© Academy of Management Journal
2009, Vol. 52, No. 2, 246–279.

ORIGIN OF ALLIANCE PORTFOLIOS: ENTREPRENEURS, NETWORK STRATEGIES, AND FIRM PERFORMANCE

PINAR OZCAN
IESE Business School

KATHLEEN M. EISENHARDT
Stanford University

Alliance portfolios are ubiquitous and influential for firm performance. Extant research addresses attributes of high-performing alliance portfolios but not how executives originate such portfolios. In our inductive case study of six entrepreneurial rivals in the wireless gaming industry, we find that executives are more likely to originate high-performing portfolios when they visualize their portfolios in the context of the entire industry as opposed to a series of single ties and when they simultaneously form ties with multiple partners. The emergent theoretical framework emphasizes agency and strategic action in contrast to a deterministic account of dyadic interdependence and social embeddedness.

Apple recently announced record corporate profits that accompanied its dramatic reversal of fortune from "near death" a decade earlier. But Apple did not act alone to bring about this reversal. Rather, Apple's portfolio of ties with EMI, Google, Salesforce.com, Microsoft, and other firms (Burrows, 2007) was key to its success. These ties enabled Apple leaders to focus on their strengths, such as architectural design, while leveraging their partners' resources and market positions (Yoffie & Slind, 2006). And the Apple story is not unique, for many firms rely on their portfolios of ties to enhance performance.

Although a handful of studies have linked portfolios of ties to firm performance (Baum, Calabrese, & Silverman, 2000; Uzzi, 1997), recent research has examined a wider variety of portfolio issues. For example, studies on the alliance function for managing portfolios (Kale, Dyer, & Singh, 2002) and the agency hazards of portfolios (Reuer & Ragozzino, 2006) have used the portfolio as their unit of analysis. Others have noted that portfolios are a central direction of future research (Gulati, 2007). Following the literature, we define a *portfolio* (which can also be termed an "egocentric network") as a firm's set of direct ties (Das & Teng, 2000).

From a theoretical view, portfolios are important because firms form ties in the context of building portfolios, making the logic of portfolio building central to understanding tie formation. Portfolios are also theoretically important because they have aggregate properties (such as tie diversity and mix of tie strengths) that affect performance (Uzzi, 1997) but are not meaningful for single ties. Portfolios are also engines of network evolution. That is, networks do not evolve by themselves. Rather, firms adjust their portfolios, thereby changing the networks in which they operate. From a practical point of view, portfolios are also critical. For example, Reuer and Ragozzino (2006) noted a study in which the average "large" firm had over 30 ties accounting for 6–15 percent of firm value. So although a single tie can be useful, a firm's portfolio of ties is likely to be more crucial to the firm's performance, thus placing portfolios at the heart of strategic interest. Our aim is to explore how firms originate "high-performing portfolios"—portfolios that are likely to improve firm performance.

Research has indicated attributes of high-performing portfolios. Portfolios with a mix of strong ties (which enable rich and efficient exchange), and weak ties (which enable greater flexibility and exploration) are likely to be high performing (Uzzi, 1997; Rowley et al., 2000). Portfolios with prominent, resource-rich, and experienced partners improve the likelihood that firms will gain the benefits of ties (Rothaermel, 2001; Stuart, Hoang, & Hybels, 1999). Portfolios that are centrally embedded within their broader industry network (Powell,

We appreciate the support of Stanford Technology Ventures Program, and advice of Tom Byers, Chris Bingham, Emily Cox, Jason Davis, Shane Greenstein, Ben Hallen, Amy Hillman, Riitta Katila, William Ocasio, Filipe Santos, Ithai Stern, Scott Stern, our anonymous reviewers, and the participants at seminars at INSEAD, IESE, EPFL, London Business School, Stanford University, Northwestern University, and the University of Maryland Entrepreneurship Conference.

Koput, & Smith-Doerr, 1996) and with many, diverse partners (Baum et al., 2000) also provide information, flexibility, and resource benefits that are likely to enhance firm performance.

But although a clear description of high-performing portfolios exists, it is unclear how firms actually form these portfolios. Instead, the literature offers a descriptive account of which ties form as networks evolve using *resource dependence* and *social embeddedness* theories (Gulati, 1995; Gulati & Gargiulo, 1999). That is, networks begin with the formation of ties between interdependent firms (Powell et al., 1996) and then evolve through the accumulation of ties between increasingly embedded firms (Gulati & Gargiulo, 1999). The result is a deterministic evolution shaped by initial resources and early ties (Gulati & Gargiulo, 1999). This deterministic account describes how "average" firms form their portfolios, but it does not clarify how firms form high-performing portfolios unless they begin as well-endowed firms with superior resources and social embeddedness. It is a "rich-get-richer" view that leaves unclear how less well endowed firms might also form high-performing portfolios.

Another possibility is that firms can engage in *strategic action.* Emirbayer and Goodwin (1994) noted that network theory overemphasizes the degree to which network structure constrains human agency. Rather, individuals can maneuver within networks and be inventive and reflective in their network actions (Hallen, 2008; Santos & Eisenhardt, in press), and so improve their portfolios. Yet although agency and strategic action may be helpful in understanding how firms build high-performing portfolios, research has not yet clarified what those strategies are.

Taken together, previous studies (1) identify attributes of high-performing portfolios, (2) provide a descriptive account of which ties form as portfolios evolve on the basis of interdependence and embeddedness, and (3) suggest a possible role for agency and strategic action. But the literature lacks an in-depth account of how firms actually create high-performing portfolios. Our study addresses this research gap. We ask, *How do firms originate high-performing portfolios?* Given the limits of extant theory, we conducted a multiple-case, inductive study (Eisenhardt, 1989). Using field and archival data, we tracked how six entrepreneurial rivals originated their portfolios, thus creating an unusually close comparison of rival portfolio formation strategies.

Our study contributes to interorganizational network theory and the study of strategy within entrepreneurial firms. A key insight is that executives who visualize their portfolios in the context of their entire industry are more likely to originate high-performing portfolios. This more complete cognitive understanding of an industry enables firms to add multiple, simultaneous ties (not a series of single ties) that increase the firms' value to their potential partners and the operating synergies of their ties. A second insight is a theoretical process framework of how firms originate high-performing portfolios that includes three strategies by which firms simultaneously add and execute multiple ties. It contrasts with the deterministic account of network evolution that often leads to mediocre portfolios. We note contributions to interdependence and embeddedness concepts in resource dependence and network theories, respectively. But our most fundamental insights are those into network agency and strategy—that is, portfolios are grounded in the strategic choices that executives make to form and execute ties with one another.

THEORETICAL BACKGROUND

Several research strands indicate the attributes of high-performing portfolios. One strand focuses on the *performance of the individual ties* that comprise portfolios. This research shows that ties are more effective when the partners are prominent and more experienced with ties and have central network positions (Ahuja, 2000; Baum et al., 2000; Gulati & Higgins, 2003; Podolny & Stuart, 1995; Stuart, 2000). These partner characteristics improve the likelihood that benefits of ties, such as access to superior resources, will be realized. Research also shows that the relationship between the partners can influence a tie's effectiveness. When partners have greater trust (Sivades & Dwyer, 2000), cooperation (Lorange & Roos, 1993), communication (Larson, 1992; Sivades & Dwyer, 2000), and coordination (Mohr & Spekman, 1994; Sivades & Dwyer, 2000), they are better able to work together, and so achieve the benefits of ties.

Research also suggests that *properties of portfolios*, such as the number and diversity of ties, can positively influence performance (Baum et al, 2000; Dyer & Nobeoka, 2000; Lavie, 2007; Powell et al., 1996). Many, diverse ties are valuable because they create multiple sources of information and access to numerous types of resources. For example, Baum et al. (2000) found that biotech ventures with portfolios containing many ties to diverse partners were more likely to survive. Relationships among partners can also influence performance. For example, Lavie (2007) found that ties with partners that compete with each other improve focal firm performance by enhancing bargaining power

vis-à-vis these partners. Research also suggests limits on strong ties. That is, portfolios with balanced tie strength are high-performing, with strong ties enabling rich and efficient exchanges and weak ties offering flexibility and new information (Rowley et al., 2000). For example, Uzzi (1997) found that garment manufacturers who had both strong ties that enabled mutual adjustment and rich information and weak ties that kept the firms linked to market changes were more successful.

Finally, network research also has implications for the attributes of high-performing portfolios. A key finding is that, as firms develop more *central network positions*, they accrue resource and information benefits that enhance their ability to identify and gain the best partners. The implication is that portfolios that put firms in central network positions perform well (Rowley et al., 2000). In keeping with this theoretical logic, Powell et al. (1996) found that firms that became more central within the biotechnology industry (and thus had portfolios with higher network centrality than those of other firms) achieved greater growth. Bae and Gargiulo (2004) extended this finding to show that firms with central portfolios are particularly able to achieve the benefits of ties to prominent partners because centrality provides superior information and tie flexibility and thus lessens power asymmetry.

Although research offers a clear view of the attributes of high-performing portfolios, it is unclear how firms originate these high-performing portfolios. Rather, the extensive literature describes what individual ties form, and with whom (Eisenhardt & Schoonhoven, 1996; Gulati, 1995; Katila, Rosenberger, & Eisenhardt, 2008), and how networks of ties evolve (Gulati & Gargiulo, 1999; Hallen, 2008; Powell et al., 1996). Nonetheless, the descriptive literature has implications for how high-performing portfolios might emerge. One possibility is *resource dependence* theory. Building on exchange theory, resource dependence identifies interdependence as the key theoretical motivation for tie formation (Combs & Ketchen, 1999; Gulati, 1995; Pfeffer & Salancik, 1978). Specifically, when firms are interdependent, they are likely to form ties to access each other's resources and so lower resource uncertainty (Dickson & Weaver, 1997; Eisenhardt & Schoonhoven, 1996; Katila et al., 2008; Mowery, Oxley, & Silverman, 1998). This likely association implies that firms may originate high-performing portfolios by creating ties with the most appropriately endowed partners. Yet resource dependence research has also shown that balanced interdependence between two potential partners leads to actual ties (Casciaro & Piskorski, 2005). This finding suggests that firms that have or develop significant resources (Ahuja, 2000; Hallen, 2008) can gain high-performing portfolios, but less well-endowed firms cannot.

Social network theory offers a second set of implications for how firms might form high-performing portfolios, in that it indicates with whom firms form ties (Gulati, 1995). The underlying theory is that ties involve uncertainty about the quality of potential partners. Since social embeddedness between potential partners reduces this uncertainty, it increases the likelihood of tie formation—that is, firms prefer to form ties with others with which they are already connected (Burt, 1992; Gulati, 1995, 1998; Rosenkopf, Anca, & Varghese, 2001). In addition, although firms prefer ties with high-status firms because status often signals quality, they actually form ties with firms of similar status because of other firms' similar preference for the highest-status partners possible (Podolny, 1994). In the context of high-performing portfolios, social embeddedness implies that firms that are already well connected and high in status can form high-performing portfolios. But less well endowed firms can not.

Together, the resource dependence and social embeddedness theories offer a deterministic explanation of portfolio formation. That is, portfolios begin with ties between interdependent firms and then evolve through the accumulation of ties between firms that are not only interdependent, but also increasingly embedded in a network. The result is a portfolio shaped by initial resources and ties (Gulati & Gargiulo, 1999). Recent research has, however, begun to explore when firms might deviate from this logic by adding "distant" ties. Research suggests that these ties are more likely when firms face uncertainty and deviations from their performance expectations (Baum, Rowley, Shipilov, & Chuang, 2005). But these nonlocal ties are also rare. For example, Baum and colleagues (2005) found that only 9 percent of the ties among Canadian investment banking syndicates were nonlocal, implying that portfolios tend to be "path dependent" and relatively closed. Thus, extant research supports a primarily deterministic evolutionary account in which initially well endowed firms (those with superior resources and high social embeddedness) are likely to form high-performing portfolios (Eisenhardt & Schoonhoven, 1996; Gulati & Gargiulo, 1999). In other words, as noted above, extant research offers a "rich-get-richer" explanation for how firms originate high-performing portfolios.

A third possibility for explaining how firms form high-performing portfolios is through *strategic actions* based on network position. A handful of

studies indicate that effective strategic action is contingent upon network position. For example, Stevenson and Greenberg (2000) found that the network positions of community groups such as soccer clubs in a small city affected the effectiveness of political tactics (e.g., coalition building) in influencing politicians. Similarly, Hallen (2008) found that network position influences the effectiveness of a strategy of gaining investment ties for ventures. Highly embedded firms should take advantage of their embeddedness and so form ties quickly, but less embedded firms should wait until they have achievements.

Other studies suggest the role of agency and strategic action in the evolution of network position. For example, Padgett and Ansell (1993) argued that the Medici were strategically astute in taking advantage of unexpected opportunities to gain a favorable network position by forming marriage ties with elite patrician families outside their "neighborhood" and economic ties with "new men" inside their neighborhood. Powell et al. (1996) also found that biotech ventures formed high-centrality portfolios that enabled superior growth by quickly adding many R&D ties to the ventures' networks. Although these authors do not describe how firms gained these ties, they do show that forming early R&D ties is helpful. Santos and Eisenhardt (in press) found that successful entrepreneurs built ties with established firms to deter the latter's market entry. Studying two businesses within the multinational Siemens, Hoffmann (2007) showed that executives adjusted their portfolios on the basis of market contingency, forming many, weak ties in uncertain markets and few, strong ties as markets became certain. Together, the findings of these studies are consistent with the importance of agency and strategic action for creating high-performing portfolios. But they also leave open alternative explanations for strategic action, such as greater effort (e.g., Padgett & Ansell, 1993) and superior initial resources (e.g., Hoffmann, 2007; Powell et al., 1996). They also offer little insight into specific actions and their underlying strategic rationales.

Overall, the literature (1) identifies the attributes of high-performing portfolios, (2) describes which ties are likely to form as networks evolve, and (3) suggests roles for agency and strategic action in creating high-performing portfolios. But the literature does not reveal what those strategic actions might be. Thus, although the attributes of high-performing portfolios are clear, how firms actually form these portfolios is not. Clarity is absent particularly in the case of firms with limited resources and social capital. Thus, we ask, How do firms originate high-performing portfolios?

METHODS

Given limited theory about how firms originate high-performing portfolios, we conducted an inductive, multiple-case study (Eisenhardt, 1989). Inductive studies are especially useful for developing theoretical insights when research focuses on areas that extant theory does not address well and when the research question is a process one such as ours. Multiple cases are effective because they enable collection of comparative data, and so are likely to yield more accurate, generalizable theory than single cases (Eisenhardt, 1991; Yin, 1994).

The setting for our study was the U.S. wireless gaming industry, which was appropriate for several reasons. First, this industry is comprised of several types of often interdependent firms, including wireless carriers (e.g., Verizon, AT&T), handset makers (e.g., Nokia), game platform providers (e.g., Sun), brand owners (e.g., NewLine Cinema), game publishers (e.g., THQ), and game developers. For example, handset makers and carriers are interdependent because their products (i.e., phones and wireless services) are complements. Game publishers are interdependent with carriers because carriers need content such as games to promote use of their networks, while game publishers need carriers to reach consumers. Given this interdependence, portfolios are common and important in this industry. Second, the newness of the wireless gaming industry made it easier to track portfolio formation.

We studied entrepreneurial game publishers. We chose entrepreneurial firms because we could track their portfolios from their birth and so avoid "left-censoring" of data. Also, since they usually begin with fewer resources and less embeddedness than established firms (Katila et al., 2008), entrepreneurial firms are likely to use an array of strategic actions. We chose publishers because they are interdependent with several types of firms. Publishers create their own gaming content, aggregate gaming content from developers, incorporate brands, and coordinate with platforms, handset makers, and carriers. Thus, portfolios are crucial for publishers. As a publisher informant said, "You're nobody until one of the big guys [e.g., an established carrier or handset maker] loves you."

We chose 4 firms from a population of about 12 publishers that were founded as the industry began around early 2000. A key advantage of our study was that we chose firms that began at the same time with comparable resources, investors, technical excellence, and founder connections. Thus, they had a common starting position. We added 2 additional publishers founded just prior to the explosive in-

TABLE 1
Focal Firms at Founding

Firm	Metropolitan Area	Founding Period[a]	Initial Investors[b]	Founders					
				Number	Average Age	Prior Firm Function	Prior Firm Industry	Prior Firm Size	Prior Employment Connections to Wireless Gaming Firms
Starclick	Los Angeles	Early	Top ten VCs Corporate	3	39	General management Marketing Engineering	Video game Software	Large Venture	Brand owner
Topmobile	Seattle	Early	Top ten VCs	2	45	General management Marketing	Telecom Video game	Large Venture	Carrier
Cellcruise	San Francisco	Early	Top five VCs	3	45	General management	Video game	Large	Brand owner
Phonemix	Seattle	Early	Corporate (leading foreign firm in wireless services)	1	51	Marketing	Telecom	Large	Carrier and handset maker
Mobilate	Los Angeles	Late	Self	3	40	Marketing Engineering	Telecom	Venture	Platform developer
Airburst	San Francisco	Late	Self	2	27	Engineering	Video game	Venture	

[a] "Early" refers to the beginning of market emergence, i.e., December 1999–April 2000. "Late" refers to mid 2002, just prior to the rapid market growth beginning in Q4 2002 (see Appendix A).

[b] VC (venture capitalist) rankings are eigenvector centrality in the network of VCs making early-stage venture investments at the time of our study, as obtained from Hallen (2008).

dustry growth that occurred at year-end 2002. The 2 later entrants had initial endowments that were comparable to each other's. Their inclusion enabled us to potentially replicate the findings, thus improving robustness and generalizability. We tracked how these 6 rivals built their portfolios from birth until year-end 2003, when the industry "clarified," portfolios and performance were clear, and as one analyst said, "Round 1 was over." A key feature of our study is that these rivals approached many of the same partners at the same time to form ties, thus allowing an unusually close comparison of rival portfolio strategies.

For an overview of the relevant dates and events in our focal industry, see Appendix A, "A History of the U.S. Wireless Gaming Industry." Table 1 summarizes characteristics of the sampled firms at their foundings.

Data Sources

We used several data sources: (1) extensive archives, including business publications, Internet sources, and corporate materials, (2) interviews with leading experts, (3) attendance at multiple industry conferences, (4) repeated semistructured interviews with executives of the focal and partner firms, and (5) informal follow-ups with e-mails, phone calls, and observations. Triangulation of data collected from multiple sources at multiple times strengthens confidence in the accuracy of findings (Jick, 1979).

An important data source was semistructured interviews. We collected qualitative and quantitative data from ten pilot interviews conducted with individuals from several industries, and then from over 80 interviews with executives in both the focal and partner firms. A key advantage of our study is its three waves of longitudinal data collection, beginning at the end of 2002. A further advantage is that the resulting portfolios and relative firm performances were unknown when data collection began.

After pilot data collection, in each firm we interviewed four types of informants who were responsible for the formation and governance of ties. The first type comprised individuals with a broad view of a firm, typically a CEO or COO (chief operating

TABLE 2
Overview of Interviews

Firm	Number of Interviews	Title of Focal Informants	Types of Partners Interviewed
Starclick	18	CEO/founder VP marketing VP sales Chief creative officer	Carrier Handset Platform
Topmobile	17	CEO/founder President/founder VP publishing VP sales	Carrier Handset Platform
Cellcruise	17	CEO VP business development VP publishing VP licensing VP production	Carrier Brand Platform
Phonemix	16	Founder CEO President VP licensing Director of development studio	Carrier Brand Platform
Mobilate	13	CEO/founder VP marketing VP development	Carrier Handset Platform
Airburst	11	CEO/founder VP business development/founder	Carrier Handset Platform

officer). The second type comprised individuals who had responsibility for contacting potential partners, negotiating relationships, and overseeing partner relationships; a vice president (VP) of business development was a typical informant of this type. The third type, often a represented by a vice president of marketing or sales, consisted of individuals who worked with partners, especially carriers and brands, on a day-to-day basis after a tie had been formed. The fourth type, often represented by a VP of product development, comprised individuals who managed product development and so worked with game developers, platform providers, and handset makers.

We conducted our primary interviews at the focal publisher firms. Following the literature (e.g., Gulati, 1995), we defined a tie as a dyadic relationship that may or may not be based on a written contract but is of strategic significance to the partners who enter into it. The interviews ranged from 60 to 150 minutes and covered the firms' portfolio formation activities since founding or the most recent data collection. After the first data collection, we conducted two later waves at 4- to 6-month intervals to track the real-time portfolio changes. During this same 18-month period, we conducted 60–90-minute interviews with two to three key informants in major partner firms that focal firm informants identified as important partner contacts. We also conducted 60–90-minute interviews with six industry experts (e.g., journalists, investors). We taped and transcribed the interviews, most within 24 hours of their occurrence. Table 2 gives the number of interviews conducted at each firm in the sample and the titles of informants; the table also indicates what type of partner contacts of each firm we interviewed subsequent to the primary interviews. The focal firm interview guide had three sections. First, we asked questions about the background and business strategy of an informant's firm. Second, we asked the informant to describe the major events in the formation and evolution of each tie the firm had made, using an open-ended format and prompting him or her with questions such as how the opportunity presented itself, how various individuals were involved (or not), and what alternatives were considered in partner selection. We also tracked failed tie attempts. We then asked the informant to step through the key events of the relationship, describing how and

by whom these were handled. Third, we asked closed-ended questions, including a quantitative evaluation of each tie along dimensions including goal achievement, communication, trust, and conflict. In the CEO interviews, we also asked about strengths and weaknesses of a firm's current portfolio, future strategy, and anticipated changes to the portfolio. This interview structure enabled the collection of specific, factual information (e.g., dates, events, managers involved, issues discussed, deal terms) as well as open-ended narrative data (e.g., intended strategy). The partner interview guide had the same basic structure as the focal firm guide and complemented the focal firm data. The interview guide for industry experts focused on event descriptions (including ties) that these experts considered most relevant in the industry's development.

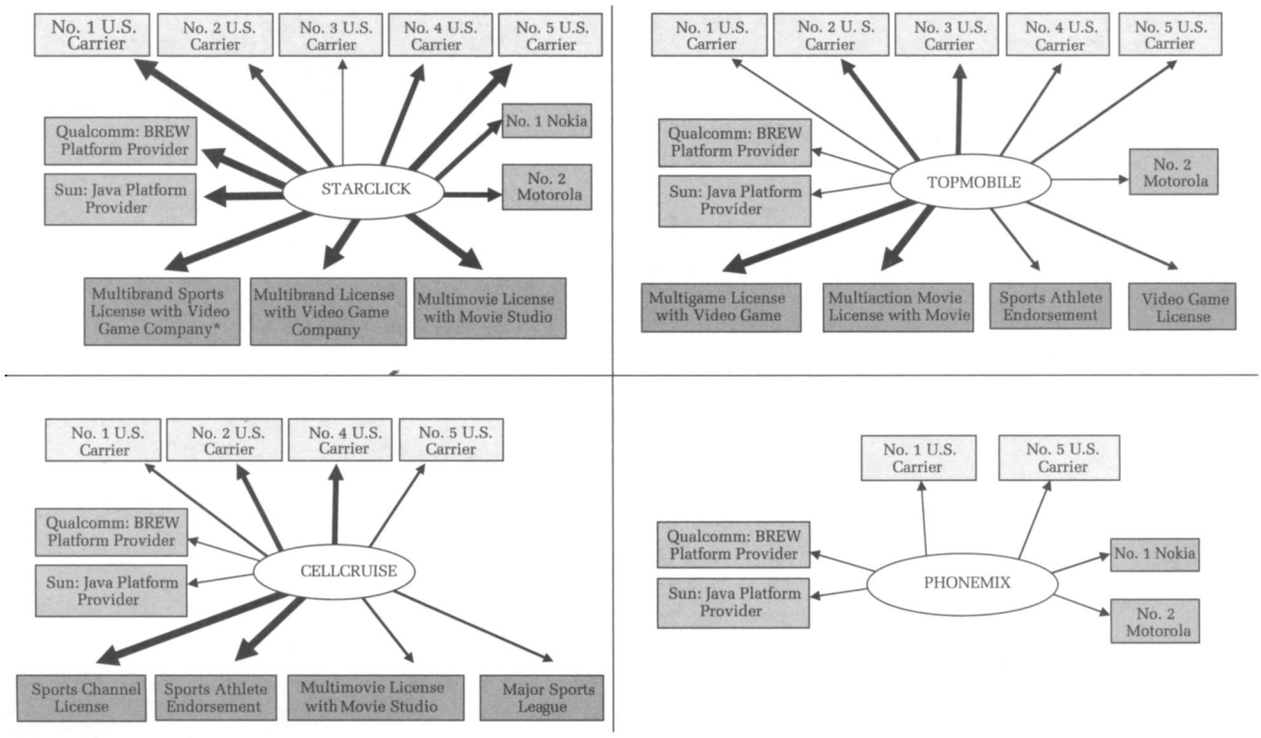
We addressed potential informant bias in several ways. First, we collected interview data in several waves over 18 months. This process enabled collection of both real-time and retrospective longitudinal data. This combination is ideal, with the retrospective data enabling efficient collection of more observations (thus enabling better grounding) and real-time data mitigating retrospective bias (Leonard-Barton, 1990). Also, we began the initial interview wave in late 2002, *before* the final portfolios and performances were known and collected poststudy archival performance data for two years *after* the study. This procedure further mitigates bias such as retrospective rationalizing about performance. Second, we used interview techniques (e.g., "courtroom questioning," "event tracking," and "nondirective questioning") that prior research has shown to yield accurate information from informants (Huber, 1985; Huber & Power, 1985). For event tracking, we put the informants back in the time frame of the events and then guided them forward through time to produce a step-by-step chronology of events (Eisenhardt, 1989). This framing typically yields accurate information. For example, informants stepped through when and how they approached potential partners, what they negotiated, and how they maintained the tie. For courtroom questioning, we emphasized facts (e.g., dates, participants, meetings) as well as open-ended narrative (e.g., intended strategy) and avoided questions that typically yield inaccurate answers, such as broad speculations (e.g., Why was your portfolio successful?). We also pressed informants to be specific when they were vague (e.g., asked for details when an informant termed a relationship "cooperative"). For the nondirective questioning, we avoided questions about specific constructs until the end of the interview. Third, we relied on informants at both focal and partner firms at multiple levels of hierarchy (e.g., CEO and VP levels) and in different functional areas. Using these diverse lenses improves the likelihood of gaining a complete, accurate picture. We also relied on informants who were particularly knowledgeable about the ties and for whom they were important and recent. Research shows that such informants are highly accurate (Kumar, Stern, & Anderson, 1993; Siedler, 1974). We also used industry experts (e.g., analysts, investors, trade journalists) as an independent source. Fourth, we promised anonymity to companies and informants to encourage candor. Finally, we complemented our interview data with wide-ranging archival and observational data. We used publications such as analyst reports and business journals; Internet publications and sources; internal sources; and observational data from three industry conferences. We also relied on an extensive database created by the major industry journal, *Wireless Gaming Review*, to add quantitative measures of performance and tie strength (described later). No method is perfect, but the steps we took likely mitigated informant and other biases and provided detailed and accurate accounts.

Data Analysis

We began by writing individual case histories including interview, observational, and archival data (Eisenhardt, 1989; Yin, 1994). We triangulated these data, emphasizing themes that were supported by different data collection methods and confirmed by several informants (Jick, 1979). We followed up with e-mails and calls to fill in missing details. The cases were about 40 to 60 pages, including quotes and timelines. Two researchers reviewed the data to form independent views of the portfolio formation process. We synthesized these views with the case history for each firm.

We then began the cross-case analysis, looking for similar constructs and themes in the cases (Eisenhardt & Graebner, 2007). Although we took advantage of opportunities to gain unique data, we began this cross-case analysis after most data had been collected in order to preserve the integrity of replication logic across cases (Eisenhardt, 1989; Yin, 1994). We used tables and other cell designs to compare several possible constructs at once (Miles & Huberman, 1994), numerous case pairings to highlight similarities and differences, and separate and combined comparisons of the two sets of firms. From the emerging constructs and themes, we formed tentative relationships between constructs (e.g., vision of industry architecture and strong

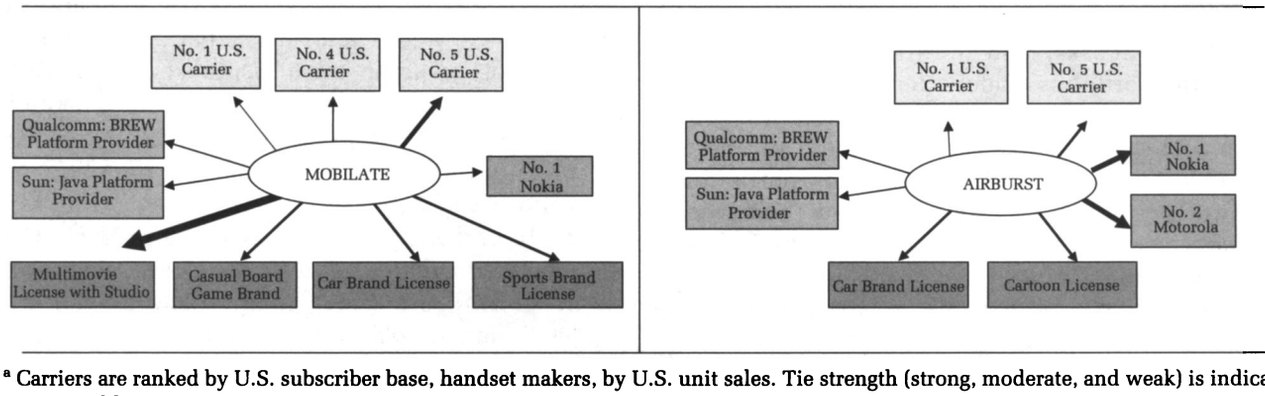
FIGURE 1A
Ending Portfolios of Main Sample[a]



[a] Carriers are ranked by U.S. subscriber base: handset makers, by U.S. unit sales. Tie strength (strong, moderate, and weak) is indicated by arrow width.

ties). We then refined these initial relationships via replication logic, frequently revisiting each case to compare and verify the occurrence of specific constructs, relationships, and logics. This iteration between theory and data helped sharpen construct definitions and measures, theoretical relationships between constructs, and underlying theoretical arguments (Eisenhardt, 1989). Given our focus on process, we also tracked event sequences in each case. As the theoretical frame clarified, we added comparison with the extant literature to highlight similarities and differences, strengthen the internal validity of findings, sharpen construct definitions and measures, and raise the generalizability of the emergent theory. We then engaged in repeated iterations among data, literature, and theory until we had a strong match between theory and data. The result is the midrange theory that follows.

FIGURE 1B
Ending Portfolios of Late Entrants[a]



[a] Carriers are ranked by U.S. subscriber base, handset makers, by U.S. unit sales. Tie strength (strong, moderate, and weak) is indicated by arrow width.

TABLE 3
Ending Portfolios of Focal Firms

	Number of Partners				Prominence of Partners			
Firm	Carrier	Brand	Platform	Handset	Carrier[a]	Average Brand Prominence	Platform	Handset
Main sample								
Starclick	5	3	2	2	Top five carriers	8.2	Same (Sun and Qualcomm) for all	Nokia Motorola
Topmobile	5	4	2	1	Top five carriers	6.9		Motorola
Cellcruise	4	4	2	0	First-, second-, fourth-, and fifth-place carriers	5.7		=
Phonemix	2	0	2	2	First- and fifth-place carriers	n.a.		Nokia Motorola
Late entrants								
Mobilate	3	4	2	1	First-, fourth- and fifth-place carriers	6.0		Nokia
Airburst	2	2	2	2	First- and fifth-place carriers	4.4		Motorola Nokia

[a] Carriers are ranked by U.S. subscriber base.

Continued on next page

Measures

Our research asks, How do firms originate high-performing portfolios? Before describing our emergent framework, we present portfolio and firm performance measures. We assessed most of these measures at the end of 2003, when firms' portfolios and firm performance were clear, and there was wide agreement that the initial phase of the industry had ended.

Portfolio performance. We characterized the portfolios using attributes that research has shown improve firm performance and were consistent with how our informants assessed effective portfolios. As noted earlier, a tie is a dyadic relationship of strategic significance to the partners that may or may not be based on a written contract (Gulati, 1995). In light of extant theory (see "Theoretical Background"), we assessed portfolio performance with multiple measures: *number of direct ties* (e.g., Baum et al., 2000), *tie diversity* (e.g., Baum et al., 2000), and *mix of tie strengths* (e.g., Uzzi, 1997); *network attributes of portfolios*: direct, eigenvector, and local centralities (Gulati, 1998; Powell et al., 1996); and *tie characteristics*: partner prominence (Stuart et al., 1999), partner importance (Gulati & Higgins, 2003), and tie strength (Powell et al.,

TABLE 3
Continued

Strength of Ties						Network Measures for Portfolios				
Carrier		Platform		Handset						
Percentage of Games Promoted	Ranking of Tie	Events	Quotes	Events	Quotations	Direct Centrality (Number of Ties)	Local Centrality	Eigenvector Centrality	Number of Strong (Mix), Prominent, and Important Ties	Diversity (Partner, Platform)
27	1.2	CEO was only publisher keynote speaker at partner conferences	They are not just the guys we ask for help from. It's a strategic relationship for us. (platform CEO)	CEO was only publisher to be a keynote speaker at partner conferences	They invite us everywhere they go. (CEO)	12	.24	.48	7 (.68), 12, 8	1.0, 1.0
15	2.3	No extra collaborations or mutual events	We only interact with them occasionally. (partner executive)	No extra collaborations or mutual events		12	.14	.25	3 (.30), 10, 9	1.0, 0.75
3	6.2	No extra collaborations or mutual events	We don't use those guys as much as we should. (CEO)	n.a.	I can't hang out with those guys. Carriers are more important. (CEO)	10	.09	.16	2 (.20), 8, 8	0.75, 0.50
0	Not in top ten	No extra collaborations or mutual events	It is not a relationship we emphasize. (Partner)	No extra collaborations or mutual events		6	.11	.14	0 (.00), 6, 2	0.75, 1.0
0	Not in top ten	Promoted Mobilate heavily on corporate website	They helped us a lot to get started. (CEO)	No extra collaborations or mutual events	They are not as crucial for us. (CEO)	10	.07	.17	1 (.10), 8, 7	1.0, 0.75
0	Not in top ten	No extra collaborations or mutual events	Only from time to time (CEO)	Member of partner forums for game development	They can help us get into the market (CEO)	6	.11	.16	2 (.30), 6, 2	0.75, 1.0

1996). Appendix B gives a complete account of these measures.

The portfolio differences are striking. Among the four early entrants, Starclick had the highest number of attributes associated with high-performing portfolios, including the most ties with diverse, prominent partners and the highest network centrality, and Phonemix had the fewest of these attributes. Of the two late entrants, Mobilate had a higher-performing portfolio (i.e., larger, more diverse, more central) than Airburst.

Table 3 summarizes quantitative characteristics and network measures of the ending portfolios of the sampled firms. The table also describes the strength of the focal ties in terms of both events and brief quotations from informants. Figure 1A diagrams the ending portfolios of the four original entrants in the sample, and Figure 1B does the same for the two late entrants.

Firm performance. We measured firm performance as follows: First, since these firms are private, we used quantitative *industry indicators* at our study's end using data from the Wireless Gaming Review. We estimated revenue as the number of "hit" games; market penetration, as the number of games and handsets per game; and profitability, as the percentage of hit games. Second, we used *quantitative rankings* by partners and industry experts of the top ten publishers in the industry. Third, we used *qualitative assessments* by the media and our

informants. Fourth, we assessed *poststudy performance* in terms of major firm events, such as an initial public offering (IPO) in the two years after our study. As it did in the measurement of portfolio quality, Starclick had the highest firm performance; it was ranked first by all informants who gave rankings, was lauded in the media (e.g., as the "star of wireless gaming"), had the highest percentage of hit games, and had the best poststudy performance (an IPO, followed by acquisition for about $700 million). Topmobile, also a relatively high performer, was ranked second. Cellcruise was a mediocre performer that informants described in words such as "second-tier," and Phonemix exited. Of the two late entrants, Mobilate was the higher performing; it was acquired for about $30 million, while Airburst exited. We now turn to our inducted framework, which offers a grounded logic to explain this striking variation in portfolios and performances.

Table 4 summarizes the sample's performance quantitatively and gives examples of the qualitative assessments we gathered from interviews.

ADVOCATING INDUSTRY ARCHITECTURE: FORMING AND STRENGTHENING FOUNDATIONAL TIES

The literature offers a descriptive account of which ties are likely to form (Gulati, 1995; Pfeffer & Salancik, 1978). The central argument from resource dependence theory is that firms with high interdependence (i.e., mutual and extensive need for the other's resources) are likely to form ties to reduce the uncertainty associated with resource dependence (Pfeffer & Salancik, 1978). Underlying this argument is the assumption that the focal construct, interdependence, is an exogenously determined property of dyadic relationships (Casciaro & Piskorski, 2005).

Our data indicate that some firms began their portfolios as this account suggests—that is, via a series of single ties with interdependent firms. But firms with high-performing portfolios did not follow this path. Rather, they advocated unique industry architectures to motivate multiple types of potential partners to form ties with them. Following Jacobides, Augier, and Knudsen (2006), we defined an *industry architecture* as a division of labor within an industry that specifies the roles of different types of firms within the industry and their interdependencies. Architecture was, then, the "blueprint" for the interaction patterns with which the partners strengthened their initial ties, shared the risk of pioneering a new market, and improved their products and prominence.

We assessed whether a firm advocated a unique industry architecture by whether both firm and partner informants agreed that the focal firm used its own view of industry architecture (a view that others did not have) to attract potential partners. We also tracked tie formation dates, events before and after formation, and portfolio, product, and financial consequences.

When the four early entrants began, around the start of 2000, the industry was highly ambiguous, and no clear understanding of industry architecture existed. As one interviewed CEO explained, "No one knew. . . . Many people had a vested interest in succeeding, but nobody knew who or what would help them succeed." Both Starclick and Topmobile (early entrants, high-performing portfolios) began their portfolios by advocating unique visions of the industry architecture. Topmobile's vision placed publishers and carriers at the core of the industry and gave their own firm a unique and exclusive gatekeeper role between carriers and other publishers. Starclick advocated a different vision, which we describe next.

Starclick executives began their portfolio by talking with several firms. Some established firms, such as AT&T, were willing to meet with the Starclick executives because they were curious about wireless gaming. A carrier executive noted, "Those guys [Starclick] came to us before some of us even knew about mobile gaming!" Soon, Starclick executives began to promote their own vision of the industry architecture, terming it a "market ecosystem." An executive noted, "At the very start we conceived of the market ecosystem. It was in the very first PowerPoints that we showed." This industry architecture was unique because it relied on strong interdependence between carriers, platform developers, and publishers (and not handset makers) as core to the industry. A Starclick vice president said, "We pitched early on that in order for you guys to succeed, we have to succeed. It really came to be that anybody who we knew that their success is going to be helped by our success, we went to." Some potential partners, especially those with their own visions, rejected this vision. For example, Sprint had a vision of carrier dominance and vertical integration in which they would publish, and Nokia advocated a handset-dominated industry. But Starclick did convince a platform firm and a major carrier about its architecture vision. Although both partners had considered doing game publishing themselves, they found Starclick's vision of industry architecture appealing because it enabled them to focus on their own businesses. So Starclick's

TABLE 4
Firm Performance

Firm	Number of Hit Games	Percentage of Hit Games	Industry Ranking	Number of Games, Number of Handsets per Game	Poststudy Performance	Qualitative Assessment (Typical Quotes)
Main sample						
Starclick	7	14	First	55 games, 8 handsets per game	Widely recognized as the industry leader	In the mobile gaming world, Starclick is held as an example of what can be achieved. Starclick is the envy of mobile gaming firms. (article)
					$150M IPO in 2004	Starclick is on top. (carrier executive)
					Acquired for about $700M in 2005	They have become their own brand. (competitor)
Topmobile	8	7	Second	102 games, 7 handsets per game	Remained a private company that continues to be a leader in the wireless gaming industry	Topmobile is quantity, Starclick is quality. (carrier executive)
						They're brash and abrasive. But they're nonetheless doing well. (competitor)
Cellcruise	1	4	Eighth	27 games, 9 handsets per game	New CEO significantly changed CC's strategy and obtained new VC financing in 2004 to fund turnaround	Cellcruise was a first-gen Starclick kind of competitor that came out at the same time. They established their business but not as successfully as Starclick. (analyst)
						We are either the last of the first tier or first of the second tier. If this were a horserace, we would be leading the second pack going around the final turn on the inside. So we are in a good position, but we're not the leaders. (CEO)
Phonemix	0	0	Not top ten	5 games, 2 handsets per game	Exited publishing business in 2004	They do some cool stuff, but they're not recognizable. (carrier executive)
Late entrants						
Mobilate	1	11	Not top ten	9 games, 9 handsets per game	Acquired for about $30M at end of 2004 by major European firm to enter U.S. market	They have done pretty well for a company that size. (carrier executive)
Airburst	0	0	Not top ten	8 games, 6 handsets per game	Exited publishing business in 2004	Not many people see us as a threat as a publisher. (CEO)

advocacy of industry architecture preempted rivalrous actions by these partners. The CEO explained:

> [The platform firm] needed applications to prove that the platform worked. [The carrier firm] needed applications to sell, because the platform alone wasn't interesting. And we brought our games to the table.

After Starclick had formed these ties, its envisioned industry architecture became the blueprint structuring the partners' interactions over many

months. One consequence of this intense collaboration was strong ties. As a Starclick VP indicated, "We had access to very senior people there [at the carrier and platform firms]. We got to be very close." Ultimately, Starclick gained exceptional marketing and codevelopment opportunities with its carrier and platform partners on a regular basis. A second consequence was that these strong ties stymied and often blocked competitors from gaining or strengthening ties to Starclick's original partners. For example, the CEO of an entrepreneurial rival complained: "Starclick gets anything they want at the carrier. It's unfair to the rest of us." An executive at Starclick's carrier partner agreed that Starclick did receive better treatment: "They were the people who were actually around and who suffered through things early on. So it doesn't bother me that they have better terms than others." These initial strong ties made it difficult to dislodge Starclick. In fact, Starclick remained the number 1 publisher on this carrier and platform provider throughout the study.

A third consequence of close collaboration was that the partners became prominent. This occurred because their structured interactions enabled them to create a superior wireless gaming experience in which consumers could very easily select, load, pay for, and play high-quality video games on their phones. The partners described this superior gaming experience as the result of the firms' strong dependence on each other. As an analyst wrote, "Although others were trying, they [Starclick and the two partners] were really the ones that combined the ability to execute with lots of games." This superior experience led to mutual financial success, which in turn made these three firms more prominent and their ties to each another more valuable. As Starclick's CEO summarized, "We were the 'unholy trinity' that made the industry." This collective success was especially helpful to Starclick. An analyst commented, "When [a carrier] launched, Starclick titles were more than 70 percent of the deck."

In contrast, Cellcruise and Phonemix (early entrants, low-performing portfolios) began by seeking ties with carriers, the firm type on which publishers were considered to be most dependent. Thus, they followed the deterministic account of tie formation and assumed a simplistic, buyer-supplier interdependence (Pfeffer & Salancik, 1978). The case of Phonemix illustrates. When Phonemix began, the plan was to perfect their games while adding ties to major carriers. But other publishers were also creating excellent games, and many publishers (although not Starclick and Topmobile) had the same dyadic view of interdependence. So Phonemix had little (if anything) unique to offer potential partners.

Phonemix was rebuffed by two of the five major carriers. One had joined Topmobile in its vision of the industry architecture, and the other had restricted its ties to established video game publishers. Phonemix formed ties with the remaining three but had difficulty gaining the attention of these busy partners. One carrier executive explained its Phonemix tie in these words: "If you're new and you want to work with us, you have to do your own promotion." A second carrier was more interested in Phonemix, but it was the smallest major carrier with the lowest marketing budget. As a Phonemix executive noted, "They work at a much smaller scale so we don't get much from them." The third carrier briefly worked with Phonemix but dropped them to focus on its stronger ties. As a Phonemix VP lamented, "We haven't achieved our goals with these carriers. We're not among the top five publishers with any of them."

Table 5 profiles each sampled firm's approach to advocating an industry architecture. Overall, we observe that Starclick and Topmobile (early entrants, high-performing portfolios) began their portfolios by advocating a unique industry architecture that defined the roles and interdependencies among multiple types of firms in a way that benefited these particular firms. Thus, they used an architectural strategy proactively to define interdependence among multiple types of firms.

The architectural strategy was effective for several reasons. First, it clarified the industry architecture for potential partners, many of whom were unsure of how and when to approach the nascent wireless gaming market. By passionately advocating a clear vision to multiple types of firms, a focal firm could mobilize less prescient potential partners to act in concert and could distribute the risks of pioneering a new market. Second, the architectural strategy structured collaboration *after* tie formation, as firms were motivated to act interdependently to realize the vision. As a result of this patterned collaboration, the partners were more likely to strengthen their ties and impede their rivals from forming strong ties with their partners. They were also more likely to achieve the advocated vision, including creating better-integrated products. This, in turn, made the partners perform better and achieve prominence within the industry.

In contrast, Phonemix and Cellcruise (early entrants, low-performing portfolios) followed the well-known path of seeking ties with the firms on which they were likely to be the most dependent. They assumed a simple view of dyadic, exogenous

TABLE 5
Advocating Industry Architecture

Firm	Vision of Industry Architecture	First Ties	Date of First Ties	Actions	Portfolio Consequences	Financial Consequences	Quotes
Main sample							
Starclick	Carriers, platforms, and publishers are the most important firms and have high interdependence with each other.	Carrier and platform	Q4 2000	Approached all five major carriers and platforms. One carrier and platform agreed to industry architecture. Worked together to realize the architecture on an integrated gaming system.	Strong ties with partners. After financial success, the partners gained prominence.	Financially successful gaming system that rode revenue surge in Q4 2002.	Those guys [Starclick] introduced us to the market. (partner) We were the 'unholy trinity' who made the industry. (CEO)
Topmobile	Carriers control consumer access but do not understand wireless. So a gatekeeper publisher provides exclusive gaming services for carriers that other publishers must use.	Carrier and other publishers	Q2 2001	Approached all five major carriers and other publishers. One carrier accepted TM's industry architecture as did several publishers. Worked together to realize the architecture on an integrated gaming system.	Strong tie with carrier. After financial success, Topmobile and the carrier partner gained prominence.	Financially successful gaming system introduced in Q1 2003.	We became this carrier's backbone in games. It's been a great relationship. (VP marketing)
Cellcruise	Publishers are suppliers to carriers.	Carriers	Q2 2001	Approached all five major carriers and gained four ties. Could not strengthen ties.	Weak ties with four major carriers.	Modest financial success.	We wanted to have a central distribution channel first and so we went after carriers first (VP marketing)
Phonemix	Publishers are suppliers to carriers.	Carriers	Q2 2002	Approached all five major carriers and gained three ties. Lost one tie. Could not strengthen ties.	Weak ties with two major carriers.	Modest financial success with smallest major carrier.	We've had a great relationship with these guys (no. 5 carrier), but they are just not very important in gaming. (president)
Late entrants							
Mobilate	Commonly understood industry architecture when founded.	Carriers, platforms and brand owners	Q2 2002	Used strategies in findings 2 and 3.	n.a.	n.a.	n.a.
Airburst	Commonly understood industry architecture at founding.	Handset maker	Q2 2002	Approached several major carriers but rejected. Shifted to handset makers.	Moderate ties with two major handset makers.	Handset makers not very important.	These carriers weren't accepting any new publishers by the time we approached them. (CEO)

interdependence and undertook serial formation of single ties. But this was ineffective. Even when these ventures gained ties, they often could not capture their partners' attention because they offered too little in the exchange relative to others. For example, established publishers from the video game industry had greater resources and embeddedness, and entrepreneurial rivals with unique industry architectures offered a clarifying vision of an ambiguous industry that mobilized action and orchestrated multiple types of interdependent partners.

Proposition 1. Compared to firms that pursue a series of single ties, firms that advocate and execute unique industry architectures (i.e., firm roles and interdependencies) are more likely to (a) form portfolios with high-performing attributes and (b) achieve high firm performance.

COORDINATING DIVERSE PARTNERS: LONG JUMPS TO NEW REGIONS OF THE NETWORK

The descriptive account of portfolio evolution begins with the formation of ties between interdependent firms (Pfeffer & Salancik, 1978) but then emphasizes the increasing importance of direct and indirect ties. The central argument is that firms form ties with partners with whom they already have direct or indirect ties because these embedded ties lower relational uncertainty about the quality of potential partners. The focal concept is embeddedness (Granovetter, 1992; Uzzi, 1997).

We observed that some firms expand their portfolios as this deterministic account suggests—that is, they use existing ties as stepping-stones to new ties. But the firms with high-performing portfolios studied here also deviated from this account by sometimes taking "long jumps" to new regions of the industry network. They deviated from the "path-dependent" trajectory of existing ties to address unbridged structural holes between firms unconnected to themselves or to each other. They then cycled between potential partners to form ties based on the *prospect* of a tie between themselves and the other potential partners. Once ties were formed, the focal firms selectively strengthened some ties by further mediating between their partners, making the ties more resistant to competition and enhancing financial performance.

We assessed whether the studied firms used a coordinating strategy by whether information from both a focal firm and its partners agreed that the focal firm had attempted to form ties with unconnected partners that were based on the prospects of ties between the focal firm and other potential partners. We also tracked tie formation dates, key events before and after tie formation, and portfolio and firm performance consequences.

Starclick and Topmobile (early entrants, high-performing portfolios) used a coordinating strategy to expand their portfolios beyond their initial foundational ties (Proposition 1). But we illustrate with the case of Mobilate (a late entrant) because a coordinating strategy with long jumps helped that firm to overcome its late entry and limited resources. When Mobilate began in 2002, the industry was clarifying, and many potential partners already had ties. As a Mobilate founder explained, "[Potential partners] already had their favorites picked out, they didn't even want to talk to anyone else." But Mobilate executives realized that they could enhance their firm's value as a partner by offering a "unique embeddedness" in which they would join different types of firms—firms that wanted to be coordinated but had not yet figured out how to coordinate, given their lack of contacts, limited time, or disparate business cultures and languages that made communication difficult. Mobilate identified brand owners and carriers as types of firms for which a coordinating strategy might work because these types of firms had not partnered in the past. So Mobilate simultaneously contacted carriers and brand owners, letting them know that Mobilate had had a discussion with the other party, although there was no actual tie with any firm. As the CEO told us,

> We saw that carriers were just figuring out how great branded games were selling and brands were saying, hey, this is a good marketing channel.

A senior executive further described this situation:

> We would tell [carriers] that we were negotiating with this huge brand and that we would work with them first if they would promote our game. Then, we would tell the other guys that [carrier] was going to promote the game if they licensed it to us. Back and forth like that.

During four months in mid 2002, Mobilate increased the interest of several carriers and brand owners in forming ties with the firm so that it could coordinate between them. As a result, despite its late entry and limited resources, Mobilate formed ties with several carriers and well-known brand owners. A VP explained: "[Brands] are why the carriers kept talking to us and vice versa."

After forming these ties, Mobilate executives continued going back and forth between the partners to further coordination and strengthen the ties. For example, when Mobilate completed their first game with a well-known brand partner, they worked with a key carrier partner to promote the game. When the game had gained sufficient sales, Mobilate went back to the brand owner to negotiate for more branded games and joint advertising. Mobilate repeated this "virtuous cycle" of strengthening ties by going back and forth between carriers and brand owners. The CEO said, "The negotiations with the brand owner and the carrier coevolve. You talk to both. Whenever you see a match, you strike the deal."

In contrast, Cellcruise, Phonemix, and Airburst (low-performing portfolios) either did not quickly expand their portfolios (e.g., Phonemix delayed) or used existing ties as stepping-stones to new ones (e.g., Cellcruise, Airburst) as the well-known embeddedness argument suggests (Gulati, 1995). We illustrate with Cellcruise (early entrant). Cellcruise executives began their portfolio by using founder and investor ties to form carrier ties. They began with carriers because carriers (with their control of

customers) were widely seen as the most crucial dependence for publishers. In line with the descriptive account of deterministic evolution (Gulati & Gargiulo, 1999), Cellcruise planned to gain carrier ties first, and then use them as stepping-stones to other partner types, such as handset producers and brand owners. A Cellcruise VP noted, "It was a conscious decision to go after carriers first. We wanted to get them first, and have something to show when we talked to other people." Given that Cellcruise founders were highly regarded from their success in the video game industry and had ties with very prominent venture capitalists, Cellcruise easily formed carrier ties. A VP said, "The carriers were just starting out, so they were very receptive back then and our founders were very well-regarded." By late 2001, Cellcruise had ties with four major carriers. The plan was on track.

Cellcruise next pursued brand ties by leveraging their existing carrier ties as planned. But they did not realize that Cellcruise was developing a mediocre reputation among their carrier partners. The executives first attributed the carriers' lack of interest to the market's being too young. Only later did they realize that rivals like Topmobile and Starclick had been able to strengthen their ties (e.g., joint marketing and game development) with carriers by also bringing other partners, such as brand owners, to the ties. A carrier VP confirmed the carriers' preference for publishers with greater value, such as possible ties to brand owners:

> Games that are more recognizable will be placed towards the top of the deck just because they have a much more healthy chance of driving revenue and getting people interested. A game like "Wheel of Fortune" is going to do a lot better than "Word Mix"; it's got a branded name, people know it.

In addition, Cellcruise executives recognized that their mediocre reputation among the carriers was also making brand owners reluctant to form ties with Cellcruise. A brand owner explained: "If we don't know how a publisher will perform, we typically ask for a large up-front payment to cover our risk." Cellcruise was delayed and often forced to pay large, up-front fees to brand owners for ties. In contrast, rivals like Starclick that used a coordinating strategy often received better deals, including waivers of up-front fees.

Once Cellcruise had brand ties, challenges remained. Because Cellcruise was delayed, more rivals like Mobilate had emerged to compete for the carriers' attention. Cellcruise was disadvantaged in this competition by its lingering reputation. It was also time-consuming to convince carriers that Cellcruise now had brand ties. A VP said, "We had to keep telling [carriers] we were working with [brand owners]." Cellcruise did solve these problems, but it never caught up to Starclick and Topmobile.

Table 6 outlines the sampled firms' varying approaches to coordinating their partners. Overall, Starclick, Topmobile, and Mobilate (high-performing portfolios) used a coordinating strategy by proactively cycling between potential partners, offering the prospect of mutually beneficial ties. This strategy proactively defined embeddedness in terms of prospects for ties. For early entrants (Starclick and Topmobile), this strategy enabled expansion of their portfolios to new regions of the industry network without constraint by their initial ties. For late entrants (Mobilate), this strategy was very helpful at a time when it was probably too late for a unique industry architecture to be a viable strategy.

A coordinating strategy is effective for several reasons. First, a firm is able to lower uncertainty about its quality as a partner by proactively defining its own embeddedness, on the basis of the prospect (not the reality) of ties. Second, the focal firm solves the "action problem" that often faces unconnected firms. As Obstfeld (2005) noted, actors often fail to connect because they have limited time, do not know each other, or have very different business cultures and languages; these conditions constitute an action problem. Coordinating strategy enables the focal firm to solve this action problem for its potential partners by saving their time and translating their cultures and languages for each other (for instance, mediating between carriers and entertainment brand owners). This process enhances tie formation. Third, it enables firms to make long jumps to rapidly expand their portfolios to new regions of a network. Since they are not limited to the path-dependent trajectory of existing ties, firms can create tie diversity and extend to new network regions more quickly than if they just stepped from one tie to the next. Finally, this strategy is effective because firms can strengthen pairs of ties by cycling between their partners, creating positive feedback that makes these ties stronger and more difficult for rivals to dislodge. This reinforcing virtuous cycle also synchronizes operations (e.g., joint branding) that can be mutually advantageous, and in turn, can lead to superior financial performance and industry prominence.

In contrast, Cellcruise and Airburst, in line with the well-known deterministic account of embeddedness, used existing ties to form new ties (Gulati, 1995). But although all firms sometimes used this approach, it was not always ef-

TABLE 6
Coordinating Diverse Partners

Firm	First Pairs by Partner Types	Date of First Pair	Actions	Portfolio Consequences	Financial Consequences	Typical Quotes
Main sample						
Starclick	Brand and carrier	Q3 2001	Approached major carriers and brands with prospect of ties. Formed ties and strengthened some of them. Later, repeated with brands and handsets. Still later some three-way ties	Added more and diverse ties, strengthened ties selectively. Increased centrality and prominence	Gained revenue with joint game development, joint promotions and other joint activities.	We went to every carrier and used the lure of Tiger Woods and so on as the draw. It's ultimately why [other carriers] worked with us because, hey, they could've gotten a crappy golf game from anyone, but they couldn't have gotten these brands from anyone else. (CEO)
Topmobile	Brand and carrier	Q3 2001	Briefly attempted to leverage carrier ties. But quickly copied Starclick coordination logic.	Added more and diverse ties, strengthened ties selectively. Increased centrality and prominence.	Gained revenue with joint promotions, and joint game development.	We focused heavily on distribution [carriers] and brands (VP business development)
Cellcruise	None	n.a.	Never used this approach. Instead, planned to leverage carrier ties to brands and handsets ties. This did not work because of poor reputation. Finally gained brand ties by paying a lot, and then went back to carriers to strengthen ties.	After delay, added brand tie, improved reputation, and strengthened some carrier ties.	Stalled revenue. Forced to pay a lot for brands. Later recovered but was behind Starclick and Topmobile.	It started out well, but we didn't get as much from them [carrier partners] as we hoped (VP business development)
Phonemix	None	n.a.	Never used this approach. Focused on initial carrier ties. Much later elaborated portfolio by adding handset ties.	Little improvement to portfolio	Limited financial success.	They [carriers] were the most important partners (president)
Late entrants						
Mobilate	Brand and carrier	Q3 2002	Similar to Starclick coordination logic with brands and carriers.	Began portfolio with these ties. Strengthened ties selectively Increased centrality and prominence	Gained revenue including joint promotions, and partially overcame late entry into market.	The negotiations with the brand owner and with the carrier coevolve. You talk to both of them to see whether the concept sells. And if you see a match, you strike the deal! (CEO)
Airburst	None	n.a.	Never used this approach. Approached carriers and brands independently after gaining initial handset ties.	Little improvement to portfolio.	Limited financial success.	We approached carriers and brands, but our competitors had already secured all those relationships (CEO)

fective, because existing ties may be poor or may not lead to the most valuable potential partners. The path dependence of this approach also constrains firms to incremental tie formation in local regions of their industry network. Finally, prior ties may offer less value to potential partners than rivals that are forming ties between multiple partners at the same time may attain, either by coordinating between unconnected firms (Proposition 2) or advocating a unique industry architecture (Proposition 1). Finally, as Phonemix shows, delay is especially damaging because it

becomes difficult to add new partners when potential partners already have sufficient ties and unbridged structural holes are less abundant.

Proposition 2. Compared to firms that only use existing ties as stepping-stones to new ties, firms that form ties with two disconnected firms by using the prospect of a tie with the other firm and cycle between them are more likely to (a) form portfolios with high-performing attributes and (b) achieve higher firm performance.

PROBING INDUSTRY UNCERTAINTIES: VARYING TIE DEPTH WITH SEQUENTIAL ATTENTION

Prior research has noted a trade-off between the number and strength of ties whereby firms can manage many weak ties or a few strong ties (Hansen, 1999). Weak ties are advantageous in the search for new information, and strong ties are suited to parties' working closely together. This trade-off is particularly acute when firms face industry uncertainties, such as marketing questions (e.g., Who are the customers?) and technical issues (e.g., Which technical standards will prevail?). Uncertainty makes it challenging to anticipate the best partners and yet does not lessen the value of strong ties for rich, efficient exchange.

Several firms approached this trade-off by favoring a small number of strong ties, allowing them to work more effectively with their partners. So they picked particular marketing and technical standards partners that fitted either their own strengths or their beliefs about the likely resolution of industry uncertainties. They often knew the risk of choosing the wrong partners but believed in the necessity of strong ties to compete effectively. Firms with high-performing portfolios avoided these bets. Rather, they simultaneously formed multiple ties to cover alternative resolutions of uncertainty. But since managing many ties is demanding (Hansen, 1999), these firms also used an unusual approach to tie execution. They shifted their attention back and forth via what we term "sequential attention"—that is, they worked closely with those partners that were active at a given time, while simultaneously communicating frequently with other partners to signal ongoing commitment. By using sequential attention, firms managed to create a higher number of strong ties by creating the illusion of constant attention to their partners.

We assessed whether firms probed uncertainties with multiple ties by first identifying major industry uncertainties from our informants (especially industry experts) and the media. We identified two: game genres and technology platform standards. We then counted the ties related to each uncertainty. For game genres, we counted the number of distinct game genres in which a firm had brand owner partners (e.g., sports, action movies, and board games). For platform standards, we counted ties to the two standards providers: Sun (Java) and Qualcomm (BREW). From firm and partner interviews, we tracked tie formation dates; events before and after tie formation, including use of sequential attention; and portfolio and financial consequences.

Although Starclick (the early entrant with the highest-performing portfolio) and Mobilate (the late entrant with the higher-performing portfolio) simultaneously formed multiple ties to probe industry uncertainties, we highlight Starclick. Starclick's founders believed that a key uncertainty was game genre, since wireless gaming was a novel experience for which it was unclear who the consumers would be (for instance, traditional gamers or "over-40's") and which genres they would buy. Recognizing this uncertainty, Starclick simultaneously formed ties for sports, action movie, and several video and board game brands in late 2001. A cofounder explained,

> We went out and got as many brands as we could to build a big portfolio. We went to everybody. We had partnerships with everybody. We got Scrabble, Tiger Woods. . . . We got everything. We were very aggressive.

As games started selling in 2002, industrywide sales information was still poor. Publishers had no information (beyond their own sales) from carriers about best-selling genres because carriers either did not track this information or kept it for themselves. But since Starclick had multiple game genres, the firm gained unique, early information. As the CEO said, "We had all these different games out, so we knew which ones sold more at any point in time." A cofounder further explained,

> A lot of our competitors think, oh, this would be really cool to have on a phone, but they don't understand that it's not a complete mass market, it's very distinct. We wanted to understand what the users are doing, how they're going to react to this new environment. Going after different brands gave us a really good insight as to what people are really going to do. So whenever you go to meetings with carriers and handset makers and platforms, you can have all kinds of stats.

This information enabled Starclick to adjust its portfolio by adding brand ties in winning genres such as simple board games and by pruning ties in less popular ones such as sports. This more appropriate set of brand ties made Starclick a more valu-

able partner. For example, when its carrier partners realized that Starclick had unique information about what was selling (and what was not), they moved to strengthen their ties with Starclick by loading more Starclick games onto their phones, doing more joint marketing, and giving Starclick games better "deck placement," which is key to game sales on phones. A carrier executive said, "Starclick is our number one publisher. They know the market very well." Of course, a few prominent firms wanted exclusivity, but they tolerated Starclick's polygamy because of the firm's superior information. Starclick's CEO described an example:

> We were penalized for our support of [partner A] because [partner B] is jealous of their competitors. For a while [B] supported our competitors, but they came back to us because we're doing great.

So although some partners preferred exclusive ties, most of them preferred ties with the most prominent publisher partners, one of which became Starclick.

Starclick also used multiple ties to probe a second uncertainty: platform standard. Most experts initially believed that Sun's Java standard would dominate because Java had been wildly successful on other continents and in other applications. It was also the choice of the pioneering carriers in wireless gaming (e.g., Sprint). For example, a Cellcruise VP said, "We looked at Europe, we looked at Asia, and said 'Java is the way to go.' " But in the United States, a new platform (BREW) was emerging. Starclick tied with Qualcomm (BREW's owner) early on. But they also tied with Sun (Java's owner) and created strong ties with both, including joint development and "beta testing." The CEO explained:

> We went to Qualcomm [BREW], and then we couldn't not go to Sun [Java] because we had to show, look, we're not just going to develop for one platform, we're going for both. Because otherwise we would have been labeled a BREW provider. So we had to have both.

This decision required Starclick to adapt its games to both platform standards and so mandated significant effort beyond simply maintaining a tie with one platform partner. The CEO explained, "We knew this was the right thing to do, but the problem was how to do it." Indeed, the key dilemma was how to maintain ties to both platforms, especially since the venture had few resources in 2001, when these decisions were made. Starclick resolved this dilemma with sequential attention, working very closely with the platform partner that was more active at a given time (e.g., closer to the launch of a new platform version) and simultaneously maintaining communication with the other platform in order to maintain the tie. For example, when Qualcomm was closer than Sun to launching a new platform, Starclick focused on Qualcomm and the BREW carriers and worked closely with them to produce many BREW games. As a partner recalled, "Starclick was very much involved in getting BREW off the ground." Yet they kept communicating with Sun and the Java carriers, albeit at a lesser level. A Starclick VP sketched how:

> We exchanged phone calls, spoke at Java conferences, made ourselves visible in the Java world in every way we could. Staying close and in their mind really can get you good opportunities later on. They remember you.

Later, when there was a new version of the Java platform, Starclick switched from emphasizing its ties with Qualcomm and other firms tied to BREW to focusing on its ties with Java partners.

In contrast, Topmobile, Phonemix, Cellcruise (early entrants), and Airburst (late entrant) did not use a probing strategy. Rather, they either focused on a few partners in order to develop needed strong ties while keeping their total number of ties manageable (Topmobile, Phonemix, Cellcruise), or formed multiple ties but did not manage them effectively because they lacked sequential attention (Airburst). In the former case, these firms acted consistently with the well-known notion that there is a trade-off between the number and strength of ties (Hansen, 1999). Topmobile is an especially intriguing example. Although both Topmobile and Starclick advocated unique industry architectures (Proposition 1) and cycled between potential partners with the prospect of ties (Proposition 2), Topmobile's focusing on a few strong ties to address industry uncertainties was its pivotal portfolio error in its rivalry with Starclick.

Although Starclick simultaneously formed ties with brand owners in multiple genres, Topmobile focused on action movie ties. According to a VP, one reason was this: "Action movie brands have always been popular in the video game market, and so we think they will be popular in wireless gaming." This focus also simplified game development and partner management. Thus, when Starclick was forming its first brand ties in several genres in late 2001, Topmobile focused on ties to brand owners of popular action movies. As industry revenues began in early 2002, the winning game genres were unclear. But by late 2002, it became apparent that action movie games were not appealing. A carrier executive explained, "Action-packed games take up a lot of memory and don't give a satisfying consumer experience on a small screen." Rather,

TABLE 7A
Probing Strategy: Using More Ties and Sequential Attention to Cope with Uncertainty in Game Genres

Firm	Dates of First Ties by Genre	Time between Ties[a]	Actions	Portfolio Consequences	Financial Consequences	Typical Quotes
Main sample						
Starclick	Q2 2001: Sports Q3 2001: Action movie Q3 2001: Video game Q3 2001: Board game	1 0 0	Add multiple game genre ties to gain information on consumer preferences. Use sequential attention to manage resource demands with brand owners. Shift attention to popular genres.	Based on this information, add/strengthen ties in popular genres, drop ties in less popular genres. Became more central and prominent.	Became publisher with most games on carriers' top ten list.	Almost all of our games are promoted on some carrier's deck right now. (VP marketing) They know the market very well. (carrier executive)
Topmobile	Q3 2001: Action movie Q1 2003: Video game Q2 2003: Sports	6 1	Focus on action games by adding action movie brands because they sold well in video game industry.	During industry takeoff, missed most popular genres. Could not strengthen carrier ties in this period. Went after brand ties in more genres.	Revenues suffered, but recovered with some hit games.	For some unknown reason, consumers didn't like action movie games. That was a big surprise to us. (president)
Cellcruise	Q2 2002: Sports Q2 2003: Movie	4	Focus on sports games by adding sports network brands and athlete endorsements because fits with founders' expertise.	During industry takeoff, missed most popular genres. Could not strengthen carrier ties in this period. Went after brand ties in more genres.	Revenues suffered but recovered and had one hit game.	Cellcruise delivers good sports games, but they still haven't figured out how to do other kinds of games well. (carrier executive)
Phonemix	None	n.a.	Pursue several game genres, but publish unbranded games.	PM had no brand ties. This contributed to their problems in gaining and strengthening ties.	No hit games. Revenue and reputation suffer.	We didn't pursue a branded game strategy. (president)
Late entrants						
Mobilate	Q3 2002: Board game Q3 2002: Car Q1 2003: Movie Q1 2003: Sports	0 2 0 0	Add multiple game genre ties to gain information about consumer preferences. Use sequential attention to manage resource demands. Shift attention to most popular genres.	Despite its late entrance, ML formed surprisingly high-performing portfolio partially because of this information.	Despite late entrance, became a visible publisher with a hit game and some carrier promotions.	We target several customer segments [via different brand genres]. Our games are doing so well. (CEO)
Airburst	Q3 2003: Car Q4 2003: Cartoon	1	Pursue music and sports genres with unbranded games. Did not sell enough to learn much. After uncertainty resolved, added 2 inexpensive brands.	Little improvement to portfolio.	No hit games. Revenue and reputation suffer.	I can only go after brands that are cheap. And even then, I can't get any of them. (CEO)

[a] Number of financial quarters.

since consumers were playing wireless games in short bursts (for instance, while waiting at the airport), they liked simple games. These games were also well-suited to the small phone screen. Publishers like Starclick with ties in multiple genres learned this information early. But since Topmobile had only action movie games, its executives knew only that their own games were not selling, but not why (Was it slow consumer adoption in the entire industry? Wrong game genre? Another factor?).

During the critical period of early 2003, when industry sales exploded, Topmobile had the wrong games. The major carriers turned to publishers such as Starclick that offered game genres that consumers were actually buying. This development favored Starclick and Mobilate, yet publishers like Topmobile, Phonemix, and Cellcruise were stymied. As a carrier executive indicated, "Some publishers still don't realize that consumers like what they can manage. Their games are way too difficult to play on a phone." Once Topmobile realized the error, they formed ties with brand owners in appropriate genres. But by then, Starclick had already used their superior infor-

TABLE 7B
Probing Strategy: Using More Ties and Sequential Attention to Cope with Uncertainty in Game Platforms

Firm	Dates of First and Second Ties	Time between Ties[a]	Actions	Portfolio Consequences	Financial Consequences	Typical Quotes
Main sample						
Starclick	Q4 2000 Q4 2000	0	Tie to both platforms to gain unique information. Tight integration with platforms is important. Sequential attention to manage resource demands.	Participated in launch of both platforms and strengthened ties with both.	Became prominent publisher for both Sun (Java) and Qualcomm (BREW).	[Java and BREW providers] were going to supply the platforms, and in many cases they were going to provide the commercial systems we were going to sell through so we figured these guys were going to be our deal partners. (CEO)
Topmobile	Q1 2001 Q2 2003	9	Java will be the dominant platform and so focus on it.	Late to create ties with BREW firms, then only able to form weak tie.	Missed BREW take-off and made little money from BREW.	We made a mistake in BREW. We thought Java would be the winner. We didn't think a small carrier solution would become so successful. (president)
Cellcruise	Q3 2001 Q3 2003	8	Java will be the dominant platform and so focus on it	Late to create ties with BREW firms, then only able to form weak ties	Missed BREW take-off and made little money from BREW.	It looked like there would be a lot more Java. So we got caught off-guard by that. We didn't see what BREW could become. (VP business development)
Phonemix	Q1 2001 Q3 2003	10	Java will be the dominant platform and so focus on it	Late to create ties with BREW firms. Did not strengthen ties w/either platform.	Missed BREW take-off and made little money from BREW.	When Qualcomm first came out with BREW, I really thought they were running up against a massive battle against Java. Because of my experience, I thought Java was the world. (founder)
Late entrants						
Mobilate	Q3 2002 Q2 2002	1	Both platforms may be important and so tie w/both. Sequential attention to manage resource demands	Able to moderately strengthen Qualcomm (BREW) tie.	Success of BREW helped Mobilate partially overcome the disadvantage of a late entry and limited resources.	We were lucky to have invested in BREW because we had no idea it was going to be so big. (CEO)
Airburst	Q3 2002 Q1 2002	2	Both platforms may be important and so tie w/both. Did not cope with resource demands via sequential attention.	Pursued both platform ties, but could not strengthen them because failed to use sequential attention. Ended up with weak ties.	Did not fully participate in BREW takeoff and made little money in Java and BREW.	We got the partnerships, but we didn't have the resources to maintain the relationships. (CEO)

[a] In number of quarters.

mation about genre preferences to improve their portfolio and sprint ahead of Topmobile.

For platform uncertainty, Topmobile also initially focused on Sun (Java). Given Java's global success and its adoption by pioneering wireless carriers (e.g., Sprint), Topmobile believed that Java would dominate wireless gaming. But when a BREW carrier planned to "kick start" the industry by dramatically discounting game-enabled handsets in late 2002, Starclick learned this information (not widely available) because of its BREW ties to Qualcomm (a BREW platform developer) and BREW carriers. Starclick switched its attention to these partners. When the "kickstart" occurred in late 2002, the resulting sales surge helped Starclick. An analyst described the situation: "During the hol-

TABLE 8
Portfolio Timeline

Firm	Market Emergence (1999–2001)	Market Transition: Market Gains Clarity and Takes Off (2002)	Market Growth (2003)
Starclick	Advocated industry architecture to form base of strong initial ties with a major carrier and platform provider, Qualcomm (BREW) (Proposition 1). Elaborated portfolio with coordinating tie between carrier and brand (Proposition 2). Formed Sun (Java) tie and brand ties in multiple genres, used sequential attention to manage platform and brand ties (Proposition 3).	Elaborated portfolio with coordinating ties between carriers and brands (Proposition 2). Developed games with brand owners in multiple game genres, used sequential attention (finding 3). Major success of gaming system during take-off in Q4. Used carrier tie to gain ties with two major handset makers.	Elaborated portfolio with coordinating ties with carriers and brands, handset makers and brands (finding 2). Continued sequential attention (finding 3) Prune ties to less popular brand genres, add ties to more popular brand genres (finding 3). Became no. 1 ranked publisher.
Topmobile	Advocated industry architecture to be the gatekeeper to a major carrier, forming strong initial tie with this carrier and ties with several publishers (Proposition 1). Elaborated portfolio with coordinating tie between carrier and brand (Proposition 2). Formed only Sun (Java) and action movie ties.	Elaborated portfolio with coordinating ties between carriers and brands (finding 2). Developed games with action movie brand owners. Used carrier tie to gain tie with one major handset maker.	Major success of gaming system during take-off in Q1. Added Qualcomm (BREW) and BREW carrier ties after platform standard clarified. Could not strengthen. Add ties to popular brand genres after game genre clarified.
Cellcruise	Formed a series of weak ties with four major carriers. Unsuccessfully leveraged carrier ties to brand ties. Formed only Sun (Java) and sports brand ties.	Due to weak ties with carriers, delayed and forced to pay a lot for brand ties. Developed games with sports brand owners.	Added Qualcomm (BREW) and BREW carrier ties after platform standard clarified. Could not strengthen. Added ties to popular brand genres after game genre clarified.
Phonemix	Formed a series of weak ties with three major carriers. Formed only Sun (Java) platform tie and had unbranded strategy.	Continued to focus on creating games and improving carrier ties, modestly successful with smallest carrier. Lost a major carrier tie	Added Qualcomm (BREW) tie after platform standard clarified.
Mobilate	-	Used coordination logic to form ties between carriers and brands (finding 2). Added multiple genre brand ties, Sun and Qualcomm platform ties, used sequential attention (finding 3).	Continued to use coordination logic and sequential attention (findings 2 and 3).
Airburst	-	Added major handset tie after rejected by major carriers. No coordination logic, and so could not afford brands. Added Qualcomm and Sun ties, no sequential attention .	Used handset tie to gain two weak carrier ties. Added two inexpensive brand ties after game genre clarified. Very low sales

iday season of 2002, [BREW carrier] did this buy-one-get-one-free deal with their new game-capable phones. That really turned the market upside down." But although Starclick anticipated these actions, Topmobile was surprised and had to scramble to form ties with Qualcomm and the BREW carriers. Although the firm formed some of these ties, they struggled to match the tie strength of the early partners like Starclick. A Topmobile VP said, "[Starclick] has been with them [Qualcomm and the BREW carrier] from the beginning, so they know them well, and have a great working relationship." A second VP lamented:

> We completely underestimated BREW. It cost us a lot of money. We still have to make up for it. We

would have developed BREW in parallel with Java if we knew how big it was going to be. Our relationship with them [Qualcomm and its partners] is cordial, but not high level.

Tables 7A and 7B describe each sampled firm's use of a probing strategy for coping with uncertainty in game genres and platforms, respectively. Overall, Starclick and Mobilate (the early and late entrants with the highest-performing portfolios) simultaneously formed ties with multiple partners to probe these key industry uncertainties. Sequential attention, which enables firms to maintain many strong ties, was key to this approach. A probing strategy is effective because it puts firms into central network positions, where information is abundant. This superior information enables the firms to adjust their portfolios quickly and accurately as industry uncertainties resolve. These firms become well positioned to exploit the revenue surges that often accompany uncertainty resolution. With these informed portfolio adjustments, firms become more valuable partners, which, in turn, makes it easier for them to strengthen their existing ties and add desirable new partners. These firms are then more likely to become financially successful, prominent, and central.

In contrast, Topmobile, Cellcruise, and Phonemix (early entrants with lower-performing portfolios) formed a few strong ties around genre and technical standards uncertainties. They assumed a fixed trade-off between the number and depth of ties in which tie depth is static (Hansen, 1999). They did not employ sequential attention and were too optimistic about their ability to anticipate the future. These executives were, unfortunately, surprised by the actual resolution of industry uncertainties. They had the wrong partners when the uncertainties clarified and the market took off. Of course, they might have guessed right, but correctly predicting the resolution of industry uncertainties is difficult (Brown & Eisenhardt, 1997). For instance, no one interviewed in this study predicted the game genres and standards platforms that succeeded in wireless gaming. Airburst (the late entrant with the lower-performing portfolio) did form ties more broadly, but it could not manage them well with limited resources and without sequential attention.

Proposition 3. Compared to firms that form fewer ties around key industry uncertainties, firms that form multiple ties around key industry uncertainties and manage them with sequential attention are more likely to (a) form portfolios with high-performing attributes and (b) achieve higher firm performance.

DISCUSSION

We add to interorganizational network theory and the study of strategy within entrepreneurial firms by specifying a theoretical framework for *how* firms create high-performing portfolios. Research has identified the attributes of high-performing portfolios (Baum et al., 2000; Uzzi, 1997) and given a deterministic account of how networks and portfolios evolve (Gulati & Gargiulo, 1999; Powell et al., 1996). But this work leaves open the question of how firms actually originate high-performing portfolios. Addressing this gap, we explored how closely comparable rivals began their portfolios. The emergent theoretical framework explains the strategic actions by which firms originate high-performing portfolios. It makes fundamental contributions in the areas of network agency and strategy.

Network Theory: Origins of High-Performing Portfolios

Our study offers several insights for interorganizational network theory regarding the origins of high-performing portfolios. A key insight is that executives in firms with high-performing portfolios visualize their portfolios in the context of an entire network, not as a series of single ties. Thus, they have a holistic understanding of possible interdependencies among types of firms, the locations of unconnected firms, and the presence of industry uncertainties. This rich cognitive view of the industry network broadens the range of strategic alternatives from which the executives can choose and enriches their strategic possibilities. In contrast, executives in firms with low-performing portfolios have a simplistic view in which they are constrained by given dyadic interdependencies (e.g., buyer-supplier), existing social relationships, and a myopic understanding of the industry that emphasizes local ties.

A second insight regarding high-performing portfolios is the crucial logic of simultaneous multiple ties. Adding multiple ties at once amplifies the value of a firm for its potential partners beyond what the firm brings alone. So the focal firm is better able to attract partners, motivate them to form ties, and so gain an advantage over rivals that rely solely on their own resources. Adding multiple ties at once also enables the partners to create operating synergies once ties are formed. Firms can, thus, synchronize and reinforce their tie execution by cocreating well-integrated industry architectures (Proposition 1), intricately synchronizing joint activities such as new products (Proposition 2), and combining information sources to better

understand industry uncertainties (Proposition 3). In contrast, firms that serially add single ties offer less value for potential partners than rivals who also bring other partners and orchestrate operating synergies among multiple firms.

A third insight is that the well-known deterministic account of network evolution in the literature (Gulati & Garguilo, 1999) implies mediocre portfolios. That is, firms that originate their portfolios by following a path-dependent trajectory of single ties based on dyadic interdependence and social embeddedness, stepping from one tie to the next, often originate weak portfolios. Although this approach may be successful for firms with superior resources and embeddedness (i.e., the rich, who get richer), it is at its core a description of average firms building mediocre portfolios.

In contrast, our theoretical framework suggests that firms that engage in strategic actions based on making multiple simultaneous ties within a holistic industry understanding are more likely to create superior portfolios. Our contribution is to highlight agency and strategy—that is, effective portfolio strategies and related strategic actions in originating portfolios. Broadly, we emphasize that portfolios and networks are not simply exogenous creations of path-dependent trajectories. Rather, they are endogenously crafted by actors who choose to form ties with each other. Overall, portfolio success goes to those with more comprehensive views of their industry and more complete repertoires of strategies.

Table 8 summarizes the histories of our six studied alliance portfolios.

A Process Framework for Originating High-Performing Portfolios

A second contribution is our development of a *process* view of how firms originate high-performing portfolios. A key strategy initiating this process is the architectural approach to potential partners. Firms form the foundation of their portfolios by *advocating industry architectures* that define a unique interdependence that is advantageous to the focal firms and their potential partners. This strategy is effective because it clarifies roles for potential partners and mobilizes their action. Once the industry architecture is accepted, it becomes the blueprint that structures and motivates interactions among partners. These collaborative interaction patterns have critical implications for portfolio performance. They are likely to lead to strong ties with partners while impeding rivals from gaining ties with these same partners. Moreover, if a collaboration to cocreate an industry architecture is successful, the partners are likely to become more financially successful, and thus become more central, prominent, and valuable partners. The key counterintuitive point is that firms seeking high-performing portfolios need not initially form ties with the "best" partners. Rather, strong collaborations around unique industry architectures can transform initially ordinary partners into highly central, prominent, and valuable partners. Overall, advocating unique industry architecture is not only a portfolio strategy. It is also a competitive strategy, especially in highly networked industries.

A second strategy is *coordination among unconnected partners* that expands a firm's portfolio to more distant parts of an industry network. This intermediating approach defines embeddedness to include the *prospect of ties* between unconnected firms and so creates unique embeddedness between a focal firm and these potential partners. It is effective because focal firms are able to solve the so-called action problem (Obstfeld, 2005) that their potential partners face—finding each other, communicating across possibly disparate business cultures (e.g., telecom carriers and consumer brand owners), and forming a tie. Thus, by recognizing that the prospect of ties can create an illusion of embeddedness, firms can inventively take advantage of opportunities (e.g., unbridged structural holes) to form ties.

A coordinating strategy is also effective because it enables firms to take long jumps to other regions of their industry. Taking long jumps adds to their centrality and importance throughout the industry. In contrast, firms that form only local ties based on existing relationships may originate an overly cohesive portfolio and have fewer potential partners. Although these partners may be the best ones, they also may not be. Further, relying on referrals from existing ties is particularly problematic when a firm is attempting to form ties with the competitors of those current partners. Since ties to partners that are rivals add to a firm's bargaining power (Lavie, 2007), relying on referrals from existing partners to form ties with their competitors is unlikely to work.

Once ties are formed, the coordinating strategy is effective because firms can then selectively strengthen these ties through a virtuous cycle of further synchronized action among the partners. In contrast, firms that rely solely on existing ties may find it more difficult to create these virtuous cycles because of asynchronous timing of their tie formation. The counterintuitive point is that a firm is successful, not by taking advantage of arbitrage opportunities gained by keeping partners separate, as suggested by *tertius gaudens* logic (Burt, 1992), but rather by actively coordinating these partners, as

with *tertius iungens* logic (Obstfeld, 2005). This strategy of creating common benefits by joining unconnected partners is at the core of originating high-performing portfolios.

A third strategy is adding multiple ties at the same time around *critical industry uncertainties.* This probing strategy is effective because these ties ensure that a firm is positioned for many possible resolutions of uncertainties. More subtly, these ties propel firms closer to the center of an industry network and so improve the likelihood of their quickly gaining unique information with which to realign their portfolios and attract new partners. In contrast, focusing on a few partners before uncertainties resolve is risky. It is difficult to predict how and when the uncertainties will resolve, and so firms may well end up with the wrong partners at the critical time when clarifying uncertainty spurs rapid market acceleration, as occurred in wireless gaming. A key insight is *how* firms actively manage tie strength with multiple partners (i.e., sequential attention) to enable more ties with strong-tie advantages. They shift their attention among ties, working closely with those partners that are currently active, while simultaneously communicating frequently with other partners to signal ongoing commitment. By using sequential attention, firms are likely to create numerous strong ties by creating the illusion of constant attention to their partners. We propose sequential attention as an effective way to mitigate the well-known trade-off between the number and depth of ties (Hansen, 1999).

Overall, our process framework identifies these strategies for creating high-performing portfolios: (1) advocate a unique industry architecture that proactively shapes the industry, (2) take long jumps that exploit opportunities to coordinate unconnected, often distant firms, and (3) defend against emerging industry uncertainties as they occur. These strategies thus combine active foresight, opportunistic maneuvering, and defensive positioning. Together they comprise a rich repertoire of strategies that relies on holistic understanding of an industry and both formation and execution of ties.

Rethinking Interdependence and Social Embeddedness

Resource dependence and social embeddedness are the two primary theoretical explanations of tie formation and network evolution. Our granular view of portfolios offers insights for both theories. First, this article contributes to resource dependence theory by enriching its core construct, *interdependence.* On the one hand, we affirm the central role of interdependence in tie formation. On the other hand, we offer a richer conception of interdependence. In prior research, interdependence is often assumed to be an exogenous and stable property of dyadic relationships (Casciaro & Piskorski, 2005; Katila et al., 2008; Pfeffer & Salancik, 1978). For example, it is common to measure interdependence using industry data such as input/output tables (Casciaro & Piskorski, 2005; Gulati & Stych, 2007). In contrast, we argue that executives can proactively create a vision of interdependence (i.e., industry architecture) that is unique and advantageous to multiple types of firms. Thus, interdependence can be multilateral and socially constructed, not just fixed and dyadic (Casciaro & Piskorski, 2005). This social construction is particularly advantageous in networked industries with complicated interdependencies and nascent industries that lack an agreed-upon architecture. Finally, since interdependencies structure the blueprint of interaction for executing ties, a firm's vision of interdependence is central to its strategy for winning in an industry.

We contribute to social network theory by sharpening its focal concept of *embeddedness.* On the one hand, we expand the concept of embeddedness to include the possibility that the prospect of ties can be used to form ties. Prior research has emphasized the importance of existing direct and indirect ties for verifying the quality of partners (Gulati, 1995; Hallen, 2008). We complement this understanding by arguing that firms are sometimes interested enough in each other to require only limited verification of quality in the form of simply having another interested potential partner (i.e., the prospect of a tie). On the other hand, we contract the concept of embeddedness. In our study, for example, Cellcruise relied extensively on its embedded ties. But this reliance led to forming ties with the wrong partners (e.g., sports brand owners) and leveraging ties with disaffected current partners (e.g., disgruntled carrier partners) or with partners that were equally embedded with Cellcruise's rivals. The key takeaway is that existing partners are not always effective stepping-stones to the best potential partners. This analysis suggests a more circumspect understanding of embeddedness.

Boundary Conditions and Alternative Explanations

A key issue is whether our theoretical insights are contingent upon the current setting: entrepreneurial firms and new markets. Since entrepreneurial firms are often more resource-poor and less socially embedded than established firms (Katila et al., 2008), they are usually at a disadvantage rela-

tive to established firms in building portfolios. So it is likely that entrepreneurial firms will engage in strategic actions, whereas established firms can rely on the dynamics described in the deterministic account of interdependence and embeddedness (Gulati & Garguilo, 1999) and still be successful. Similarly, nascent markets are often ambiguous, rapidly changing, and uncertain and so offer latitude for strategic action (Santos & Eisenhardt, in press). Indeed, the portfolio differences between early and late entrants suggest that the early period in an industry's development offers a better window for engaging in effective strategies than later periods. So our insights are probably most appropriate for entrepreneurial (or aggressive growth) firms and nascent (or rapidly changing) markets where strategic action is both important and rewarded. In contrast, the deterministic account may describe "average" firms and may be effective for well-endowed firms in stable industries.

As in all research, there may be alternative theoretical explanations. For example, perhaps the firms that originated high-performing portfolios started with better resources. Yet as noted in the Methods section, the four early entrants began with similar resources (strong teams, excellent technology, well-connected and high-status investors), as did the two late entrants. So although initial conditions may explain cross-group differences (e.g., Starclick vs. Mobilate), they do not explain the striking within-group differences. Another possibility is attention. This explanation offers insight into Phonemix, which delayed expanding its portfolio and instead focused on product development. But it does not explain the other firms. For example, Cellcruise and Airburst actively attempted to form high-performing portfolios but did not succeed. Rather, strategic difference is the most likely explanation: for example, Starclick and Mobilate pursued strategies of adding and executing multiple ties at once, and Cellcruise and Airburst pursued different (and flawed) strategies, often attempting to add local, single ties one by one.

An intriguing commonality between Starclick and Mobilate is their location. These two most portfolio-savvy firms among the early (Starclick) and late entrants (Mobilate) are from Los Angeles, an area known for its deal-making business culture. In contrast, the less portfolio-savvy firms are from San Francisco (Cellcruise, Airburst), a region that prizes technology. Perhaps in industries in which partnerships are especially crucial, the L.A. culture gets it right whereas Silicon Valley lags behind. The impact of local business culture on strategic thinking is an interesting avenue for future research.

Toward a Strategic View of Portfolios and Networks

Prior research has emphasized a deterministic view of portfolio and network evolution that is shaped by exogenously determined interdependence and a path-dependent trajectory of embedded ties. With a few exceptions (see Ahuja, 2000, Hallen, 2008; Powell et al., 1996), researchers have treated partner characteristics such as prominence as static; viewed relationships (if they are considered at all) as simply strong or weak; and ignored tie execution in favor of tie formation. We add emphasis on agency, strategic action, and the dynamics of portfolios and networks, addressing evolving prominence, shifting centrality, and nuances of execution such as sequential attention. This suggests a research agenda that places agency and strategic action in the spotlight.

REFERENCES

Ahuja, G. 2000. The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. ***Strategic Management Journal***, 21: 317–343.

Bae, J., & Gargiulo, M. 2004. Partner substitutability, alliance network structure, and firm profitability in the telecommunications industry. ***Academy of Management Journal,*** 47: 843–859.

Baum, J., Calabrese, T., & Silverman, B. 2000. Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. ***Strategic Management Journal,*** 21: 267–294.

Baum, J. C., Rowley, T., Shipilov, A., & Chuang, Y.-T. 2005. Dancing with strangers: Aspiration performance and the search for underwriting syndicate partners. ***Administrative Science Quarterly,*** 50: 536–575.

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: 1–35.

Burrows, P. 2007. Welcome to Apple World. ***BusinessWeek***, July 9 and 16.

Burt, R. S. 1992. ***Structural holes***. Cambridge, MA: Harvard University Press.

Casciaro, T., & Piskorski, M. J. 2005. Power imbalance, mutual dependence, and constraint absorption: A closer look at resource dependence theory. ***Administrative Science Quarterly***, 50: 167–199.

Combs, J. G., & Ketchen, D. J. 1999. Explaining interfirm cooperation and performance: Toward a reconciliation of predictions from the resource-based view and organizational economics. ***Strategic Management Journal***, 20: 867–888.

Das, T. K., & Teng, B. 2002. Alliance constellations: A social exchange perspective. ***Academy of Management Review***, 27: 445–456.

Dickson, P. H., & Weaver, K. M. 1997. Environmental determinants and individual-level moderators of alliance use. ***Academy of Management Journal***, 40: 404–425.

Dyer, J. H., & Nobeoka, K. 2000. Creating and managing a high performance knowledge sharing network: The Toyota case. ***Strategic Management Journal***, 21: 345–368.

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

Eisenhardt, K. M. 1991. Better stories and better constructs: The case for rigor and comparative logic. ***Academy of Management Review***, 16: 620–627.

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

Eisenhardt, K. M., & Schoonhoven, C. B. 1996. Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. ***Organization Science,*** 7: 136–150.

Emirbayer, M., & Goodwin, J. 1994. Network analysis, culture, and the problem of agency. ***American Journal of Sociology***, 99: 1411–1454.

Farrell, J., Monroe, H. K., & Saloner, G. 1998. The vertical organization of industry: Systems competition versus component competition. ***Journal of Economics & Management Strategy***, 7: 143–182.

Granovetter, M. 1992. Economic institutions as social constructions: A framework for analysis. ***Acta Sociologica***, 35: 3–11.

Gulati, R. 1995. Social structure and alliance formation patterns: A longitudinal analysis. ***Administrative Science Quarterly***, 40: 619–652.

Gulati, R. 1998. Alliances and networks. ***Strategic Management Journal***, 19: 293–317.

Gulati, R. 2007. ***Managing network resources.*** Oxford, U.K.: Oxford University Press.

Gulati, R., & Gargiulo, M. 1999. Where do interorganizational networks come from? ***American Journal of Sociology***, 104: 177–231.

Gulati, R., & Higgins, M. C. 2003. Which ties matter when? The contingent effects of interorganizational partnerships on IPO success. ***Strategic Management Journal,*** 24: 127–144.

Gulati, R., & Sytch, M. 2007. Dependence asymmetry and joint dependence in interorganizational relationships: Effects of embeddedness on a manufacturer's performance in procurement relationships. ***Administrative Science Quarterly,*** 52: 32–69.

Hallen, B. L. 2008. The causes and consequences of the network positions of new organizations: From whom do entrepreneurs receive investments. ***Administrative Science Quarterly***, 53: 685–718.

Hansen, M. T. 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. ***Administrative Science Quarterly***, 44: 82–111.

Hoffmann, W. 2007. Strategies for managing a portfolio of alliances. ***Strategic Management Journal***, 28: 827–856.

Huber, G. P. 1985. Temporal stability and response-order biases in participant descriptions of organizational decisions. ***Academy of Management Journal***, 28: 943–950.

Huber, G. P., & Power, D. J. 1985. Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. ***Strategic Management Journal***, 6: 171–180.

Jacobides, M. G., Augier, M., & Knudsen, T. 2006. Benefiting from innovation: Value creation, value appropriation, and the role of industry architectures. ***Research Policy,*** 35: 1200–1221.

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

Kale, P., Dyer, J., & Singh, H. 2002. Alliance capability, stock market response, and long-term success: The role of the alliance function. ***Strategic Management Journal,*** 23: 747–767.

Katila, R., Rosenberger, J., & Eisenhardt, K. M. 2008. Swimming with sharks: Technology ventures, defense mechanisms, and corporate relationships. ***Administrative Science Quarterly***, 53: 295–332.

Kumar, N., Stern, L. W., & Anderson, J. C. 1993. Conducting interorganizational research using key informants. ***Academy of Management Journal***, 36: 1633–1651.

Larson, A. 1992. Network dyads in entrepreneurial settings: A study of the governance of exchange relationships. ***Administrative Science Quarterly***, 37: 76–104.

Lavie, D. 2007. Alliance portfolios and firm performance: A study of value creation and appropriation in the U.S. software industry. ***Strategic Management Journal***, 28: 1187–1212.

Leonard-Barton, D. 1990. A dual methodology for case studies: Synergistic use of a longitudinal single site with replicated multiple sites. ***Organization Science***, 1: 248–266.

Lorange, P., & Roos, J. 1993. ***Strategic alliances: Formation, implementation, and evolution.*** Cambridge, MA: Blackwell.

Miles, M. B., & Huberman, A. M. 1994. ***Qualitative data analysis: A sourcebook of new methods*** (2nd ed.). Beverley Hills, CA: Sage.

Mohr, J., & Spekman, R. 1994. Characteristics of partner-

ship success: Partnership attributes, communication behavior, and conflict resolution techniques. ***Strategic Management Journal***, 15: 135–152.

Mowery, D. C., Oxley, J. E., & Silverman, B. 1998. Technological overlap and interfirm cooperation: Implications for the resource-based view of the firm. ***Research Policy***, 27: 507–523.

Obstfeld, D. 2005. Social networks, the tertius iungens orientation, and involvement in innovation. ***Administrative Science Quarterly***, 50: 100–130.

Padgett, J. F., & Ansell, C. K. 1993. Robust actions and the rise of the Medici, 1400–1434. ***American Journal of Sociology***, 98: 1259–1320.

Pfeffer, J., & Salancik, G. R. 1978. ***The external control of organizations: A resource dependence perspective.*** New York: Harper & Row.

Podolny, J. M. 1994. Market uncertainty and the social character of economic exchange. ***Administrative Science Quarterly***, 39: 458–483.

Podolny, J. M., & Stuart, T. E. 1995. A role-based ecology of technological change. ***American Journal of Sociology,*** 100: 1224–1260.

Powell, W. W., Koput, K. W., & Smith-Doerr, L. 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. ***Administrative Science Quarterly***, 41: 116–145.

Reuer, J. J., & Ragozzino, R. 2006. Agency hazards and alliance portfolios. ***Strategic Management Journal***, 27: 27–43.

Rosenkopf, L., Anca, G., & Varghese, P. 2001. From the bottom up? Technical committee activity and alliance formation. ***Administrative Science Quarterly***, 46: 748–772.

Rothaermel, F. T. 2001. Complementary assets, strategic alliances, and the incumbent's advantage: An empirical study of industry and firm effects in the biopharmaceutical industry. ***Research Policy***, 30: 1235–1250.

Rowley, T., Behrens, D., & Krackhardt, D. 2000. Redundant governance structures: An analysis of relational and structural embeddedness in the steel and semiconductor industries. ***Strategic Management Journal***, 21: 369–386.

Santos, F. M., & Eisenhardt, K. M. In press. Constructing markets and shaping boundaries: Entrepreneurial agency in nascent fields. ***Academy of Management Journal***.

Siedler, J. 1974. On using informants: A technique for collecting quantitative data and controlling measurement error in organization analysis. ***American Sociological Review***, 39: 816–831.

Sivades, E., & Dwyer, F. R. 2000. An examination of organizational factors influencing new product success in internal and alliance based processes. ***Journal of Marketing,*** 64(1): 31–49.

Stevenson, W. B., & Greenberg, D. 2000. Agency and social networks: Strategies of action in a social structure of position, opposition, and opportunity. ***Administrative Science Quarterly***, 45: 651–678.

Strauss, A., & Corbin, J. 1998. ***Basics of qualitative research*** (2nd ed.). Thousand Oaks, CA: Sage.

Stuart, T. E. 1998. Network positions and propensities to collaborate: An investigation of strategic alliance formation in a high technology industry. ***Administrative Science Quarterly***, 43: 668–698.

Stuart, T. E. 2000. Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. ***Strategic Management Journal***, 21: 791–811.

Stuart, T. E., Hoang, H., & Hybels, R. 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. ***Administrative Science Quarterly,*** 44: 315–349.

Uzzi, B. 1997. Social structure and competition in interfirm networks: The paradox of embeddedness. ***Administrative Science Quarterly***, 42: 36–67.

Yin, R. K. 1994. ***Case study research—Design and methods.*** Thousand Oaks, CA: Sage.

Yoffie, D., & Slind, M. 2006. ***Apple Computer, 2006.*** Harvard Business School Case no. 3706496.

APPENDIX A

A History of the U.S. Wireless Gaming Industry

1999

The U.S. wireless gaming industry began in late 1999 with scattered efforts by several firms to create games for mobile phones. These early games, however, were not user-friendly, relied on the very awkward (and soon obsolete) WAP format, and were not adopted by consumers.

2000

Despite the limited appeal of the initial wireless gaming experience, a number of firms began exploring the commercial opportunity of wireless gaming in 2000. Some of these firms were diversifying from other industries, including video games (e.g., THQ), telecommunications (e.g., Sprint), handset makers (e.g., Nokia), technology suppliers (e.g., Qualcomm), entertainment (e.g., Disney), and computing (e.g., Sun). Others were entrepreneurial entrants (including the four early entrants in this study). The opportunity was to create content for mobile phones that went beyond the original "killer app," voice. This expansion was critical for carriers' ability to recoup their investment in their wireless infrastructure. It was also critical for handset manufacturers' ability to provide additional reasons for the development of more advanced phones and so the continuation of sales growth.

Several key industry features became apparent at this time and continued throughout our study. One was that wireless gaming is an industry with interdependencies among several types of firms because it is difficult for any one firm to supply all of the components that are needed for mobile gaming. This yields multiple buyer, supplier,

and most notably, complementor relationships within the industry. But while it was apparent that wireless gaming firms would have interdependencies, the actual industry architecture (e.g., types of firms, their roles within the industry, their relationships with one another) was ambiguous and mostly did not yet exist. This is typical at the outset of industries (Jacobides et al., 2006). Most salient for our focal publisher firms was that it unclear whether there would even be a role of standalone publishers.

A second key feature of this industry was the variety of approaches to firm boundaries. There was a lack of clarity about firm boundaries, especially at the outset, and so boundary decisions were among the most crucial. As in other industries (Farrell, Monroe, & Saloner, 1998), executives had several broad alternatives. Their firms could be vertically integrated, compete at the component level, or be systems integrators of components. For example, some carriers decided to be highly vertically integrated and attempt to play a dominant role, while others preferred to work more collaboratively with other firms that would supply components and complements.

The third key feature of this industry was the competition between types of firms for dominance. That is, competition was not solely among firms of the same type, but rather was also between types of firms for control of the industry. In wireless gaming, this competition would play out between two key complementors, carriers and handset makers. One analyst captured the tension as follows: "Who's going to win? Is it the handset manufacturers or is it the carriers? Who owns the customer? Who has the customer relationship?"

2001

By 2001, there were a few mobile games available on Sprint and on handsets, especially from Nokia, that came to the U.S. from Europe mostly via AT&T. Two established technology firms (Sun Microsystems and Qualcomm) were creating standard gaming platforms (i.e., Java and BREW) that were critical to wireless gaming. The carriers were also making it clear that they intended to be the most important firms in the industry by controlling their subscriber bases. Finally, our four early entrant firms had begun building their portfolios.

But the users' gaming experience was still difficult. An analyst described the trials of just buying a game: "The purchase process was and continued to be so torturous. . . . Like you have to enter your credit card every time you buy a new game!" Thus, firms focused on creating a more integrated, user-friendly gaming experience by developing software platforms for gaming and integrating the various components of a wireless gaming system such as handsets, billing systems, and games. This innovation involved innovation of components (like handsets) as well as complementary products (like games and platforms). Some firms formed ties with other firms to accomplish these innovation-related tasks, while others remained more independent. This was an important choice for our four early entrant firms as they began their portfolios. Starclick and Topmobile followed the former path by creating their own visions of the industry architecture; Cellcruise and Phonemix took the latter path by focusing on creating a series of single ties as game suppliers to carriers.

Another important choice for our four early entrants was gaming platform standard. Topmobile, Phonemix, and Cellcruise added ties to Sun (Java), as was consistent with the tie choices of the pioneering carriers (AT&T, Sprint) and with how the industry had unfolded in other parts of the world. In contrast, despite the potentially extensive costs of maintaining two platform ties, Starclick formed ties with both Sun (Java) and Qualcomm (BREW). A key point is that (unlike ties with other types of firms) ties to platform providers are relatively easy to form because a platform provider is more likely to prosper when many firms use its platform.

By the end of the year, the carriers were close to launching much more user-friendly gaming systems. But the crucial issue of a viable business model for creating gaming content remained. Many carriers viewed their contribution to the industry to be their distribution channel and saw no need to give content providers such as publishers any money. Conversely, the publishers saw no viable way to make a profit, and so there were very few games. As an industry expert described,

> The carriers were thinking in terms of an Internet model that put all of the risk on the content providers while they provided a channel. It's like we the carriers have access to these customers. We will either do you a favor and let you put your games on our handsets, and we'll charge you a fee to get in front of user. So there was no one really providing content for the new medium.

Moreover, basic industry features, such as the industry architecture; standards, such as for gaming platforms; and identification of consumers and their preferred game genres were still very ambiguous, although several firms, including Starclick and Topmobile, were pursing their own visions. But industrywide, there was no clear role for publishers; continuing tension between carriers and handset makers; lack of clarity as to whether Java, BREW, or both would be the eventual standard platform; and no obvious business models for being profitable. An executive noted, "The market was just sort of emerging, not even as a something that could be a viable ecosystem from a business standpoint." There also were very few sales. As an industry analyst summarized, "At that point there was some availability of mobile games, but it was very spotty and very very niched."

2002

At the beginning of 2002, the industry finally began to coalesce. A key to this was that many carriers (although not Starclick and Topmobile's original partners, who were following their industry architecture visions) began looking to Japan, at the success of DoCoMo, and realizing the role in the industry that they could play. They started to recognize the crucial missing pieces that were needed to enable "this whole business ecosystem to develop." As an industry expert summarized,

> The main learning that really took place was the business model which fundamentally amounted to paying the content provider 50-60-70 percent of the fee that the user spends in order to produce the content. When the carriers started to get the importance of paying content providers a living wage for providing games and ring tones and screensavers and stuff like that, through the mobile channel that's when things really turned around.

By midyear, the carriers were actively launching integrated systems for providing wireless gaming. Thus, there was a visible effort from the carriers to launch their wireless gaming systems and promote wireless games. For example, Verizon completed the "soft rolling launch" of its GetItNow service across the United States in September 2002. Sprint launched its Vision services with four or five different handsets in August. AT&T launched mMode in September. Consumers could now buy a phone and download content. This is also when our two late entrant firms (Mobilate and Airburst) began. It was an important time in the industry because it was now easy to buy "wand play" wireless games for consumers and there were business models in place with which publishers could make money. As one analyst described,

> So it was really in the 3rd quarter of 2002 when all of a sudden consumers could go into a store, buy a phone, download content, and the price of that content would show up on their monthly bill. And that's when consumers started to get a taste of what it could mean to have an entertaining experience using their mobile phone. And content providers started to be able to do a spreadsheet to show if I sell this much content through the channel then I should get this much cash 60 or 90 days later. That was really the crystallizing moment I think in Q3 2002.

It was also becoming clearer that, while Java would be a successful platform, there was good chance that BREW would be as well. So both of the late entrant firms, Mobilate and Airburst, formed ties to Sun (Java) and Qualcomm (BREW).

As noted above, an interesting feature of the wireless gaming industry was the different approaches to vertical integration, especially among the carriers. For example, Verizon relied on key partners, including their major platform partner, Qualcomm, for BREW. In contrast, Sprint was more vertically integrated, owned the system that they used for content distribution, and limited access to their service to about 12 publishers. These differences across the industry created distinct challenges for publishers in dealing with different carriers. As one expert noted,

> Sprint builds everything in house and so they own the system that they use for content distribution which imposes interesting differences in how the carriers relate to content providers in general. Sprint took a much different approach and got content from 12 or 13 different content providers.

But despite the challenges, our focal firms all tried to elaborate their portfolios with carrier ties because of their crucial importance in the industry. Starclick, Topmobile, and Mobilate had expanded their carrier ties by offering to coordinate the ties that they were simultaneously forming with brand owners. In contrast, Cellcruise, Phonemix, and Airburst tried to leverage past relationships to gain new ties.

With the launch of their systems, the carriers began major advertising campaigns to promote game playing on mobile phones. An industry expert said,

> In Q4 2002, Verizon, Sprint and AT&T all start marketing this stuff. So they took out TV ads, print ads, like the first page of *USA Today*. Verizon had trailers that were running before movies. Even in New York City, they were wrapping little bus kiosks with their stuff.

But the wireless gaming industry needed a "kickstart," which occurred when a BREW carrier began heavily subsidizing download-capable handsets. This subsidization greatly increased the number of handsets that could be used for wireless gaming. An expert noted:

> When a consumer went into a store to upgrade their phone for the holiday season in Q4, they could buy a download-capable handset for $50. And that move really kick-started the installed base of the handsets out there so that people could very quickly get a phone that was capable of downloading entertainment and start using it. It was even possible for consumers to buy a download-capable handset for $50 and get a second one free during the holiday season of 2002.

Overall, the events of 2002 indicated that wireless gaming was a viable market and clarified the carriers' dominance over the handset makers. Although the handset makers created portals such as Club Nokia with the intent of becoming the place consumers would go to download games, the carriers were not accommodating. Rather, they required the handset manufacturers to meet their specifications or be closed off from their subscriber bases. The carriers also exercised control over "deck placement" (the placement of games in the scroll-down list on phones). High deck placement (including being the "featured game" or a "Top 10" game) was very highly correlated with sales. As one analyst noted,

> The carriers basically said we're not going to cooperate on handset portals. If you want to sell your handsets to us, you're going to have to fit our specifications. So the carriers have really taken the lead in deciding what content goes on the deck.

2003

With the breakout fourth quarter of 2002, it became apparent that the wireless gaming industry was real. Cingular and T-Mobile became the last of the five major carriers to launch their wireless gaming systems, in early 2003. It also became clear that both Java and BREW were important standards. As an industry expert noted,

> It's at the beginning of 2003 that they start to receive the checks from the Q4 2002 sales and they're like wait a minute. This is a real business here. So people start to get excited, the buzz starts to build. . . . This is a real business. I mean it was like there was real money being made, and people were really quite excited about the whole thing.

The role of publishers had also clarified. As one executive noted,

> The role of the publisher has emerged in the last year as being important . . . it's now pretty clear why publishers are important. A year and half ago it wasn't so clear. The whole ecosystem is clearer about everybody's role.

But there was still industry-level uncertainty, especially surrounding game genre. Consumers were buying games. But there was very little information within the industry about the genres of games being bought. Were they sports, action, casual, movie-based, or something else? There was also very little information about who the consumers were. Were they traditional gamers, over 40s, women, and so forth? So publishers were busy developing content to take advantage of the newly realized viability of the industry but doing so with very little information. Starclick and Mobilate addressed this uncertainty with brand ties for multiple game genres that they had added previously.

At the end of 2003, industry revenues were about $80M, and projections were for $250M in 2004, and more growth beyond that. All five major carriers posted significant sales gains for wireless gaming downloads, a high percentage of which flowed to the publishers. The industry had now clarified to include carriers, handset makers, standard platform developers, brand owners, game developers, and publishers, which all specialized in one or more aspects of wireless gaming systems. Among these different node (firm) types in the network, the carriers (e.g., Verizon Wireless, or Sprint), handset makers (e.g., Nokia or Motorola), platform developers, and brand owners (e.g., Suzuki Motors or Disney) were established firms, while publishers were both established firms and ventures, and developers were very small entrepreneurial firms or even single individuals.

The end of 2003 also marked the end of what analysts termed "round 1" of the wireless gaming industry, and the winners (for instance, in terms of the relative performance rankings of entrepreneurial publishers) were clear. In fact, many of the firms in this study made major strategic changes (including exit) and all made portfolio changes in early 2004 that reflected these outcomes. The anticipated next big event in the evolution of the industry was the entry of the most influential video game publishers (e.g., Electronic Arts). As one analyst said, "OK, the business is big enough, now they [Electronic Arts and others] should do something. There will be the entrance of these new competitors for the people who survived round 1."

APPENDIX B

Measures of Portfolio Attributes and Firm Performance

Portfolio Attributes

We measured portfolio attributes using characteristics that are commonly used in portfolio, tie, and network research (e.g., Baum et al., 2000; Rowley et al., 2000; Uzzi, 1997) as well as characteristics that our informants regarded as particularly relevant (e.g., importance of strong ties with particular types of partners), as is common in grounded, inductive research (e.g., Eisenhardt, 1989; Strauss & Corbin, 1998). Consistently with prior research (e.g., Baum et al., 2005; Gulati, 1995; Rowley et al., 2000), we defined the industry network in terms of the most influential firms in the industry at the time of our study: the five major U.S. carriers, which had over 90 percent of the subscriber base; two handset makers, which together sold over 80 percent of U.S. handsets at the time of our study; two technology platforms, the only ones used in the industry; and an unconstrained number of brand owners, because the number of brands is effectively without limit. This network definition ensured a focus on ties of strategic importance, as suggested by our definition of ties (Gulati, 1995). The wireless gaming industry network is smaller (e.g., there are only two firms for certain types of firms) and more differentiated (in terms of number of types of firms with distinct roles, dependences, and importance) than the industry networks examined in prior research (e.g., Baum et al., 2000; Gulati, 1995; Rowley et al., 2000).

Centrality

Following prior research, we measured centrality in several ways:

Direct centrality (relational embeddedness) refers to the size of a focal firm's portfolio (i.e., egocentric network) (Gulati, 1998) and is measured as the total number of the focal firm's direct ties.

Local density (structural embeddedness) was defined as the extent to which a dyad's mutual contacts were connected to one another (Granovetter, 1992). We measured this as the number of direct ties between the focal firm's partners divided by the total number of possible ties between these partners.

Eigenvector centrality (positional embeddedness) was defined as the position of the focal firm within the network as computed by eigenvector centrality (Gulati & Gargiulo, 1999). We excluded about 15 other publishers from this network computation because we did not have complete data about them. They were not our focus in this study of portfolio (not network) formation. But since we did know that they did not have ties to our focal firms and their brand owner partners, and did have ties to the same carriers, handset makers, and platforms, the eigenvector centrality ranking of our six firms relative to each other is not sensitive to their omission.

Tie Strength

There is no standard measure of tie strength in the literature because the nature of tie strength depends on the types of partners involved. Thus, we used several

measures, tailored to the particular characteristics of relationships with a single type of partner as informed by the industry analysts and other informants whom we interviewed. A key finding of our study was that some firms purposefully varied the depth of their ties (finding 3). To cope with this, we used the highest value of tie strength as our measure because it best captured the effective strength of a relationship (i.e., strong when it was advantageous to a publisher for it to be so).

Strength of ties with carriers. First, tie strength was measured by the number of games of the publisher on the wireless network of the carrier as well as the number and percentage of games that were promoted by the carrier. These values were taken from the Wireless Gaming Database (www.gamespot.com). These measures were appropriate for measuring tie strength because our informants (including industry analysts) and our analysis of market data indicated that a carrier's decision to publish and promote a game was based on the strength of the relationship between the publisher and the carrier. Publishers with strong ties typically gained preferential treatment, and those with weak ties had much less opportunity and might not even be able to show all of their games to the carrier.

Second, we asked carrier informants to name the top ten publishers in terms of their importance to the carrier. While focal publishers such as Starclick were mentioned in the top ten by all carriers, others, such as Airburst, were never mentioned.

Strength of ties with brand owners. We measured tie strength as weak when a tie involved a single brand because publisher informants agreed that, once they had the exclusive rights to the brand, the brand partnership required a low level of interaction. We coded tie strength as strong when the tie involved multiple brands from the same brand owner because this type of tie involved closer negotiation and interaction with several brands.

Strength of ties with platform and handset partners. Strong ties with these partners were helpful because they could provide a publisher with benefits via their ties with other important partners, early access to new technology that would enable the focal publisher to tailor and integrate games more effectively, and enhanced overall visibility in the market. These additional benefits were mostly introductions to other firms, opportunities to attend exclusive conferences and/or give keynote speeches, and opportunities to codevelop and/or beta-/alpha-test early versions of a phone or platform. We considered ties with such partners to be strong when executives were invited to important industry events by these partners, received direct introductions to other prominent firms, and/or participated in early product development and testing. We considered ties to be weak when a firm simply participated in a rollout of new handsets (handset partners) or engaged in coordinated efforts to offer games on a platform (platform partners).

Number of Strong Ties

Count of a firm's number of strong, direct ties.

Mix of Strong and Weak Ties

Count of the number of strong ties divided by all direct ties (Uzzi, 1997)

Prominence and Importance of Partners

Prior research suggests that prominent partners are particularly advantageous for the performance of ties (Stuart, 1998).

Prominence. Measures varied by type of partner. *Carrier prominence* was measured by the subscriber base of the carrier in the United States. Data reveal that there were five prominent carriers at the time of our study that accounted for over 90 percent of subscribers.

Brand prominence was measured through a survey in which 20 students from a major U.S. university (a prototypical target market for wireless gaming) ranked the brands of the focal firms from 1 to 10, where 10 indicated "I know this brand very well" and 1 indicated "I don't know this brand at all." The average of these ratings was taken for each brand and then averaged over all brands of the firm. We considered brands with a rating greater than 7 to be prominent.

There were two technology *platforms* in wireless gaming during this study: BREW and Java. Qualcomm and Sun, respectively, owned these platforms. Both firms had significant market capitalization, employee count, and product innovation track records. The major U.S. carriers chose one of these two platforms to provide games to their subscribers. Thus, we considered both to be prominent.

The primary *handset makers* at the time of our study in the United States were Nokia and Motorola, which together had approximately 80 percent of the handset market share. Both firms had significant market capitalization, employee counts, product innovation track records, and other signals of prominence. Thus, we considered both to be prominent.

Importance. All of these partner types were valuable to publishers. But as in many industries (Gulati & Higgins, 2003; Powell et al., 1996), some partner types were more important than others. In order to measure the importance of each partner type, we asked informants to rank partner types in their order of importance for the focal firm's success. These rankings indicated that *carriers* were the most important because they owned distribution, directly touched consumers, and could affect game sales directly (e.g., promotions, deck placement). *Brand owners* were ranked second in importance because a prominent brand was an influential factor in consumers' purchasing decisions. Informants differed in their rankings of *handset makers* and *platform providers* but collectively ranked them equivalently. Platform partners were helpful for adapting more quickly and effectively to advances in the software platform for games, and handset manufacturers were helpful for adapting to the latest phones and features in the market. Thus, we ranked these types of partners third.

Number of prominent ties was the count of direct ties with prominent partners.

Number of important ties was the count of direct ties with the most important partners (i.e., carriers and brands).

Number of strong, important ties was the count of direct, strong ties with the most important partners (i.e., carriers and brands).

Diversity

Our focal firms, publishers, could have four primary types of partners in the wireless gaming market (see also Appendix A):

- *Carriers,* which own distribution channels to wireless subscribers
- *Brand owners,* which can bring additional legitimacy and sometimes content to a game
- *Platform providers,* which own industry-standard software platforms that publishers and carriers use to interface with one another and to bill
- *Handset makers,* which provide the handsets that the publishers must ensure that their games can operate on.

Publishers also collaborated with game developers to write game software code. These were mostly freelancers and small firms that worked with publishers on a project basis. Informants did not consider game developers as important to their alliance portfolios, and there were many such developers. Thus, we omitted them from the analysis.

Partner diversity was the number of types of noncompetitor partners with which a focal firm had direct ties divided by all possible types of noncompetitor partners. This measure captures the degree to which the focal firm had a complete set of functional ties by partner type without being biased by small and different numbers of possible partners within particular partner types (e.g., carriers, platforms).

Platform diversity was the number of direct ties to alternative gaming platforms and handset makers divided by all possible partners of these types. This measure captured the degree to which a focal firm participated in the full range of standards and platforms possible within the industry.

In contrast, the commonly used measure of tie diversity in the literature is computed as 1 – (sum of proportion of a direct tie type squared/all direct ties) (Baum et al., 2000). But this measure does not capture diversity within networked markets well for several reasons. First, it fails to account for situations in which a firm is missing a category of partners. This is a critical omission when multiple types of partners contribute to an entire product system, as in networked markets. Second, the assumption is that partners of the same type offer the same resources, and so the measure misses when different partners of the same type represent important but different technical standards, platforms, and consumer bases. Third, it misses the fact that there are different numbers of important partners within different types (e.g., five major carriers vs. two platforms). Thus, we did not use this measure but rather relied on the above two measures, which are more accurate indicators of tie diversity in networked markets.

Firm Performance

We measured firm performance in several ways, both at the end of the study and after it, using both quantitative and qualitative data. Such variety is likely to yield a stronger measure of firm performance (Jick, 1979). Given that the focal firms were new, private firms operating in a new industry, we were unable to obtain revenue and profitability measures. Nonetheless, our use of multiple measures gives us a robust measure of firm performance, particularly within each group of firms (i.e., early and late entrants).

Quantitative estimates of financial performance for each publisher included revenue (number of hit games), market penetration (number of games and handsets/game for each publisher), and profitability (percentage of hit games). These measures indicate game availability in the market and are likely to be good proxies for firms' revenue, market penetration, and profitability for several reasons. First, all of the focal firms were start-ups that only sold wireless games. Therefore, their game sales figures were their total revenue. Second, availability of games is a good approximation of game sales and market penetration in this market because, as informants unanimously agreed, availability leads to revenue, and prices are very similar across games. Third, informants agreed that hit games are particularly important in this industry because a hit game brings much more revenue than a non–hit game. (For example, according to an industry analyst, a hit game has about 50,000 downloads; a non–hit game gets about 5,000, on average.) In accordance with the market data and industry practice, we measured a hit game as one in the top 95th percentile of all games. Finally, given the importance of hit games for revenue and the cost structure of publishers—high up-front fixed costs (e.g., game development, brand license) but few distribution variable costs—the percentage of games that are hits is likely to be a good indicator of profitability.

Number of games was the number of games of focal firms that were published at least through one carrier on one handset in the United States.

Number of handsets per game was the mean number of handsets on which a focal firm's games were available. The higher the number of handsets on which a game is available for download, the more likely the game will be sold. Each handset model is counted as a separate handset because not all games are on all the models of a given maker (e.g., Nokia).

Number of hit games was the count of all of a firm's games that were in the top 95th percentile of all games.

Percentage of hit games was the count of hit games/total games for each firm.

Third, we measured publisher performance as average *performance ranking* by our informants, including partner executives from the major carriers and the editor of the most important publication in the industry, *Wireless Gaming Review.* We tabulated only their top ten rankings, since informants had difficulty ranking publishers below the top ten and further rankings would have added little insight.

Fourth, we assessed firm performance in terms of typical qualitative comments of our informants (i.e., focal firm executives, partner executives, industry experts) and media sources.

Fifth, we measured *poststudy performance.* Specifically, we tracked key events at each firm for two years after the end of our study (end of 2003) in secondary sources such as websites, industry publications, and firm announcements marking major developments. Events such as an IPO, an exit, major funding from investors, and acquisition were considered as indicators of performance.

Taken together, these varied measures of firm performance offered a robust and triangulated assessment, particularly within each of our two groups, early and late entrants.

Pinar Ozcan (pozcan@iese.edu) is an assistant professor of strategic management at the IESE Business School. She specializes in strategy, entrepreneurial growth, and the emergence of new technology markets. Her recent research focuses on how entrepreneurial firms grow by building a high-performing alliance portfolios, leveraging opportunities present in nascent markets that are highly dynamic and ambiguous. She holds a Ph.D. from Stanford University.

Kathleen M. Eisenhardt (kme@stanford.edu) is the Stanford Warren Ascherman M.D. Professor of Strategy and Organization at Stanford University and the codirector of the Stanford Technology Ventures Program. She received her Ph.D. from Stanford University. Her research interests include strategy and organization theories for technology-based firms, alliances portfolios of new ventures, and learning and opportunity-based views of strategy.