

A R T I C L E S

Success and Failure in Technology Acquisitions: Lessons for Buyers and Sellers

by Melissa E. Graebner, Kathleen M. Eisenhardt, and Philip T. Roundy

Executive Overview

Technology acquisitions can benefit firms by providing valuable resources, increasing market power, and initiating strategic renewal. Yet despite these opportunities, technology acquisitions often present a significant challenge for both buyers and sellers. In this article, we review the research on technology acquisitions and outline what is known and what remains to be studied. First, we examine firms' motivations for engaging in technology acquisitions. Second, we explore the features and challenges that make technology acquisitions unique. Third, we summarize the research on how both buyers and sellers can improve the performance of technology acquisitions. Fourth, we propose a research agenda to address unanswered questions and emerging issues related to technology acquisitions, placing particular emphasis on cross-border deals and the effects of acquisition activity on an industry's competitive dynamics.

Acquisition of external technologies is an essential means by which established firms add to their technical capabilities and products, enhance their market power, and achieve strategic renewal (Agarwal & Helfat, 2009; Eisenhardt & Martin, 2000; Santos & Eisenhardt, 2009). Indeed, acquisitions are a prominent feature of the strategies of many technology firms, including Cisco, Google, Nokia, SAP, and Lilly. Technology acquisitions have helped Cisco to strengthen its videoconferencing products and drive demand for networking equipment (Sorkin, 2009b; Vance, 2009), Oracle to broaden its business software offerings (Worthen, 2009), and Dell to gain expertise in computer services (Sorkin, 2009a).

Buyers often pursue technology acquisitions to tap the innovative potential of young, entrepreneurial firms, which are an increasingly important engine of new technical knowledge. As described by Benson and Ziedonis (2009), the National Science Foundation reported that the share of industrial research and development (R&D) spending by U.S. firms with fewer than 1,000 employees climbed from 4.4% in 1980 to more than 25% in 2003. Entrepreneurial firms that receive venture capital backing are particularly vibrant sources of technical innovation and new products. Venture capital-funded firms produce significantly more inventions per investment dollar (and more influential inventions) than established firms in related industries (Kortum & Lerner, 2000). Thus, venture-funded firms may be especially attractive acquisition targets.

We appreciate the generous support of the Herb Kelleher Center for Entrepreneurship at the Red McCombs School of Business and the Stanford Technology Ventures Program.

* **Melissa E. Graebner** (Melissa.graebner@mcombs.utexas.edu) is Associate Professor of Management at the Red McCombs School of Business, University of Texas at Austin.

Kathleen M. Eisenhardt (kme@stanford.edu) is Stanford W. Ascherman M.D. Professor of Strategy and Organization and Co-Director of the Stanford Technology Ventures Program at Stanford University.

Philip T. Roundy (Philip.roundy@phd.mcombs.utexas.edu) is a doctoral student at the Red McCombs School of Business, University of Texas at Austin.

Yet despite their strategic potential, many technology acquisitions fail to create value (King, Slotegraaf, & Kesner, 2008). The CEO of serial buyer Cisco Systems has estimated that the failure rate for technology acquisitions is 90% (Evans, 2004). In this article, we review the research on technology acquisitions, outlining the motivations for these deals as well as the pitfalls that can undermine their performance. While a large literature has addressed other types of M&A activity, we focus on research that is specific to technology acquisitions, defined as transactions in which the acquired firm operates in a technology industry such as networking equipment, software, medical devices, semiconductors, or biotechnology. Because many (though not all) technology acquisitions involve targets that are entrepreneurial firms, throughout our discussion we place special emphasis on deals involving large firms acquiring small technology ventures.

Motivations of Buyers and Sellers

As noted above, many technology firms pursue mergers and acquisitions despite mixed evidence for their success, raising the question of what firm leaders hope to accomplish from these deals. We begin to answer this question by discussing the motivations of buyers and then turn to the motivations of sellers, who have received less attention from researchers but play a significant role in technology acquisitions (Coff, 2003; Graebner & Eisenhardt, 2004). Table 1 summarizes our discus-

sion of buyers' and sellers' motivations.

Buyer Perspective

Adding Strategically Valuable Resources

The resource-based view of the firm (Wernerfelt, 1984) highlights the relevance of maintaining a strategically valuable portfolio of resources for long-term competitive advantage and superior performance. Consistent with this view, the most commonly acknowledged reason that buyers pursue technology acquisitions is to obtain specific products or technologies that are owned or under development by the target firm (Birkinshaw, Bresman, & Hakanson, 2000; Graebner, 2004; Ranft & Lord, 2000). Buyers often hope to create value by combining targets' technologies with buyers' own technical, manufacturing, marketing, and sales resources (Graebner, 2004; Schweizer, 2005).

A second, closely related reason that buyers acquire technology firms is to gain capabilities that are embedded in the knowledge of individuals and teams within the acquired firm. Ranft and Lord (2000) found that while 35% of acquirers of technology firms named obtaining specific product-related technologies as their primary motive for engaging in acquisitions, obtaining product innovation and engineering capabilities came in a close second, with 32% of responses. These two motives often go hand in hand, since buyers are typically concerned with both obtaining existing technologies and accessing the knowledge required to develop future product generations and

Table 1
Technology Acquisitions: Buyer and Seller Motivations

	Motivation	Rationale for Acquisition
Buyers	● Add strategically valuable resources	● Rapidly obtain products and technologies
		● Harness innovative power of smaller, younger firms
		● Access tacit, socially complex knowledge
	● Enhance market power	● Expand market footprint to new geographic regions or customer groups
		● Eliminate current and potential rivals
	● Achieve strategic renewal	● Provide opportunities for resource reconfiguration and recombination of technologies
● Unfreeze "mental maps" and enable adaptation		
Sellers	● Add strategically valuable resources (at the right time)	● Obtain necessary resources quickly, without risk and uncertainty of public offering or dilution from additional fundraising
		● Shed stressful managerial responsibilities
	● Relieve personal pressures	● Move toward financial liquidity

other related innovations (e.g., Mayer & Kenney, 2004; Ranft & Lord, 2002). For example, Schweizer (2005) found that pharmaceutical firms' objectives for biotechnology acquisitions included both the short-term goal of gaining access to potential blockbusters and the long-term goal of acquiring know-how that would enhance the acquirer's growth strategy.

While firms can also obtain technologies and technical knowledge through alliances or internal development, acquisition offers unique advantages. The knowledge that high-tech buyers hope to gain through acquisition is often complex, tacit, based on accumulated experience, and embedded in relationships and ways of communicating among multiple individuals (Kogut & Zander, 1992; Ranft & Lord, 2002). These characteristics amplify the strategic advantage the knowledge can provide (Eisenhardt & Martin, 2000), but make it difficult to transfer through more arm's-length relationships such as alliances. Internal development has its own limitations. Research and development activities are subject to path dependency (Cyert & March, 1963; Kogut & Zander, 1992; Nelson & Winter, 1982) and time compression diseconomies (Dierickx & Cool, 1989), making it difficult for firms to quickly build technical capabilities that are unrelated to their existing knowledge. Thus, acquisition may be superior to internal development when the desired resources are distant from the firm's current areas of expertise (Capron & Mitchell, 2009; Kogut & Zander, 1992) or when speed is important.

Moreover, large, established firms may choose acquisition over internal development as a means to build technology resources because smaller, younger firms are often more innovative. Larger firms' payment systems rely more heavily on seniority than on skill or performance, reducing the ability of those firms to hire and motivate innovative scientists and engineers (Zenger & Lazzarini, 2004). In addition, an older firm's internal R&D draws on the organization's existing technical knowledge and ways of accomplishing tasks, and is less likely to produce truly groundbreaking or influential innovations (Balasubramanian & Lee, 2008; Sorenson & Stuart, 2000). Acquiring young ventures can help mitigate these disadvantages.

Enhancing Market Power

Most acquisition research emphasizes the resource-based view of the firm in conceptualizing the motivations of buyers (Benson & Ziedonis, 2009; Graebner, 2004; Puranam, Singh, & Chaudhuri, 2009). That is, technology acquisitions are viewed as ways for firms to maintain and upgrade their portfolios of strategically valuable resources. A less explored yet also important motivation for buyers is to increase their market power (Santos & Eisenhardt, 2009). Acquisitions can increase a buyer's power by providing customer relationships that rapidly expand the buyer's presence into new geographic areas or customer segments (Birkinshaw et al., 2000; Graebner, 2004), making it more difficult for rivals to emerge (Santos & Eisenhardt, 2009). Ranft and Lord (2000) found that buyers consider market or customer knowledge and sales relationships as a primary motivation in 18% of technology acquisitions. For example, Birkinshaw and colleagues (Birkinshaw et al., 2000) found that buyers making cross-border acquisitions of R&D units sought to create or expand their presence in particular international markets. Meanwhile, research in the biotechnology industry found that European pharmaceutical companies bought U.S. biotechnology ventures to gain footholds in the U.S. market (Schweizer, 2005). While firms can also reach new markets through alliances, acquisition provides exclusive and permanent access to the target's knowledge and customer relationships, providing the buyer with resources that are unique and therefore more competitively valuable (Kale & Puranam, 2004).

In addition to building market presence, acquisitions can enhance a buyer's power by completely eliminating one or more potential rivals. In their study of constructing and dominating nascent markets, Santos and Eisenhardt (2009) observed that some firms acquired targets with technologies that posed competitive threats to the buyers' market control. Buyers eliminated these threats by shutting down the target firms (or portions of them) after acquisitions were completed. Firms pursued this strategy either because the targets themselves were potentially serious rivals or be-

cause the targets could provide market entry “stepping-stones” if acquired by other firms.

Achieving Strategic Renewal

Finally, buyers may benefit from acquisitions as a means to achieve strategic renewal that goes beyond any single technology or market. By strategic renewal, we mean significant and disruptive change in a firm’s approach to achieving superior performance (cf. Agarwal & Helfat, 2009). Over time firms often grow to rely on limited sets of knowledge and managerial practices, creating “core rigidities” (Leonard-Barton, 1992) that restrict adaptation to new environmental challenges (Levitt & March, 1988). However, acquisitions can revitalize buyers, preventing them from becoming rigid and inert (e.g., Vermeulen, 2005). Acquisitions renew buyers by stimulating redeployment and reconfiguration of resources from both the target and acquiring firms (Capron, Dus-sauge, & Mitchell, 1998; Capron & Mitchell, 1998; Karim & Mitchell, 2000) and by exposing buyers to new practices and routines that may “help to unfreeze mental maps, structures, and processes” (Vermeulen & Barkema, 2001, p. 460).

Strategic renewal can be especially valuable for technology firms, which often face dynamic competitive environments. Resource reconfiguration is particularly beneficial for these firms because new technologies often arise from combinations of existing knowledge (Kogut & Zander, 1992). By introducing new pieces of technology to buyers, acquisitions increase the number of possible combinations that can be pursued (Ahuja & Katila, 2001). Moreover, acquisitions can improve technology firms’ ability to innovate by enhancing their absorptive capacity, or ability to recognize, assimilate, and apply new information (Cohen & Levinthal, 1990). While organizations can also achieve renewal through other means such as alliances or joint ventures, acquisitions allow great flexibility (Conner & Prahalad, 1996), an important advantage in turbulent high-technology industries. In contrast, if a firm wants to redeploy an alliance partner’s resources in new ways, the alliance contract may have to be renegotiated, generating delays, financial costs, and exposure to

opportunism (Pisano, 1990; Schilling & Steensma, 2002).

Interestingly, strategic renewal may be a partly unanticipated benefit of acquisitions (Vermeulen, 2005). Graebner (2004) found that some acquisitions yielded “serendipitous” sources of value such as unexpected knowledge and capabilities, fresh market intelligence information, innovative strategic ideas, or opportunities to combine technologies in unanticipated ways. However, although buyers did not anticipate these specific sources of value, some companies did realize that acquisitions could lead to broader renewal. An executive interviewed for the Graebner study explained: “We have an expression, ‘[Our company] 2.0.’ By virtue of these new people, we re-create the company.” Thus, sophisticated buyers may recognize that acquisitions can lead to strategic renewal, but often cannot predict what form this renewal will take.

When Not to Acquire

While the preceding discussion outlined the advantages of technology acquisitions, these deals also have disadvantages relative to alternatives such as internal development and alliances. For example, acquisitions require time-consuming post-deal integration activities. As a result, most technology firms will combine acquisitions with a portfolio of other strategies. Firms may rely on internal development for technologies that are close to their existing expertise (Capron & Mitchell, 2009) and may ally rather than acquire when the desired resources are seen as important but not central to the firms’ success, making exclusivity and close coordination less critical (Kale & Puranam, 2004). Firms may also turn to alliances when acquisition is unrealistic, perhaps because companies with the needed resources are very large, possess too many unwanted resources, or are simply not for sale (Santos & Eisenhardt, 2009). For example, Cisco Systems is an active acquirer of small firms, but also engages in significant internal R&D as well as alliances with Intel, Hewlett-Packard, and other technology giants.

Seller Perspective

Buyers’ motives tell only half the story in technology acquisitions. Since technology firms often

have considerable discretion to determine whether, when, and by whom they are acquired (Coff, 2003; Granstrand & Sjolander, 1990), sellers' motives and preferences are also pivotal in these deals. At least two factors contribute to sellers' influence. First, technology acquisitions are not typically "fire sales" of distressed resources. Attractive technology ventures often have alternatives to being acquired, such as remaining independent, raising private capital, and going public (Graebner & Eisenhardt, 2004). Second, technology buyers rely on cooperation from target leaders to accurately value and effectively integrate target firms (Coff, 2003). As a result, reluctant target firm leaders may discourage potential buyers simply by conveying their hesitance to be acquired. On the other hand, leaders who are ready to sell may proactively encourage potential buyers that they find attractive (Graebner & Eisenhardt, 2004). We next examine what is known about sellers' acquisition motives and decision making.

Adding Resources — At the Right Time

Like those of buyers, sellers' acquisition decisions seem to be shaped by the desire to gain access to critical resources (Graebner & Eisenhardt, 2004; Inkpen, Sundaram, & Rockwood, 2000). Technology entrepreneurs pay attention to acquisition opportunities when their firms are facing specific "strategic hurdles" such as ramping up sales, filling gaps in a product line, raising a funding round, or hiring a new CEO (Graebner & Eisenhardt, 2004). Each of these hurdles is associated with a gap in one or more key strategic resources, such as capital, large-scale manufacturing capabilities, or experienced senior management. Surprisingly, when potential sellers are not facing strategic hurdles, they often pay little attention to acquisition overtures, perhaps because leaders are focused on short-term operational issues. In contrast, facing strategic hurdles seems to prompt managers to step back from their everyday activities and take stock of their firms' overall resource needs, competitive positions, and strategic options, which may include a public offering, additional rounds of private financing, selling to a larger firm, or even acquiring a smaller firm. Target leaders may choose to sell because it seems faster and less risky

than waiting for an uncertain public offering or diluting founders' ownership stakes with additional rounds of private financing.

Strategic resources not only influence potential targets' decisions regarding if and when to sell, but also shape targets' preferences for specific buyers. Case studies of technology acquisitions indicate that sellers prefer buyers who offer a combination of similar and complementary resources that can enable significant value creation from merging the two firms (Graebner & Eisenhardt, 2004). In other words, sellers favor buyers who possess the resources needed to make the target successful, even after it is acquired. Consistent with this observation, Dalziel (2008) found that sellers in the telecommunications equipment industry considered the acquisition of their firms to be successful if the deal had a positive influence on their own firm's strategic goals, such as having their technology broadly deployed in the market.

Relieving Personal Pressures Through Exit

Sellers of technology firms, especially young firms, also may be motivated to sell for idiosyncratic personal reasons. Selling a firm allows leaders to begin to achieve financial liquidity and shed stressful managerial responsibilities. Graebner and Eisenhardt (2004) found that firm leaders may be interested in selling because of stressors such as exceptionally long working hours, strife in the top management team, major personal events such as marriage, or financial pressure from friends and family who have invested in the firm. Acquisition can be a means to reduce these personal pressures. As one CEO explained: "We'd alleviate the burn-out factor . . . because someone else would come in and do all the work! And then we hoped that we could hand the reins over pretty quickly and just enjoy life" (Graebner & Eisenhardt, 2004, p. 383).

However, sellers do not view acquisition as the "end of the road" for their firms, and many continue to feel responsibility for their employees' welfare. Beyond achieving strategic success, selling firm leaders are often looking for a matching culture for their employees and hope to maintain their firms' autonomy, protect their employees from layoffs and relocations, and (if leaders plan to

stay after the deal closes) receive interesting and important job responsibilities in the combined firm (Dalziel, 2008; Graebner, 2009; Graebner & Eisenhardt, 2004).

Sellers' preferences have important implications for buyers. First, buyers' timing is key, since acquisition overtures that are made when sellers are not facing strategic hurdles are likely to be rebuffed. Second, because sellers often have an array of personal and firm-related motivations, they may be less sensitive than buyers to the actual selling price. While sellers will certainly bargain for a high price, other motivations are often even more relevant. Overall, sellers' interests in synergistic value creation and cultural fit align with the interests of buyers motivated by resource acquisition and strategic renewal. This alignment may even enable buyers to underpay for some acquisitions by convincing sellers of their firms' strategic and cultural fit.

Unique Features and Challenges

The preceding discussion indicates that technology acquisitions can offer appealing benefits for buyers and sellers. Buyers are motivated to obtain strategically valuable resources quickly and perhaps cheaply, to secure greater market power, and to achieve strategic renewal. Sellers are motivated to fill resource gaps and relieve idiosyncratic personal pressures, and prefer buyers that

make strategic success for the combined firm and cultural fit for their employees more likely. Yet despite the potential of technology acquisitions, it is not yet clear whether these deals, on average, create value. Some studies suggest that acquisitions of pharmaceutical (Higgins & Rodriguez, 2006) and Internet (Uhlenbruck, Hitt, & Semadeni, 2006) targets may produce financial gains for buyers, but other research finds that acquisitions of high-tech firms do not create abnormal returns (King et al., 2008). In light of this mixed evidence, we next outline the unique features that may create performance challenges for technology acquisitions (see Table 2).

Pre-Acquisition

Unusually Powerful Sellers

As noted previously, a distinctive feature of technology acquisitions is that target firms often have alternatives to a given acquisition offer, such as raising additional equity capital or being bought by another suitor. The most attractive targets are especially likely to have robust, promising alternatives. As a result, sellers can and do reject buyers if the timing is wrong, the offer is too low, or the likelihood of cultural fit or strategic success from the combination is weak (Graebner & Eisenhardt, 2004). Sellers may discourage buyers either through formal means such as "lockup agreements" that provide financial benefits to a pre-

Table 2
Technology Acquisitions: Unique Features and Challenges

	Features/Challenges	Implications for Buyers	Implications for Sellers
Pre-Acquisition	● Unusually powerful sellers	● Sellers can reject unattractive or ill-timed offers	● Seller's power is reduced after acquisition, making deal negotiations key
	● Extreme resource uncertainty	● Buyers risk overpaying for target resources	● Overconfident sellers may overlook attractive offers
	● Mutual information asymmetry	● Buyers may incorrectly assess sellers' resources and receptiveness to acquisition	● Sellers may incorrectly assess buyers' resources and plans for post-deal implementation
Post-Acquisition	● Risk to buyer and seller momentum	● Managers may be distracted from buyer's core business ● Buyer's internal R&D competence may be damaged	● Acquired personnel may experience logistical problems and negative emotions, leading to decreased productivity and less innovation
	● Integration vs. autonomy dilemma	● Integration is necessary for knowledge transfer, but loss of autonomy may disrupt target's routines, trigger turnover, and destroy knowledge	● Acquired firm may be subjected to ineffective implementation decisions because buyer does not understand target's resources or motivations

ferred bidder (Coff, 2003) or through informal means such as declining to meet with buyers or intentionally creating negative impressions of their own firms (Graebner & Eisenhardt, 2004). However, although sellers often have extensive power prior to an acquisition, they become much less powerful after the sale, so sellers must negotiate carefully before the deal closes in order to protect their interests.

Extreme Resource Uncertainty

A second distinctive feature of many technology acquisitions is extreme uncertainty about the value of the target's resources. Targets' products are often still under development, leaving both technical and market success in question. In addition, targets' underlying technical capabilities typically involve complex, socially embedded knowledge that is difficult to measure (Coff, 1999). Complexity and social embeddedness improve the likelihood that the acquired capabilities are inimitable and will bring competitive advantage to the buyer, but these characteristics also create uncertainty and expose buyers to the possibility that sellers' resources will be less valuable than expected (Coff, 1999).

Sellers are likely to share buyers' uncertainty about the value of their own firms. Like buyers, sellers face the fundamental challenge of evaluating technical resources that are still under development or are embedded in novel products. Sellers may also find it difficult to evaluate (or even identify) the combinations of technical resources that the acquisition would enable. Finally, given the tendency of entrepreneurs to be overconfident (e.g., Wu & Knott, 2006), sellers may overestimate the value of their own technologies. This creates potential problems for both parties: Overconfident sellers may ignore attractive offers, and buyers may be forced to pay excessive prices to close a transaction.

Mutual Information Asymmetry

Buyers and sellers share a degree of fundamental uncertainty about the potential value of technology acquisitions. But in addition, each firm has information that the other lacks. Buyers typically have less information than sellers regarding the target's resources because the target's most valu-

able technological knowledge is tacit and impossible to fully explain (Coff, 1999). Moreover, some sellers may opportunistically hide or distort information that is relevant to valuing their companies (Granstrand & Sjolander, 1990), such as the intentions of key individuals to leave the firm or known shortcomings in their technologies. Buyers are at a particular disadvantage when the target firm is privately held and not subject to the scrutiny and disclosure requirements of public firms. Buyers often react to this information asymmetry by engaging in disingenuous negotiation because they perceive sellers to be distorting information about their firms even when they are not (Graebner, 2009).

Buyers also lack information about events happening within target firms that could influence sellers' receptiveness to being acquired. As noted earlier, sellers may pay little attention to acquisition overtures unless they are contending with challenging strategic hurdles and stressful personal circumstances. Buyers need to synchronize their acquisition overtures with these events in order to close deals with attractive targets; however, factors that influence targets' receptiveness, such as major changes in leaders' personal lives or dissent within the management team, may not be visible to buyers. In addition, there is evidence that some sellers may "string along" buyers to their own advantage. For example, Santos and Eisenhardt (2009) found that some entrepreneurs feigned interest in being acquired and deliberately prolonged acquisition talks as a means to delay a larger firm's entry into their markets.

While the buyer perspective has received more attention from researchers, sellers also face information asymmetry. Sellers may inaccurately assess the complementary resources of buyers and the potential synergies between the firms because sellers are unable or unwilling to conduct formal or informal due diligence (Graebner, 2009). A seller may select a buyer because of its strength in particular technologies or its complementary resources in marketing and manufacturing, but subsequently learn that these resources are not as robust as expected. Sellers also have asymmetric information about the buyer's intentions. A buyer may plan to shut down a seller's technology (San-

tos & Eisenhardt, 2009) or lay off its employees (Graebner, 2009), but buyers are unlikely to reveal such intentions prior to acquisition. The tendency of buyers to mistrust sellers makes them particularly likely to withhold important information from sellers, exacerbating sellers' information asymmetry (Graebner, 2009).

Post-Acquisition

Maintaining Buyer and Seller Momentum

A major challenge in technology acquisitions is maintaining the productive momentum of both buyers and sellers. After a deal closes, the combined firm must pursue change on multiple fronts simultaneously. The acquired firm must continue to develop its technology and complete its products, the buyer must continue its own development efforts and respond to changes in its competitive environment, and both firms must work together to realize potential synergies from the deal (Graebner, 2004). Delays in any of these activities may create opportunities for rivals to gain ground.

Technology acquisitions can damage the momentum of the acquired firm by generating distracting logistical problems, fostering negative emotions, and creating confusion about organizational goals (Graebner, 2004). A recent study in the semiconductor industry found that after an acquisition, acquired inventors generated patents at less than 50% of the rate of a comparison group of non-acquired inventors (Kapoor & Lim, 2007). Moreover, research in the pharmaceutical industry found that productivity diminished more for acquired employees who lost standing in the acquisition process—in other words, employees who transitioned from being “big fish in small ponds” to “smaller fish in bigger ponds” (Paruchuri, Nerkar, & Hambrick, 2006). Ironically, this suggests that the acquisition target's best scientists may experience the worst loss of momentum after an acquisition occurs.

Technology acquisitions may also damage the productivity of the acquirer, despite increasing the buyer's knowledge base and its absorptive capacity. Integrating the acquired organization's resources, and especially its technology-related employees and knowledge, is a delicate and com-

plicated process that demands a substantial commitment of managerial attention (Ahuja & Katila, 2001; Haspeslagh & Jemison, 1991) and may distract the acquirer from its own core business (Hitt, Hoskisson, & Ireland, 1990; Schoar, 2002). Acquiring managers can become so preoccupied with negotiation and integration processes that their attention is diverted from other organizational activities, such as internal research and development (Hitt, Hoskisson, Johnson, & Moesel, 1996). Consistent with this observation, Hitt, Hoskisson, Ireland, and Harrison (1991) found that buyers are more likely to reduce their R&D expenditures and decrease their patenting activity after an acquisition. Overall, these observations suggest that it is critical to maintain focus on the momentum of both buyers and sellers.

Integration vs. Autonomy Dilemma

A second post-deal challenge in technology acquisitions is the trade-off between integrating the acquired firm and leaving it autonomous. Integration and resource reconfiguration may be necessary in order to exploit potential synergies between the acquired and acquiring firms (Capron, 1999; Capron & Mitchell, 1998; Larsson & Finkelstein, 1999), but the loss of autonomy that typically accompanies integration can itself be detrimental to acquisition performance (Chatterjee, Lubatkin, Schweiger, & Weber, 1992; Very & Lubatkin, 1997).

Balancing integration and autonomy is an issue in many types of acquisitions, but it is especially critical when the target is a technology firm. Because the tacit, socially complex forms of knowledge that motivate technology acquisitions are difficult to transfer, a high degree of post-deal integration may be required in order to realize an acquisition's potential value (Puranam, Singh, & Zollo, 2006; Ranft & Lord, 2000, 2002). However, integration may ultimately lead to the destruction of the acquired firm's knowledge-based resources and innovative capabilities by triggering employee turnover and disrupting organizational routines (Ranft & Lord, 2002), or by stifling an entrepreneurial culture. For example, a study of semiconductor acquisitions found that acquired inventors generated fewer patents if the target was integrated into the acquirer rather than left auto-

mous (Kapoor & Lim, 2007). Similarly, Puranam and Srikanth (2007) observed a trade-off between integration and autonomy in pharmaceutical and information technology acquisitions. Integration stimulated more innovation by the buyer, yet autonomy fostered independent innovation by the acquired firm.

The dilemma of balancing integration and autonomy is intensified in technology acquisitions by buyers' inaccurate or incomplete information about target firms. Ideally acquirers would protect those parts of the organization that contain the most valuable knowledge; however, acquirers may initially have poor information about where valuable knowledge resides in the acquired firm (Ranft & Lord, 2002). Similarly, buyers might hope to identify those innovative employees who are most vulnerable to negative effects from post-deal integration. For example, Paruchuri et al. (2006) found that integration had more detrimental effects on the productivity of acquired employees whose expertise diverged from the expertise of the acquirer and who had collaborated more extensively with others in developing their previous innovations. However, buyers are unlikely to be able to make such assessments immediately after acquiring a technology firm.

A third problem is that buyers may have an inaccurate perception of sellers' true motives, leading buyers to fruitlessly offer financial incentives as a means of counteracting the negative effects of post-deal integration (Graebner, 2009). Because buyers often perceive sellers' motives as primarily monetary, buyers may offer incentives such as stock options, performance-related bonuses, and long-term contracts as means to retain and motivate acquired employees. However, evidence suggests that such incentives may not be effective means of retention in technology acquisitions when acquired personnel are dissatisfied with other aspects of the deal (Graebner, 2009; Ranft & Lord, 2000).

Performance of Technology Acquisitions

Given the unique features and challenges of technology acquisitions, how might the leaders of buyers and sellers improve the performance of these deals? Answering this question is

complicated by the diversity of motives for technology acquisitions, which makes it difficult to define and measure success. Notwithstanding this difficulty, we now turn to what is known about improving the performance of technology acquisitions. Table 3 summarizes our discussion.

Buyer Perspective

Picking the "Right" Targets

Buyers' acquisition success begins with selecting the right targets. The greatest "combination potential" (Larsson & Finkelstein, 1999) is likely to exist when a buyer and target have a balance of similarities and complementarities. If a buyer and target have few similarities, the buyer may be too unfamiliar with the target's resources to effectively

Table 3
Technology Acquisitions: Performance

	Proposed Tactic	Empirical Support
Buyers	Picking the "right" targets:	
	● Balance similar and complementary resources	● Large sample support
	● Avoid targets with relatively large knowledge base versus buyer	● Large sample support
	Taking the "right" actions:	
	● Dating—form prior relationships with sellers	● Mixed findings
	● Delay—wait until target IPO	● No support
	● Vigilant negotiation	● Not yet tested
	Implementing effectively:	
	● Leave R&D units autonomous while integrating other functions	● Case study support
	● Base integration decisions on target's stage of development	● Large sample support
	● Place acquired leaders in influential roles; engage in frequent, rich communication	● Case study support
	Accumulating learning:	
	● Gain acquisition experience	● Large sample support
	● Combine with other technology experiences	● Large sample support
Sellers	Paying attention to buyer overtures	● Not yet tested
	Evaluating fit	● Not yet tested
	Being realistic in negotiations	● Not yet tested
	Promoting momentum and serendipity	
	● Mobilizing and mitigating actions	● Case study support

value and implement the deal. For example, Higgins and Rodriguez (2006) found that buyers in pharmaceutical acquisitions had worse announcement returns when they lacked experience in their targets' therapeutic categories. On the other hand, some complementary differences between a buyer and target are necessary in order to create opportunities for synergy. Ahuja and Katila (2001) used the degree of overlap in a buyer's and target's patenting histories as a proxy for the similarity in their technological knowledge, and found that a moderate degree of knowledge overlap led to better performance for acquisitions in the chemical industry. Their finding was replicated by Kapoor and Lim (2007) in the semiconductor industry and Cloudt, Hagedoorn, and Kranenburg (2006) in a sample that included the electronics, communications, computer, and pharmaceutical industries.

Complementarities may emerge not only from melding different areas of technical knowledge, but also from combining the target's technical knowledge with the buyer's manufacturing, marketing, sales, and distribution capabilities. Consistent with this logic, a recent study of long-term stock returns following technology acquisitions found that the interaction of the seller's R&D resources with the buyer's marketing resources had a positive effect on performance (King et al., 2008). In contrast, the interaction of target and acquirer R&D expenditures had a negative impact on acquisition performance (King et al., 2008), indicating that firms that invest in the same types of resources may have redundancies and few opportunities for synergy.

A final issue that buyers should consider when selecting targets is the relative size of a target firm's knowledge base. If the target's knowledge base is too large relative to the acquirer's, implementation complexity may outweigh potential value creation and lead to less innovation, as indicated by fewer patents produced (Ahuja & Katila, 2001; Cloudt et al., 2006). On the other hand, the absolute size of a target's knowledge base has not been consistently linked to acquisition performance (Ahuja & Katila, 2001; Cloudt et al., 2006).

Taking the "Right" Actions

Identifying attractive targets may not be easy given the uncertainty surrounding targets' resources. Moreover, buyers also need to convince attractive targets to sell and need to negotiate favorable deal terms in order to appropriate the value created by the acquisition. Research has proposed several actions that might help buyers achieve these objectives. One proposed strategy is *dating* (i.e., forming alliance or investment relationships prior to acquisition). Prior relationships such as corporate venture capital investments might be expected to provide a buyer with better information about a target, including its fit with the buyer's resources and culture as well as its receptivity to acquisition. Furthermore, if prior ties lead to rapport between the two firms, the buyer may become a seller's preferred suitor and perhaps pay a lower price (see Graebner & Eisenhardt, 2004).

Some evidence indicates that buyers are more confident in purchasing targets with which they have had alliances. A recent study of primarily high-tech acquisitions found that acquirers were more likely to pay in cash vs. stock when the target was a former alliance partner, a sign that buyers saw these deals as less risky (Reuer & Ragozzino, 2008). Whether prior relationships actually enhance the performance of technology acquisitions remains an open question, however. A study of acquisitions of manufacturing firms (some high-technology and some not) found that previous alliances improved acquisition performance as measured by change in return on assets (Porrini, 2004). Similarly, a study in the pharmaceutical industry suggested that pre-acquisition alliances with targets increased buyers' announcement returns (Higgins & Rodriguez, 2006). However, a study of acquisitions of entrepreneurial firms, primarily in the information technology industry, found that prior corporate venture capital relationships had the opposite result: Prior investment in a target was negatively associated with a buyer's announcement returns (Benson & Ziedonis, in press). One explanation is that prior relationships may lead buyers to limit their search for targets (and possibly to overlook superior targets), or per-

haps to overpay because they experience escalation of commitment (Haunschild, Davis-Blake, & Fichman, 1994) that clouds their judgment. Familiarity may also lead sellers to have unrealistic expectations regarding how they will be treated after deal close (Graebner, 2009), leading to organizational dysfunction that interferes with post-deal implementation. Finally, some attractive technology ventures may avoid alliances with potential buyers in order to protect their technologies and retain a broad array of exit alternatives (Katila, Rosenberger, & Eisenhardt, 2008). A final problem with “dating” before acquiring is that buyers may not be able to “date” the most desirable target firms. Some attractive technology ventures avoid alliances with potential buyers in order to protect their technologies and retain a broad array of exit options. (Katila, Rosenberger, & Eisenhardt, 2008).

Another action that buyers might take is to *delay* (i.e., wait until privately held targets hold initial public offerings, or IPOs). IPOs are typically preceded by “road shows” in which firms meet with prominent investors and share detailed information about their technologies, strategies, and business risks. Once a company is publicly traded, its share price reflects the consensus opinion of many investors and financial analysts, reducing the uncertainty surrounding the underlying value of the firm. Such transparency is likely to be particularly valuable when buyers seek to purchase young firms or firms with substantial intangible resources (Ragozzino & Reuer, 2007; Reuer & Shen, 2004)—typical attributes of targets in technology acquisitions. Consistent with this argument, firms with substantial intangible resources are more likely than other firms to undergo an IPO before being acquired rather than being acquired while still private (Reuer & Shen, 2004). In addition, acquirers are less likely to buy private targets in technology industries than in other industries (Capron & Shen, 2007).

But despite technology buyers’ apparent preference for public targets, the evidence does not confirm that acquisitions of public firms are higher performing. On the contrary, increasingly strong evidence suggests that acquisitions of private firms, including private technology firms,

lead to better announcement returns for buyers (Benson & Ziedonis, in press; Capron & Shen, 2007; Faccio, McConnell, & Stolin, 2006; Fuller, Netter, & Stegemoller, 2002; Moeller, Schlingemann, & Stulz, 2004). (An exception is Higgins and Rodriguez, 2006, who found no significant differences in announcement returns between acquisitions of public and private firms in the pharmaceutical industry.) One reason may be that buyers who wait for targets to go public face competing bidders and are forced to pay higher prices. A second reason may be that buyers who wait miss the most desirable targets because they have either already been sold or have become strong, independent firms.

A final set of actions buyers may pursue is *vigilant negotiating* tactics. Coff (1999) found that when buying companies in knowledge-intensive industries such as software and pharmaceuticals, buyers avoided tender offers, negotiated for longer periods of time, offered lower premiums, and paid a higher percentage of the sale price in stock or earn-outs rather than cash. These tactics may provide opportunities for buyers to gather more information about target firm resources and may reduce buyers’ risk of overpaying. Yet these negotiating strategies have not been directly associated with improved acquisition performance and may not be acceptable to the most desirable target firms, which are likely to have other alternatives. Overall, while dating, delay, and vigilant negotiating seem to be logical steps for buyers, these tactics still lack empirical proof of their effectiveness.

Implementing Effectively

Although identifying attractive targets and negotiating favorable deal terms can be helpful, implementation remains a substantial challenge in technology acquisitions. As noted earlier, buyers struggle with creating synergistic value through integration while still offering autonomy to motivate and retain acquired employees. One proposed solution is to delay the integration process until mutual learning and trust have developed between the two firms (Haspelagh & Jemison, 1991). Such delays may be problematic for technology acquisitions, however, since these deals are

often undertaken in order to speed products to market (e.g., Graebner, 2004). An alternative is to pursue a hybrid integration approach in which some functions are integrated more quickly than others. Schweizer (2005) found that pharmaceutical acquisitions performed better (they received better assessments from managers and were less likely to be divested) if buyers rapidly integrated all non-R&D functions but left the acquired R&D groups autonomous. But it is unclear whether these results generalize to other technology industries where product cycles are much faster.

Puranam and colleagues were particularly insightful in examining the integration vs. autonomy tension. Puranam, Singh, and Zollo (2006) argued that target firms are especially vulnerable to disruption from integration activities during exploratory phases of their development, including the period before the launch of the target's very first product and the period before the launch of its first post-acquisition product. Supporting this argument, the study found that post-deal integration delayed product launch for target firms with no prior products, but not for other target firms. Moreover, integration delayed a target's first post-acquisition product launch, but had no effect on subsequent product launches. These findings suggest that if a target's first product (or first post-acquisition product) is of high strategic priority to the buyer, it may be beneficial to delay integration until after these milestones have occurred.

In addition, Puranam, Singh, and Chaudhuri (2009) examined factors that predict buyers' integration vs. autonomy decisions. Their study did not directly examine whether the chosen integration strategies led to better performance, but did help to shed light on buyers' decision processes. The authors distinguished between acquisitions that were motivated by the buyer's desire to obtain a component technology and those motivated by the desire to obtain a complete stand-alone product, finding that integration is more likely in component acquisitions. They further divided component acquisitions based on whether the buyer and target had "preexisting common ground" in their technological capabilities. When such common ground was present, component

acquisitions were less likely to be structurally integrated.

While Puranam and colleagues examined implementation at a high level, other research has taken a more granular approach. For example, Graebner (2004) and Ranft and Lord (2002) used case study methods to examine the implementation of technology acquisitions. Their studies suggest practices that may reduce the integration-autonomy tension by ameliorating the negative effects of integration. These practices include engaging in frequent, rich communication with acquired employees and placing acquired leaders in influential positions in the combined firm.

Accumulating the "Right" Learning

Finally, buyers may improve the performance of technological acquisitions by learning from specific experiences. One potentially useful type of experience is *prior acquisitions* (Haleblian & Finkelstein, 1999). Puranam and Srikanth (2007) found that experienced technology buyers were better able to navigate the tension between integration and autonomy. Specifically, these buyers were able to integrate acquired firms with less negative impact on future innovation. Although studies of acquisition experience are not explicit with regard to what is learned, anecdotal evidence suggests that buyers may be learning heuristics, or "simple rules" strategies that shape how buyers identify and prioritize targets, implement post-deal integration, and manage the timing and sequence of multiple deals (Bingham, Eisenhardt, & Furr, 2007; Sull & Eisenhardt, 2001).

Additional research suggests that combining acquisitions with *other forms of technology experience* improves acquisition performance. It seems likely that developing internal R&D expertise enhances the abilities of buyers to identify attractive targets, price them accurately, and integrate them effectively (see, e.g., Benson & Ziedonis, 2009). Furthermore, buyers' technical resources and capabilities may help win over attractive sellers by offering better combination potential and a greater likelihood of strategic success (Graebner & Eisenhardt, 2004). However, these benefits need to be weighed against the possibility of developing redundant resources that diminish the value of

future acquisitions (King et al., 2008). Perhaps for this reason, an acquirer's level of R&D expenditures does not consistently predict subsequent acquisition performance (e.g., Benson & Ziedonis, 2009; Higgins & Rodriguez, 2006; Puranam & Srikanth, 2007). An additional source of relevant experience is corporate venture capital investment. Corporate venture investing seems likely to provide learning regarding emerging technologies and exposure to nascent firms, which can be helpful in later identifying and evaluating potential targets. Indeed, a consistent pattern of corporate venture investing appears to improve buyers' subsequent acquisition performance (Benson & Ziedonis, 2009), despite the fact that corporate venture investors perform poorly when acquiring their own portfolio companies (Benson & Ziedonis, in press).

Seller Perspective

Sellers may differ from buyers in their motives for acquisition and their assessments of acquisition performance. In particular, while sellers value the financial gain from the acquisition and the subsequent financial performance of the buying firm, they are as much or more concerned with other performance outcomes (Dalziel, 2008; Graebner, 2009; Graebner & Eisenhardt, 2004). These include ensuring that the seller's technologies are successful, providing cultural fit for acquired employees, and maintaining some degree of autonomy from the buying firm. Although few studies have examined how sellers can improve their own performance outcomes, some insights have emerged.

Paying Attention to Buyer Overtures

As noted earlier, leaders of potential targets often pay little attention to potential buyers except when they are facing strategic hurdles or are wrestling with stressful personal situations (Graebner & Eisenhardt, 2004). While this behavior allows target firm leaders to focus their attention on pressing operational issues, it creates a risk that they will miss out on an attractive acquisition opportunity. A spurned buyer may go on to acquire one of the target's competitors, reducing the pool of interested buyers if and when the original

target eventually wants to explore acquisition. In the meantime, the combination of a spurned buyer and an alternate target may create a strong new competitor that threatens the original target's success. These findings suggest that potential sellers should probably pay more consistent attention to buyers' overtures.

Evaluating Fit

To optimize the match between the two firms, sellers should assess whether potential buyers possess the resources needed to further sellers' strategic goals. These resources may range from complementary technologies to manufacturing and marketing capabilities. Sellers should conduct as much due diligence on the buyer as possible, and should think analytically—and honestly—about how their own firms are likely to add value to the combined organization. Sellers may need to contemplate the possibility that the best course of action for the buyer will be to dismantle the acquired organization and shut down its technology; furthermore, this outcome is more likely if the buyer owns a competing technology in the same market segment. To the extent that the seller is concerned with finding a broad audience for its own products and future innovations, target firm leaders may want to avoid buyers with directly competing technologies.

Being Realistic in Negotiations

Sellers may also improve acquisition performance for themselves by being more realistic in the negotiation process. For example, case studies of technology acquisitions suggest that while target firm leaders often approach these deals as transactions based on trust, buyers are unlikely to share this view (Graebner, 2009). Buyers may assume that they are negotiating with counterparts who are not trustworthy, and as a result may feel justified in misleading sellers regarding their post-acquisition plans. Prior alliances and other past relationships with potential buyers do not seem to provide more accurate information, but rather appear to lull sellers into a false sense of security (Graebner, 2009). Social interaction during the negotiation process has a similar effect. A key point is that sellers should not assume that infor-

mal, unwritten commitments made during the negotiating process will be honored once the deal has closed and the target has lost its bargaining power.

Promoting Momentum and Serendipity

Sellers typically have little control over whether their firms are integrated or left autonomous once the deal is closed. However, regardless of the buyer's integration decisions, selling firm leaders may still be able to influence acquisition performance by maintaining the momentum of their firms (Graebner, 2004). Sellers are typically more knowledgeable than buyers about the intricacies of running the acquired organizations. Moreover, buyers often leave a leadership void because they are distracted by the demands of their own businesses or by subsequent acquisition activity. Acquired leaders may step into this void and create value by engaging in "mobilizing" actions, which include setting specific goals for their employees and accelerating coordination with the buyer, and "mitigating" actions, which include initiating real-time communications and expediting resolution of employee concerns (Graebner, 2004). These behaviors are likely to improve the financial performance of the deal as well as help achieve other outcomes important to the seller, such as employee satisfaction and strategic success. Acquired leaders can also play an important role in realizing unexpected or serendipitous value from an acquisition by identifying and championing opportunities for resource reconfiguration or by generating innovative strategic ideas. Buyers can foster these behaviors by placing target leaders in influential cross-organizational roles (Graebner, 2004).

Open Issues for Future Research in Technology Acquisitions

While researchers have made substantial progress in understanding technology acquisitions, questions remain. This article has already noted several gaps in current knowledge about technology acquisitions. First, relatively little is known about the seller's point of view. A few studies have begun to illuminate sellers' motivations and viewpoints, but more elaboration is needed. For example, sellers' perspectives may

vary with differences in company history, size, or ownership structure, such as whether the target is family-owned versus venture capital-controlled or publicly traded. Sellers' motivations, alternatives, and expectations may also depend on the firm's performance as well as industry conditions.

A second open issue we identified is the use of acquisitions to enhance market power. Most research on technology acquisitions draws from the resource- and knowledge-based theories of the firm and views acquisitions as a means to combine strategically valuable resources. However, emerging evidence suggests that technology acquisitions may also be used to create market power by expanding firms' market footprints and eliminating rivals. A greater understanding of the market power motive and its interplay with resource acquisition motives would be useful to both buyers and sellers. Sellers in particular would benefit from knowing how to identify buyers that may intend to increase their power by acquiring and shutting down target firms.

In addition to these open issues, several other areas are deserving of attention from researchers studying technology acquisitions. The remainder of this section discusses these gaps and provides suggestions for future research directions.

Measurement and Prediction of Performance

Many questions linger regarding the performance of technology acquisitions. One fundamental issue that is still unresolved is how the performance of technology acquisitions should be measured. As Zollo and Meier (2008) have noted, no single measure captures all of the important dimensions of acquisition performance. One measure commonly used in M&A research, abnormal stock returns surrounding the announcement of a deal, is particularly problematic for technology acquisitions. Technology acquisitions often involve targets that are quite small relative to their buyers, and so these transactions may have little or no immediate influence on buyers' stock prices. In addition, like buyers and sellers, the financial markets may struggle to accurately gauge the value of a technology transaction. For example, the stock market may be unable to predict sources of value such as serendipitous resource reconfiguration.

Alternative measures include product releases, patenting activity, and retention of key personnel. However, these measures also have drawbacks, particularly for assessing acquisitions that were motivated by the buyer's desire to eliminate a rival firm or technology. For example, if an acquisition is aimed at eliminating a competing technology, it makes little sense to measure the buyer's performance by whether the acquired firm launches new products after the deal closes (Santos & Eisenhardt, 2009). A related issue is that buyers and sellers may differ in their criteria for acquisition performance (Dalziel, 2008; Graebner, 2009), making it possible that one party could consider an acquisition successful while the other views it as disappointing. Overall, research on technology acquisitions would benefit from a clearer typology of the multiple dimensions of performance and a better understanding of which dimensions correspond to each party's specific acquisition motives.

Notwithstanding the difficulty in defining and measuring the success of technology acquisitions, researchers have proposed several tactics that firms may pursue to improve acquisition performance, such as engaging in alliances prior to acquisition, waiting until targets are publicly traded, and exercising vigilance during negotiations. Yet evidence for the effectiveness of these tactics remains limited and/or mixed, leaving few clear recommendations for managers. More fine-grained analyses may be required to tease out the circumstances in which specific tactics may be useful, as well as to describe in more detail how tactics should be deployed. For example, pre-acquisition alliances may lead to better acquisition performance only if they are structured in particular ways. Future research could also provide deeper insights into how post-deal implementation processes influence acquisition performance. While several studies have examined the costs and benefits of structural integration at the organizational level of analysis, we need to better understand implementation at the group and individual levels. For example, it would be useful to know how acquired and acquiring firm scientists and engineers can collaborate successfully.

National Context

Many questions also remain regarding the effects of national context on technology acquisitions. Most research on technology acquisitions has examined domestic transactions in North America and, to a lesser extent, in Western Europe. Yet both domestic acquisition activity outside of North America and cross-border acquisition activity are growing rapidly (Moschieri & Campa, 2009). For example, Cisco Systems initially concentrated its acquisition activity near its headquarters in Northern California (Mayer & Kenney, 2004), but the company has increasingly looked outside the United States for targets, making several acquisitions in Israel and recently offering \$3 billion for a Norwegian videoconferencing firm.

Several factors suggest that cross-border technology acquisitions will continue to increase in frequency. A 2008 survey by Deloitte LLP and the National Venture Capital Association found that while venture investors still consider the United States to be the center of innovation in many technology industries, other countries are emerging as viable competitors in specific sectors, including Japan in telecommunications, Taiwan in semiconductors, India in software, the United Kingdom in biopharmaceuticals, and Germany in medical devices and clean energy technologies. Venture capital investments in these countries are likely to promote the founding and growth of entrepreneurial firms, some of which will become acquisition targets or even acquirers.

At the same time, U.S. and Western European firms increasingly perceive a shortage of domestic science and engineering talent, causing them to offshore product development and other technical activities to nations such as India and China (Manning, Massini, & Lewin, 2008). This is likely to further strengthen technology clusters in those nations and to foster more cross-border M&A activity. Other drivers of cross-border transactions include the process of economic integration in Europe (Moschieri & Campa, 2009) and U.S. tax policies that motivate American firms to acquire abroad rather than repatriate overseas cash reserves (Vance, 2009).

Given their increasing prevalence, both domestic technology acquisitions occurring outside of North America and technology acquisitions that cross national borders deserve more research attention. It is likely that cross-border technology acquisitions in particular present both special challenges and unique opportunities. One of the few studies to examine cross-border acquisitions in technology industries found that foreign buyers of “Silicon Valley-type” U.S. firms in the computer and communications industries faced substantial hurdles (Inkpen, et al., 2000). Target employees were accustomed to an entrepreneurial culture focused on innovation, risk taking, and learning through failure, and were frustrated with European acquirers’ slower, more consensus-based decision-making processes. Differences in compensation and governance, including Europeans’ limited use of stock options, also led to clashes in expectations. Recent research also suggests that cross-border combinations may encounter obstacles such as national institutions that favor employee rights and restrict the buyer’s ability to reconfigure resources (Capron & Guillen, 2009). Yet another source of difficulty for cross-border technology acquisitions may be the ability of both firms to gather adequate information about one another prior to agreeing to a deal. Information asymmetries may be even greater than in domestic technology acquisitions as geographic dispersion makes it more costly for acquirers to evaluate potential targets and vice versa. This could alter buyers’ acquisition practices—for example, increasing buyers’ preference for public vs. private targets (Reuer & Shen, 2004).

Despite these arguments, it is not clear that cross-border technology acquisitions perform worse than domestic deals. Some studies suggest that cross-border acquisitions perform similarly to domestic ones (e.g., Gugler, Mueller, Yurtoglu, & Zulehner, 2003); others suggest that cross-border cultural differences may actually provide a source of value (Cloudt et al., 2006; Morosini, Shane, & Singh, 1998). Given these mixed results, additional research is needed to understand how cross-border and non-U.S. domestic transactions may differ from domestic U.S. deals in their sources of value, key success factors, and performance.

Competitive Dynamics

Another gap in our understanding of technology acquisitions is the longer term effects of these deals on an industry’s competitive dynamics and, in turn, on acquirers’ performance. Acquisition activity may foster more organizational foundings in an industry, for two reasons: First, acquisitions lead to turnover, creating a pool of departed employees who may end up founding or joining new firms (Stuart & Sorenson, 2003). Second, acquisitions may lead to more venture capital investment in an industry. Venture capitalists rely on harvest events, including acquisitions and initial public offerings, to achieve financial liquidity for their investment funds. While IPOs may offer the highest returns, few portfolio companies will ever “go public.” An active acquisition market provides venture investors with an attractive alternative means to harvest value from their investments.

An increased rate of organizational foundings could have both positive and negative effects for acquirers. If new ventures are founded by acquired employees who subsequently left the combined firm, these ventures are likely to draw upon the acquirer’s knowledge base and may become its direct competitors. The extent to which acquired employees’ new ventures directly compete with an acquirer will likely depend on legal institutions such as intellectual property protection and the enforceability of non-compete agreements. These legal institutions differ across nations, and in the case of non-compete agreements, even across states within the United States. Thus, the effect of acquisitions on industry dynamics is likely to depend on legal and economic policies at both the national and regional levels.

Although an increased rate of new venture creation could lead to a more competitive industry environment that undermines acquirers’ long-term performance, new ventures may also benefit buyers by providing a pool of future acquisition targets, creating a virtuous cycle that enables the acquirer to continue to harvest innovations created by young, small firms. Furthermore, if acquired individuals have a positive impression of their acquirer, they may favor that firm when selling their future ventures. This suggests that

technology buyers need to consider the reputational effects of their behavior when making acquisition implementation decisions. While acquisition research has often focused on how to retain acquired employees, it may be just as important to find ways to amicably part with employees who leave. More broadly, understanding how behavior in one technology acquisition influences the next—for better or for worse—is an important step toward developing a program perspective on firms' acquisition activity (Laamanen & Keil, 2008).

Acquisition Timing

A final set of issues deserving of further research attention pertains to the timing of technology acquisitions. Two recent studies have found evidence of an "early bird" advantage accruing to first movers in acquisition waves (Carow, Heron, & Saxton, 2004; McNamara, Halebian, & Dykes, 2008). Yet in technology industries, the timing of an acquisition involves difficult trade-offs. As noted earlier, buyers face great uncertainty surrounding the value of target firms. The longer a buyer waits, the more information will be available about potential targets. For example, the buyer will be able to determine whether a target has completed its product and how the product has been received by the marketplace. Waiting also allows the target to become larger and more robust, and possibly better able to withstand the distraction and disruption of post-deal integration without losing its innovative momentum.

However, waiting poses the risk that a desirable target will be acquired by a competitor, will grow too large to acquire, or will develop its technology in a direction that is incompatible with the platforms and product road maps of the buyer, diminishing the potential synergy from the deal. Moreover, anecdotal evidence suggests that firms that acquire early may prompt competitors to make hasty decisions and acquire less attractive targets. For example, in the late 1990s, Amazon was viewed as a viable threat to eBay's dominance of the online auction market. When Amazon acquired an online payment firm in order to facilitate auction transactions on its site, eBay quickly acquired another online payment firm, Billpoint,

in a deal that performed poorly and eventually had to be supplanted by the acquisition of PayPal. This anecdote suggests that "baiting" competitors to make bad acquisitions could be a valuable side benefit of initiating an acquisition wave. Additional research could test the extent to which an early-bird advantage is present in technology acquisitions, and whether this advantage is moderated by industry, buyer, or target characteristics.

Conclusion

This article has reviewed what is known about technology acquisitions, including buyers' and sellers' motivations for engaging in these deals, unique features and challenges associated with technology acquisitions, and strategies for improving acquisition performance. Buyers pursue technology acquisitions to obtain strategically valuable resources, achieve market power, or generate strategic renewal. Sellers pursue acquisitions not only to obtain valuable resources but also to relieve idiosyncratic personal pressures. Despite these opportunities, technology acquisitions face obstacles due to unusually high seller power, uncertainty about target value, information asymmetries between buyer and seller, and implementation challenges such as maintaining both firms' momentum and balancing integration with autonomy. Both buyers and sellers may play a role in mitigating such obstacles. Finally, we described open issues in our understanding of technology acquisitions, highlighting the seller's perspective, market power, cross-border transactions, long-term competitive dynamics, and acquisition timing as areas deserving additional research attention.

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