LEARNING SEQUENCES: THEIR EXISTENCE, EFFECT, AND EVOLUTION

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Much is known about the importance of learning and some of the distinct learning processes that organizations use (e.g., trial-and-error learning, vicarious learning, experimental learning, and improvisational learning). Yet surprisingly little is known about whether these processes combine over time in ordered ways, because most research on learning explores one particular process. Using theory elaboration and theory-building methods and data on the accumulated country entries of entrepreneurial firms, we address this gap. Our core contribution is an emergent theoretical framework that develops the concept of learning sequences. We find that learning sequences exist and are influenced by initial conditions. We also find that learning sequences evolve in fundamentally distinct ways over time and with repeated use. Finally, data show how different learning sequences differentially affect both shorter- and longer-term performance, suggesting that it matters which learning processes are used and when. Overall, our findings on learning sequences have important implications for learning theory, international entrepreneurship, and the growing literature on process management.

Organizational learning is of fundamental interest in organizational theory and strategy. Some studies have shown that firms learn to diversify into new countries (Barkema, Bell, & Pennings, 1996; Zahra, Ireland, & Hitt, 2000) and product-markets (Miner, Bassoff, & Moorman, 2001) to capture scale and scope economies. Other empirical work has shown that firms learn to expand their operations through acquisitions (Haleblian & Finkelstein, 1999; Hayward, 2002) and alliances (Anand & Khanna, 2000; Hoang & Rothaermel, 2005) to create corporate value. Still other research has revealed that firms learn to disseminate knowledge (Darr, Argote, & Epple, 1995), augment throughput (Lieberman, 1984), and reduce defects (Levin, 2000) to improve pricing and productivity. Indeed, research suggests that organizational learn-

ing is a central means by which firms generate innovations, adapt to environments, take advantage of emergent market opportunities, and create competitive advantage (Argote, 1999).

However, despite the importance of organizational learning, empirical research generally explores one particular learning process (e.g., "trial-and-error learning," "vicarious learning," "experimental learning," and "improvisational learning") while underexploring the question of whether different learning processes get used together in sequence. For example, much work examines direct learning—that is, a firm's learning from its own experience (Schwab, 2007)—in particular trial-and-error learning (Baum & Dahlin, 2007; Tsang, 2002; Van de Ven & Polley, 1992). Studies in this stream suggest that learning occurs as organizations change their subsequent behavior in response to prior performance outcomes. To illustrate, in his study on the internationalization of Japanese electronics firms, Chang (1995) suggested that firms learn how to enter new countries by drawing on performance outcomes. Executives started with an initial investment in a foreign country such as the United States. If results from the initial investment proved positive, they expanded investment in the same country; but if results were not positive, they did not. Other work on direct learning examines experimental learning or impro-

visational learning. Scholars argue that through experimental learning organizations gain knowledge and insight through deliberate, small-scale tests, generally conducted "off-line" (i.e., in controlled, nonmarket settings) that are explicitly designed to help managers better prepare for the future (Pisano, 1994; Thomke, 2003). By contrast, through improvisational learning organizations learn in real time as design and action converge to solve emergent problems and take advantage of surprising opportunities (Miner et al., 2001). Finally, some scholars fasten their attention on indirect learning—that is, learning from others' experience (Ingram, 2002). Work in this stream generally focuses on vicarious learning, which occurs as firms observe actions by other firms and then change their own behavior or beliefs as a result (Haunschild & Miner, 1997). Through vicarious learning firms thus gain the benefits of accumulated knowledge while avoiding the expense of accumulated experience (Kim & Miner, 2007; Srinivasan, Haunschild, & Grewal, 2007). Empirical studies have shown the relevance of vicarious learning in a variety of settings, such as market entry (Greve, 1998), investment banker choices (Haunschild & Miner, 1997), hotel chain location decisions (Baum & Haveman, 1997), nursing home acquisitions (Baum, Li, & Usher, 2000), and product introductions (Srinivasan et al., 2007).

Although it is well known how each of these of learning processes is used alone, what is not known is whether firms use them together over time in ordered ways. Some research has attempted to explore interactions. Scholars have explored direct learning and indirect learning (Schwab, 2007), showing that both occur concurrently in organizations (Baum & Dahlin, 2007) or partially considering interactions (Chuang & Baum, 2003; Shaver, Mitchell, & Yeung, 1997). Missing from this body of research, however, is empirically grounded understanding about if a temporal order exists in the learning processes firms use and if this matters. We explore this gap.

This article is organized around three research questions: (1) Do learning sequences exist? (2) Do learning sequences matter? and (3) Do learning sequences evolve over time? In keeping with other process-based organizational research (Abbott, 1990, 1995; Langley, 1999; Van de Ven & Poole, 1995), we define a *learning sequence* as an ordered use of learning processes. Given the state of extant theory, we use theory-building (Eisenhardt, 1989) and theory elaboration methods (Lee, 1999). The setting is the internationalization of nine entrepreneurial firms with headquarters in Singapore, the U.S., and Finland.

THEORETICAL BACKGROUND

Research from the trial-and-error learning, experimental learning, improvisational learning, and vicarious learning streams is pertinent to our research questions. We focus on these specific direct and indirect learning processes since the literature suggests their particular importance and prevalence (Argyris & Schön, 1978; Baum & Dahlin, 2007; Huber, 1991; Leavitt & March, 1988; Miner et al., 2001; Srinivasan et al., 2007). Following previous research, we define learning as a regular shift in behavior or knowledge informed by prior action (Argote, 1999; Cyert & March, 1963; Levitt & March, 1988; Miner et al., 2001). This definition incorporates both behavioral learning models, which stress change in action, and cognitive learning models, which stress change in ideas.

One common direct learning process discussed in the literature, trial-and-error learning, is defined as the process by which firm executives undertake a course of action, and the consequences of that completed action lead to change in the firm's action or knowledge base (Argyris & Schön, 1978; Baum & Dahlin, 2007; Greve, 2003). An important characteristic therefore is that trial-and-error learning occurs *after* a firm experiences the consequences of an action and changes its behavior or bases inferences on that completed action. Managers repeat seemingly successful organizational actions, reflect on the outcomes, and then revise understandings and/or actions as needed (Haunschild & Sullivan, 2002). As one illustration, Van de Ven and Polley (1992) described trial-and-error learning in one firm during the development of a biomedical innovation. The authors found that when the prior actions of entrepreneurs were deemed successful, more resources were devoted to the innovation unit's pursuit of that same course of action. Also in keeping with trial-and-error learning, the authors observed that when the actions of entrepreneurs were deemed unsuccessful, resource controllers intervened, and new courses of actions were prescribed for the unit.

Experimental learning is another direct learning process. Experimental learning takes place in controlled situations that organizations use to test causal propositions and create new knowledge (Cook & Campbell, 1979). Because the central purpose of learning through experimentation is to acquire new knowledge of relationships, post hoc reflection on outcomes is high (Miner et al., 2001). Scholars have argued that organizations deliberately vary inputs off-line in comparative contexts (e.g., assessing the functionality of a product with different technical features integrated) and then

closely monitor outcomes to correctly attribute outcomes to inputs (Thomke, 2003). Scholars have further argued that this off-line nature of experimental learning sets it apart from other direct learning processes such as trial and error (Miner et al., 2001). Thus, in experimental learning, variation in conditions is planned and intentionally introduced to produce insights about input-output relations. The literature also suggests that experimental learning often relies on two key characteristics. First, it involves relatively low-cost initiatives (e.g., use of economical, easy-to-modify prototypes or inexpensive focus groups to test different product sizes, colors, or packaging materials) that help yield more robust designs and solutions and direct attention to potential downstream risks (Brown & Eisenhardt, 1997; Thomke, 2003). Second, the new knowledge derived from experimental learning, if useful, can quickly be incorporated into firm activities (Pisano, 1994). Hence, because experimental learning often involves low-cost initiatives, firms can use a variety of them to learn without the fear of suffering crippling mistakes or financial overcommitment.

A third direct learning process is improvisational learning, defined as a real-time learning process in which firms learn to solve unexpected problems or capture surprising opportunities in the moment (Miner et al., 2001). Real-time learning influences novel action at the same time that the action is taking place (Miner & Moorman, 1998; Weick, 1998). This emphasis on learning in real time as design and action converge sets improvisational learning apart from experimental learning and trial-and-error learning. Hence, whereas deliberate formation of contrasting situations during experimental learning results in the creation of new, generalizable knowledge, solving a surprising problem during improvisation results in knowledge idiosyncratic to a particular time or place. Improvisational learning is also distinct from trial-and-error learning, where prior experience plays a key role in changes to action or cognition. With trial and error, learning occurs only after consequences of past actions occur. Actions and their outcomes inform subsequent action or cognition (Miner et al., 2001). In contrast, with improvisational learning, managers do not wait for the consequences of past actions. Changes in action or cognition are made "on the fly," as planning and doing occur simultaneously. Yet, as firms often retain and repeat successful activities discovered after an improvised outcome, improvisational learning may represent the first step in longer-term trial-and-error learning (Miner et al., 2001).

A common indirect learning process—that is, a process of learning from others' experience rather than firsthand—is vicarious learning (Huber, 1991; Kalnins, Swaminathan, & Mitchell, 2006; Levitt & March, 1988; Srinivasan et al., 2007), which generally occurs when firms alter their behaviors or cognition in response to the actions of competitors (Kim & Miner, 2007). Through observation, decision makers gather information about the characteristics and outcomes of competitors. The frequent result is imitation of seemingly successful practices (Denrell, 2003). Some research suggests that vicarious learning may be an important initial learning process. Faced with insufficient information for learning from their own experience, organizations can rely on others' experiences to cover their deficit in understanding (Baum et al., 2000; Henisz & Delios, 2001; Kraatz, 1998). Research shows that vicarious learning is particularly valuable in new industries and when uncertainty is high. For example, to explore how vicarious learning takes place as firms introduce new products in nascent markets, Srinivasan et al. (2007) examined product introductions of 67 firms in the U.S. digital camera market and found that changes in a focal firm's rate of new product introductions were influenced by changes in new product introductions of other similarly sized and successful firms. Yet other research suggests that vicarious learning may not be a good initial learning process because new and/or inexperienced firms lack the "absorptive capacity" to learn from others, so that even if they are able to gain knowledge, they may not be able to internalize and leverage it fully (Henisz & Delios, 2001; Zahra & George, 2002).

In summary, the extant research on organizational leaning has generally focused on the relevance of discrete direct learning processes (e.g., trial-and-error learning, experimental learning, or improvisational learning) and indirect learning processes (e.g., vicarious learning). Like other organizational process research, this research has generally addressed how learning using a discrete process occurs over time.[1] But although research on organizational learning provides much understanding about how firms use each of these discrete learning processes alone, it has provided little understanding about whether firms use multiple

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[1] Process research generally focuses on understanding the temporal dynamics of organizational phenomena such as learning (Van de Ven, 1992; Langley, 2007). For example, as noted earlier, research on trial-and-error learning describes how firms engage in an action and then the consequences of that action influence subsequent action (Van de Ven & Polley, 1992).

learning processes together in ordered ways over time.

Some empirical researchers have attempted to address this gap by exploring whether direct and indirect learning get used together (Baum & Ingram, 1998; Henisz & Delios, 2001; Schwab, 2007). Baum et al. (2000) examined acquisitions made by chain nursing homes in Ontario from 1971 through 1996 and found that a chain was more likely to acquire a target the more similar the target was to all the focal chain's current components and the nearer the target was to other, similar, chains' current components. Likewise, Schwab (2007) indicated that relying on both direct and indirect learning leads to a substitutional interaction in which knowledge that is consistent from both sources exhibits a weaker effect than the linear addition of their independent effects. Yet, although these studies are important in that they suggest that firms appear to use both direct and indirect learning and that each may influence the other, future research opportunities remain, since it is unclear whether direct or indirect learning occurs first and whether sequence matters. Moreover, prior empirical research on learning suggests that direct learning can be unpacked into a set of distinct processes (i.e., experimental, trial-and-error, and improvisational learning) and that each may distinctly influence how learning takes place over time (Miner et al., 2001). As a push in this direction, Miner and colleagues explored improvisational learning and how this process contrasts with experimental and trial-and-error learning. But because the focus of this study was improvisational learning, the authors did not directly explore how it might be used in connection with experimental learning or trial-and-error learning, except to conjecture that improvisational learning may drive out experimental learning or serve as an episode in longer-term trial-and-error learning. Further, the authors did not discuss whether vicarious learning temporally links with experimental learning, trial-and-error learning, and/or improvisational learning.

Overall, much is known about how firms use specific learning processes. However, little is known about whether firms use multiple learning processes in temporally ordered ways. In other words, understanding of learning sequences remains extremely limited. This gap is critical. From a practical perspective, if a particular order of learning processes leads to better performance outcomes than another order, there are immediate applications for managers. From a theoretical perspective, not understanding about learning sequences in process research on learning is problematic, since the concept of sequences is central in

much organizational process research (Adair & Brett, 2005; Amis, Slack, & Hinings, 2004; Burgelman, 1994, 1996; Langley, 1989) and is explicitly highlighted when scholars build theory from process data (Langley, 1999, 2007; Rindova, Ferrier, & Wiltbank, 2010; Van De Ven, 1992).

Our core contribution of the present study is helping to establish sequences as a meaningful concept and focus in process research on learning. First, we uncover the existence of distinct learning sequences. Second, we reveal how they evolve in distinct ways with repeated use. Finally, we show how different learning sequences differentially affect performance, both in the shorter and longer term, thereby implying that it matters which learning processes organizations use and when they use them. Beyond contributing to the field of organizational learning, these findings have implications for international entrepreneurship and the growing literature on process management.

METHODS

The research setting was nine entrepreneurial corporations in the global information technology (IT) industry. The IT industry was attractive for this study because its high rate of change suggests the need for learning (Davis & Eisenhardt, 2011). We chose entrepreneurial firms because their small size simplifies the observation of learning processes. In addition, studying entrepreneurial firms minimizes "left censoring" of data because the firms can be tracked from inception.

We focus on how entrepreneurial firms learn during internationalization (i.e., new country entry [Root, 1994]). Internationalization is a useful context in which to explore learning. First, country entries are discrete and easily detected events that can be analyzed in isolation or as part of a larger set of experiences. Second, during internationalization, firms enter countries that may or may not be similar to previously entered countries. This suggests variance in the effects of prior experience and the degree to which a focal firm may or may not rely on learning from other firms. Third, data for each country entry can be isolated, enabling both single and multiple country analysis.

We studied nine firms with headquarters in each of three culturally distinct (Hofstede, 1980) regions: Finland, the U.S., and Singapore. Studying multiple regions enhances the relevance and generalizability of results.[2] All sample firms were eight years

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[2] We focused on these regions for several reasons. First, the mutual cultural distinctiveness of Singapore,

old or younger at the time of data collection and had made all their country entries within the four years prior to data collection. This relative recency should enhance accurate recall of events. Moreover, each sample firm had entered at least four countries. This number of entries ensures sufficient experience from which to examine if and how learning processes get used together over time. Table 1 summarizes information on our sample.

We relied on four data sources: (1) quantitative and qualitative data from semi-structured interviews with company leaders, (2) e-mails, observations, and phone calls made to follow up on interviews and to track internationalization over time, (3) quantitative data on companies' internationalization performance, by country, from company and public sources, and (4) archival data, including company websites, business publications, and other materials produced inside the firms.

The primary data source was the semi-structured interviews. We conducted two types of interviews corresponding to two types of informants. The first type, labeled "HQ-level," were interviews with individuals such as a firm's CEO, founder, COO (chief operating officer), and others responsible for firmwide activities; the second type, labeled "country-level," were interviews with "country managers" and "country team members" who were involved with entry into a particular country. The data comprised over 50 interviews on three different continents with both the multicountry view from the corporate perspective and specific detail from individual countries (see Table 2 for more information about informants).

Each interview consisted of three main parts: (1) firm background information, (2) event chronology for a specific country entry (country-level interview) or for several entries (HQ-level interview), and (3) direct questions related to learning processes. For the event chronology, we asked open-ended questions that focused on the stream of country entry events (e.g., How did your company gain its first sale? How did you move to your second sale?), and avoided broad speculation that was not grounded in specific events. We then reviewed the chronology, and asked if we had covered all key events.

We concluded the interview with direct questions related to learning, such as "What, if any, were the lessons gained during this country entry?" and "What, if any, lessons from other country entries were used in this country entry?" The technique of asking different questions (i.e., nondirective and directive) provides a stronger grounding of theoretical insights, mitigates bias (Eisenhardt, 1989; Yin, 1994), and is consistent with theory elaboration (Lee, 1999) and theory building (Eisenhardt, 1989). We also sent follow-up e-mails, added extra interviews as needed, and triangulated interview data with observations and archival data to improve accuracy and completeness (Jick, 1979).

Informant bias was an important consideration. We addressed this issue in several ways. First, we combined real-time and retrospective data. Such a combination is valuable, since the retrospective data enable efficient collection of many observations (for good grounding), and real-time data deepen understanding about the order of events (Leonard-Barton, 1990). Second, previous research suggests that our interview techniques (e.g., "courtroom" questioning, event tracking, nondirective questioning, establishing a "back in time" cognitive frame) typically yield accurate information convergent among informants and with archival data (Brown & Eisenhardt, 1997). The few differences that may arise primarily result from informants' relating different parts of the story, not from inter-informant conflicts. Third, reliance on informants at multiple levels of hierarchy helps yield a more complete and thus, more accurate, picture of events through complementary perspectives and granularity. Combining qualitative stories with quantitative measures has similar effects. We also relied on informants who were particularly knowledgeable about the relevant events surrounding internationalization and for whom internationalization was quite important, thus improving memory accuracy. Fourth, ensuring anonymity for both companies and informants encourages candor.[3] Finally, we

the U.S., and Finland (Hofstede, 2001) allowed us to have more generalizable findings that apply beyond a particular set of firms, such as those coming from a large market such as the United States. Second, Singapore, the U.S., and Finland have clusters of technology-based firms, which allowed us to find and compare regional patterns for similar firms. Thus, we have Singaporean, Finnish, and U.S.-based entrepreneurial firms focused on software (Table 1). Third, the choice of Singapore, U.S., and Finnish entrepreneurial firms is important from a methodological point of view, as in each country managers speak English fluently. This language uniformity improves candor, depth of comments, and mitigates loss of data that may occur through translation and back-translation of interview data.

[3] Firms are disguised with pseudonyms drawn from early national presidents of the respective home countries: "Jackson," "Polk," "Tyler," and "Adams" (U.S.); "Kallio," "Stahlberg," and "Ryti" (Finland); "Wee" and "Nair" (Singapore). See Table 1 for information on our sample firms.

TABLE 1
Description of Firms[a]

Firm and HQ Location	Product	Sales and Employees[b]		Year Founded	First Four Country Entries (in Order)	Cultural Distance to HQ	Entry Mode	Importance of Country Entry[c]	Additional Data
Wee Singapore	IT security monitoring	$3.2M	100	2000	Hong Kong Malaysia Japan China	0.28 0.85 5.15 0.47	2 2 2 3	"International expansion is key in our expansion plan."	42 archival documents One day of on-site meetings/ observations at corporate HQ in Singapore Follow-up interview with CEO
Jackson U.S.	Wireless chips for mobile devices	$1M	100	1999	China Taiwan Korea Japan	3.01 2.80 3.39 2.63	5 5 1 1	"We were founded from the beginning to be a multi-site international company."	6 archival documents Two days of on-site meetings/observations in U.S. HQ Follow-up interview with director of marketing
Ryti Finland	Clinical data capture solutions	$9.3M	75	2000	Sweden U.S. Czech Republic Germany	0.74 1.37 1.13 1.21	5 5 5 5	"It's vital, it's the cornerstone. It's the only way to go forward."	One day on site in Finland HQ Discussions with Finnish professor advising TMT 11 archival documents Follow-up interview with cofounder
Kallio Finland	Wireless solutions	$1.5M	35	1999	Italy Switzerland Ireland U.K.	1.76 1.44 1.58 1.70	3 3 3 4	"There's no choice to not be international."	One day on site in Finland HQ Discussions with local advisor Business case on firm Follow-up interview with cofounder
Adams U.S.	Real time analytics (supply chain, CRMs)	$8.5M	65	1996	Australia U.K. France Germany	0.02 0.08 1.54 0.41	1 5 1 1	"Ultimately you need to become global."	10 archival documents One day of on-site with meetings/observations in U.S. HQ Follow-up interview with former chairman
Stahlberg Finland	Security software solutions	$13.9M	104	1996	Sweden Germany U.S. Japan	0.74 1.21 1.37 4.34	1 5 5 5	"From the beginning, a high degree of vision and concept around doing what was right for the global market."	Discussions with board member Press releases and industry reports One day (each) of on-site meetings in U.S. and Finland Follow-up interview with U.S. CEO
Polk U.S.	Security software solutions	$11M	100	1996	China Germany Switzerland U.K.	3.01 0.41 0.34 0.08	5 1 1 5	"We have a global customer so just de facto, we have to be international."	20 archival documents One day of on-site meetings/ observations at corporate HQ in U.S. Follow-up interview with CEO
Tyler U.S.	Clinical data capture solutions	$70M	192	1994	Sweden Netherlands Germany Japan	2.73 1.77 0.41 2.63	1 1 1 1	"It is a global problem that we are trying to solve. It's not limited to the US."	Follow-up discussions with CEO Six years of press reports and industry documentation on firm Three days of on-site meetings in U.S. HQ.
Nair Singapore	Medical software solutions	$1.8M	10	2000	India Japan Australia Malaysia	0.80 5.15 3.66 0.85	3 3 3 3	"We have to go international—it is unavoidable."	One day of meetings in HQ Discussions with advisor to TMT 13 archival documents Follow-up interview with CEO

[a] HQ = "headquarters." Calculation of the cultural distance of each focal country from each HQ nation is based on Hofstede's (1980) rank scores. In the entry mode column, 1 = "distributor," 2 = "joint venture," 3 = "alliance," 4 = "acquisition," 5 = "greenfield."

[b] Assessed at the end of data collection.

[c] Representative quotes.

supplemented interview data with archival information from each time period in question.

We began data analysis by writing individual case histories (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), synthesizing the interview and archival data from each focal firm into a chronological story of internationalization and how the firm learned in each country entered. We used these histories for two types of analysis: within-case and cross-case. Within-case analysis concentrated on

TABLE 2
Description of Informants

Firm and HQ Location	Position[a]	Age	Nation of Birth	When Joined Firm	Prior TMT Experience	Description of Other Informants' Focal Informant
Jackson	Director of marketing	22	U.S.	Founding	No	Quick learner
U.S.	Marketing manager	23	U.S.	2003	No	Knows U.S and Chinese culture
	CEO and founder	60	China	Founding	No	Seasoned entrepreneur
Ryti	VP operations	28	Finland	Founding	No	Thorough and calm
Finland	Cofounder/VP technology	28	Finland	Founding	Yes	Innovative, get-it-done
	Cofounder/VP business development	25	Finland	Founding	Yes	Smart, proactive
	Cofounder/VP technology	27	Finland	Founding	Yes	Hardworking, straightforward
Wee	CEO and cofounder	45	Hong Kong	Founding	Yes	Dynamic, fast, great "side-view"
Singapore	GM, Singapore	38	Singapore	Founding	No	Technically sound
	CEO, Malaysia	36	Malaysia	2001	Yes	Strategic thinker, can talk at all levels
Kallio	Executive VP marketing	29	Finland	Founding	No	Analytical, able to consolidate thoughts
Finland	Cofounder, VP sales	27	Finland	Founding	Yes	Able to cope with new situations
	CEO	36	Finland	Founding	No	Friendly, impulsive
	Cofounder	28	Finland	Founding	Yes	Direct, technical
Adams	Founder/ chairman	50	U.K.	Founding	No	Mr. International
U.S.	VP of international	48	U.K.	Founding	No	Professional
	Manager, U.K.	47	U.K.	1999	No	Process-oriented
	VP and director, Australia	34	Australia	1999	No	Good entrepreneur
Stahlberg	CEO, U.S.	55	U.S.	1997	No	A sales and marketing-oriented person
Finland	CEO	52	Finland	2000	No	Stubborn, focused
	CFO	43	Finland	Founding	No	Analytical
	Founder	33	Finland	Founding	No	Brilliant, intense, highly focused
	Director, Central Europe	47	Finland	2002	No	Unconventional, maverick
	President, Japan	40	France	2000	No	Could sell snow cones to Eskimos
Polk	CEO and President	45	U.S.	1997	No	Impatient
U.S.	Director, U.K.	39	New Zealand	2003	No	Scrappy, likes a lot of balls in the air
	CTO, founder	50	China	Founding	No	Technical
Tyler	Chairman and CEO	53	U.S.	2000	No	Upbeat
U.S.	Principal engineer	50	U.S.	Founding	No	Intelligent
	Staff scientist	31	Japan	1997	No	Laid-back, talented in engineering
	Head of sales,	49	U.S.	2000	No	Has a good perspective
	Europe and Manager, Southeast Asia	55	Belgium	2002	No	Knows how to do global business
	CSO, cofounder	56	U.S.	Founding	No	Forward thinker
	Director of sales	46	U.S.	2000	No	Sales oriented
	COO	52	U.S.	1997	No	Defensive
Nair	CEO and founder	38	Singapore	Founding	Yes	Reserved, methodical
Singapore	VP of business development	30	Singapore	Founding	No	Polite, optimistic
	Business director, U.S.	38	Malaysia	2003	Yes	Hard worker, concise in communication

[a] VP = "vice president," CFO = "chief financial officer," CTO = "chief technical officer," CSO = "chief strategy officer," COO = "chief operating officer."

emergent themes and theoretical relationships linking experience and learning based on the insights from each firm.

Since one of our research questions asked if learning sequences influence performance, an important element of within-case analysis was determining each firm's performance in each country entered. We focus on country-level performance rather than overall corporate performance since the learning sequences described in this study are specifically related to learning during internationalization. In keeping with prior studies on internationalization, we assessed country performance in

multiple ways (Brush & Vanderwerf, 1992; Delios & Beamish, 2001; Dunning, 1980; Geringer & Hebert, 1990). First, we assessed country performance as the time until the first sale in a new country, calculated in months. Second, we assessed country performance as the time until a firm broke even (covered costs) in the new country entered, calculated in months. We chose time until first sale and time to break even because these metrics provide reliable, objective measures of performance available across the sample. Third, we assessed country performance through a question at the end of each interview, asking informants to rate the "success of

the firm in the new country after the first year" (0 = "very unsuccessful," 5 = "moderately successful," 10 = "extremely successful"); we then computed the mean response of informants in each firm. Our Likert measures are likely to be accurate as they span functional and hierarchical levels, thereby providing assessment of country performance from several vantage points. Overall, because we used a small sample to ensure depth of understanding about learning sequences our quantitative analysis on performance is limited. However, because we took multiple, independent measures of country performance, our study helps provide a more reliable assessment of performance than is possible from one performance measure alone (Zahra & Dess, 2001).

As an important additional step, we also assessed both shorter and longer-term performance consequences resulting from following each learning sequence. We did this because prior theoretical research on learning suggests that learning may have both immediate and distant consequences (Levinthal & March, 1993; March, 1991; Sapienza, Autio, George, & Zahra, 2006). To assess shorter-term performance consequences of learning sequences we averaged the scores for the first and second country entries for each of the three performance metrics.[4] Likewise, to assess longer-term performance consequences, we averaged the scores for the third and fourth country entries for each of the three performance metrics.[5]

After within-case analysis, we began cross-case analysis, looking for the emergence of similar themes and relationships related to learning in multiple cases (Eisenhardt, 1989; Miles & Huberman, 1994). During cross-case analysis, we used a variety of lenses, including grouping sample firms as Finnish, U.S., or Singaporean and by executive experience and entry patterns. From the emerging patterns, we formed tentative theoretical constructs and propositions. We then refined them through replication logic, frequently revisiting the data to systematically compare and verify the occurrence of specific learning sequences within each case. We were aware of the existing literature on common learning processes (i.e., trial-and-error learning, vicarious learning, improvisational learning, and ex-

perimental learning) and so examined the data for the emergence of these construct categories and their temporally ordered use in each country entry. But we also looked for unexpected learning processes. Thus, we combined theory elaboration (Lee, 1999) and theory generation (Eisenhardt, 1989) in our analysis. We then iterated between theory and data to clarify our findings and theoretical arguments. We also relied on research on learning, process management, and international entrepreneurship to sharpen the conceptual underpinnings of our findings and visually depict them. For example, since sequences are a key focus in process research (Abbott, 1990; Langley, 2007; Van de Ven, 1992) and our study examines learning processes, we decided to follow the schematic approach used in other process research to depict our learning sequences. Following Langley's (1989) use of the initial letters of the names of people's positions (i.e., M = "manager"; L = "line person"; and S = "staff person") and arrows to depict interaction sequences (e.g., L→M→S), we used the initial letters of the names of types of learning processes (i.e., T = "trial-and-error learning"; V = "vicarious learning"; E = "experimental learning"; and I = "improvisational learning") and connecting arrows to depict learning sequences (e.g., V→T→E). The overall analysis involved iterations between data, theory, and later extant research until a strong match between data and the theoretical framework occurred.

LEARNING SEQUENCES

Do Learning Sequences Exist, and Do They Matter?

The organizational learning literature generally has focused on particular learning processes, such as trial-and-error learning or vicarious learning, one by one. Although this literature indicates that these different learning processes might work together (Miner et al., 2001), it does not suggest that *learning sequences* exist. The data in our study, however, reveal their existence. We find that organizations temporally order the use of multiple learning processes over time. Moreover, our data reveal the existence of several distinct learning sequences: "seeding" and "soloing." We define *seeding* learning sequences as those that begin with indirect learning and then continue with direct learning. We define *soloing* learning sequences as those beginning with direct learning and then continuing with direct learning. Seeding and soloing emerged from the data and reflect the ways that firms in our study began to learn. That is, firms may begin learning indirectly from others' experience and so "seed" their subsequent direct learning. Alterna-

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[4] For example, if the time until the first sale in the first country a firm entered was 10 months and the time until first sale in the second country entered was 8 months, the "shorter-term time until first sale" would be 9 months.

[5] For example, if the time until first sale in the third country entered was 20 months and the time until first sale in the fourth country entered was 18 months, the "longer-term time until first sale" would be 19 months.

tively, firms may begin learning directly through firsthand experience (and so be "soloing," in that they do not rely on others to learn).

We coded sequences as "seeding" if, in each new country entered, a firm first began using an indirect learning process (e.g., vicarious learning) before transitioning to a direct learning process (e.g., trial-and-error learning). Likewise, we coded sequences as "soloing" if in each new country entered, the firm began using a direct learning process (e.g., experimental learning) and then switched to another direct learning process (trial-and-error learning or improvisational learning). Thus, a key distinguishing feature of soloing learning sequences is the absence of indirect learning. All nine of our sample firms developed seeding or soloing learning sequences in each of their country entries. See Table 3 for a summary of the sequence patterns we observed and Appendixes A and B for more detail on the learning sequences in each firm over time.

We find evidence for two variations in seeding sequences. The first variation is vicarious learning followed by trial-and-error learning. As have other researchers, we assessed vicarious learning as a change in cognition and/or behavior resulting from observing others (Kim & Miner, 2007) and trial-and-error learning as a change in cognition and/or behavior resulting from a completed action (Baum & Dahlin, 2007; Van de Ven & Polley, 1992). Yet, unlike prior work on vicarious learning, which tends to report on one specific form of vicarious learning, our analysis uncovered at least three forms. Specifically, we show that vicarious learning may take the form of (1) *a modeling effect*, wherein a firm imitates a competitor's behavior, (2) *an inhibitory effect*, wherein a firm ceases behavior after observing another firm experience a negative outcome from pursuing that behavior, or (3) *an eliciting effect*, wherein a firm engages in a behavior similar to a competitor's but in a different way.

Ryti offers an illustration of a modeling effect. Three young, inexperienced entrepreneurs (each about 25 years old) who had recently graduated from Helsinki University of Technology founded Ryti, with the intention of creating software to expedite drug discovery within the pharmaceutical industry. The founders developed technology that allowed patients, research professionals, and data managers to quickly capture and report clinical data through PDAs, cell phones, and computers during "phase three" clinical trials. Shortly after founding, the founders observed from Finnish competitor firms that accumulating trial experience seemed key to gaining access to global customers and that experience appeared easy to get in nearby Sweden. Given their lack of international experi-

ence to guide their actions, the founders copied the seemingly successful practice of competitors and entered Sweden. Trial-and-error learning then followed this vicarious learning. During project implementation with a Swedish firm, leaders in the latter became frustrated with Ryti's poor communication with them. This outcome prompted Ryti executives to improve their firm's intranet and create a more effective dedicated e-mail list. One cofounder remarked, "Our customer got frustrated since we were not actively sharing information on a daily basis. We learned to set up different mechanisms and improve the company intranet and the e-mail list to tackle that specific problem."[6]

More intriguingly, our data show that beyond a modeling effect, vicarious learning may also take other novel forms, such as an eliciting effect. Wee illustrates. The two founders of Singapore-based Wee had the goal of helping customers manage information security risks. When making their first country entry, into Hong Kong, the founders decided to target banks as their primary customer. This choice was influenced by vicarious learning. The country manager of Singapore recalled, "For the majority of the banks [in Singapore] . . . their physical security, alarm and monitoring devices, is all taken care by Commercial Industry Security Corporation (CISCO). It has a monitoring service. Whenever there is a key or intrusion that takes place, the physical security monitoring devices send traffic back to the command center but in a physical way. What we decided to do is exactly the same thing in the cyber world."

After engaging in vicarious learning, Wee executives relied on trial-and-error learning. After entering their first country (Hong Kong), these executives used a sales approach of targeting IT groups in banks. Yet leaders discovered that because new technology guidelines required senior executives to understand the risks associated with their technol-

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[6] Interviewees typically described learning as experienced by their executive teams (Daily et al. 2000). Although such executive team learning resembles team learning as described by Edmondson et al., 2001, we argue that it is more appropriately labeled "organizational learning," because the executive teams in our sample constituted their entrepreneurial organizations' membership, leadership, and understanding. This view is also consistent with the argument in the literature that organizational learning in an entrepreneurial firm is often equivalent to individual learning, given that the firm consists of a relatively small number of people and has little structure (Bingham & Eisenhardt, 2011; Kim, 1993; Zahra et al., 2000)—that is, entrepreneurial firms are often equivalent to executive teams.

TABLE 3
Learning Sequences

(3A) Country 1 Entry

Firm	Sequence	Country 1[a]	International Experience of TMT at Time of Country 1
Ryti	Seeding	V→T	Low: 1 year "Among the founding team, there is a lot of inexperience."
Jackson	Seeding	A→T	Low: 2 years "My role in China was to validate that the market is there, and that our solution is competitive."
Wee	Seeding	V→T	Medium: 4 years "He [cofounder] lived in Australia for five years. . . . I worked for two years in the U.K. and a year an a half in New Zealand."
Kallio	Seeding	A→T→I	Low: <1 year "I [cofounder] lived for two months in Buenos Aires." ["How long has the other cofounder lived outside Finland?"] "It's countable in months, not years. He lived in the Ivory Coast for one summer but that's the longest."
Tyler	Soloing	E→T	High: 6 years "John essentially had the long-term experience as an international salesperson. He had been in the industry for a long time and had a lot of sales contacts, basically knew how to process work. Hanz had worked for him in Sweden."
Adams	Soloing	E→T	High: 13 years "Most of my jobs for the last 15–20 years have had an international context in the sense I have managed businesses outside my home country." "He has lived and worked in South Africa, the U.K., Europe, and the United States. His experience has been exclusively global from the get-go."
Stahlberg	Soloing	I→T	High: 6 years "We can speak the same language, we know the country, and we know the company." "I have lived and worked outside my home country for almost 20 years." "He had been a sales manager in Germany for Nokia previously for a year or two. . . . I also had some experience in dealing with Germany."
Polk	Soloing	E→T	High: 10 years "We have international experience here, so we brainstorm a little bit about what we should do and how we should do it. . . . I [CEO] have about 22 years of international experience." "Our manager for China has lived outside China for about 8–9 years."
Nair	Soloing	E→T→E	Medium: 4 years "I have been in the U.S. for four years. I also spent three years at the Center for Natural Products Research in Singapore."

(3B) All Country Entries

Firm	Sequence	Country 1	Country 2	Country 3	Country 4
Ryti	Seeding	V→T	V→A→T→E→I	A→T→E	A→D→T→E
Jackson	Seeding	A→T	A→T→D→I	A→T→I	A→T→A→I
Kallio	Seeding	A→T→I	A→T→E	A→T→E→V	A→D→T→V
Wee	Seeding	V→T	V→T→I→D	A→T→I	V→T→V→I
Tyler	Soloing	E→T	T	E→T	T
Adams	Soloing	E→T	E→T	E→T	T
Stahlberg	Soloing	I→T	I→T	T	T
Polk	Soloing	E→T	I→T	I→T	T
Nair	Soloing	E→T→E	E→T→E→A	T→A	T→A

[a] V = "vicarious learning," T = "trial-and-error learning," A = "learning from external advice of others (via contact)," I = "improvisational learning," E = "experiential learning," D = "deviance-error learning." Please see Appendixes A and B for more specific detail on learning sequences used by each sample firm in each of its country entries.

ogy, many Hong Kong banks had shifted responsibility for information security away from IT and into audit. Given this outcome, Wee executives began targeting audit groups instead of IT groups. The CEO said, "There are a lot of organizations, including banks, which have transitioned from info-security under IT to info-security under the audit group. . . . So we changed."

Our study also indicates another variation in seeding sequences. Although the first variation is vicarious learning followed by trial-and-error learning, the second variation is advice from external entities, such as consultants, venture capitalists, and partners, followed by trial-and-error learning.[7] Jackson illustrates the use of this second seeding sequence variation (see Appendix A). At the outset of their entry into their first country, China, executives at Jackson hired a consultant to help understand how to enter the market. Regarding the China entry, one executive noted that the consultant "spear-headed the whole thing." From the consultant, Jackson executives learned that the due diligence process in China is long and that they needed to work with multiple distributors because the market is so big and regionally diverse. Jackson executives entered the country and began working with multiple distributors as instructed by the consultant. As one vice president (VP) stated, "[Consultant] has been working with us to help us know how to develop relationships with distributors in China."

After beginning with advice from the external consultant, Jackson executives turned to trial-and-error learning. For example, after entering China and trying to promote the firm's wireless chips, executives discovered that Chinese firms didn't want to buy chips alone. Instead, they wanted turnkey solutions. A senior leader stated, "We found that companies in China require a very complete, end-to-end solution." On the basis of this new information, Jackson executives changed their behavior and started providing turnkey solutions that better set the firm apart from the competition. The senior leader continued, "Texas Instruments, Intel—the big guys—they don't really provide that complete, end-to-end solution the way a start-up like we can, so it allows us to differentiate."

Although our data show evidence of seeding learning sequences (in which firms start with an indirect learning process and then switch to a direct learning process), they also show evidence of soloing learning sequences (in which firms start with a direct learning process and then switch to another direct learning process). As Table 3 indicates, there were several variations in soloing sequences (see Appendix B for more detail on these learning sequences). Some firms began with improvisational learning before moving to trial-and-error learning. More commonly, however, firms began with experimental learning before moving to trial-and-error learning. Intriguingly, however, though the literature suggests that experimental learning generally occurs through deliberate, small-scale tests conducted "off-line" in controlled settings to help managers gain understanding (Miner et al., 2001; Pisano, 1994; Thomke, 2003), our data suggest that such experimental learning frequently occurs "online," as managers try to learn while taking advantage of transient and unpredictable windows of opportunity.[8]

Adams provides an illustration of this soloing sequence variation. Adams is a U.S.-based firm whose technology allows companies to integrate real-time information and personalized analytics into their corporate information portals, enterprise applications, and critical business processes. Leaders started with experimental learning when entering their first country, Australia, which they viewed as a market culturally similar to the U.S. and one in which leaders could learn to do international business. One executive stated, "Australia is a good test bed. . . . It's low risk and easy to see what drives profitability." As part of the experiment, corporate leaders gave a highly experienced country manager a lot of autonomy to run the Australian business. However, they discovered that this autonomy resulted in an Australian venture that became too disconnected from corporate policies. This experimental outcome helped corporate leaders see the need to ensure more control and oversight of foreign teams and ventures. After starting with some experimental learning, Adams executives then learned through trial and error. Corporate leaders began pushing the local country manager to use a "features and functions" selling approach (an approach in which the seller's message is "I'll tell you the features and functions. You figure it out whether it suits your need or not"). However, the country manager experienced very little success using that approach. Because of this negative outcome, the country manager and corporate leaders decided to adopt a new selling approach that emphasized solutions/consultative ser-

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[7] Both variations of seeding involve firms starting with an indirect learning process; the key difference between the two variations is that vicarious learning does not involve a focal firm's deliberate contact with other firms (i.e., distant observation), whereas learning from the advice of external firms does involve contact with other firms.

[8] Our study suggests that experimental learning may be more nuanced than is described in the literature. We find that experimental learning often occurs online in the form of executives' deliberately trying different sales approaches in comparative contexts to see which is most effective, seeing which market responds first to inquiries, or trying a new ownership structure to see if it is more effective than what exists.

vices. The country manager explained, "The corporation was fairly infantile at the time we signed on in Australia, so it did not necessarily have lots of relevant selling experience that was useful. There was a much greater tool- or product-selling mentality. We were better able to get into the market with a solution-selling methodology."

Overall, we find evidence for learning sequences. In general, this finding is important because prior process research on learning has not explored the concept of sequences directly and so does not specify if some learning processes may be used earlier versus later. A key question, though, is why firms use seeding sequences and soloing sequences. The prior international experience of executives appears to be relevant here (see Table 3). Conceptual research suggests that when entrepreneurial firms enter new countries for the first time, they often lack the organizational structure needed to make collective responses (Sapienza et al., 2006). This research also suggests that in these situations, pre-history resources, such as the prior experience of executives, likely play a salient role (Helfat & Lieberman, 2002). Our empirical study showed that the prior international experience of top management team members[9] appears to shape whether firms begin by either learning directly (through first-hand experience) or indirectly (through others' experience) and so whether firms use seeding sequences or soloing sequences.

Recall that in seeding sequences, firms start with an indirect learning process before transitioning to a direct learning process. They do so because their executives are often inexperienced in the context in which knowledge is needed. Thus, our data show that in firms whose top management team had little (if any) international experience, vicarious learning or learning from the advice of external parties was used before trial-and-error learning in initial country entries (see Table 3). In contrast, firms using soloing sequences did not rely on indirect learning. Rather, they focused exclusively on a sequence of different direct learning processes (e.g., experimental learning or improvisational learning preceding trial-and-error learning). Firms appeared to use soloing learning sequences because their executives were more experienced in the context in which

knowledge was needed. Therefore, when its top management team had more prior international experience, a firm did not use indirect learning in initial learning sequences (see Table 3). Several top management team members at Adams, as one illustration, had extensive international experience and relied more on this experience than on guidance from external sources. For example, the VP of International stated, "Most of my jobs for the last 15–20 years have had an international context in the sense I have managed businesses outside my home country." Further, this VP described the firm's CEO, a person with over 20 years of international experience, as "Mr. International," saying "He has lived and worked in South Africa, the U.K., Europe, and the United States. His experience has been exclusively global from the get go."

We also find that initial learning sequences matter. Firms that use seeding sequences (i.e., start with indirect learning before direct learning) do not appear to perform as well in the shorter-term as firms that use soloing sequences. Specifically, firms that used seeding sequences in their first two country entries took more time to capture their first sale, took more time to break even, and had lower overall ratings of success than firms that used soloing sequences (e.g., experimental or improvisational learning before trial-and-error learning). Figure 2 provides data and illustrative graphs. With little international experience, leaders in these firms generally had less understanding of how to coordinate internal activities such as sales and product adaptations in new foreign markets (Carpenter & Fredrickson, 2001; Carpenter, Sanders, & Gregersen, 2001; Daily, Certo, & Dalton, 2000). As a result, these leaders appeared to first use indirect learning; they looked to other firms around them for clues about how to perform initial country entry activities. Although such indirect learning is efficient, our data suggest that it may be less helpful for early performance, as what is gained is often non-strategic surface level knowledge that is not tailored to a firm's specific needs and situation. For example, prior to entering their second country (the U.S.), inexperienced leaders at the Finnish firm Ryti learned indirectly from the advice of a Finnish government agency named FinnPro about "practical details regarding local contacts and then also some market information." However, a VP noted the restricted value of this indirect learning when he stated, "FinnPro was not very helpful. I think we could have got that information from various other sources. That wasn't particularly valuable information." Moreover, the lack of direct experience on the part of executives using vicarious learning often leads them to not fully grasp true causal links be-

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[9] In keeping with prior research, we define TMT members as those directly in charge of a firm's strategic decisions and overall competitive positioning (Daily, Certo, & Dalton, 2000). Also in keeping with the literature, we assessed *international experience* as the number of years organization members had lived and worked outside their home country (Carpenter & Fredrickson, 2001; Carpenter et al., 2001).

tween others' actions and outcomes (Lane & Lubatkin, 1998). Vicarious learning may therefore lead to partially incorrect knowledge. Another cofounder of Ryti recalled how this was case when the firm entered the U.S.:

> Eighty percent of the top 25 pharma companies are headquartered in the United States and all of the competition was in the United States so we decided to rent an apartment in Cambridge (MA). I bought the flight ticket for the guy and handed him a telephone book listing the pharma companies and sent him off. . . . We just thought that we would be able to come and close the deals and build the market position afterwards. But we realized that you really need to build the market position and then you start closing the deals. So we were coming at it from the wrong end in the beginning based on what we saw others do. I worked for one year for McKinsey and then for a year doing academic research at HUT, I worked a couple of months for some pharma companies, but I didn't have for myself any relevant business experience. I think that this is the biggest flaw that we used to have. We are very young, very energetic, which is good, but . . . among the founding team, there is a lot of inexperience.

By contrast, firms that used soloing sequences seem to perform better in the shorter-term (see Figures 2 and 3). In their first two country entries, they took less time to capture their first sale, less time to break even, and had higher overall ratings of success than the firms using a seeding sequence. These firms appeared to perform better because of the previous international experience of their executive teams. Such experience among executives in new entrepreneurial firms seems to positively influence the outcomes of early internationalization for several reasons. First, it can decrease the time needed to identify opportunities as well as the time needed to capture opportunities given existing networks and access to resources. The founder of Polk provided support for these points when he said, of his first country entry into China, "Because I worked there I know that there is a gap. As a businessman, you want to be the bridge and take a profit when you connect two places together. . . . The first sale in China was quite easy. I have friends there." Executives' prior international experience also lowers the risk and so the cost of experimentation to uncover high-performance organizational solutions (Sapienza et al., 2006). For example, when discussing how his firm decided to go into Australia (in a first country entry) shortly after founding, the CEO noted the use of experimental learning based on the prior experience of a top management team member ("John"). Said he, "We started thinking about entering Australia based on

John. We knew he knew he had set up solutions in Australia before. . . . The major experiment was letting John approach this thing on a much more solutions oriented basis. To his credit, John not only did it, but proved that it was indeed the appropriate way to market the product. It also ended up helping the U.S. as well." The VP of International concurred when he remarked, "John approached us and said he wanted to go back to Australia . . . with us he was essentially re-writing a business very similar to the one he started before. . . . It was so clear that he knew what to do . . . it clicked from the beginning." In summary, our data suggest that particular learning sequences exist, that they are influenced by prior executive experience, and that they appear to be consequential to early performance. Collectively, these observations lead to the following propositions:

> *Proposition 1. Firms use seeding or soloing learning sequences.*

> *Proposition 2. More executive experience at the time of first entry is more likely to lead to the use of a soloing sequence.*

> *Proposition 3. Less executive experience at the time of first entry is more likely to lead to the use of a seeding sequence.*

> *Proposition 4. Use of a soloing sequence leads to higher performance in the shorter term than use of a seeding sequence.*

Do Learning Sequences Evolve over Time, and Does This Matter?

Our first section helps address two of our research questions (i.e., do learning sequences exist, and do they matter) by describing the existence of learning sequences and how they do matter for shorter-term performance. This section now addresses the remaining research question: Do learning sequences evolve over time? Further, we describe how the evolution of learning sequences matters for longer-term performance.

Two patterns related to evolution emerged from the data. The first is sequence expansion. Firms that used seeding sequences in their first country entry expanded the number of learning processes used in subsequent country entries. By contrast, firms that used soloing sequences in their first country entry contracted the number of learning processes used in subsequent country entries. We assessed expansion and contraction of learning sequences by tracking the addition and deletion of learning processes over time in each new country

FIGURE 1
Learning Sequence Evolution

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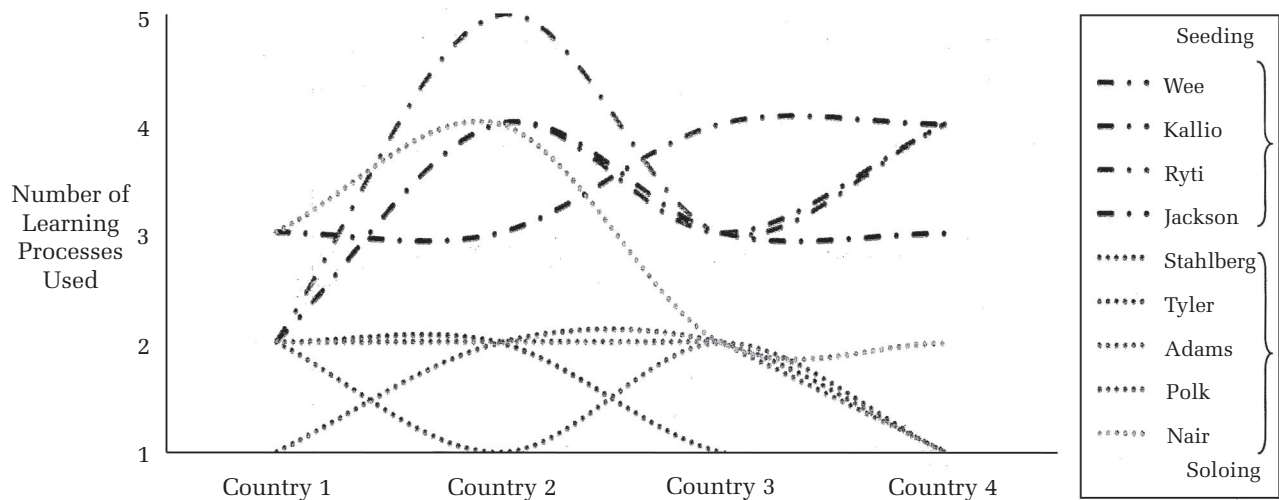
entry. Figure 1 and Table 3 summarize this finding, and Appendixes A and B provide more detail for it.

As Table 3 shows, there were variations in the expansion of seeding sequences. An interesting variation was firms iterating between indirect and direct learning. During this iteration sometimes firms would rely on different indirect learning processes (e.g., vicarious learning or learning from the advice of external firms), whereas sometimes they would rely on the same process. For example, when Wee leaders entered their fourth country (China) they used vicarious learning at the onset of the entry (i.e., entry of a competitor firm into the large market of China helped persuade Wee leaders to enter). After entering and learning through direct trial and error, Wee leaders then again relied on vicarious learning (i.e., they saw other foreign firms exiting China when sales plummeted during the SARS epidemic and so decided to do the same).
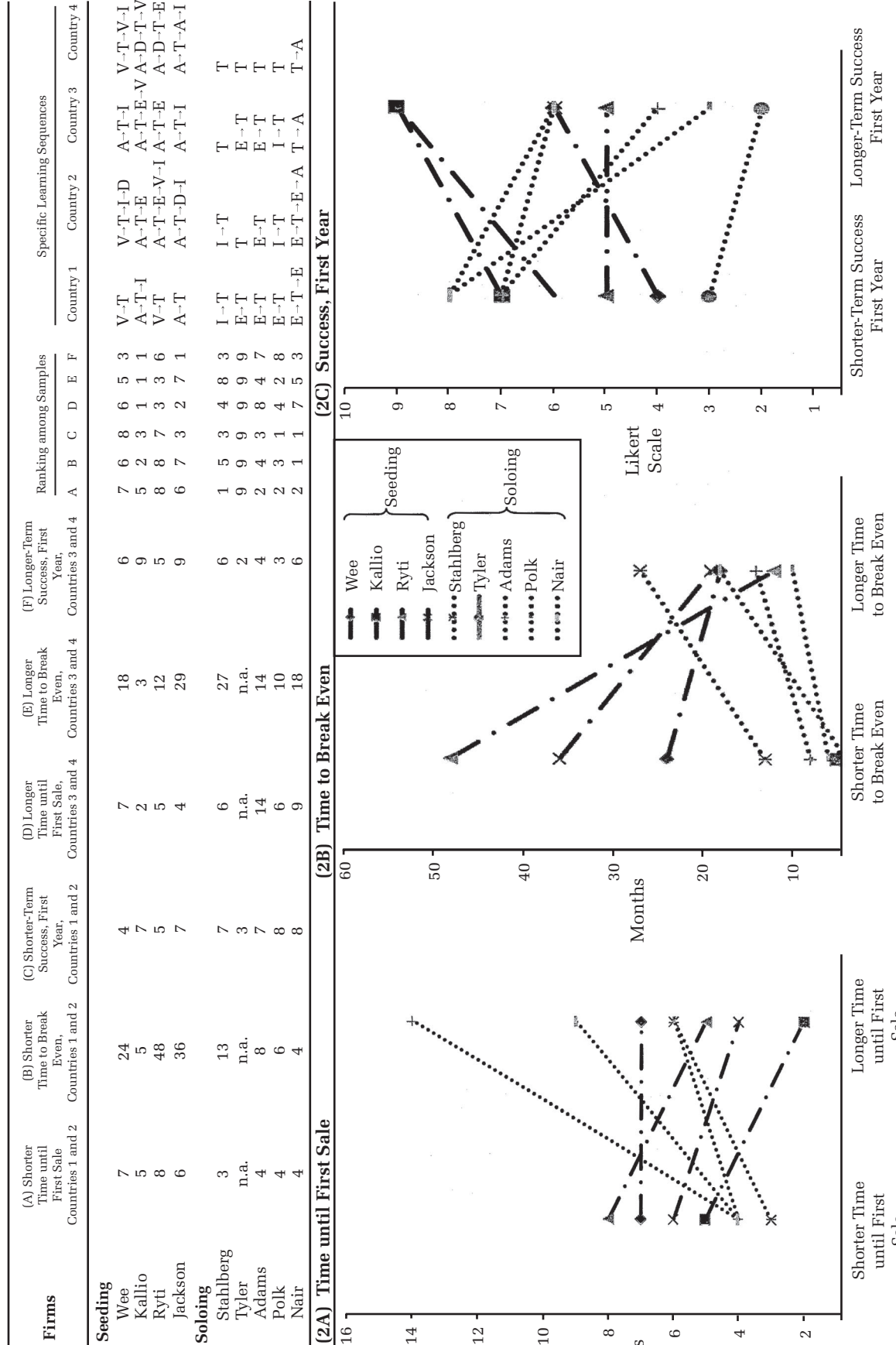
A more common variation, however, was firms' expanding their number of direct learning processes after engaging in indirect learning. Moreover, we found that firms appeared to be using a novel direct learning process, one that differs from other direct learning processes discussed in the literature (i.e., trial and error, experimental, and improvisational). We call this new process *deviance-error learning*. Deviance-error learning emerged from the data, and we define it as breaking away from a previously successful action pattern, the consequences of which are a drop in performance and then a return to the previously used action. Thus, with deviance-error learning, firm members learn the true importance of a prior action pattern when they move away from it and see performance dip. Deviance-error learning is therefore a

different process from extant notions of trial-and-error learning in which firms only change current action patterns when performance falls below aspirations (Baum & Dahlin, 2007; Greve, 2003).[10]

Jackson illustrates. When leaders entered their second country, Taiwan, they first relied on indirect learning in the form of advice from a hired external consultant ("C"), who provided insight about competitive positioning in Taiwan. One VP remarked, "We were looking at cell phones, automotive navigation systems, and PDAs. Of those three product segments, we asked [C] about the competitor companies—What do they make? How well do those products fit in to what we have to offer? What is the value proposition that we can offer x company, y company, z company? His (C's) role has really been teaching us how to think about approaching companies." Deviance-error learning then followed learning from advice. Leaders moved away from using indirect sales through distributors (a successful action pattern established in their first country, China) to focus on direct sales. However, lack of market responsiveness in Taiwan helped Jackson leaders realize the need to refocus on indirect sales in Taiwan and subsequent countries to improve speed to market and bridge lack of local understanding. Leaders therefore returned to work with distributors as they had in their first country entry. Trial-and-error learning came after deviance-error learning and learning from advice. In discussions with Taiwanese firms, Jackson leaders found out that their CEOs often were not the final deci-

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[10] Please see Table 4 for greater details on distinctions among learning processes.

FIGURE 2
Performance Consequences of Learning Sequences[a]

Firms	(A) Shorter Time until First Sale, Countries 1 and 2	(B) Shorter Time to Break Even, Countries 1 and 2	(C) Shorter-Term Success, First Year, Countries 1 and 2	(D) Longer Time until First Sale, Countries 3 and 4	(E) Longer Time to Break Even, Countries 3 and 4	(F) Longer-Term Success, First Year, Countries 3 and 4	Ranking among Samples A	B	C	D	E	F	Specific Learning Sequences Country 1	Country 2	Country 3	Country 4
Seeding																
Wee	7	24	4	7	18	6	7	6	8	6	5	3	V→T	V→T→I→D	A→T→I	V→T→V→I
Kallio	5	5	7	2	3	9	5	2	3	1	1	1	A→T→I	A→T→E	A→T→E	A→D→T→V
Ryti	8	48	5	5	12	5	8	8	7	3	3	6	V→T	A→T→E→V→I	A→T→E	A→D→T→E
Jackson	6	36	7	4	29	9	6	7	3	2	7	1	A→T	A→T→D→I	A→T→I	A→T→A→I
Soloing																
Stahlberg	3	13	7	6	27	6	1	5	3	4	8	3	I→T	I→T	T	T
Tyler	n.a.	n.a.	3	n.a.	n.a.	2	9	9	9	9	9	9	E→T	T	E→T	T
Adams	4	8	7	14	14	4	2	4	3	8	4	7	E→T	E→T	E→T	T
Polk	4	6	8	6	10	3	2	3	1	4	2	8	E→T	I→T	I→T	T
Nair	4	4	8	9	18	6	2	1	1	7	5	3	E→T→E	E→T→E→A	T→A	T→A

(2A) Time until First Sale

(2B) Time to Break Even

(2C) Success, First Year

Legend:
Wee, Kallio, Ryti, Jackson — Seeding
Stahlberg, Tyler, Adams, Polk, Nair — Soloing

[a] Time is number of months. D is "deviance-error learning"; V is "vicarious"; T is "trial-and-error learning"; E is "experimental learning"; A is "learning from others (via contact)"; I is "improvisational learning."

FIGURE 3
Learning Sequence Performance Consequences

Learning Sequence	Shorter Term	Longer Term
Soloing	+	−
Seeding	−	+

sion makers. Rather, it was someone at a lower level. Consequently, Jackson executives changed their sales approach to appeal to lower levels too. Finally, after engaging in learning from advice, deviance-error learning, and trial-and-error learning, Jackson relied on improvisational learning. During product delivery to a Taiwanese customer, Jackson engineers had to reconfigure their product solution on the fly when the customer told them they only wanted development boards with documentation and support instead of the full solution Jackson engineers had prepared. Through the improvisational episode, leaders realized that this stripped-down, no-frills solution could be offered to more technologically savvy customers in later countries.

Contrary to the expansion of seeding sequences, wherein firm leaders began increasing the number of learning processes used over time, we also find support for the contraction of soloing sequences, where firm leaders begin decreasing the number of learning processes used over time (see Figure 1 and Table 3). For example, though executives at Stahlberg relied on both trial-and-error learning and improvisational learning in their first two country entries, they relied only on trial-and-error learning in their next two. To illustrate, shortly after the Finnish firm entered the United States (third entry), corporate executives moved marketing and sales functions there, perceiving the U.S. market to be the firm's most important one. However, executives soon found that moving too many functions to the U.S. too soon made Stahlberg overly "U.S. centric." As a result, corporate executives decided to move marketing and sales back to Finland, where they could have greater control. Likewise, when the firm entered Japan (fourth entry), corporate executives wanted the local country manager to use a commission-based profit and loss system. Yet corporate executives found that the commission-based system did not work well and so switched to transfer-based pricing. The country manager of Japan explained the trial-and-error learning: "Corporate wanted to do a commission-based establishment. . . . So we did a commission agreement until they

[corporate] saw it would be better to do transfer-price-based accounting."

Why do some learning sequences contract over time, while others expand? Firms that use soloing sequences eliminate some learning processes over time because they performed well in the shorter term, and so executives became overconfident. Executives seemed to assume they already knew how to do business in different countries and therefore only needed to draw on their own experiential wisdom. A Stahlberg leader conveyed the essence of this point when he said, "I have a long experience of many sectors, and therefore I have a wide understanding of many different problems. . . . I pretty much know the culture in these countries which I cover." Similarly, another Stahlberg leader remarked, "I knew pretty much everything before, so I haven't learned many new things." Executives at Polk reflected similar sentiments. A European director asserted, "I obviously understand what it takes to set up an office and create demand and also all the legal implications of doing everything here."

By contrast, seeding sequences expand. Firm executives increase the number of learning processes over time because the firms performed less well in the shorter term and so executives do not become overconfident. Because of their lower performance in initial country entries and their own relative lack of international experience, executives in these firms may feel that more learning processes are needed for them to better understand how to act in subsequent country entries. One of the founders of Wee hinted at this when describing how his firm began to rely on more learning processes in their third country entry. Said he, "We knew that our big limitation was that we only had the technical know-how and domain knowledge. What we didn't have was the domestic country knowledge. That is what a local partner could give us." Likewise, a VP at Jackson noted how his firm started using more learning processes in later country entries:

> It is now a mix of what we are learning on the field, what our marketing guy in Asia is telling us, plus looking at reviews, looking at electronic press releases, looking at articles written about companies. We use lots of sources of information. If I were to break it down, I say the VC [venture capital] ones are generally the highest-quality sources of information but we learned they cannot always hit all the main points. There are a lot of gaps.

A related question is if the expansion of seeding sequences and the contraction of soloing sequences matters. We find that the former seems to lead to higher performance and the latter seems to lead to lower performance. Specifically, during their third

and fourth entries, firms using seeding sequences took less time to capture their first sale, took less time to break even, and had higher overall ratings of success after the first year than firms using soloing sequences (see Figure 2). Hence, a key insight is that although the use of soloing sequences leads to higher performance than the use of seeding sequences in the shorter term (the time it takes for a firm to achieve its first two country entries), the pattern is reversed for performance in the longer term (time to the third and fourth entries) because of expansion and contraction.

The expansion of seeding sequences seems to lead to higher performance for several reasons. First, it provides greater opportunities to learn. This appeared to be the case for Wee when, in its third country entry, it learned from the advice of a partner (a learning process the firm had not used until that point). The firm's general manager recalled:

> Our partner sent a group of engineers. They would be in the room for days, going through the new features we have, testing them out and doing the user acceptance test. They point out things that Singapore and Malaysia would miss. For example, a Windows screen. Sometimes there is a box we click to say "okay." They said that the box is not the same size as the others. I am not kidding you. This is the level they go down to. The amount of improvements they can point out is tremendous. Because of this, the new version of our product, our monitoring system, benefited a lot of other countries as well.

The expansion of seeding sequences also appears to increase performance by improving the reliability of what is learned. More learning processes may provide a multimodal method for comparing data against each other. Any finding or conclusion carries more weight and is likely to be more convincing if based on the pooling of several distinct but corroboratory sources of information (Yin, Bateman, & Moore, 1983). As one executive at Jackson noted about the increasing number of learning processes his firm relied on to make partner choices:

> By looking at our competitors, we get a very good gauge of who the partnering companies are. Then we obviously supplement that with all the standard web site press. Also talking to analysts too. We have been in contact with analysts who specialize in automotive aftermarket and OEMs and handsets asking them what's hot, what's interesting, and who are good companies coming up in this area.

More broadly, the use of many distinct learning processes may improve performance since it helps address a fundamental trade-off between the speed of learning and the quality of what is learned. On the one hand, processes such as experimental learning and trial-and-error learning are time consuming, resource intensive, and not very efficient. Yet the knowledge generated is often of high quality and so likely to reduce the future probability of mistakes (see Table 4). On the other hand, vicarious learning is easy and efficient. But, because the knowledge generated is based on weak causal inferences drawn from others' observable actions, it is of lower quality and so less likely to reduce the future probability of mistakes. The use of more learning processes in sequences may therefore let firms acquire quality information while also allowing for speed in action. Overall, although many studies have suggested that greater performance from learning stems from enlarging the number (Anand & Khanna, 2000; Argote, 1999) or variety (Hayward, 2002; Schilling, Vidal, Ployhart, & Marangoni, 2003) of experiences to be observed, our study suggests the complementary idea that it can come from enlarging the number and variety of learning processes used together in a single experience.

Data also suggest several reasons why the contraction of soloing sequences might lead to lower performance. First, increased reliance on trial-and-error alone increases the likelihood of repeating past actions that resulted in positive outcomes but that may be inappropriate for current experience. A senior leader at Tyler provided support for this point when he said, "I don't think we did any external market research on Europe before entry . . . our foray has been 'Well, this is what FDA approved. Therefore, it must be good for Europe.' . . . Guess what? We sold nearly nothing, that doesn't work." This leader later admitted, "We designed our product to meet U.S. requirements, because that was where we were and all the research that we did was catered to U.S. So to watch it overseas and hope it's going to sell is hope."

Second, because critical examination of cause-effect relationships and the creation of new knowledge are severely reduced when individuals rely only on trial-and-error learning, performance also seems to decrease as executives become more influenced by psychological proclivities that push them to attribute negative outcomes to external factors (Weiner, 1985). For example, explaining his firm's poor outcomes in Japan (fourth country entered), the CFO of Stahlberg stated, "There has also been the problem that the Asian engineers are not as technically capable as the Finnish engineers." Likewise, recounting his firm's lack of sales in Latin America, Tyler's head of global sales snidely remarked, "In European countries, they set up a high standard of health care. In Latin America, half of them still use voodoo." In summary, less

TABLE 4
Learning Processes

Characteristics	Direct Learning Processes				Indirect Learning Processes	
	Experimental Learning	**Trial-and-Error Learning**	**Improvisational Learning**	**Deviance-Error Learning**	**Vicarious Learning**	**Learning from External Advice**
Definition	Learning through controlled situations to test causal propositions and create new knowledge (Cook & Campbell, 1979).	Learning through the consequences of a firm's previous actions (Baum & Dahlin, 2007).	Learning that occurs on the fly as design and action converge (Miner et al., 2001).	Learning that occurs when firms break away from a successful action pattern.	Learning indirectly from other firms through observation but without contact (Bandura, 1977).	Learning from others instruction through direct contact (Dyer & Nobeoka, 2000).
How learning occurs	Through the intentional manipulation of inputs and observation of outputs firms gain knowledge and understanding of causal relationships.	Firms undertake a course of action and the consequences of that completed action lead to change in inferences of action.	Firms adjust their beliefs and/or behavior in real time (without waiting for consequences of action) in order to solve unexpected problems or capture surprising opportunities.	Firms deviate from a previously successful action pattern; the result is a performance drop and then a return to the previously used action. Firms learn the true importance of a prior action pattern when they deviate from it and see performance dip.	May take the form of (1) a modeling effect (a focal firm replicates a competitor's behavior), (2) an inhibitory effect (i.e., ceasing behavior after observing another firm experience a negative outcome for pursuing that behavior), or (3) an eliciting effect (i.e., engaging in an action similar to a competitor 's but doing it differently).	Firms adjust their understandings and/or action through instruction from external parties, including partners, VCs, and industry associations.
Explicit intent to learn	*High*: Goal is to develop new understandings that can then be incorporated into ongoing organizational activities.	*Medium*: Trial and error may be used as a deliberate form of learning. Trial and error may also be "blind" and involve little intent to learn.	*Low*: Goal is more to address surprising problems and/or opportunities and less to gain knowledge about action/outcome relationships.	*Medium*: May be a deliberate form of learning. May also be less deliberate; deviance from a successful past action pattern may have capturing a novel opportunity as its goal, not learning.	*High*: Goal is to gain the benefits of accumulated knowledge while avoiding the expense of accumulated experience.	*High*: Firms hire outside others and/or ask targeted questions to help cover particular deficiencies in internal stock of knowledge.
Reliance on what was done in the past	*High*: Outcomes from off-line and online experiments are carefully compared with what the firms has done in the past.	*Medium*: Firms repeat past actions that resulted in positive outcomes. If outcomes are not positive, they revise beliefs and/or actions as needed.	*Low*: Design and action converge in time and result in a novel production that is idiosyncratic to time and place.	*Low*: Firms move away from effective actions used in the past. But doing so helps them better understand the reason for those actions.	*Low*: Firms use vicarious learning to jump-start action since they often do not have an experience base to draw upon.	*Low*: Firms move away from own stock of knowledge built from the past and rely more heavily on the knowledge of others.

TABLE 4
(Continued)

Characteristics	Direct Learning Processes				Indirect Learning Processes	
	Experimental Learning	**Trial-and-Error Learning**	**Improvisational Learning**	**Deviance-Error Learning**	**Vicarious Learning**	**Learning from External Advice**
Relation with other learning processes	May be used to guide trial-and-error learning.	May drive out indirect organizational learning.	May lead to longer term trial-and-error learning (Miner et al., 2001).	May be a viewed as a form of unplanned experimental learning.	May be used to seed direct learning.	May seed direct learning and become used more than vicarious learning.
Exploration/ exploitation emphasis	*Exploration*: Decision makers deliberately manipulate inputs to discover new knowledge and practices.	*Exploitation*: Own experience is usually not a source of new ideas but a basis for refinement of existing ones.	*Exploitation*: Intention is to make do with materials at hand to create a solution for an emergent problem and/or opportunity.	*Exploration*: Decision makers deviate from practices that proved successful in prior experience.	*Exploration*: Decision makers engage in non-local search when they look beyond their boundaries for new ideas and practices. Often ideas come from firms in the same industry.	*Exploration*: Firms engage in non-local search. May be more global than vicarious learning since external sources of information are not necessarily in the same industry.
Potential benefits and detriments	*Benefit*: Knowledge generated may be generalizable over time given that it contains understanding about main and interaction effects. *Detriment*: Experimentation can be costly in terms of resources and time away from core activities.	*Benefit*: Learning can gradually and systematically build off errors committed in the past. *Detriment*: Errors may have been avoided through experimentation or vicarious learning.	*Benefit*: Allows firms to rapidly respond to attractive emergent opportunities faster than the competition. *Detriment*: Knowledge is short-term and idiosyncratic to particular experiences and so less generalizable over time.	*Benefit*: Knowledge generated reflects more understanding of why successful actions used in the past are successful. *Detriment*: Can be costly in that firms deviate from successful actions only to see a drop in performance and then a return to that successful action.	*Benefit*: Expedites learning by avoiding direct trial and error. *Detriment*: Knowledge gained could be less useful given that it is based on making weak causal inferences from observation of behavior (i.e., involves drawing inferences from noisy data).	*Benefit*: Expedites learning by avoiding direct trial and error. Also improves weak inferences made through vicarious learning. *Detriment*: Costs to hire external sources to help instruct and cover informational deficiencies could be high. Also requires that firms know deficiencies a priori.

reflection about causal relationships stemming from the increased use of trial and error alone appears to increase the probability that assessments of unfavorable outcomes slip into a pattern of finger-pointing rather than occasions for learning. Consequently, underlying but unresolved problems propagate over time so that performance gradually decreases with the accumulation of experience. As support, the co-founder of Tyler sadly admitted, "Here we are years later and we have not yet found the key to completely succeeding with this particular product." Similarly, another member of the founding team disclosed, "We have the same problems in Asia as in Europe, and we haven't even started to get to that one yet." Collectively, these observations lead to our second group of propositions.

Proposition 5. Seeding learning sequences expand with use in later experience.

Proposition 6. Soloing learning sequences contract with use in later experience.

Proposition 7. Use of a soloing learning sequence leads to lower performance in the longer term than use of a seeding learning sequence.

DISCUSSION

Organizational learning is of fundamental importance because it enables innovation, adaptation, and improvement in efficiency and productivity (Argote, 1999). Yet most research generally explores how one particular learning process is used while underexploring whether firms use multiple learning processes together over time in temporally ordered ways. Using data on the accumulated country entries of entrepreneurial firms, we address this gap. Our findings have implications for several research areas, including process management, organizational learning, and international entrepreneurship.

Process Research and Learning Sequences

Our primary contribution is to establish "sequences" as a meaningful focus and concept in process research on learning. Process research centers on understanding how things happen over time and why they happen this way (Langley, 1999, 2007). Whereas variance theories offer explanations for the world in terms of relationships between independent and dependent variables (e.g., more of A leads to more of B), process theories offer explanations in terms of sequences of events, activities, and choices (Langley, 1999). With process theory, the concept of sequence thus takes center stage. Intriguingly, although much process theory on organizational learning exists (on, for example, trial-and-error learning or vicarious learning), the concept of sequences has been noticeably absent from extant research. This absence may be partly attributable to the fact that organizational learning has a fluid character that makes it difficult to isolate distinct learning processes and their temporal ordering. However, by exploiting the benefits of inductive multiple case methods for time series analysis (Eisenhardt & Graebner, 2007; Yin, 1994), we are able to overcome some of these challenges and develop the concept of sequence in organizational learning.

In line with other organizational research exploring sequences, our research uses the term to refer to temporally ordered elements (Abbott, 1990; Langley, 1999). In our study, we are concerned with the order of discrete learning processes used in firms. In particular, we develop the concept of learning sequences by addressing the central questions in representative organizational process research on sequences, which include (1) whether sequence patterns exist, (2) what influences those patterns, and (3) what the patterns affect (Abbott, 1990).

First, our study helps address the question of existence. Do learning sequences exist and, if so, are there typical patterns? Our data reveal two primary patterns: seeding and soloing. With seeding sequences, executives begin by using an indirect learning process before using a direct learning process. By contrast, with soloing sequences executives begin by using one direct learning process and then switch to another direct learning process. Our data also reveal variations of seeding and soloing sequences. Thus, beyond showing support for the existence of learning sequences more generally, we also show support for common versions. For example, the most common version of soloing learning sequences used in initial country entries was firms starting with experimental learning and then transitioning to trial-and-error learning. A less common version was firms starting with improvisational learning and then transitioning to trial-and-error learning. Finally, our study provides some insight into the internal interdependencies in learning sequences and so helps address the question of whether certain orderings of learning processes are seldom or never used. As one illustration, data show that experimental learning did not follow improvisational learning in any of the learning sequences uncovered in our sample firms. One explanation is that with improvisational learning there is a lower explicit intention to learn, whereas with experimental learning there is a higher explicit intention to learn (Miner et al., 2001). Hence, because the goal of improvisational learning is more to address surprising problems and/or immediate opportunities, and less to gain information about causal laws, it is less likely that experimental learning, which centers on generating generalizable knowledge, will follow it.

Second, our study helps address the question of why initial learning sequence patterns exist. We therefore explore factors that seem to influence whether seeding or soloing sequences get used. We find that less international experience among TMT members makes firms more likely to use a seeding sequence in their initial country entry, whereas more international experience among TMT members makes firms more likely to use a soloing sequence. Indirect learning therefore appears to "seed" direct learning when firms lack experience. Hence, while extant studies contribute by highlighting a range of potential learning processes (Huber, 1991; Miner et al., 2001), this study contributes by suggesting that sometimes constraints (e.g., lack of international experience) may shape the order in which firms use those processes together over time.

Similarly, the presence or lack of international experience also appears to influence why later learning sequence patterns exist. Unexpectedly, we find that initial learning sequences both contract

and expand with continued use. Soloing sequences contract. Executives with international experience appear to get overconfident. Overconfident executives overestimate the likelihood they can rely on their existing stock of knowledge and personal abilities for success in later country entries. As one executive at Stahlberg said smugly, "I know what to do . . . selling is selling, whatever you sell even if it's a toothbrush. You have the same points which you have to go through. In each new country I'm using the same model, selling exactly the same way." This finding provides insight into the finding of other learning scholars as to why firms tend to exploit similar domain expertise when continuing to expand abroad (Vermeulen & Barkema, 2001). Seeding sequences, alternatively, expand. Executives with less international experience recognize their lack of knowledge and so come to rely on more learning processes when entering new countries to address this deficiency. For example, after the first country entry, one senior executive remarked, "We are no longer just relying on the information that we think we have."

Finally, our study helps answer questions about the consequences of learning sequences. We examined whether and how the order of learning processes used in a country entry influences country performance. We found that learning sequences differ in their shorter-term versus longer-term performance impacts. Soloing sequences appear better than seeding sequences in the shorter term. During this time frame, soloing sequences involve more experimental learning than seeding sequences. The use of more experimental learning seems to be particularly performance enhancing early in experience (see Figure 2), as the purpose of experimental learning is to gain new knowledge and practices that can then be incorporated into organizational activities. Thus, we find some empirical support for the conjectures of others that experimental learning may be useful in guiding subsequent trial-and-error learning (Miner et al., 2001).

The use of soloing sequences, however, appears to result in lower longer-term performance than the use of seeding sequences. One possible reason for this is that continued use of soloing sequences reflects a drift toward more local search (i.e., emphasis on just trial-and-error learning) over time. In contrast, the ongoing use of seeding sequences seems to reflect a drift toward more global search (i.e., emphasis on different types of indirect learning processes). Prior research suggests that such global search is important for performance because it gives executives a fuller perspective and thus make them less susceptible to learning biases (Katila & Ahuja, 2002; Levinthal & March, 1993).

Therefore, although it may take a firm a while to integrate the knowledge generated from a global search, once integrated it appears to give firms a knowledge edge in the longer term. Hence, unlike prior studies that suggest firms may emphasize indirect learning more as performance falls below aspirations (Baum & Dahlin, 2007) our study suggests indirect learning may become more emphasized as performance nears or exceeds aspirations. Indeed, the learning sequences that appeared to lead to the highest performance in the longer term were ones that reflected more, and more distinct types of, indirect learning processes (see Figure 2).

In sum, we contribute by showing that particular learning sequence patterns are present in organizations. We also address what influences the choice of and change in those sequences, and what those sequences mean for important organizational outcomes such as performance. Overall, our study helps reveal the existence, effects, and evolution of learning sequences. Such revelation is important, as existing process research on learning does not answer questions about whether there are learning sequences, let alone questions dealing with their causes and consequences. Thus, we contribute to process research on learning by developing the concept of sequences, a concept that lies at the heart of process research (Burgelman, 1996; Graebner, 2004; Langley, 1989; Van de Ven & Polley, 1992) and one that scholars have noted as critical in the development of theory about the temporal dynamics of strategy-related phenomena such as learning (Langley, 1999, 2007; Van De Ven, 1992; Van de Ven & Poole, 1995).

Organizational Learning

Besides establishing sequences as a meaningful focus and concept in process research on learning, our study also adds to organizational learning research by shedding more nuanced light on the nature of common learning processes discussed in the literature (see Table 4).

First, our study provides an expanded view of how experimental learning occurs. Extant research describes how experimental learning takes place as leaders intentionally manipulate inputs off-line and then observe outputs to gain knowledge and understanding of causal relationships (Cook & Campbell, 1979; Huber, 1991; Pisano, 1994; Thomke, 2003). Our data indicate that although experimental learning may occur off-line through the use of controlled situations to test causal propositions and create new knowledge (which can then be implemented in ongoing organizational activities), it frequently also occurs online, as execu-

tives deliberately try variations of practices and products as they go. This is because the uncertainty associated with the technology-based environment in which our firms did business increased the time pressure to take advantage of serendipitous opportunities faster than the competition. A senior executive lent credence to this point when he remarked about his firm's online experimental learning process of deciding which countries to enter: "We throw out our seeds and see which one will germinate fastest." Thus, finite attention and time, unpredictable windows of opportunity, and limited capital increase the likelihood that fewer resources will be allocated to off-line experimental learning about projects with only potential future value and that more resources will be allocated to online experimental learning about possibilities for immediate revenue.

Second, our study provides an expanded view of how vicarious learning occurs. Current studies tend to describe one particular form of such learning—modeling, defined as replication of a competitor's behavior (Denrell, 2003; Kim & Miner, 2007). However, although this study shows support for vicarious learning via a modeling effect, it also shows that vicarious learning may take the form of several different, less well understood, effects. Data indicate that sometimes vicarious learning has an inhibitory effect, defined as ceasing behavior after observing another firm experience a negative outcome for pursuing that behavior. For example, in one firm, executives learned to create a more lightweight product prior to entering the U.S. after watching competitors suffer with a product that was not lightweight. The country manager of the U.S. said, "We actually learned a lot from the pioneers out there. We have learned that the total cost of ownership is an issue when loading a lot of heavy-duty software for companies. So scalability for them has been an issue. We decided we were going to go for lightweight software. . . . Having seen where firms have gone and not really succeeded helps us be better."

Vicarious learning may also have an eliciting effect, defined as engaging in a behavior similar to that of a competitor firm but in a different way. To illustrate, by watching their U.S.-based competitors, leaders in one firm realized the importance of having a U.S. presence so that they could have added legitimacy for Asian customers. A senior executive remarked, "We realized that it was important to have an American base. . . . One of our competitors in Taiwan at the time was [firm] and they had a strong American presence. They had a Taiwanese reseller for them. They were an American company with a Taiwanese reseller. So, it somehow worked out really well for them, because their Taiwanese reseller was able to leverage the American image in the Taiwanese market."

International Entrepreneurship

We also contribute to the growing literature on international entrepreneurship. Many studies in this research stream describe how new firms internationalize shortly after founding in pursuit of performance advantages (Autio, George, & Alexy, 2011; Autio, Sapienza, & Almeida, 2000; Bingham, 2009; Sapienza et al., 2006; Zahra et al., 2000). Our study improves understanding of how these performance advantages might be realized and when.

First, we contribute by showing how determinants of performance advantages in the shorter term may lead to performance disadvantages in the longer term. Previous studies have suggested that the first entry of an entrepreneurial firm can be challenging owing to liabilities of both newness and foreignness (Zaheer & Mosakowski, 1997). But in theoretical work, Sapienza and colleagues (2006) posited that the prior international experience of executives may partially substitute for lack of organizational experience and so mitigate the aforementioned liabilities. They thus suggest that entrepreneurial firms whose executives have previous international experience will perform better in their first country entry than entrepreneurial firms whose executives do not have that experience. Our empirical study supports and extends this work. We find that entrepreneurial firms whose executives had more previous international experience generally exhibited higher average performance in their first two country entries than entrepreneurial firms whose executives had less previous international experience. However, our study also suggests that early performance advantages in initial country entries may lead to overconfidence among experienced executives and so lead to less learning and lower performance in later country entries. Hence, the prior international experience of executives seems to generate shorter-term performance advantages but longer-term performance disadvantages. In general, our finding on the dampening effect of overconfidence on learning and performance over time helps address the question in the international entrepreneurship literature of whether the "imprinting" of early executives provides continued performance advantages (Autio et al., 2011). It is also consistent with other research on entrepreneurial firms suggesting that executive teams with greater confidence tend to deprive their firms of important opportunities for learning and therefore increase the likelihood that their firms

will underperform relative to their industries (Hayward, Shepherd, & Griffin, 2006).

Second, we contribute by showing how determinants of performance disadvantages in the shorter term may lead to performance advantages in the longer term. We find that entering a new country for the first time is a costly exercise for entrepreneurial firms, especially when executives do not have previous international experience. Lack of experience causes some leaders to begin learning indirectly (see Table 3). Yet because indirect learning often consists of making weak causal inferences for effective actions based on distant observations of others' behaviors (Kim & Miner, 2007), it can result in incomplete and even inaccurate understandings that can lead to lower performance in initial country entries relative to the performance of entrepreneurial firms in which executives have previous international experience. However, our data also show that relatively inexperienced firms with lower performance in initial country entries rebound by adding more learning processes (see Table 3) and so perform better in later country entries. This finding on the increasing number and diversity of learning processes used over time may provide additional insight into why some entrepreneurial firms are able to develop larger and more diverse action repertoires for new country entry over time (Autio et al., 2011). More broadly, this finding helps extend the important concept of "learning advantages of newness" discussed in the international entrepreneurship literature (Autio et al., 2000) to executive, and not just organizational, experience. Autio and colleagues argued that younger firms are better able to internationalize than older firms because older firms have more structural and other institutional constraints that make them increasingly resistant to change. Similarly, we find that executives with less international experience prior to their current entrepreneurial venture appear to do more learning over the longer term (i.e., increase the number of learning processes used in new country entries) than those executives with more prior international experience and so outperform them in later country entries. By highlighting how learning advantages of newness might well be relevant at the individual level of analysis (in addition to the firm level), our work suggests the intriguing notion that inexperienced founders may constitute a more important long-term source of competitive advantage for entrepreneurial firms entering new markets than previously theorized.

Limitations

Like all studies, ours has limitations that suggest opportunities for future research. To more accurately portray learning sequences over multiple experiences, we restricted our analysis to nine firms. Although we found intriguing patterns, more work is needed to examine learning sequences in a larger number of firms and a wider range of industries. Likewise, we focus on learning across a series of country entry experiences. It would therefore be valuable to explore how our findings generalize (or do not) to experience with other strategically relevant motors for growth, such as alliances, acquisitions, and product development. In addition, our sample consists of small, young firms in which learning may be more critical to survival than it is for more established firms. Although a focus on younger firms may allow for greater transparency of learning, better understanding of the existence, causes, and consequences of learning sequences in older firms is also needed. Similarly, we focus on the information technology industry. It may be that this dynamic setting increases the number and range of opportunities to learn. Finally, although we identify particular learning sequences that seem to lead to higher performance than others in the shorter and longer terms, future research is needed to continue exploring which sequences are better and under what conditions. More generally, all research designs involve trade-offs due to the practical limits of data collection. We chose a small sample to allow rich examination of learning sequences and their potential causes and consequences. However, although this choice increases the likelihood that findings will be fresh and internally valid, it does so at the expense of generalizability and external validity. Thus, an important next step is to submit our findings and emergent propositions to rigorous empirical tests.

Conclusions

Scholars know much about the importance of learning and particular learning processes that organizations use (e.g., trial-and-error learning, vicarious learning). But too little is known about whether multiple learning processes get used together in learning sequences. Our work is a first step in addressing this gap. It is also part of a larger research program that addresses not only how learning occurs in entrepreneurial firms and in dynamic environments (Bingham, 2009; Bingham & Kahl, 2012), but also what is learned (Bingham & Eisenhardt, 2011), the impact of that learned content (Bingham, Eisenhardt, & Furr, 2007; Davis,

Eisenhardt, & Bingham, 2009; Eisenhardt, Furr, & Bingham, 2010), and why some firms learn more than others (Bingham & Eisenhardt, 2008; Bingham & Haleblian, 2012).

From our exploration of rich field data, we find the existence of learning sequences. Moreover, we find that learning sequences seem to reflect two broad patterns: seeding and soloing. These two patterns show variation across firms, and the extent of executives' international experience influences their adoption. Our study also suggests that learning sequences evolve over time, but in opposing ways. Seeding sequences expand, and soloing sequences contract. Further, our study suggests that the performance benefits associated with each learning sequence are contingent upon when it is used: Soloing sequences seem to lead to higher performance than seeding sequences in the shorter term, whereas the reverse appears true for the longer term. In sum, this study provides an emergent and empirically grounded model for the existence, evolution, and effect of learning sequences. More broadly, our study highlights the sequential nature of key strategic organizational processes, thereby suggesting that careful, in-depth analysis may reveal intriguing new insights in many other areas of management research beyond learning.

REFERENCES

Abbott, A. 1990. A primer on sequence methods. *Organization Science,* 1: 375–392.

Abbott, A. 1995. Sequence-analysis—New methods for old ideas. In J. Hagan & K. Cook (Eds.), *Annual review of sociology,* vol. 21: 93–113. Palo Alto, CA: Annual Reviews.

Adair, W. L., & Brett, J. M. 2005. The negotiation dance: Time, culture, and behavioral sequences in negotiation. *Organization Science,* 16: 33–51.

Amis, J., Slack, T., & Hinings, C. R. 2004. The pace, sequence, and linearity of radical change. *Academy of Management Journal,* 47: 15–39.

Anand, B. N., & Khanna, T. 2000. Do firms learn to create value? The case of alliances. *Strategic Management Journal,* 21: 295–315.

Argote, L. 1999. *Organizational learning: Creating, retaining and transferring knowledge.* Norwell, MA: Kluwer Academic.

Argyris, C., & Schön, D. 1978. *Organizational learning: A theory of action perspective.* Reading, MA: Addison Wesley.

Autio, E., George, G., & Alexy, O. 2011. International entrepreneurship and capability development-qual-

itative evidence and future research directions. *Entrepreneurship: Theory and Practice,* 35: 11–37.

Autio, E., Sapienza, H., J., & Almeida, J. G. 2000. Effects of age at entry, knowledge intensity, and imitability on international growth. *Academy of Management Journal,* 43: 909–924.

Bandura, A. 1977. *Social learning theory.* Upper Saddle River, NJ: Prentice-Hall.

Barkema, H. G., Bell, J. H., & Pennings, J. M. 1996. Foreign entry, cultural barriers, and learning. *Strategic Management Journal,* 17: 151–166.

Baum, J. A. C., & Dahlin, K.. B. 2007. Aspiration performance and railroads' patterns of learning from train wrecks and crashes. *Organization Science,* 18: 368–385.

Baum, J. A. C., & Haveman, H. A. 1997. Love thy neighbor? Differentiation and agglomeration in the Manhattan hotel industry, 1898–1990. *Administrative Science Quarterly,* 42: 304–338.

Baum, J. A. C., & Ingram, P. 1998. Survival-enhancing learning in the Manhattan hotel industry. *Management Science,* 44: 996–1017.

Baum, J. A. C., Li, S. X., & Usher, J. M. 2000. Making the next move: How experiential and vicarious learning shape the locations of chains' acquisitions. *Administrative Science Quarterly,* 45: 766–801.

Bingham, C. B. 2009. Oscillating improvisation: How entrepreneurial firms create success in foreign market entries over time. *Strategic Entrepreneurship Journal,* 3: 321–345.

Bingham, C. B., & Eisenhardt, K. M. 2008. Position, leverage and opportunity: A typology of strategic logics linking resources with competitive advantage. *Managerial and Decision Economics,* 29: 241–256.

Bingham, C. B., & Eisenhardt, K. M. 2011. Rational heuristics: What firms explicitly learn from their process experiences. *Strategic Management Journal,* 32: 1437–1464.

Bingham, C. B., Eisenhardt, K. M., & Furr, N. R. 2007. What makes a process a capability? Heuristics, strategy, and effective capture of opportunities. *Strategic Entrepreneurship Journal,* 1(1–2): 27–47.

Bingham, C. B., & Haleblian, J. 2012. How firms learn heuristics? Uncovering missing components in organizational learning. *Strategic Entrepreneurship Journal:* In press.

Bingham, C. B., & Kahl, S. 2012. The process of schema emergence: Assimiliation, deconstruction, unitization and the plurality of analogies. *Academy of Management Journal:* In press.

Brown, S. L., & Eisenhardt, K. M. 1997. The art of continuous change: Linking complexity theory

and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly,* 42: 1–34.

Brush, C. G., & Vanderwerf, P. A. 1992. A comparison of methods and sources for obtaining estimates of new venture performance. *Journal of Business Venturing,* 7: 157–170.

Burgelman, R. A. 1994. Fading memories: A process theory of strategic business exit in dynamic environments. *Administrative Science Quarterly,* 39: 24–56.

Burgelman, R. A. 1996. A process model of strategic business exit: Implications for an evolutionary theory of strategy. *Strategic Management Journal,* 17: 193–214.

Carpenter, M., & Fredrickson, J. 2001. Top management teams, global strategic posture, and the moderating role of uncertainty. *Academy of Management Journal,* 44: 533–545.

Carpenter, M., Sanders, W. G., & Gregersen, H. B. 2001. Bundling human capital with organizational context: The impact of international assignment experience on multinational firm performance and pay. *Academy of Management Journal,* 44: 493–511.

Chang, S.-J. 1995. International expansion strategy of Japanese firms: Capability building through sequential entry. *Academy of Management Journal,* 38: 383–407.

Chuang, Y.-T., & Baum, J. A. C. 2003. It's all in the name: Failure-induced learning by multiunit chains. *Administrative Science Quarterly,* 48: 33–59.

Cook, T. D., & Campbell, D. T. 1979. *Quasi-experimentation: Design and analysis.* Boston: Houghton Mifflin.

Cyert, R. M., & March, J. G. 1963. *A behavioral theory of the firm.* Englewood Cliffs, NJ: Prentice Hall.

Daily, C. M., Certo, S. T., & Dalton, D. R. 2000. International experience in the executive suite: The path to prosperity? *Strategic Management Journal,* 21: 515–523.

Darr, E., Argote, L., & Epple, D. 1995. The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises. *Management Science,* 41: 1750–1762.

Davis, J. P., & Eisenhardt, K. M. 2011. Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly,* 54: 413–452.

Davis, J. P., Eisenhardt, K. M., & Bingham, C. B. 2009. Optimal structure, market dynamism, and the strategy of simple rules. *Administrative Science Quarterly,* 56: 159–201.

Delios, A., & Beamish, P. W. 2001. Survival and profit-ability: The roles of experience and intangible assets in foreign subsidary performance. *Academy of Management Journal,* 44: 1028–1038.

Denrell, J. 2003. Vicarious learning, undersampling of failure, and the myths of management. *Organization Science,* 14: 227.

Dunning, J. H. 1980. Toward an eclectic theory of international production: Some empirical tests. *Journal of International Business Studies,* 11: 9–31.

Dyer, J. & Nobeoka, K. 2000. Creating and managing a high-performance knowledge-sharing network: The Toyota case. *Strategic Management Journal,* 21: 345–367.

Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review,* 14: 532–550.

Eisenhardt, K. M., Furr, N. R., & Bingham, C. B. 2010. Microfoundations of performance: Balancing efficiency and flexibility in dynamic environments. *Organization Science,* 21: 1263–1273.

Eisenhardt, K., & Graebner, M. 2007. Theory building from cases: Opportunities and challenges. *Academy of Management Journal,* 50: 25–32.

Geringer, J. M., & Herbert, L. 1990. Measuring performance of international joint ventures. *Journal of International Business Studies,* 22: 249–264.

Graebner, M. 2004. Momentum and serendipity: How acquired leaders create value in the integration of technology firms. *Strategic Management Journal,* 25: 751–777.

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

Greve, H. R. 2003. *Organizational learning from performance feedback: A behavioral perspective on innovation and change.* Cambridge, U.K.: Cambridge University Press.

Haleblian, J., & Finkelstein, S. 1999. The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly,* 44: 29–56.

Haunschild, P. R., & Miner, A. S. 1997. Modes of interorganizational imitation: The effects of outcome salience and uncertainty. *Administrative Science Quarterly,* 42: 472–500.

Haunschild, P. R., & Sullivan, B. N. 2002. Learning from complexity: Effects of prior accidents and incidents on airlines' learning. *Administrative Science Quarterly,* 47: 609–643.

Hayward, M. L. A. 2002. When do firms learn from their acquisition experience? Evidence from 1990-1995. *Strategic Management Journal,* 23: 21–39.

Hayward, M. L. A., Shepherd, D. A., & Griffin, D. 2006. A hubris theory of entrepreneurship. **Management Science,** 52: 160–172.

Helfat, C. E., & Lieberman, M. B. 2002. The birth of capabilities: Market entry and the importance of pre-history. **Industrial and Corporate Change,** 11: 725–760.

Henisz, W. J., & Delios, A. 2001. Uncertainty, imitation, and plant location: Japanese multinational corporations, 1990-1996. **Administrative Science Quarterly,** 46: 443–475.

Hoang, H., & Rothaermel, F. T. 2005. The effect of general and partner-specific alliance experience on joint R&D project performance. **Academy of Management Journal,** 48: 332–345.

Hofstede, G. 1980. **Culture's consequences.** Beverley Hills, CA: Sage.

Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. **Organization Science,** 2: 88–115.

Ingram, P. 2002. Interorganizational learning. In J. A. C. Baum (Ed.), **Companion to organizations:** 642–663. Malden, MA: Blackwell.

Jick, T. D. 1979. Mixing qualitative and quantitative methods: Triangulation in action. **Administrative Science Quarterly,** 24: 602–611.

Kalnins, A., Swaminathan, A., & Mitchell, W. 2006. Turnover events, vicarious information, and the reduced likelihood of outlet-level exit among small multiunit organizations. **Organization Science,** 17: 118–131.

Katila, R., & Ahuja, G. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. **Academy of Management Journal,** 45: 1183–1194.

Kim, J.-Y., Miner, A., & S.. 2007. Vicarious learning from the failures and near-failures of others: Evidence from the U.S. Commercial banking industry. **Academy of Management Journal,** 50: 687–714.

Kraatz, M., & S.. 1998. Learning by association? Interorganizational networks and adaptation to environmental change. **Academy of Management Journal,** 41: 621.

Lane, P. J., & Lubatkin, M. 1998. Relative absorptive capacity and interorganizational learning. **Strategic Management Journal,** 19: 461–477.

Langley, A. 1989. In search of rationality: The purposes behind the use of formal analysis in organizations. **Administrative Science Quarterly,** 34: 598–631.

Langley, A. 1999. Strategies for theorizing from process data. **Academy of Management Review,** 24: 691–710.

Langley, A. 2007. Process thinking in strategic organization. **Strategic Organization,** 5: 271–282.

Leavitt, B., & March, J. G. 1988. Organizational learning. **American Review of Sociology,** 14: 319–340.

Lee, T. W. 1999. **Using qualitative methods in organizational research.** Thousand Oaks, CA: Sage.

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

Levin, D. Z. 2000. Organizational learning and the transfer of knowledge: An investigation of quality improvement. **Organization Science,** 11: 630–647.

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

Levitt, B., & March, J. G. 1988. Organizational learning. **American Review of Sociology,** 14: 319–340.

Lieberman, M. B. 1984. The learning curve and pricing in the chemical processing industries. **Rand Journal of Economics,** 24: 441–452.

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

Miles, M. B., & Huberman, A. M. 1994. **Qualitative data analysis** (2nd ed.). Thousand Oaks, CA: Sage.

Miner, A. S., Bassoff, P., & Moorman, C. 2001. Organizational improvisation and learning: A field study. **Administrative Science Quarterly,** 46: 304–337.

Miner, A. S., & Moorman, C. 1998. Organizational improvisation and organizational memory. **Academy of Management Journal,** 23: 698–723.

Pisano, G. P. 1994. Knowledge, integration, and the locus of learning: An empirical analysis of process development. **Strategic Management Journal,** 15: 85–100.

Rindova, V., Ferrier, W. J., & Wiltbank, R. 2010. Value from gestalt: How sequences of competitive actions create advantage for firms in nascent markets. **Strategic Management Journal,** 31: 1474–1497.

Root, F. R. 1994. **Entry strategies for international markets.** San Francisco: Jossey-Bass.

Sapienza, H., Autio, E., George, G., & Zahra, S. 2006. A capabilities perspective on the effects of early internationalization on firm survival and growth. **Academy of Management Review,** 31: 914–933.

Schilling, M. A., Vidal, P., Ployhart, R. E., & Marangoni, A. 2003. Learning by doing something else: Variation, relatedness, and the learning curve. **Management Science,** 49: 39–56.

Schwab, A. 2007. Incremental organizational learning

from multilevel information sources: Evidence from cross-level interactions. *Organization Science,* 18: 233–251.

Shaver, J. M., Mitchell, W., & Yeung, B. 1997. The effect of own-firm and other-firm experience on foreign direct investment survival in the United States, 1987-92. *Strategic Management Journal,* 18: 811–824.

Srinivasan, R., Haunschild, P., & Grewal, R. 2007. Vicarious learning in new product introductions in the early years of a converging market. *Management Science,* 53: 16.

Thomke, S. 2003. *Experimentation matters.* Boston: Harvard Business School.

Tsang, E. W. 2002. Acquiring knowledge by foreign partners from international joint ventures in a transition economy: Learning-by-doing and learning myopia. *Strategic Management Journal,* 23: 835–854.

Van De Ven, A. H. 1992. Suggestions for studying strategy process: A research note. *Strategic Management Journal,* 13: 169–188.

Van de Ven, A. H., & Polley, D. E. 1992. Learning while innovating. *Organization Science,* 3: 92–116.

Van de Ven, A. H., & Poole, M. S. 1995. Explaining development and change in organizations. *Academy of Management Review,* 20: 510–540.

Vermeulen, F., & Barkema, H. G. 2001. Learning through acquisitions. *Academy of Management Journal,* 44: 457–476.

Weick, K. 1998. Improvisation as a mindset for organizational analysis. *Organization Science,* 9: 543–555.

Weiner, B. 1985. An attributional theory of achievement motivation and emotion. *Psychological Review,* 92: 548–573.

Yin, R. K. 1994. *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA: Sage.

Yin, R. K., Bateman, P. G., & Moore, G. B. 1983. *Case studies and organizational innovation: Strengthening the connection.* Washington, DC: Cosmos.

Zaheer, S., & Mosakowski, E. 1997. The dynamics of the liability of foreignness: A global study of survival in financial services. *Strategic Management Journal,* 18: 439–464.

Zahra, S. A., & Dess, G. G. 2001. Entrepreneurship as a field of research: Encouraging dialogue and debate. *Academy of Management Review,* 26: 8–10.

Zahra, S. A., & George, G. 2002. Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review,* 27: 185–203.

Zahra, S. A., Ireland, R. D., & Hitt, M. A. 2000. International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management Journal,* 43: 925–950.

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This article continues with appendixes.

APPENDIX A
Seeding Learning Sequences[a, b]

Firm	Country 1	Country 2	Country 3	Country 4
Ryti	V→T V. Saw from other firms in the industry that trials were key and easy to get in Sweden, so leaders started to get trials there too. T. During project implementation with Swedish customer (action) the customer became frustrated with poor communication (outcome). Leaders worked to improve corporate communication with customers through company intranet and dedicated email lists (change in behavior).	V→A→T→E→I V. Watched where competitor firms were located in the U.S. and then set up an office in that location (Cambridge, MA). A. FinnPro helped establish an office, screen the market. and create introductions to lawyers, venture capitalists, and banks. T. Leaders established an office and contacted customers (action) but were told that their image wasn't sophisticated enough (outcome). As a result, leaders hired a PR firm and marketing agency and moved to a nicer office (change in behavior). E. Leaders intentionally tried different sales approaches (mailing, direct sales, e-mail shots, trade events) to determine which was most appropriate. Direct sales was best and so used more (change). I. In negotiations with customer, leaders discovered that the standard front-end payment schedule wasn't accepted and so they altered it on the fly to be back-end loaded (change in behavior).	A→T→E A. Relied on FinnPro for advice about where to establish an Eastern European office. FinnPro said that much pharmaceutical activity was occurring in the Czech Republic and so leaders entered there. T. Had interest from potential customers in the Czech Republic (action), but few had money for solutions (outcome). Leaders changed qualification questions to uncover the ability to pay early in discussions (change in behavior). E. Tested many European markets to find a beachhead. Leaders saw that Germany had lots of pharmaceutical firm headquarters and so decided to move to Germany (change in behavior).	A→D→T→E A. Relied on FinnPro for basic market data. D. Management had always sent a Finn to open a new country who spoke the language. This time they did not, and it caused communication problems. Sending a non-German- speaking sales lead clarified the importance of sending in a Finn who spoke the local language (change in cognition). T. Tried to do business with German pharmaceutical firms but realized that customers were risk averse (outcome). Leaders switched to German contracts to offset fears of doing business with a non-German firm (change in behavior). E. Leaders deliberately decided not to create a legal entity for the German venture but to try using a satellite office. They found that the satellite office reduced complexity and seemed to be a better solution for new country entries.
Jackson	A→T A. Learned from consultant that firms need to work with multiple distributors in China as the market is so big and diverse across regions. Leaders began working with multiple distributors (change in behavior) T. When trying to do business with Chinese (action), leaders learned that that Chinese didn't want to buy semiconductors (outcome); they only wanted turnkey solutions. Leaders began providing turnkey solutions (change in behavior).	A→T→D→I A. Consultant provided insight about the right firms to target when entering Taiwan. Leaders targeted these firms when entering (change in behavior) T. In discussions with Taiwanese firms (action), leaders found out that their CEOs often were not the final firm decision makers (outcome); rather it was someone at a lower level. Leaders changed sales approach to appeal to lower level too (change in behavior). D. Moved away from using indirect sales through distributors (as in first country entered, China) to focus on direct sales for entry into Taiwan. Realized in Taiwan the need to refocus on indirect sales in future markets to improve speed to market and bridge lack of local understanding (change in cognition). I. Improvised product during delivery to Taiwanese customer that just wanted development boards with documentation and support instead of a complete turnkey solution (change in behavior). Firm leaders offered this no frills solution in later countries.	A→T→I A. Consultant told firm about which Korean distributors to work with. Leaders pursued these distributors (change in behavior). T. During discussions with potential customers (action), leaders discovered Korean firms wanted to start design right away and not wait (outcome). Leader expedited their design phase (change in behavior) I. In the middle of sales pitch to a prominent Korean firm, the VP improvised to more strongly emphasize features after Korean customer appeared less concerned with price and more concerned with features. Leaders relied on the new sales pitch in later meetings with customers.	A→T→A→I A. Spoke to prototypical large Japanese firms to gain insight about demands in Japan. Leaders learned that in Japan reliability is the first concern and price is the second. T. Leaders started using local distributors after entering (action). This wasn't effective (outcome) and so they started using large, global implementation partners (change in behavior) A. Japanese implementation partners helped leaders better understand the factors local firms would consider (e.g., ISO 9000 certification, escrow accounts). Leaders adjusted their sales timeline (change in cognition) because they saw it would take longer than anticipated to close deals. I. Improvised projection figures in meeting after learning that firms were interested in price of chips at time of shipping, not current pricing. Learned to better clarify expectations.
Wee	V→T V. Focused on information security software by watching what a prominent firm in Singapore did in the physical world (change in behavior). T. Leaders used sales approach of approaching IT leaders in customer organizations (action). This did not work out, as many firms had transferred responsibility for IT security out of IT and into audit (outcome). Leaders began targeting audit groups instead of IT groups (change in behavior).	V→T→I→D V. Decided to promote solutions on 24/7 services by watching a few firms in the U.S. and Europe (change in behavior). T. Entered Malaysia promoting 24/7 security monitoring solutions (action). But the limited IT infrastructure made firms reluctant to make purchases (outcome). Leaders backward-integrated into security infrastructure (change in behavior). I. Inability to get government account caused leaders to improvise a new conceptualization of their target customer as "large firms with proprietary data and that ability to pay" so that they could quickly capture an emergent opportunity with an insurance firm. d: Entered Malaysia without funding of joint venture (JV) partners (had funding in first country entered, Hong Kong). Leaders learned they needed JVs to provide resources for in country growth and so decided to get a JV partner and use one for future entries (change in behavior).	A→T→I A. Relied on local partner in Japan to help learn what to change in their product for the Japanese market (change in behavior) T. Leaders tried to promote sales but did not have the track record in Japan to establish legitimacy and so customers felt less comfortable about outsourcing their IT security (outcome). Leaders began to rely more on local partner for selling (change in behavior). I. Leaders improvised, changing their conceptualization of their target customer to capture an emergent opportunity with a large manufacturing firm (change in cognition). Learned a broader view of target customers.	V→T→V→I V. Entry of competitor firms into large market of China helped persuade firm to do the same (change in behavior). T. CEO created an alliance with a local partner to help promote sales (action). But few sales were achieved (outcome), and leaders realized that because of the size of the country, having a cross-regional partner was ineffective. So they decided to start using multiple partners for different geographies (change in behavior). V. Leaders saw other foreign firms exiting China during the SARS epidemic, when sales plummeted. They followed suit (change in behavior). I. When packaging its software for a customer, leaders heard that the customer would only pay for hardware, so engineers decided to bundle its software in a physical box (change in action). Used physical box option in later entries.
Kallio	A→T→I A. FinnPro provided market knowledge and contacts for potential customers in Italy. T. After implementing pilot in Italy (action), where infrastructure was poor (outcome), leaders decided to do future pilots in host countries (change in action). I. Engineers discovered they needed to develop ten more features than what was piloted. Leaders learned to only offer features that had previously been tested (change in cognition).	A→T→E A. FinnPro provided market knowledge about the potential customers in the country. Leaders pursued these when entering. T. Project leader negotiated features with customer without R&D input (action). R&D resisted making changes (outcome), and the leader learned to not promise a feature not already developed and tested (change in behavior). E. Leaders tried different negotiation tactics (i.e., with and without a senior member). Having the senior member provided more credibility to customers and so leaders started bringing him to future meetings with client.	A→T→E→V A. Relied on documentation of implementation partner. T. Working with a partner created customer communication problems (outcome). Leaders started communicating more transparently and actively (change in behavior). E. Tried a new way to manage customer accounts. Compared to old method, the new method helped protect R&D from customer complaints and so was continued in each new entry. V. Firm compared itself with U.S. competitor start-ups expanding abroad. Leaders learned they had accomplished the same thing with six times less funding.	A→D→T→V A. Spoke to competitors such as Wistow and Seven to understand how they created the same value proposition with different approaches. D. Moved away from focus on Europe to explore merger with a U.S. firm. Leaders received low valuations and so decided to refocus on Europe. They realized that the real reason for remaining focused on Europe was to master the continent (change in cognition). T. When trying to buy a U.K. firm, leaders met resistance from Swedish investors (outcome). Leaders realized they needed to spend more time convincing constituents (change in cognition). V. Leaders imitated Blackberry's approach but in an open European market (change in behavior).

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[a] V = "vicarious learning," T = "trial-and-error learning," A = "learning from external advice of others (via contact)," I = "improvisational learning," E = "experimental learning," D = "deviance-error learning."

[b] We note "action," "outcome," and other terms in parentheses to denote the learning process.

APPENDIX B
Soloing Learning Sequences[a, b]

Firm	Country 1	Country 2	Country 3	Country 4
Tyler	E→T E. Entered Sweden as it was a country with nationalized medicine, and firm leaders believed doctors in these countries would be more receptive to technology (controlled situation to test proposition). After trying to get trials started (action), leaders saw skepticism for their technology (outcome) and so decided to better educate local doctors (change in behavior). T. Tried to get doctors who were excited about the technology to create a purchase order (action), but they didn't want to buy (outcome). Discovered that doctors often didn't make decisions. Rather a government official made decisions, and so leaders needed to solicit them (change in cognition).	T T. Entered Netherlands because leaders knew a few prominent radiologists. After demonstrating analog technology with radiologists (action), leaders saw that local firms were not interested in their analog product (outcome). Instead, leaders discovered local radiologists wanted a digital CAD solution (change in cognition). Because they didn't have a digital CAD solution, leaders decided to push their analog product more aggressively (change in behavior). T. Managers tried to better promote analog product to local doctors (action) but were told that their product was too big for the mobile units many doctors were using (outcome). Decided that local medical system promoted efficiency over effectiveness (change in cognition).	E→T E. Entered Germany because it was believed to be a big market, with nationalized medicine and many prominent doctors with money to pay for technology (controlled situation in which to test proposition). Leaders found that though the market was big, doctors did not want to use clinical trial data from other countries (outcome). This helped leaders realize that the sales process would take much longer than anticipated (change in cognition). T. Had local doctors begin using technology to conduct trials (action). Trials seemed to suggest benefits, but few doctors were willing to make purchases (outcome). Managers saw that many German doctors waited to follow the actions of the region's most prominent doctors (change in cognition).	T T. After entering Japan, leaders discovered that doctors just wanted print-outs, not machines (outcome). They learned their product was too big (change in cognition). T. Leaders used a local distributor to promote technology (action), but few doctors responded positively (outcome). After talking with a few doctors, leaders realized that many doctors felt distributors were corrupt and so did not like to work with them (change in cognition). Leaders began to look for a consulting company that could perform the same role (change in behavior).
Adams	E→T E. Australia was seen as a test bed in which leaders could learn to do international business. Leaders gave manager lots of autonomy (action) but found that this resulted in a disconnect from corporate (outcome), so leaders added oversight (change in behavior). T. Corporate leaders pushed local country manager to use a features and functions selling approach (action). After little success (outcome), the country manager persuaded corporate to adopt a more solutions/consultative selling approach (change in behavior).	E→T E. Entered U.K. with a very small team to gauge market interest. Leaders saw interest and so entered. T. Local country manager worked to leverage existing relationships from the U.S. to U.K. (action), but they realized that relationships didn't translate to Europe (outcome). This caused leaders to see they needed a good implementation partner to build value proposition. They thus hired PWC (change in cognition and then behavior).	E→T E. Entered France to see if European expansion was possible. Leaders realized they were early to the market (outcome). As a result, corporate decided to slow entry into France (change in behavior). T. Leaders signed a customer in France on the basis of stating that they would be putting a team of French nationals in place in fairly short order (action). However, the American economy and the business were starting to slow down globally, and so there was not enough resources to expand (outcome). Thus, corporate decided to concentrate on larger markets (change in behavior).	T T. Leaders entered country after a German customer expressed interest (action). They found it hard to close deals, given lack of resources from the U.S. corporate office (outcome), and so decided to pull out of the country and focus on building up major markets in the U.K. and U.S. (change in behavior).

Continued

APPENDIX B
(Continued)

Firm	Country 1	Country 2	Country 3	Country 4
Stahlberg	I→T I. Leaders entered Sweden to do business with a big customer, but during contract negotiation, the customer wanted more than initially agreed upon. The country manager thus had to improvise a novel discount policy. Leaders learned that big reference accounts required larger discounts than they had expected. T. After signing, the customer complained about local support. Dealing with the challenge helped leaders see they needed more of an infrastructure in Sweden (change in behavior).	I→T I. When country manager found out that German customer wanted more than a license deal, he created a novel solution sale as well. Firm learned another way to promote its products. T. Leaders found that running the operation from Finland proved difficult to close subsequent deals (outcome). Leaders realized that they should have conducted more up-front research and have more local country contacts. They decided to hire a local country manager (change in cognition and behavior).	T T. Leaders entered the U.S. and, since the market was perceived to be so big, they moved many functions there, including marketing and sales (action). However, the leaders found that moving too many functions too soon made the firm too U.S. focused (outcome). HQ management decided to move some functions back to Finland, where it could have greater control (change in behavior).	T T: Leaders began with a commission-based profit and loss statement (action). But the commission-based system did not work well (outcome), and so leaders switched to transfer pricing (change in behavior).
Polk	E→T E. Experimented after entering China by sending a trial version of the software aggressively everywhere to see which companies would be most interested. Discovered that systems integrators appeared particularly attractive. T. Used a sales approach with potential customers that relied on using U.S. references (action). Chinese firms did not readily accept those references (outcome). Leaders came to understand that China-based references were more important (change in cognition).	I→T I. When trying to create a unique product solution for Compaq in Germany, engineers uncovered a valuable product feature the management didn't know existed (change in protocol based on location). This feature was then promoted as a key feature (new activity). T. During the project for Compaq (action), project management difficulties associated with cultural differences sometimes arose (outcome). HQ realized that the firm should have put people on the ground in the country with knowledge of the culture and language (change in cognition).	I→T I. Had to adjust in real time several features of its "proof of concept" for first customer. T. While trying to complete customer solution in Switzerland, the firm relied on a "fly in" model and sent people over to Switzerland for periods of time to work with customer (action). Leaders at HQ began to see that this model of doing sales and support from the U.S. was very inefficient (outcome). They decided that countries entered should have local offices and country managers and so they hired local people (change in behavior).	T T. Hired local sales manager and established an office in the U.K. to generate local sales (action). However, sales were much slower than expected (outcome). HQ leaders realized that their marketing message was too technical and did not say enough about a business solution. As a result, they altered their sales approach to make it more understandable (change in behavior).

Continued

APPENDIX B
(Continued)

Firm	Country 1	Country 2	Country 3	Country 4
Nair	E→T→E E. India seen as a test bed for developing new solutions, as development costs were much lower than in other countries. T. Worked hard to close deals (action) but had few sales (outcome). Leaders realized that local firms wanted "Indian pricing" and so leaders had to give bigger discounts (change in action). E. Experimented with promoting different products (i.e., trial solutions, educational products, high-throughput screening) to see which would be in most demand. High-throughput screening seemed best and so was emphasized.	E→T→ E→A E. "Threw out seeds to see which [country] would germinate fastest." Firms in Japan seemed interested, so the firm entered that country with a partner. T. Leaders created a contract with a firm (action) but drastically overpriced their solution (outcome), and so learned to not overprice (change in action). E. Experimented selling both an integrated solution and component parts of solutions. Japanese customers liked the component parts more and so leaders began to offer more modular solutions (change in behavior). A. Learned from partner how to better negotiate with clients: "What are the things they fight for and what are the things they leave alone."	T→A I. Leaders entered Australia and began working with IBM to showcase solutions at conferences and workshops (action). After little success (outcome), leaders realized that too much "educating" was wasting time and should be significantly cut back (change in behavior). A. From Australian academics, leaders gained information on market opportunities in Australia—specifically, which projects the government was funding. This impacted how the firm positioned its products (change in behavior).	T→A T. After entering Malaysia, the firm tried to promote its bioinformatics solutions to several promising customers (action), but firms in the Malaysian market were not that familiar with bioinformatics and so were reluctant to purchase solutions (outcome). This caused leaders to spend more time doing "roadshows" to help educate others (change in behavior). A. Lack of sales pushed leaders to rely more on a local partner to do "relationship management" so firm could gain access to top accounts (change in action).

[a] V = "vicarious learning," T = "trial-and-error learning," A = "learning from external advice of others (via contact)," I = "improvisational learning," E = "experimental learning," D = "deviance-error learning."

[b] We note "action," "outcome," and other terms in parentheses to denote the learning process.