry) is positively related to new venture sales growth.

METHODS
Sample

It is difficult to obtain data on the international activities, technological learning, and other organizational practices of new ventures. Thus, this study used a combination of a two-wave mail survey, archival data, and phone and e-mail contacts with companies and trade associations to reduce source bias and obtain reliable and valid data.

The difficulty of identifying international new ventures has been noted (cf. Oviatt & McDougall, 1997). To develop a representative sample, we employed four criteria. First, to increase the findings’ generalizability, we selected new ventures from multiple high-technology industries. These industries are important for U.S. global competitiveness, job creation, and innovativeness (Datar, Jordan, Kekre, Rajiv, & Srinivasan, 1997). The complexity of these industries’ products and their dynamic environments also increased their attractiveness for this study. We used the U.S. Department of Commerce classifications (Brown & Garten, 1994, 1995) to select 12 industries: biotechnology, computer software, factory automation, telecommunication, environmental technologies, medical and surgical equipment, pharmaceuticals, specialty chemicals, aerospace, test measurements, advanced materials, and semiconductors. Finally, secondary data for several variables were also available, making it possible to cross-validate the results. This, too, encouraged us to study these industries.

A second sample selection criterion was company age. Even though different age ranges have been used in the literature, there is a growing consensus that firms 6 years and younger are new ventures (Brush, 1995; Brush & Vanderwerf, 1992; Shrader, 1996). Previously, researchers have used different cutoff points, such as 12 (Covin, Slevin, & Covin, 1990) and 8 years (McDougall, 1989; Zahra, 1996). However, Bantel (1998) argued that by the age of 5, many start-up firms that have failed to build strong market positions have become extinct. Older companies (up to the age of 12) have survived the liability of newness but have not yet “reached the mature stage where they resemble established firms” (Bantel, 1998: 207). Given this evidence, the need to control for changes in the firm’s environments, and the desire to be consistent with the literature, we used only firms 6 years of age or younger in this study.

The third criterion concerned a new venture’s ownership. We included both independent (private) and corporate new ventures because both compete directly in several markets (Bell & McNamara, 1991; McDougall, Deane, & D’Souza,
Privately owned ventures are established and managed by individual entrepreneurs. Corporate ventures are created and managed by established companies, subsidiaries, or business units of established companies (Shrader & Simon, 1997). Units that have been acquired, spun-off, or divested by established companies were not considered because these transactions significantly alter the relationship between the parent corporation and their new ventures, making it difficult to discern the transfer of resources from the corporation to its ventures. We excluded joint ventures because partners usually share responsibility for their operations, decision making, and resource provisions.

Finally, using the above criteria, we compiled a list of companies with international operations. A international new venture has been defined as one that has obtained at least 10 percent of its sales from foreign markets (McDougall, 1989), a criterion used in research on established companies (e.g., Hitt et al., 1997; Tallman & Li, 1996). However, this figure is high for young ventures that are early in their internationalization. The 10 percent figure might also restrict the range of international sales, making it difficult to determine the effects of varying degrees of internationalization on technological learning. To capture a broader spectrum of international business operations among new ventures, we used a minimum of 5 percent of sales from foreign markets.

Different secondary sources were used to develop a mailing list. As noted in the Appendix, the components of these lists were obtained from computerized searches (including visits to companies’ Internet home pages), trade and business publications, and contacts within the U.S. Department of Commerce and national trade associations. Because of the lack of information about companies and their international operations, several difficulties surfaced during this process. For example, as Porter (1980) noted, young industries are often populated by hundreds of young and unknown companies. Therefore, to develop our list, we reviewed articles included in trade publications, scanned announcements of new products, and read ads for new products to identify potential companies. We then reviewed additional secondary sources, such as lists of companies from trade associations. Still, identifying firms with international operations proved to be exceedingly difficult because the necessary information was not available for all firms. Consequently, we identified articles that mentioned international operations by new ventures and cross-validated this information to ensure that each company met the 5 percent threshold. Also, we contacted several knowledgeable U.S. Department of Commerce employees who followed specific industry sectors. These analysts provided information on the companies they tracked and connected us with people in trade associations who knew their respective industries. Through this iterative process, we identified 1,417 companies. Before mailing the final questionnaires, however, we contacted 73 companies about which we had questions to verify their active involvement in international markets. Of these, 29 indicated that they did not have significant international operations and thus were eliminated, reducing the target population to 1,388.

Two mailings were completed in 1993. Of the questionnaires mailed, 34 were returned as undeliverable, reducing the sample to 1,354. The two mailings resulted in 321 completed questionnaires (a 23.8 percent response rate). This rate compares favorably with those reported in past surveys of new ventures (e.g., Chandler & Halks, 1993; McDougall, 1989). Responding firms averaged 3.4 years (s.d. = 1.1) of age, 71.9 (s.d. = 59.3) full-time employees, and 17.3 (s.d. = 11.5) percent of their sales from international operations. Respondents included CEOs and presidents (68%), vice presidents for international operations (19%), and senior vice presidents (13%). These managers/executives were among the most informed about their companies’ international operations, innovation, and learning.

We tested for response bias by examining the differences between respondents to the first and second mailings. A t-test showed no significant differences between the two groups based on age, size, or sales growth. A chi-square test, moreover, showed no significant association between respondent status (first versus second mailing) and a firm’s location, industry type, or ownership. We conducted the same analyses (using the chi-square and t-tests) for responding and nonresponding companies. These results, too, were insignificant, suggesting that responding firms represented the population from which they were drawn.

To ensure the reliability and validity of the data, we pretested the survey by seeking comments from five new venture firm managers (representing three industries) and two venture capitalists. These individuals, who had a combined high-technology industry experience of 21 years, closely reviewed and critiqued the survey and offered several suggestions for improving its wording, design, and administration. A revised copy of the survey was then sent to 50 venture managers in high-technology companies (representing 10 of the study's 12 industries), located in a southeastern metropolitan area. One mailing yielded complete responses from 17
companies. Managers were asked to comment on the survey questions and suggest other items. Information from the 17 pretest surveys was used to improve the survey instrument’s wording, organization, and presentation.

We also attempted to ensure reliable and valid data by using multiple and different data sources and cross-validating them to ensure accuracy. Further, as reported below, when we relied on data supplied by managers, we tested for interrater agreement, as has been done in previous studies (e.g., Hitt, Hoskisson, Johnson, & Moesel, 1996; McDougall, 1989). This test required sending a copy of the questionnaire to a second executive in each responding venture (n = 321). When possible, managers responsible for international operations were targeted; otherwise, senior executives responsible for strategic planning or marketing were targeted. Completed responses from a second executive were received from 103 of the 321 responding companies. These data were used to determine interrater agreement. Where possible, we also validated survey-based measures through secondary data, again following previous research (Covin et al., 1990; Hitt et al., 1996). Finally, where appropriate, we calculated Cronbach’s coefficient alpha to ensure internal consistency.

Measures

The following measures were constructed for the study’s independent, dependent, and control variables:

International diversity. Five indicators were used to measure international diversity. Using the secondary sources presented in the Appendix to obtain a proxy of the geographic diversity of a firm’s international operations, we counted the number of countries in which the venture sold its products (Tallman & Li, 1996). These data were validated by cross-checking. Information was available from at least two secondary sources for 59 companies, and the simple correlations between the figures in the two sources were high (r = .81, p < .01). Also, the survey asked managers to provide data on the number of foreign countries to which their companies’ products were exported. This number also correlated strongly with the number of these countries (r = .91, n = 301, p < .001). Finally, managers were asked, “In how many countries (other than the US) are this company’s products sold?” Responses to this question were strongly correlated with data collected from secondary figures (r = .91, n = 301, p < .001). These analyses supported the validity of the secondary data on the number of countries.

The technological diversity of international markets was believed to influence a venture’s technological learning (Kidd & Teramoto, 1995). According to Kogut and Singh (1988), a key indicator of a country’s technological advancement is R&D expenditures. Sources of data for this variable are reported in the Appendix. International publications also included detailed time series of data for different regions and countries, affording an opportunity to cross-check the information. Cross-checking publications of reputable organizations such as the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the National Science Foundation, and the Organisation for Economic Cooperation and Development (OECD) further enhanced confidence in the data’s quality. Still, we correlated the data gathered from at least two sources on R&D spending by different countries; the correlation was high (r = .91, n = 163, p < .001). Average country R&D spending, computed as a percentage of gross domestic product (GDP), was used as an indicator of the technological vitality of a venture’s international markets. This average was calculated by dividing the total of R&D ratios across the countries the new venture had entered by the number of these countries.

The cultural diversity of countries was measured using Hofstede’s (1980) classification of national cultures; 11 country groups were indicated. We counted the number of cultural groups in a venture’s markets. Thus, a firm that entered the Japanese, Mexican, and South African markets had a score of 3, because each of these countries fell into a separate cultural group in Hofstede’s classification.

The geographic diversity of foreign revenue was calculated using an entropy measure that was developed from data provided by managers regarding the percentage of their companies’ international revenues earned from operations outside the United States, in Canada, Europe, Asia, Australia, Latin America, or Africa. The Appendix explains this measure. Using this information, we developed a geographic diversity (GD) index that was calculated with the formula $GD = \sum S_i$, where $S_i$ was the percentage of a venture’s sales in a given market, summed across the six regions noted above.¹ We

¹ We also calculated an entropy-type measure of international diversity (ID) using the same data and the formula $ID = \sum_i (P_{ij} \times \ln (1/P_{ij}))$, where $P_{ij}$ is the proportion of a firm’s sales in a given market $i$ and $\ln (1/P_{ij})$ is the weight given to each market, defined by the natural logarithm of the inverse of its sales. Prior researchers have used similar formulas to measure the related construct of
used secondary data from 103 firms to validate this measure. The correlation between the two was high and statistically significant ($r = .74$, $n = 103$, $p < .001$); the Appendix presents the sources of these data. Interrater agreement between the responses provided by two managers on the entropy measure was also high ($r = .71$, $n = 98$, $p < .001$).

Finally, we measured the number of foreign market segments using data provided by managers. Buzzell and Gale (1987) indicated that companies differ in their definitions of served markets, a factor that favored the use of survey data. For each country in which a firm’s products were sold, managers provided the number of different market segments their firms targeted, using the measure presented in the Appendix. We then divided the total number of segments by the number of countries a firm entered and used the average in the analyses. The study’s measure was strongly correlated to managers’ responses to the item “This company targets many foreign market segments” ($5 = $ strongly agree, $1 = $ strongly disagree; $r = .73$, $n = 307$, $p < .001$). Interrater agreement between the responses provided by two company managers was also significant ($r = .72$, $n = 97$, $p < .001$). Secondary data for 71 new ventures’ market segments were also highly correlated with the survey measure ($r = .61$, $n = 71$, $p < .001$). Secondary data came from newspaper and trade publication articles, press releases, and companies’ Internet home pages. We searched for phrases such as “foreign customer groups,” “foreign market segments” and “end users,” which previous work has used to indicate the narrowness or breadth of companies’ markets (Buzzell & Gale, 1987).

**Mode of international market entry.** International market entry mode was measured with data on firms’ international export agreements, licensing agreements, joint ventures, acquisitions, and start-ups, or greenfield investments (cf. Anand & Singh, 1997; Arora & Gambardella, 1997; Mitchell & Singh, 1996; Pennings & Harianto, 1992) collected from Lexis-Nexis, one of the most reputable research data bases. Data are from a large number of specialized trade publications, newspapers, magazines, and company press releases. The large number of sources and the details provided on each episode increase confidence in the data used to develop the measures. However, databases such as Lexis-Nexis typically give more attention to the strategic actions of large, established, well-known companies and may not capture all the international business announcements made by small, young new ventures. Thus, the results reported here are conservative.

The search process yielded 641 announcements of international activities covering 693 transactions. Of these transactions, 273 were related to exporting (39.5 percent), 191 to licensing (27.6 percent), 23 to acquisitions (3.3 percent), and 206 to start-ups (29.7 percent). We used the number of announcements of international transactions within each of the five entry modes as the study’s measures.

To validate measures derived from secondary sources, we asked managers to indicate the percentage of their firm’s revenues earned from foreign activities by allocating 100 points among exports, licensing, joint ventures, and subsidiary operations. The simple correlations between these figures and the number of announcements of international business transactions averaged .83 ($n = 307$, $p < .001$).

**Technological learning.** Technological learning was measured with multiple survey items. The studies by Olk and Young (1997), Simonin (1997), and Zander and Kogut (1995) used survey-based measures of learning. Given that our sample consisted of young firms, we thought that traditional measures might obscure the breadth, depth, and speed of learning. Moreover, we were able to locate secondary data (on such features as cycle time) to measure technological learning for only a handful of new ventures. Thus, we asked managers about their firms’ technological learning, an approach suggested by five new venture managers and two venture capitalists. The interrater agreement on the study’s three measures was strong and statistically significant ($p < .001$): breadth ($n = 98$, $r = .72$), depth ($n = 95$, $r = .65$), and speed ($n = 98$, $r = .71$). The measures also had acceptable Cronbach alphas: breadth, .78; depth, .71; and speed, .72. The Appendix presents the measures, which were based on several sources (Dodgson, 1991a, 1991b; Huber, 1991; Nonaka & Takeuchi, 1995; Senge, 1990).

**Knowledge integration.** Again following previous research (Bartlett & Ghoshal 1987a, 1987b; Ghoshal, 1987; Grant, 1991, 1996a, 1996b, 1997; Hamel & Prahalad, 1994; Nonaka, 1991, 1994) we developed seven items to measure knowledge integration. Using a five-point scale (5 = widely used, 1 = never used), we asked managers to indicate the extent to which their ventures used each of seven activities to capture, interpret, synthesize, and integrate what they had learned from their interna-
tional operations. The items focused on the use of regular formal reports and memos that summarize learning, information-sharing sessions, face-to-face discussions by cross-functional teams, use of experts and consultants to synthesize learning, formal analysis of failing international projects, formal analysis of successful projects, and formal discussions of the best ways to use what has been learned in designing new products (or upgrading existing ones). When these items were factor-analyzed (with a varimax orthogonal rotation), one factor explaining 64.8 percent of the variance emerged. The sum total of managers’ responses to the seven items was averaged and used as the measure of knowledge integration ($\alpha = .67$). Interrater agreement between the two responding managers was statistically significant ($r = .62$, $n = 94$, $p < .001$).

**New venture performance.** The importance of profitability and growth as key outcomes of new venture international operations (McDougall & Oviatt, 1996; Oviatt & McDougall, 1994) and technological learning (Bartlett & Ghoshal, 1987a, 1987b) has been noted. Three issues required attention in measuring new venture performance. The first was the length of the lag effect of the study’s variables on performance. Most prior studies have not used lagged performance in their analyses, and the few that have used one- or two-year lags (e.g., Tallman & Li, 1996; Sambharya, 1995). Here, data were collected for, and averaged over, the period 1995–96. Thus, the performance data represented a time period of two to three years after the data on the independent variables were collected. Given the youth of the sample’s ventures, a two-year time frame was believed to capture some of the effects of international expansion and technological learning. Also, averaging data over two years controlled for unusual events in the firms’ markets. Although a longer time lag (four or five years) might have been desirable, it would have introduced considerable noise into the performance data. Ramanujam and Varadarajan (1989) argued that diversification activities are likely to change drastically over time, necessitating adjustments for macroeconomic conditions, industry structures, and firm strategy variables.

A second issue was the timing of the new venture firm performance measures as a consequence of internationalization. This study follows the literature in measuring performance two years after collection of data on the other variables (Hitt et al., 1997; Tallman & Li, 1996; Sambharya, 1995) rather than at the time of the initial international transactions (identifying the initial transactions would have been very difficult). Further, this study focuses on linking a new venture’s international operations to its overall performance to discern a general pattern of relationships among the variables. This approach has the advantage of gauging the firm’s commitment to international expansion rather than capturing temporary benefits accruing from individual transactions.

The final issue was the selection of performance criteria. This is an issue on which there is considerable debate (Brush, 1995; Brush & Vanderwerf, 1992; Shrader, 1996). Two performance measures were selected: sales growth and return on equity (ROE). Sales growth is widely considered a key indicator of new ventures’ performance (Bloodgood et al., 1996; Brush, 1995; Chandler & Hanks, 1993). ROE has also been used widely as well (cf. Chandler & Hanks, 1993; Zahra, 1996). Although both measures have been criticized (Brush & Vanderwerf, 1992), they are used extensively to evaluate new venture performance by trade publications, industry experts, and venture capitalists. Sales growth and ROE may be more volatile than other measures, such as market share. Unfortunately, data on market share were not available from secondary sources. Moreover, market share data have serious limitations because the definitions of market and industry boundaries are often unclear, especially in young industries such as those examined in this research (Grant, 1998; Porter, 1980).


First, we contacted most of the trade publications listed above to obtain the formulas used to calculate sales growth and ROE. In every case, ROE was measured by dividing net profits by equity. Sales growth was measured as the difference between sales in two consecutive years divided by sales one year earlier, with the quotient multiplied by 100. Our phone calls to trade publications indicated that they sometimes obtained the percentage of increase or decrease in sales from company informants; these informants were unwilling to share absolute sales data. Second, to further ensure reliable data,
we validated the sales growth and ROE data using the secondary references mentioned above. The correlations were high for both variables (ROE, \( r = .83, n = 91, p < .001 \); sales growth, \( r = .74, n = 82, p < .001 \)).\(^2\) Data on ROE and sales growth were available for 243 and 229 ventures, respectively.

To address the volatility of sales growth and ROE figures, we explored two options. First, for each measure, we subtracted the overall sample mean from a firm’s sales growth and ROE figures. Next, we reran the analyses after subtracting the industry-specific average (determined at the two- or four-digit Standard Industrial Classification [SIC] code level) from a firm’s scores. We performed these analyses controlling for past performance by entering past sales growth and ROE figures, as reported later. The results were similar; therefore, the results reported herein reflect industry-specific adjustments in sales growth and ROE.

**Control variables.** This study also included controls for several variables that might affect the hypothesized relationships, including company age, company size, major industry type, venture ownership, length of international business experience, and prior new venture performance.

**Company age** was measured by the number of years a venture had been in existence. Age may influence a venture’s technological learning (Dodgson, 1993), international business activities (Brush & Vanderwerf, 1992), and the profitability of foreign operations. Also, sales growth is age-sensitive (Chandler & Hanks, 1993). The Appendix provides information on the secondary sources used to collect information about company age. However, some secondary sources may include reorganization and mergers as a basis for firm age. Such transactions can influence the resources a firm has for internationalization. To validate the study’s measures, we asked managers to report their companies’ ages as of 1993. There was agreement between secondary and survey data in 91.3 percent of the cases, leaving contradictory information on 28 responding companies. In these 28 instances, we examined the responses provided by the second manager and reconciled 7 cases. We contacted each of the remaining 21 cases by phone, e-mail, or fax and asked for the year the company was established. These actions resolved 17 of the 21 cases. The remaining 4 cases were excluded from further consideration.

**Company size** was measured by the natural logarithm of a firm’s full-time employees. Company size may affect ability to learn (Simonin, 1997), internationally diversify operations (Erramilli & D’Souza, 1993), select an entry mode (Brush, 1995), and survive in international markets (Li, 1995). Information for this variable was gathered through the survey and validated using the secondary references listed in the Appendix under company age. The simple correlation between the information obtained from the survey and secondary references was strong (\( r = .93, n = 281, p < .001 \)).

**Major industry type** was measured at the two- or four-digit SIC code level. The industries varied in their technological opportunities and ability to induce learning (Li, 1995), globalization (Brown & Garten, 1995), and profitability (Brown & Garten, 1994). The survey asked managers to provide the name of the company’s major industry (defined in the survey as the one from which the company generated most of its sales) and, where possible, its two- or four-digit SIC code. We collected information for this variable from the secondary references listed in the Appendix under company age. There was strong agreement between the information obtained from secondary sources and data provided by executives (\( r = .98, n = 306 \)).

The study also controlled for venture ownership because differences between independent and corporate new ventures in their strategic choices and technological strategies have been reported (Zahra, 1996). Ownership may also affect ventures’ international operations and the resources available to them. We asked “How would you classify this company’s current ownership?” (independently owned private company, unit of a corporation, or other). We coded these responses as a dichotomous variable, with 0 for independent firms and 1 for corporate units. There was strong agreement between secondary and survey data on this variable (\( r = .95, n = 291 \)).

We controlled for the length of international experience because companies with more international business experience might have gained more resources and skills, which would affect their performance. We asked managers, “In what year were...
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<td>.04</td>
<td>.07</td>
<td>.02</td>
<td>.29</td>
<td>.19</td>
<td>.08</td>
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<td>.29</td>
<td>.37</td>
<td>.31</td>
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<tr>
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<td>2.50</td>
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<td>-.09</td>
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<td>.24</td>
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<td>.17</td>
<td>.19</td>
<td>.25</td>
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<tr>
<td>20. ROE</td>
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<td>11.37</td>
<td>.23</td>
<td>.18</td>
<td>-.14</td>
<td>.03</td>
<td>-.21</td>
<td>.23</td>
<td>-.08</td>
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<td>-.08</td>
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<td>.21</td>
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</tr>
</tbody>
</table>

*a Values of n vary; for an n of 180 or higher, a simple correlation has to be at least .15 to be significant at p < .05.
your company’s products sold outside the USA for the first time? Responses to this question were validated by collecting data from the multiple sources listed in the Appendix under geographic diversity and the number of countries. The correlation between the survey and secondary sources was strong ($r = .79, n = 83, p < .001$). We subtracted the year a firm was established from the year its products were first sold overseas; this figure was then entered into the analyses.

We also controlled for prior performance because it can affect the speed, extent, and mode of a firm’s internationalization. Therefore, we included prior ROE and prior sales growth figures in the analyses. Information was gathered from the survey. Interrater agreement on these two variables was significant [ROE, $r = .76, n = 99, p < .001$; sales growth; $r = .79, n = 101, p < .001$]. We also validated the information gathered through surveys by collecting data from secondary sources (using the references described earlier). The correlations between the two sources were high (ROE, $r = .81, n = 284, p < .001$; sales growth, $r = .84, n = 273, p < .001$).

**ANALYSIS AND RESULTS**

Table 1 presents ranges, means, standard deviations, and correlations. The magnitude of the correlations and the results of regression diagnostics (Hair, Anderson, Tatham, & Black, 1996) suggested that multicollinearity was not a serious problem.

Before conducting tests of the hypotheses, we adjusted all the study’s variables except the dichotomous ownership measure for interindustry effects. Adjustments were made by subtracting the industry’s mean score, calculated with either the secondary or the survey data, from a firm’s score, as in prior research (Dess, Ireland, & Hitt, 1990; Sousa De Vasconcellos E Sá & Hambrick, 1989; Zahra, 1996).

Hypotheses 1a–1c and 2a–2c concern the associations between international diversity, modes of international market entry, and technological learning. Hypotheses 3a through 3f focus on the moderating effect of knowledge integration on the relationships covered in the first two sets of hypotheses. These three sets of hypotheses were tested jointly using moderated regression analyses. Following Cohen (1968), we regressed each dimension of technological learning on international diversity (five measures), entry mode (four measures), and the knowledge integration measure after first introducing the control variables. The results from this step (the base model) appear in the columns marked 1 in Table 2. Next, we introduced nine interaction terms into the analysis, as reported in the columns marked 2, in Table 2, which present the full model.

As shown in Table 2, the equation for the breadth of technological learning was statistically significant. Consistent with Hypothesis 1a, four of the five international diversity measures were significant predictors of breadth of technological learning: number of countries, technological diversity, cultural diversity, and number of foreign market segments. Also, and consistent with Hypothesis 2a, acquisitions and exports were positively associated with the breadth of a new venture’s technological learning.

The equation for the depth of technological learning was also statistically significant. Consistent with Hypothesis 1b, the technological and cultural diversity of foreign markets and the number of foreign segments were positively associated with the depth of technological learning. Both start-ups and foreign acquisitions were also positively related to the depth of technological learning, supporting Hypothesis 2b.

The equation for the speed of technological learning was statistically significant. Technological diversity was positively associated with speed. However, the number of foreign countries entered had a negative effect on speed. None of the other measures of international diversity was related to speed of technological learning. To test for the curvilinear relationship posited in Hypothesis 1c, we reran the analyses reported in Table 2 after adding squared terms for each of the five measures of international diversity. The curvilinear relationship was supported for both the number of foreign countries and segments, but not for technological, cultural, or geographic diversity. Thus, the results provided marginal and mixed support for Hypothesis 1c.

The results in Table 2 show that, consistent with Hypotheses 2a–2c, start-ups and acquisitions had positive effects, but licensing and exports were insignificant predictors of the speed of technological learning.

The results regarding the moderating effect of knowledge integration (third set of hypotheses) on the international diversity and mode of international entry on technological learning are presented in the columns marked 2 in Table 2. The equation for the breadth of technological learning was statistically significant. When the results for the full model (step 2) were examined, the multiple squared correlation coefficient ($R^2$) increased to .37, and the change in the $R^2$ between the base and full models was also statistically significant, providing support for a moderating effect. Consistent with Hypothesis 3a, the interactions of knowledge
### TABLE 2
Results of Regression Analyses: Effects of Internationalization on Technological Learning

<table>
<thead>
<tr>
<th>Variable</th>
<th>Breadth 1</th>
<th>Breadth 2</th>
<th>Depth 1</th>
<th>Depth 2</th>
<th>Speed 1</th>
<th>Speed 2</th>
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<td>-0.03</td>
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<td>0.07</td>
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<td>-0.11</td>
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<td>0.28*</td>
</tr>
<tr>
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<td>0.39*</td>
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<td>0.31*</td>
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<td>0.29*</td>
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<td>-0.08</td>
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<td>0.13</td>
</tr>
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<td>0.28*</td>
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<td>0.28*</td>
<td>0.28*</td>
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<tr>
<td>diversity</td>
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<td>0.34**</td>
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<tr>
<td>Interaction with geographic</td>
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<td>0.09</td>
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<tr>
<td>diversity</td>
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<td>0.35**</td>
<td>0.35**</td>
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</tr>
<tr>
<td>Knowledge integration</td>
<td>0.48**</td>
<td>0.29*</td>
<td>0.25*</td>
<td>0.25*</td>
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</tr>
<tr>
<td>Interaction with acquisitions</td>
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<td>-0.07</td>
<td>-0.09</td>
<td>-0.09</td>
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</tr>
<tr>
<td>Knowledge integration</td>
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<td>-0.05</td>
<td>-0.02</td>
<td>-0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction with exporting</td>
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<td>.37</td>
<td>.25</td>
<td>.31</td>
<td>.22</td>
<td>.29</td>
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<tr>
<td>Adjusted R²</td>
<td>4.86***</td>
<td>9.04***</td>
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<td>8.04***</td>
<td>2.93***</td>
<td>6.81***</td>
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<tr>
<td>df</td>
<td>16, 284</td>
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<td>16, 291</td>
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<td>ΔR²</td>
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<td>ΔF(ΔR²)</td>
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<td>2.67**</td>
<td>3.11***</td>
<td>3.11***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† p < .10
* p < .05
** p < .01
*** p < .001

Integration with the following variables were statistically significant: number of countries, technological diversity, cultural diversity, and number of foreign segments. Consistent with Hypothesis 3d, the interaction of knowledge integration and acquisitions was statistically significant. The interaction of knowledge integration with exports was marginally statistically significant.

Consistent with Hypothesis 3b, the full model for depth of learning was statistically significant. The R² increased to .31, and the change in the R² between the base and full models was statistically significant, providing support for a moderating effect. Consistent with Hypothesis 3b, the interactions of knowledge integration with technological diversity, cultural diversity, and number of foreign segments. Consistent with Hypothesis 3e, the interactions of knowledge integration with acquisitions and start-ups were statistically significant.
The full model for the speed of technological learning was also statistically significant. The $R^2$ increased to .29, and the change in $R^2$ between the base and full models was also statistically significant, again supporting moderation. The interactions of knowledge integration with technological diversity were also positive and statistically significant, providing support for Hypothesis 3e. Also, the interactions of start-ups and acquisitions with knowledge integration were statistically significant, supporting Hypothesis 3f.

To test the effect of technological learning on new venture performance, we regressed ROE and sales growth separately on technological learning after first introducing the study’s control variables. The results appear in Table 3.

The model for ROE was statistically significant, with an $R^2$ of .20. Further, the breadth, depth, and speed of technological learning were positive and significant predictors of ROE. Table 3 also shows that the model for sales growth was statistically significant, with an $R^2$ of .18. The breadth and speed of technological learning were positive predictors of sales growth. The depth of technological learning was not significant in the sales growth model, however. Overall, the results provided strong support for Hypotheses 4a and 4c and partial support for 4b.

The final set of hypotheses predict that international diversity and modes of entry are positively related to a new venture firm’s ROE (Hypothesis 5a) and sales growth (Hypothesis 5b). We considered several analytical techniques to test these hypotheses. For example, we examined use of structural equations models (SEM) and path analysis. However, these techniques were ruled out because of potential problems with the degrees of freedom and multicollinearity concerns. Also, the treatment of interaction terms in SEM is controversial. For these reasons, multiple regression analysis was used. Results appear in Table 4.

As shown, the predictors explained 24 percent of a venture’s ROE and 27 percent of its sales growth. Two of the five measures of international diversity were positively related to ROE: the number of foreign countries entered and the cultural diversity of these countries. These results provide support for Hypothesis 5a. Licensing and exports were positive predictors of ROE, supporting Hypothesis 5a. However, contrary to expectations, the number of foreign segments was negatively related to ROE. These results provided strong, but not complete, support for Hypothesis 5a.

### TABLE 4

*Effect of Internationalization on New Venture Performance*

<table>
<thead>
<tr>
<th>Variable</th>
<th>ROE</th>
<th>Sales Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
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</tr>
<tr>
<td>Constant</td>
<td>1.41</td>
<td>2.21*</td>
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<tr>
<td>Firm age</td>
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<td>0.25*</td>
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<tr>
<td>Firm size</td>
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<td>0.11</td>
</tr>
<tr>
<td>Ownership</td>
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<td>−0.07</td>
</tr>
<tr>
<td>International experience</td>
<td>0.21*</td>
<td>0.22*</td>
</tr>
<tr>
<td>Prior ROE</td>
<td>0.45**</td>
<td>0.20*</td>
</tr>
<tr>
<td>Prior sales growth</td>
<td>0.23*</td>
<td>0.39**</td>
</tr>
<tr>
<td>International diversity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of foreign countries</td>
<td>0.27*</td>
<td>0.22*</td>
</tr>
<tr>
<td>Technological diversity</td>
<td>−0.04</td>
<td>0.25*</td>
</tr>
<tr>
<td>Cultural diversity</td>
<td>0.22*</td>
<td>0.39**</td>
</tr>
<tr>
<td>Geographic diversity</td>
<td>0.08</td>
<td>0.16†</td>
</tr>
<tr>
<td>Foreign segments</td>
<td>−0.14*</td>
<td>0.05</td>
</tr>
<tr>
<td>Modes of entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start-ups</td>
<td>−0.03</td>
<td>−0.07</td>
</tr>
<tr>
<td>Acquisition</td>
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<tr>
<td>Licensing agreements</td>
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<td>0.34**</td>
</tr>
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<td>Export agreements</td>
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<tr>
<td>Adjusted $R^2$</td>
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<td>.27</td>
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<td>$F$</td>
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<td>4.09***</td>
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<tr>
<td>$df$</td>
<td>15, 181</td>
<td>15, 166</td>
</tr>
</tbody>
</table>

* $p < .10$  
* * $p < .05$  
** ** $p < .01$  
*** *** $p < .001$
The results in Table 4 show that the number of foreign countries a new venture entered and their technological and cultural diversity were positively related to sales growth. Geographic diversity of revenue was also positively associated with sales growth. Licensing, acquisitions, and exports were also positively associated with sales growth. These results are consistent with Hypothesis 5b.

**DISCUSSION**

Increasingly, new ventures are entering international markets early in their life cycles. The results show a strong relationship between international diversity and mode of market entry and the breadth, depth, and speed of a new venture firm’s technological learning, especially when the firm undertakes formal knowledge integration. In turn, the breadth, depth, and speed of technological learning are related to new venture firm performance. International diversity and mode of international entry are also positively related to new venture performance. Table 5 is an overall summary of the study’s results, which are discussed in more detail below.

**Evaluation of Results**

Hypotheses 1a–1c. Innovation is important for effective firm performance in competitive global markets (e.g., Franko, 1989; Hitt et al., 1998). An important criterion for the development of innovation is the possession of adequate knowledge. Thus, firms must build knowledge to develop and use innovation effectively. Organizational learning enables a firm to develop new knowledge. One means by which firms learn is to move into new foreign markets in which they are exposed to and then assimilate different types of knowledge. Thus, the higher the diversity of foreign markets entered, the greater the opportunity for organizational learning. As Table 5 shows, the results provide strong but not universal support for this hypothesis.

For most firms, moving into new international markets produces an exposure to the greatest diversity of knowledge. This may be particularly true for smaller and younger new venture firms. The results strongly support these arguments. Indeed, as new venture firms move into a broader set of and more diverse international markets, they increase the potential for greater breadth and depth of technological learning. However, greater diversity of markets can reduce the speed of technological learning. The results partially supported the hypothesized curvilinear relationship between international diversity and learning speed. In particular, they indicate that the effect of diversity on the speed of technological learning can be negative. New ventures that diversify internationally, therefore, may have to trade speed off against the breadth and depth of technological learning. Learning can be quite important, and the knowledge gained may partially transfer from one market to another, thereby enriching the value of the learning that occurs. Learning from one market with cultural values similar to those of another market may allow some knowledge to be ap-

**TABLE 5**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Hypothesis</th>
<th>Predicted Sign</th>
<th>Dependent Variable</th>
<th>Overall Results</th>
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<td>Strong support</td>
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<tr>
<td></td>
<td>H1b</td>
<td>+</td>
<td>Depth</td>
<td>Partial support</td>
</tr>
<tr>
<td></td>
<td>H1c</td>
<td>Inverted U</td>
<td>Speed</td>
<td>Marginal and mixed support</td>
</tr>
<tr>
<td>Mode of entry</td>
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<td>Breadth</td>
<td>Strong support</td>
</tr>
<tr>
<td></td>
<td>H2b</td>
<td>+</td>
<td>Depth</td>
<td>Strong support</td>
</tr>
<tr>
<td></td>
<td>H2c</td>
<td>+</td>
<td>Speed</td>
<td>Strong support</td>
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<td>+</td>
<td>Breadth</td>
<td>Partial support</td>
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<tr>
<td>× international diversity</td>
<td>H3b</td>
<td>+</td>
<td>Depth</td>
<td>Partial support</td>
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<tr>
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<td>H3c</td>
<td>+</td>
<td>Speed</td>
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<td>Knowledge integration × mode of entry</td>
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<td>Breadth</td>
<td>Partial support</td>
</tr>
<tr>
<td></td>
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<td>Depth</td>
<td>Strong support</td>
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<td>Depth</td>
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<td>Speed</td>
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<td>New venture performance</td>
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<td>Mode of entry</td>
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<td>Sales growth</td>
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</tbody>
</table>
plied in the newer market. Thus, new technical knowledge acquired in Canada may also be at least partially useful in the United States and the United Kingdom. Younger entrepreneurial firms are generally more effective at developing and exploiting innovation, particularly radical innovation (Afuah, 1998). Therefore, if new ventures can increase the breadth, depth, and speed of their technological learning, they can create and market innovation more quickly, thereby gaining competitive advantage, even over larger, more resource-endowed firms.

**Hypotheses 2a–2c.** As Table 5 shows, the results provide strong support for these predictions. Indeed, one of this study’s contributions is its documentation of the potential effect of different modes of international market entry on the breadth, depth, and speed of technological learning. Previously, it has been suggested that firms establish start-ups to transfer knowledge to their subsidiaries and use acquisitions to gain access to new knowledge (Hennart & Park, 1994). Although our data do not allow us to corroborate the motives for choosing a particular mode of international entry, the results show that start-ups and foreign acquisitions may have different effects on separate dimensions of technological learning for new venture firms.

The results show a positive association between the use of acquisitions and the breadth of technological learning. Acquisitions give a firm access to different knowledge bases (Hennart & Park, 1994). There was no relationship between start-ups and breadth of learning, perhaps because some time may elapse before a new venture gains knowledge from creating these units. The results also show that the use of high-control modes of entry in the forms of acquisitions and start-ups is positively associated with the depth of technological learning. Thus, these transactions deepen a firm’s technological knowledge. Start-ups are likely to serve a dual role by transferring knowledge from and to parent firms.

Foreign start-ups and acquisitions enhance the speed of technological learning. In contrast, lower-control modes of entry have a negative effect on speed. These results extend the literature by showing that new ventures can benefit from using higher-control entry modes through increasing the speed with which they acquire new technological knowledge.

**Hypotheses 3a–3f.** The results also suggest that knowledge integration increases the breadth and depth of the technological learning new ventures gain from international diversity. Broad and deep technological learning can provide a competitive advantage (Kodama, 1995). Table 5 shows support for the moderating effect of knowledge integration. Integration is useful in enhancing technological learning when the technological diversity of foreign markets is high.

The results also show that knowledge integration plays a more important role with the modes of entry. Knowledge integration, in conjunction with acquisitions, positively affects the breadth of technological learning. Additionally, the depth and speed of technological learning derived from foreign start-ups and acquisitions are higher with greater formal knowledge integration. Thus, for new firms, knowledge integration can be an important organizational competence.

**Hypotheses 4a–4b.** The literature suggests that technological learning can enhance a company’s performance (Dodgson, 1991, 1993). As Table 5 suggests, the results support this proposition, showing that technological learning is positively associated with new venture performance. New ventures that achieve technological learning gain important knowledge that can be used to design and offer a greater variety of innovative products (breadth of knowledge), to offer highly differentiated, high-quality products (depth of knowledge), and to move products to market faster (speed of developing and using knowledge), and therefore these ventures should achieve higher financial performance. In the current environment, in which short product life cycles result in pressure for faster development-to-market cycles, the emphasis is on speed. In fact, some authors have argued that true competitive advantage is not derived from size or from having more resources, but from being able to move faster than competitors (Hitt et al., 1998). Thus, increasing the breadth, depth, and speed of technological learning is important for the success of new venture firms.

**Hypotheses 5a–5b.** Table 5 shows that the results also support previous work suggesting that international expansion can have a positive effect on a firm’s performance (Ghoshal, 1987; Hitt et al., 1997; Leontiades, 1986; Prahalad & Doz, 1987). Hitt and his coauthors (1997) presented arguments for and found an inverted U-shaped curvilinear relationship between international diversification and performance. Early movement into international markets generally creates positive returns, but continued international diversification may eventually produce negative returns. These researchers suggested that negative returns were caused by the increased transaction costs and the challenges of managing a geographically dispersed organization operating in multiple and diverse markets. Although several of the dimensions of international diversity examined in this study showed a positive
effect on performance indicators, the number of foreign segments had a negative effect on ROE. Technological diversity and cultural diversity had no relationship with ROE. Also, acquisitions and start-ups had no relationship with ROE. Acquisitions, however, had a positive and significant association with sales growth. This pattern of findings suggests that some dimensions of international diversity have positive effects on performance, and others have negative or no effects. Alternatively, four of the five measures of international diversity and three of the four modes of entry had positive effects on sales growth. Obviously, there are more costs, both financial and managerial, related to FDI than to licensing and exporting. This difference might be reflected in the lack of relationships observed between acquisitions and start-ups and ROE. The lack of a relationship between start-ups and sales growth highlights the possibility that a start-up business has to work diligently to establish distribution channels and position its products before it can generate significant sales. Acquisitions, on the other hand, may result in almost immediate sales growth.

The lack of relationships observed between FDI indicators and ROE serves as a reminder for new ventures to patiently invest to build global operations. New ventures usually have limited resources, and managers need to seriously consider the attractiveness of FDI transactions and balance their effects on short-term performance with the learning to be gained from these operations. If firms experience broad and deep learning from these transactions, their long-term performance may improve. As argued earlier, FDI provides greater opportunities for learning because of the intensity of involvement in the new markets. However, it takes greater time for this learning to develop and to affect performance. Thus, the effect of FDI on firm performance is mediated by the amount of learning created and internalized within start-up and acquired businesses. Conversely, licensing and export transactions provide fewer opportunities for learning but, in the shorter term, have higher potential for direct effects on performance. Thus, FDI is likely to have greater longer-term effects on new venture firm performance.

Finally, the results show that international diversity is positively associated with ROE, whereas the number of foreign segments in which a firm operates has a negative effect on ROE. Given the youth of the companies examined in this research, the negative relationship between the number of segments and ROE is understandable. Managing and serving these segments can tax the resources of the firm, thereby reducing its short-term performance. However, because targeting a large number of foreign segments is sometimes a precursor to international diversity, a negative relationship between diversity and ROE may be evident earlier than a negative association between international diversity and venture performance.

This research makes several contributions to scholars’ knowledge. First, there has been little empirical research on the effects on the performance of new venture firms of international diversity and modes of entry. Thus, this study adds to knowledge not only of international diversity and entry modes and their effects on performance and learning, but also to knowledge about different types of organizations, in particular new venture firms. Perhaps, more importantly, we have provided specific data on the learning that occurred, in this case technological learning, whereas in much prior research, organizational learning has been assumed and left unmeasured (e.g., Hitt et al., 1997). Our research showed that international diversity and high-control entry modes indeed increase technological learning. In turn, technological learning, or new knowledge created, has a positive effect on firm performance, as measured by ROE and sales growth. Our research also suggests that international diversity and mode of entry have a positive, direct effect on firm performance, in addition to their more indirect effect of increasing technological learning.

**Managerial Implications**

The results of this study should encourage managers to articulate, identify, and capture the technological learning achieved by their new ventures. This learning can play a pivotal role in differentiating a new venture firm’s products, achieving speedy market introductions, and gaining a competitive advantage. The results also show that international diversity and modes of entry provide an important means of increasing a new venture firm’s learning of technological skills and exploiting this knowledge in its operations. Thus, managers must develop and nurture skills that ensure effective integration of learning as their firms expand internationally. However, managers cannot assume that learning will occur automatically or that it will lead to improved performance.

The results also emphasize the importance of international business operations for successful new venture performance. These operations are largely associated with more growth and profitability. These findings should encourage managers to explore when, where, and how to best internationalize their firms’ business operations. Managerial
attitudes and preferences are at the core of a venture’s internationalization activities.

Future Research Directions

The results of this study suggest several avenues for future research on the internationalization of new ventures. One important avenue is to converge on the definition of a new venture. As noted previously, researchers have used different firm ages to classify new ventures. We used six years of age, a choice consistent with some past work (e.g., Brush & Vanderwerf, 1992; Shrader, 1996). Definition in terms of age is important because over time, ventures may develop the expertise needed to more successfully enter international markets and to learn new technological skills from these operations. Furthermore, internationalization can be a lengthy process. Future researchers, therefore, should explore the effects of different and perhaps longer time frames on the nature and strength of the relationships among the variables examined in this study. Also valuable would be research to determine the appropriate time lags between international diversity and learning and between learning and higher performance.

New ventures might seek to achieve different strategic goals through international expansion. Future researchers, therefore, should explore additional performance measures to establish the link between international expansion and performance. In particular, the use of market share could help to validate the current results and provide additional insights into the effects of international diversity and modes of entry on new venture performance.

This study has focused on the benefits of international diversity among new ventures. However, international diversity can tax a firm’s resources, structure, and management team. It can also complicate the communication process within the organization and the relationships the new venture establishes with other companies. Thus, future research should explore the costs of international diversity in new ventures.

There is also a need to document the effects of international diversity on different types of organizational learning (marketing, competitive, and social) and link them to new venture performance. The field could benefit from research documenting the approaches companies use to capture and exploit the knowledge gained from their learning activities. The development and testing of a framework linking learning, competence development, strategic choices, and performance (McGrath et al., 1995) could yield valuable insights. Such a framework would be useful for examining the effects of technological learning on a new venture firm’s future international expansion. The evolution of organizational capabilities may serve as a catalyst to additional expansion in existing or new international markets. These capabilities may also shape the new venture firm’s future choice of entry modes and the types of markets it chooses to enter.

A fertile area for future research is how new ventures learn. One cannot and should not assume that new companies learn in the same way as established companies. We need to understand better the antecedents and the process of learning by new ventures. The quality of a venture’s founders (Huber, 1991), information-processing capacity, and environment likely have important implications for learning and the value that can be achieved from it. Future research is needed to examine if differences in learning among new ventures are determined by the background and prior international experience of their founders and managers and/or by the characteristics of the markets entered. Future studies should also clarify the moderating effect of a firm’s managers’ international experience on the relationship between international diversity and technological learning. Prior exposure to foreign cultures and markets might alert managers to the potential new knowledge that can be gained from international diversity, a factor that can affect the speed, depth, and breadth of the firm’s future technological learning.

Additionally, there is a need for research into the international business activities of new ventures in low-technology industries. The structural characteristics of these industries (for instance, slow technological change) can affect the need for and speed of internationalization and, as a consequence, the benefits the firms gain from international operations. The amount and value of technological learning from international operations might also be more limited in low- than in high-technology industries. These intuitively appealing variations, however, require systematic analysis and validation using either comparative studies (low vs. high technology) or analyses of different low-technology sectors.

Comparative studies of the approaches used by new ventures and established companies for knowledge integration are also needed. Little is known about the nature of these approaches or the effects of organizational structures and management systems on knowledge integration. Future researchers should also explore differences between established companies’ and new ventures’ international diversity and modes of entry and their effects on learning and performance. Comparative studies
along these lines could enrich understanding of potential sources of competitive advantage for new ventures and established firms.

In conclusion, our research shows the value and importance of international diversity and modes of entry for new venture firms. Furthermore, it has shown the more specific effects of international expansion on technological learning, long assumed to be an important characteristic of newer and more established firms. Finally, both international expansion and technological learning have largely positive effects on the performance of new venture firms. Thus, these findings have important implications for the theory and practice of managing new venture firms.

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APPENDIX

This Appendix presents the secondary sources used to select the companies in the sample and gather the secondary data used to measure the study's variables.

**Sources of Data**

**Company names.** Companies to be surveyed were identified from a list of 100 industrial and service companies (Black Enterprise, June 1993); 100 Best Small Companies (Business Week, 1993); COMPSTAT (1993); the Global 100 List (Electronics Business, 1991–93); the 100 Fastest-Growing Companies (Fortune, 1993); Hoover’s Guide to Computer Companies (1992); the 100 Fastest-Growing Public Companies (Inc., May 1993); the 100 Fastest-Growing International Companies (International Business, December 1992); the American Electronics Association Directory (1993); the Top 100 Independent Software Vendors (Software Magazine, 1993); and America’s Top 50 Women Business Owners (Working Women, May 1993).

**Number of countries.** We gathered secondary data for this variable from the list of 100 industrial and service companies (Black Enterprise, June 1993), 100 Best Small Companies (Business Week, 1993–94); COMPSTAT PC+ (1993–94); the Global 100 list (Electronics Business, 1991–93); 100 Fastest-Growing Companies (Fortune, 1993–94); Hoover’s Guide to Computer Companies (1993–94); 100 Fastest-Growing Public Companies (Inc., May 1993); the American Electronics Association Directory (1993); Top 100 Independent Software Vendors (Software Magazine, 1993); and America’s Top 50 Women Business Owners (Working Women, May 1993). We also visited companies’ Internet home pages (n = 33), where available.


**Geographic diversity (GD).** Data used in validating this measure came from multiple secondary sources that included these: Hoover’s Handbook of Emerging Companies (1993–96); Hoover’s Guide to Computer Companies (1993–95); and companies’ Internet home pages (n = 29). Combined, these lists provided data on 71 companies. Newspaper and trade publication articles (obtained through Lexis-Nexis) provided information for 32 companies.

**Company age and size.** This information was collected from the list of 100 industrial and service companies (Black Enterprise, June 1993); the 100 Best Small Companies (Business Week, 1993–94); COM-

Timing of international market entry. Validation data for this variable were gathered for a subset of 83 ventures from Hoover’s Handbook of Emerging Companies (1993–96); Hoover’s Guide to Computer Companies (1993–95); companies’ Internet home pages; and newspaper and trade publication articles (obtained through Lexis-Nexis).

Technological learning. Three measures were developed with survey data, as follows: (1) Breadth was measured by managers’ responses to 19 items that were extracted from the literature, as noted in the text. Instructions read as follows: “In the course of their international operations companies sometimes learn different things or gain new insights. Listed below are several items that pertain to a company’s technology (defined as know-how), research and development, and technological innovation activities. Please read each statement carefully and then indicate the extent your company has gained knowledge and new insights, or learned skills or capabilities from its international business operations in each of the areas listed below. A score of 5 would mean that you believe your company has learned many different and varied skills in a given area. A score of 1 would mean that your company has learned only a few (or a limited number of) skills in a particular area. If an item does not apply to your company’s situation, please circle ‘not applicable.’” The items used in this measure were developed to cover a broad range of a new venture firm’s technological activities. They were: (1) designing new products (processes), (2) prototyping new products (processes), (3) pretesting new products (processes), (4) timing new product (process) introductions, (5) sequencing new product (process) introductions, (6) customizing products for local markets, (7) manufacturing, (8) sourcing technology, (9) integrating technologies acquired from other companies with your own technologies, (10) organizing the R&D function, (11) staffing the R&D function, (12) determining R&D spending levels, (13) funding new technology, (14) managing the R&D process, (15) coordinating R&D with other organizational units (functions), (16) identifying emerging technologies, (17) forecasting technological trends, (18) transferring technologies across international borders, and (19) protecting your technological trade secrets. Managers’ responses were averaged, and the resulting score was used as the study’s measure.

To validate the breadth index, we used responses to three semantic differential scales. Managers described the learning their firms had gained from their international operations using these items: narrow vs. broad (−5), specialized vs. general (−5), and limited vs. wide-ranging (−5). Average responses to the three items were significantly correlated with the study’s measure \( r = .63, p < .001 \). According to Campbell and Stanley (1963), the convergent validity of a scale can be established by correlating two measures that purport to gauge the same construct. The .63 correlation therefore indicates that the two measures gauge the same construct, though imperfectly. However, this is a strong correlation.

(2) Depth was measured as the average rating on the same 19 items listed under breadth. Managers were asked: “Please indicate how well your company has learned or mastered new skills in each of the areas listed below. As you evaluate these items, please bear in mind that we are interested in the depth or quality of learning your firm has attained because of its international operations. A score of 5, therefore, would mean that you believe your company has thoroughly and completely mastered new skills in the area(s) listed. A score of 1, however, would mean that your company has been exposed to these skills at a elementary or basic level but has not mastered these skills yet. If an item does not apply to your company’s situation, please circle ‘not applicable.’” Three semantic differential scale items were used for validation. Managers were asked to describe the learning their firm had achieved in international operations as basic vs. advanced (−5), simple vs. complex (−5), and shallow vs. deep (−5). The average on the three items was then correlated with the study’s measure \( r = .71, p < .001 \).

(3) Speed was also measured with the 19 items. Managers were asked: “After reading each statement carefully, please indicate your opinion as to how fast your company was in learning and mastering new skills in the areas listed below. If an item does not apply to your company’s situation, please circle ‘not applicable.’” Two semantic differential scales were used for validation: learning in international markets as slow vs. fast (−5) and sluggish vs. rapid (−5). The average of the two items was then correlated with the study’s measure \( r = .61, p < .001 \).

Shaker A. Zahra is a professor of strategic management at the J. Mack Robinson College of Business, Georgia State University. His research focuses on entrepreneurship in high-technology ventures, internationalization, and strategy making in global high-technology industries.

R. Duane Ireland holds the W. David Robbins Chair in Business Policy and is a professor of management systems in the E. Claiborne Robins School of Business, University of Richmond. His current research interests include strategic decision-making processes, the acquisition, integration, and application of knowledge through strategic alliances, innovation, corporate governance, factors influencing the gathering of competitive intelligence, and the formulation and implementation of strategies in high-growth entrepreneurial ventures.

Michael A. Hitt holds the Weatherup/Overby Chair in Executive Leadership at Arizona State University. He received his Ph.D. from the University of Colorado. His current research interests include international strategies, partner selection in international strategic alliances, the importance of knowledge and human capital for competitive advantage, strategic entrepreneurship, and the effects of corporate governance on firm resources and outcomes.