

Article

Rhythm and Entrainment of Acquisition and Alliance Initiatives and Firm Performance: A Temporal Perspective

Organization Studies
33(10) 1281–1310

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DOI: 10.1177/0170840612453530

www.egosnet.org/os



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Abstract

A temporal perspective, focusing on when and under what conditions firms should accelerate or slow down their acquisition and alliance initiatives, is gaining momentum in strategy research. We explore the temporal relationships between rhythm, entrainment and firm performance. Firms that temporally structure the rhythm of repetitive acquisitions in an even-event pace achieve superior performance as compared to an even or event pace. We also find that intraentrainment—the internal synchronization between acquisition and alliance initiatives—enhances performance and the extraentrainment of alliances—the synchronization with competitors' alliance rhythm—enhances performance. Our findings have important implications for the organizational improvisation, dynamic fit and alliance/acquisition experience literatures which further opens the window to understanding the creation of competitive advantage by managing rhythm-type strategic actions over time.

Keywords

acquisition, alliance, entrainment, rhythm, synchronization, temporal

“We’re thoughtfully non-rhythmic.” (Mike Tomlin, Head Coach of the Pittsburgh Steelers)¹

Introduction

While an increasing number of firms simultaneously engage in multiple acquisition and alliance initiatives, our understanding of their temporal relationships and performance implications has

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received limited theoretical attention (Ancona & Chong, 1996). Research by Vermeulen and Barkema (2002) and Laamanen and Keil (2008) has laid a foundation for theorizing about the performance implications of rhythm-type activity. At the same time, their research has raised important new questions related to the phenomenon of repetitive strategic initiatives. Building on this base, we examine three interrelated research gaps. What is the relationship between the rhythm of acquisition and alliance initiatives and performance? Does the extraentrainment of a firm's alliance and acquisition initiatives with its competitors' initiatives enhance performance? Does the intraentrainment of a firm's alliance and acquisition initiatives enhance performance? Temporal constructs such as rhythm and entrainment are particularly salient for answering these questions because they have the capability to provide nuanced explanations of how firms' repetitive actions create and destroy shareholder value (Amburgey & Miner, 1992; Bluedorn & Denhardt, 1988; Klarner & Raisch, *in press*; Orlikowski, 1996; Perez-Nordtvedt, Payne, Short, & Kedia, 2008; Shi & Prescott, 2011; Shi, Sun, & Prescott, 2012). We define rhythm as the variability in the frequency of firm acquisition and alliance activity over a specified time period (Ancona & Chong, 1996). The Social Entrainment Model² (McGrath & Kelly, 1986) founded in the biological sciences defines entrainment as one cyclical process (such as repetitive alliances) being captured by, synchronous with, and setting to oscillate in rhythm with, another process (such as repetitive acquisitions). Thus, the SEM is a particularly useful theoretical approach for explaining the phenomenon of repetitive acquisition and alliance initiatives, and their performance implications, and therefore helps close gaps in the literature.

Researchers have explained a positive relationship between an even-paced rhythm and performance by drawing on time compression diseconomies and absorptive capacity mechanisms. For example, Vermeulen and Barkema (2002) examining the impact of foreign expansion rhythm and Laamanen and Keil (2008) studying the rhythm–performance relationship for acquisitions found that an even-paced rhythm enhanced organizational outcomes. They reasoned that an even-paced rhythm provides sufficient time for managers to understand and digest expansion processes, thereby enhancing performance. These studies are informative for understanding the implications of an even-paced rhythm. However, the performance effects of conceptualizing rhythm in terms of a continuum of temporal heterogeneity from even-paced to even-event paced to event-paced rhythms (Bluedorn, 2002) has not been examined. The implication is that the form of the rhythm–performance relationship may change across the rhythm continuum.

An even-paced rhythm is when there is low variability in the timing of repetitive acquisition and alliance initiatives. They occur at roughly equal intervals such as every 18 months. At the other end of the continuum, an event-paced rhythm is characterized by high variability in the timing of repetitive acquisition and alliance initiatives where the timing of their occurrence is irregular. An even-event paced rhythm is a synthesis of the two where repetitive initiatives follow an even pace but are responsive to opportunities (*i.e.*, events). An even-event paced rhythm falls between the other two on the continuum (Cunha, 2004).

Across the rhythm continuum, we propose that the form of the rhythm–performance relationship is characterized by an inverted U. This effect occurs because there are relatively greater downsides associated with the two ends of the temporal continuum represented by even and event pacing. These downsides include the creation of blind spots, the development of ritualized behavior, reduced diversity in firms' absorptive capacity, reduced complexity of firms' sequence of action thus making competitor imitation less difficult, and the underdevelopment of an entrainment quotient (Ofori-Dankwa & Julian, 2001) that provides timing flexibility in the face of changing circumstances. We suggest that firm performance is highest at the point of an even-event paced rhythm where organizations are in a state of improvisation (Brown & Eisenhardt, 1997; Cunha,

2004; Crossan & Sorrenti, 1997; Eisenhardt & Brown, 1998). Improvising firms focus on restricted flexibility where they engage in even-paced activity yet are responsive to events, thus minimizing the downside risks but at the expense of coordination complexity (Crossan, Cunha, Vera, & Cunha, 2005). Examining the temporal rhythm continuum is important because it refocuses a central debate in the acquisition and alliance literature from one where these initiatives are framed as a dichotomy between planned or opportunity driven to a dialectic discourse where a synthesis between the approaches is the objective (Cunha, 2004).

A second limitation is that prior research has focused on one type of strategic initiative (acquisitions or alliances). A single activity focus limits researchers from exploring complex temporal topics such as intraentrainment and extraentrainment (Perez-Nordtvedt et al., 2008). We begin to address this important gap by examining two performance-based entrainment questions. Entrainment requires the synchronization between two cyclical firm activities (intraentrainment) or a firm activity with an external cue or *zeitgeber* (extraentrainment) (Perez-Nordtvedt et al., 2008). In our setting, extraentrainment is when a firm's acquisition and/or alliance rhythm is synchronized with their competitors' acquisition and/or alliance rhythm (Dushnitsky & Lavie, 2010; Keil, Maula, Schildt, & Zahra, 2008; Porrini, 2004). Extraentrainment explains the performance consequences of a fit between two levels of analysis: the environment and firm. Intraentrainment occurs when the internal rhythm of a firm's acquisition activities and processes become synchronized with the rhythm of their alliance activities (Pérez-Nordtvedt et al., 2008). Intraentrainment is particularly relevant when the synchronization of acquisition and alliance impacts performance.

Our perspective is that managing the rhythm of acquisition and alliance initiatives and entraining them with important constraints within and external to the firm is a form of temporal fit (Ancona & Chong, 1996; Pérez-Nordtvedt et al., 2008; Standifer & Bluedorn, 2006) and coordination (Montoya-Weiss, Massey, & Song, 2001), both of which have performance implications.

In the remaining sections we first develop the theoretical underpinnings of our temporal lens of acquisitions and alliances initiatives. We then develop hypotheses for our rhythm and entrainment research questions. We test our hypotheses on a sample of small and medium-sized (SME) specialty pharmaceutical companies over a 19-year window and find considerable supporting evidence. We end with a discussion of implications and future research directions.

Theoretical Background

A temporal lens of acquisition and alliance initiatives

The temporal dimension of strategy is embedded in a wide range of phenomena, including but not limited to first-mover advantages (Lieberman & Montgomery, 1988), competitive dynamics (Bridoux, Smith, & Grimm, 2011), the resource-based view (Dierickx & Cool, 1989), decision making under uncertainty (Eisenhardt, 1989), change management (Sanchez-Burks & Huy, 2009), organizational learning (March, 1991) and the real option perspective (Kogut & Kulatilaka, 2001). Given that a central focus of these research streams is on a single strategic activity, key temporal concepts of interest include alliance duration, timing of market entry and speed of post-acquisition integration, to mention a few. Temporal concepts related to repetitive strategic initiatives, such as rhythm and entrainment, are not as central in these research streams.

In the acquisition and alliance streams there are notable exceptions with respect to a focus on multiple strategic initiatives. For example, questions related to acquisition and alliance experience and performance (Haleblian & Finkelstein, 1999), strategic momentum (Amburgey & Miner,

1992) and acquisitions and alliances as learning races (Hamel, 1991) have all examined repetitive activity and outcomes.

While these thrusts offer unique contributions, two important complementary temporal issues serve as our focus: rhythm and entrainment. First, over time, how the rhythm of strategic initiatives and their interplay (Haspeslagh & Jemison, 1987) impact performance is an important managerial issue since they require significant resources and attention. In temporal terms, should firms spread out strategic initiatives evenly over the years (even pace) or should they conduct these activities in a more opportunistic manner (event pace) or should they adopt an even-event pace where repetitive initiatives follow an even pace but are responsive to opportunities (i.e., events)? The concept of rhythm reflects these distinctions.

Second, scholars recognizing the interdependence of multiple acquisitions and alliances note that multiple initiatives occur synchronously at the same level of analysis (e.g., firm) and across levels of analysis (firms and their competitive environment) (Haleblian & Finkelstein, 1999). We build on the interdependency notion by drawing on the social entrainment model (McGrath & Kelly, 1986) to articulate how intraentrainment and extraentrainment influence performance (Pérez-Nordtvedt et al., 2008).

Rhythm and entrainment temporal constructs are central to the process of insuring that resources are directed to the right place at the right time so that organizations can efficiently achieve their goals (Moore, 1963) as well as management scholars' general interest in time as a basic input for achieving competitiveness (Bluedorn & Denhardt, 1988; Gulick, 1987). In other words, time is a scarce and important organizational resource that needs to be actively managed.

The Social Entrainment Model and Rhythm in the Context of Acquisitions and Alliances

McGrath and Kelly (1986) were among the first to introduce the entrainment perspective in the social sciences. The entrainment perspective specifies that psychological and behavioral cycles can become synchronized to social or environmental processes. For example, in universities, the academic calendar and faculty teaching/meetings are entrained.

As McGrath and Kelly state, "the social entrainment model provides a coherent framework for describing the operation of rhythmic process, their coupling to or synchronization with one another and potentially to outsider cues" (1986, p. 80). Their statement echoes our focus. Multiple acquisition and alliance initiatives are cyclical processes for which firms build routines and manage interdependencies based on the need to coordinate scarce resources, knowledge and learning. For instance, knowledge can be transferred from prior acquisitions or alliances to current ones so that skillsets and M&A/alliance capabilities are sequentially pooled (in a temporal order). Similarly, resources in terms of managerial and social connections and knowledge in terms of target identification or due diligence can be reciprocally pooled through knowledge spillovers or formal structure and processes. A corporate office that conducts assessments and assists in the implementation of an acquisition is one such example.

Incorporating acquisition and alliance activity within the entrainment perspective addresses several core temporal topics. Studying temporal constructs such as rhythm addresses a fundamental concern of strategy, i.e., how firms behave and why firms differ (Rumelt, Schendel, & Teece, 1994). For example, according to Fine (1998), developing a rhythm is particularly important in industries where competitive advantage is temporary. A temporal view that emphasizes the role of rhythm and entrainment suggests a past-present-future link (when to do) (George & Jones, 2000) and is in line with the conceptualization of strategy as emergent, dynamic, logically

incremental, and path-dependent patterns of interaction (Mintzberg, 1990). Rhythmic patterns emerge over time.

The entrainment perspective focusing on rhythmic-type processes within and external to the firm provides a theoretical foundation for studying multiple activities and multi-level phenomena (Ofori-Dankwa & Julian, 2001; Pettigrew, 1990). More specifically, acquisition and alliance activity can be synchronized along a time line. Why rhythms and cycles become integrated and synchronized is a core feature of the entrainment perspective.

A rhythm- and entrainment-driven approach complements the opportunity-driven approach in that it assumes that managers purposely plan and implement acquisition and alliance activities in a proactive manner (Eisenhardt & Brown, 1998). In large corporations, corporate development offices assume this role (Kale, Dyer, & Singh, 2002). In our context of SMEs, corporate development offices are not common or economically feasible. However, SMEs are likely to adopt a rhythm-type acquisition and alliance approach under two interrelated circumstances. First, for firms whose growth strategies are based on acquisition and alliance initiatives one would expect to see such an approach. Second, firms which lack the necessary capabilities for internal organic growth would adopt a rhythm- and entrainment-based approach. In our setting, either as a conscious choice or due to limited resources, many SME specialty drug firms do not have the capabilities to internally develop, manufacture and market new products. To compensate, managers proactively seek partners or targets and infuse rhythmic-type acquisition and alliance processes in their organizational routines. The development of entrainment processes is a strategic choice where context influences the discretionary range of options available to managers (Hambrick & Finkelstein, 1987; Pérez-Nordtvedt et al., 2008).

An entrainment perspective provides an alternative view of the static vs. dynamic fit debate (Zajac et al., 2000). From an entrainment perspective, activities are embedded and interdependent and, to some extent, fit should be achieved by matching different activities along a time dimension. Entrainment is linked to, yet differentiated from, related concepts such as strategic fit and adaptation. Strategic fit research has mainly focused on “what” or “how” to match (Miles & Snow, 1978); the entrainment perspective focuses on temporal fit or “when,” “at what frequency” and “with which rhythmic pattern” to match. As stated by Pérez-Nordtvedt and her associates (2008, p. 5), “... entrainment is a *form* of organizational adaptation, which involves repetitive adjustments to ongoing, endogenous environmental cycles over a period of time.” An entrainment approach provides clarity to the fit debate in two ways. On the one hand, incorporating time shifts attention towards understanding the dynamics of why and how outcomes are differentially shaped by multiple and repetitive activities. Second, the determination of fit is inherently a temporal criterion of a dynamic matching process between firm initiatives and changing internal and external influences.

Hypotheses

Rhythm and performance

Rhythm or the variability in the frequency of strategic activity impacts performance through coordinating internal events. Rhythm creates a dominant temporal order and reflects “dynamic equilibrium processes by which the many aspects of complex social systems” are coordinated (McGrath & Kelly, 1986, p. 89). It serves as an effective temporal mechanism for allocating time across strategic initiatives (Bluedorn & Denhardt, 1988).

Scholars have theorized that an even-paced rhythm is positively related to performance. The positive effect is due to the establishment of absorptive capacity (Vermeulen & Barkema, 2002), involving

the development of an acquisition routine (Laamanen & Keil, 2008), including the coordination of learning processes across a series of repeated acquisitions and alliances (Hayward, 2002) and the effective utilization of scarce managerial attention (Laamanen & Keil, 2008). When firms use an even-paced rhythm, knowledge regarding target identification, integration processes, due diligence, deal negotiation and the establishment of a dedicated alliance function accumulates incrementally and weaves into a routine over time (Kale & Singh, 2007; Laamanen & Keil, 2008; Zollo & Singh, 2004). As suggested by Brown and Eisenhardt (1997), a rhythmical pattern characterized by an even pace enhances predictability. An even-paced rhythm enhances routine development because managers acquire acquisition and alliance know-how in a smooth and consistent manner.

While an even pace has many positive attributes, it has several associated liabilities such as the creation of inertia and competency traps. In light of these trade-offs, we identify five theoretical rationales for an inverted U effect for the rhythm–performance relationship. Firm performance is highest at the midpoint of the continuum of temporal heterogeneity represented by an even-event paced rhythm (Cunha, 2004; Eisenhardt & Brown, 1998).³

First, when firms and their managers overly adhere to an even-paced rhythm, it generates negative performance effects when it creates blind spots. For instance, managers may overwhelmingly rely on routines that were developed from a series of temporally distant acquisitions, while temporally local deals are more relevant for an imminent acquisition (Argote, Beckman, & Eppler, 1990). This is especially true when managers learn rapidly during initial deals/alliances, “but then grow stale as they lose touch with the external environment” (Henderson, Miller, & Hambrick, 2005, p. 447). Blind spots are particularly salient in high-technology contexts (such as ours) where knowledge and skillsets decay quickly (Barkema & Schijven, 2008). An event-paced rhythm may create a blind spot if managers pay overwhelming attention to temporally local deals while ignoring knowledge accumulated through past experience. An even-event paced rhythm enhances the likelihood of identifying managerial blind spots and making necessary upgrades to their routines.

Second, when a temporal rhythm is overly even-paced, managerial behavior tends to become ritualized, i.e., managers develop one or two acquisitions/alliances every year. As a result, managers are more likely to frame new deals in a symbolic way without paying sufficient attention to how these deals generate new information about the appropriateness of their routines or targets. For example, target identification methods remain largely unchanged even though other firms, consultants or academics have developed new or alternative methods. Information, once coded in a firm’s routine, creates inertia (Hedstrom, 1998; March, 1991) where new or divergent information is unlikely to influence the established routines. Thus, an overly even-paced rhythm hinders the renewal and upgrading of routines in a just-in-time manner. An event-paced rhythm, on the other hand, makes it extremely hard for firms to accumulate and institutionalize knowledge routines. An even-event paced rhythm facilitates the renewal of routines in a timely manner and avoids the pitfalls related to core rigidities.

Third, an overly even-paced rhythm results in firms allocating resources in a linear and continuous way, which might suppress creative ways of resource bundling and allocation (Geibler, 2002). The development of creativity is not released by “a series of points and steps that follow one another in a regular fashion” (Geibler, 2002, p. 134). Creative resource allocation processes require freedom, flexibility and diverse forms of absorptive capacity (March, 1991). For example, an even-paced rhythm facilitates the allocation of capital and other scarce resources such as managerial personnel to relevant acquisition and alliance activities based on prior experience (Hall, Lovaglio, & Musters, 2012). However, relying on past experiences reduces the likelihood of engaging in proactive learning of viable alternative resource allocation processes, which become particularly important when the environment changes. An event-paced rhythm tends to generate creativity

associated with opportunities in the environment. However, by maintaining an even-event paced rhythm, firms can enhance their knowledge repertoires while being less subject to inertia processes. Thus, a reflective resource allocation process (March, 1991) is best achieved through an even-event paced rhythm that strikes a balance between even- and event-paced rhythms.

Fourth, unlike many internal initiatives which can be shielded from competitor attention, acquisitions and alliances are easily caught on competitors' radars (Prescott & Miller, 2001). From an action and reaction point of view (Grimm & Smith, 1997), an overly even-paced rhythm reduces within-firm variability and hence the complexity of a firm's sequence of competitive actions. An overly even-paced rhythm reduces the possibility of surprise action since competitors can map the focal firm's action and reaction cycles. An event-paced rhythm does offer the potential of surprise. However, it is not clear if firms actively manage surprises.

Finally, the notion of entrainment quotient is particularly relevant to our hypothesis of the benefits of an even-event paced rhythm. Ofori-Dankwa and Julian (2001, p. 427) defined entrainment quotient as the relative ease and speed at which individuals or organizations can shift or adjust their time orientation to effectively entrain or "detrain." This is an important competitive edge for firms driven by alliances and acquisitions since it requires individuals from different organizations to temporally coordinate their activities. Firms that strike a balance between even- and event-paced rhythms develop an entrainment quotient that allows them to balance planned action with emerging opportunities. This is particularly relevant in our context since acquisition and alliance targets are not always available. Therefore an acquirer or partner has to introduce some degree of planning flexibility based on the availability of targets.⁴

Our set of rationales is similar to and consistent with the improvisation literature (Crossan & Sorrenti, 1997; Crossan et al., 2005; Cunha, 2004). An improvisation perspective suggests that firms need to engage in reflective planning yet exercise flexibility when needed (Cunha, 2004). Improvising firms pursue an even-event paced rhythm where they partially predict the future based on past action (reflection), while at the same time intentionally maintain sufficient flexibility to cope with environmental uncertainty. These five rationales suggest that the rhythm-performance relationship exhibits an inverted U form.

The underlying theoretical reasoning for the development of our alliance and acquisition hypotheses is the same. However, because the literature has identified important similarities as well as distinctions underlying the logic and management of alliances and acquisitions, we test for their individual effects. There are many similarities between the two initiatives. The routines and processes for acquisition and alliance activity are quite similar and thus fungible (Wang & Zajac, 2007; Zollo & Reuer, 2010). The underlying rationales of why firms pursue them are similar (e.g., boundary of the firm, growth goals, value creation and claiming, synergies, information asymmetries), the theoretical approaches are similar (e.g., learning, resource and knowledge-based views, transaction cost theory) (Villalonga & McGahan, 2005; Wang & Zajac, 2007; Zollo & Singh, 2004) as well as their strategic planning, negotiations and evaluation processes (Zollo & Reuer, 2010). Finally, practicing managers seem not to have a preference for acquisitions over alliances (Dyer et al., 2004). Despite these similarities they differ in some important ways. The distinctions include the development of activity-specific routines (Wang & Zajac, 2007), their level of integration (Wang & Zajac, 2007), the degree of control and coordination (Inkpen, 2002), the level of resource commitment (Yang, Lin, & Lin, 2010, p. 5) and due diligence processes (Zollo & Reuer, 2010).

Hypothesis 1a: The relationship between the rhythm of acquisitions and performance is characterized by an inverted U such that an even-event paced rhythm outperforms even- and event-paced rhythms.

Hypothesis 1b: The relationship between the rhythm of alliances and performance is characterized by an inverted U such that an even-event paced rhythm outperforms even- and event-paced rhythms.

Extraentrainment: synchronization of rhythm with the external environment

While our inverted U hypotheses recognize the interdependence of multiple acquisitions and alliances, two related questions central to our focus are the performance implications of synchronizing alliance and acquisition initiatives internally and externally (Haleblian & Finkelstein, 1999). More specifically, does the internal synchronization of acquisition and alliance rhythm enhance performance and what are the performance implications when firms synchronize their alliance and acquisition rhythm with that of their competitors? We begin by theorizing about external synchronization and then address internal synchronization.

Extraentrainment is defined as the synchronization of a focal firm's rhythm with a pacer in its external environment, e.g., competitors' actions. We hypothesize that performance is enhanced when firms match their acquisition and alliance rhythms with that of their competitors. In our context, SME specialty pharmaceutical firms should monitor their competitors' acquisition and alliance behavior carefully, particularly in therapeutic areas where they directly compete.⁵ Jansen and Kristof-Brown (2005) found that the synchronization of rhythm between individuals and their working environment significantly influenced job satisfaction and stressfulness. Firms experience similar effects when synchronizing their acquisition and alliance rhythm to the external context.

According to the entrainment perspective, extraentrainment creates a coordination interface between firms and their environment (Ancona & Chong, 1996; McGrath & Kelly, 1986; Pérez-Nordtvedt et al., 2008; Standifer & Bluedorn, 2006). Synchronization is "satisfying" since it creates an ordered and coordinated interaction pattern, reducing feelings of uncertainty (Moore, 1963). Pérez-Nordtvedt and associates (2008) theorize that a temporal misfit or failure to synchronize with the external environment leads to ineffectiveness and suboptimal performance. When new international ventures synchronized their activity cycles with those of their most important customer, performance increased significantly (Khavul, Pérez-Nordtvedt, & Wood, 2010). Synchronization, as they stated (2010, p. 108), is a temporal "mechanism that enables greater integration, communication, interaction and socialization between two exchange parties."

Establishing competitors as benchmarks provides signals for when to accelerate or slow down acquisition and alliance initiatives. Benchmarks are socially constructed and act as an important signal for the reevaluation of acquisition and alliance programs. Extraentrainment is thus a "strain-reducing mechanism because it imposes less of a burden on an individual firm to attend to discordant external stimuli" (Jansen & Kristof-Brown, 2005, p. 95). These effects are transformed into a sense of control. This is particularly meaningful in our context where technological know-how about drug discovery processes is highly specialized and the outcome of drug development and regulatory approval is highly uncertain.

Extraentrainment with competitors' initiatives validates a firm's behavior, creating a sense of self-assurance through conformity to "social norms" (Jansen & Kristof-Brown, 2005). For instance, Williamson and Cable (2003, p. 350) found that "when focal firms face strong ambiguity about the environment, they are more likely to be motivated to monitor the actions of other organizations in their field in an effort to find viable solutions to organizational issues." Extraentrainment is a form of rational imitation (Hedstrom, 1998).

The concept of entrainment is also consistent with the tenets of institutional theory (Perez-Nordtvedt et al., 2008). Due to institutional norms, firms in similar environmental contexts seek

legitimacy by developing similar structures, practices and, in general, imitate each other (they become isomorphic), which results in several benefits including access to resources, status and survival (Aldrich & Ruef, 2006; Scott, 2007). In institutional theory, imitation is a mechanism used to achieve a fit between an organization and its environment. In our case, a focal firm's set of relevant competitors is part of the institutional context that it leverages as part of its legitimization initiatives. The entrainment perspective suggests that such a fit is dynamic and imitation should occur along a temporal line, i.e., a fit between a focal firm's timing of activity cycles with that of their respective competitors is an example of isochronism. As Pérez-Nordtvedt et al. (2008, p. 12) state, "the synchronization of activity cycles could easily be one of the several legitimacy expectations for organizations." However, the entrainment perspective differs from traditional institutional theory in the sense that institutional theory focuses on *what* to imitate, while the entrainment perspective focuses on *when and at what rate* to imitate.

The above reasoning suggests that firms adjust their rhythms to competitors as a result of benchmarking. This is consistent with rivalry-based imitation that has the objective of "maintaining competitive parity or limit(ing) rivalry" (Lieberman & Asaba, 2006, p. 368). An alternative explanation⁶ is derived from information-based theorizing where "firms match/follow others that are perceived as having superior information" (Lieberman & Asaba, 2006, p. 368).

Our sample of specialty pharmaceutical firms primarily engages in rivalry-based rather than information-based imitation. We define a focal firm's competitors based on the stage of development under the assumption that firms in the same stage are more likely to be direct competitors. We used journals, newspapers and media reports in the specialty pharmaceutical industry and interviews with industry experts to identify each firm's stage of development based on key words (such as emerging, established). Our categorization matches with that of Bank of America's specialty pharmaceutical report.

Firms within the same stage have similar resources, origins and history (Table 1). Specialty pharmaceutical firms in the same stage of development often occupy different product niches since the market size of orphan drugs is less than 200,000 individuals (see industry context section). Thus, competition hinges at the resource rather than at the product level. As Lieberman and Asaba (2006) theorize, when firms compete for the same resources and share similar origins, rivalry-based motives are likely to be the dominant rationale for imitation.

Firms in different stages are unlikely to imitate each other's rhythm as a means of legitimization for two reasons. Most of our sample firms face resource constraints and are less capable of imitating firms in other stages of development. There are fewer opportunities for firms in different stages

Table 1. Firm characteristics across different stages of development

Stage	Number of observation	Assets (\$ million)	Asset growth	ROA	Financial leverage	R&D	Tobin's Q	Tobin's Q (3 year moving average)
Emerging stage	162	119.00	52%	-32%	24%	2.29	5.95	6.07
Developmental stage	131	1079.00	46%	3.28%	31%	0.24	3.44	3.52
Established stage	72	668.00	24%	7%	44%	0.06	2.75	2.64
Total	365	572.00	44%	-11%	30%	1.12	4.44	4.49
Scheffe multiple-comparison test		18.35***	110.53***	232.17***	870.88***	46.65***	272.93***	219.52***

*** $p < .001$

to be aware of each other's actions and motivated to respond, especially since they have low levels of market commonality and resource similarity (Chen, 1996).

Extraentrainment does not imply that alignment between a firm's and competitors' rhythms need to perfectly coincide. As long as the pattern maintains a consistent relationship within a tolerance range, the interconnected rhythmic activities are not required to be exactly synchronized (Bluedorn, 2002; Pérez-Nordtvedt et al., 2008).

While we propose a similar structure for the alliance and acquisition extraentrainment hypotheses, we recognize there are distinctions in how firms use each initiative when addressing competitive dynamics. For instance, Dyer et al. (2004) found that firms are more likely to initiate an acquisition when market uncertainty and the level of competition for resources are high.

Hypothesis 2a: Firms that extraentrain the rhythm of their acquisition initiatives with that of their competitors achieve higher levels of performance.

Hypothesis 2b: Firms that extraentrain the rhythm of their alliance initiatives with that of their competitors achieve higher levels of performance.

Intraentrainment of acquisition and alliance rhythms

Within a firm, strategic initiatives such as acquisitions and alliances each have their own rhythm, which need to be coordinated to achieve internal temporal synchronization (McGrath, Kelly, & Machatka, 1984; Ofori-Dankwa & Julian, 2001; Zerubavel, 1981).

Strategic fit scholars recognize the importance of both internal and external fit (Miles & Snow, 1978; Miller, 1992). It has been suggested that intraentrainment has a positive effect on performance that parallels that of extraentrainment (Pérez-Nordtvedt et al., 2008). Pérez-Nordtvedt et al. (2008) and Standifer and Bluedorn (2006) both suggest that internal rhythmic activities are equally important to external ones for effective temporal coordination. Through intraentrainment, key internal resources such as managers with extensive experience in managing strategic initiatives can be deployed and coordinated effectively. McGrath and Kelly (1986, p. 90) suggest that intraentrainment results in a "dynamic equilibrium" in which process patterns that constitute a balanced or steady state change over time and do so in systematic ways. Such a "dynamic equilibrium" can be achieved in two ways for acquisition and alliance initiatives.

When acquisition and alliance initiatives are intraentrained, a commonality between each activity creates a foundation for information exchange. The greater the degree of interdependence between strategic initiatives, the more important it is to create a platform for exchanging relevant information (Marks, Mathieu, & Zaccaro, 2001; Standifer & Bluedorn, 2006). This logic has been examined in the product development literature where Lilly and Walters (1997) reported that pairing two new product development efforts generate numerous benefits including timely information sharing, building interest and demand for the new product and customer feedback.

Acquisitions and alliances have a high degree of interdependence. Indeed, when firms engage in one type of activity (such as alliance), they often need to engage in other types of activity (such as an acquisition) to access complementary resources (Keil et al., 2008; Porcini, 2004). Knowledge from one activity can cross-fertilize, spill over or reinforce the value of the others (Zollo, Reuer, & Singh, 2002) creating repetitive momentum (Amburgey & Miner, 1992). Wang and Zajac (2007) found that knowledge from prior alliances/acquisitions helps firms in future alliances/acquisitions. Similarly, Zollo and Reuer (2010) found that when an acquisition is managed in ways similar to alliances, knowledge spillover effects are more likely to occur. Alliance capabilities such as partner

selection and negotiations are similar to those of acquisitions (Zollo & Reuer, 2010). When sequentially intraentraining acquisitions and alliances, managers apply their most recently acquired knowledge from one activity to inform the other. In this respect, firms may synchronize an alliance initiative with their acquisition processes as a prelude to acquiring an alliance partner.⁷ While this is a plausible explanation, we did not find evidence in our sample that prior alliance partners had been acquired by our sample firms.

Synergies created by knowledge sharing reduce the need to prepare for and create buffers in response to an unforeseeable external market event (Standifer & Bluedorn, 2006). Intraentrainment smoothes the resource allocation process by deploying scarce resources to the “right activities at the right time.” For instance, qualified alliance and acquisition managers are usually in short supply in SMEs. By assigning the same manager to each strategic initiative in a synchronous manner, organizations can enhance performance by reducing slack managerial resources and leveraging existing resources. As Standifer and Bluedorn (2006, p. 911) state, “effective internal synchronization should help minimize the need for buffers through entrainment’s positive effect on monitoring and coordinative activities.”

The intraentrainment of multiple activities strengthens their cumulative effect (Albert, 1995). It creates a heightened sense of beginning or ending for organizational members, which results in members sharing the same set of circumstances (Barley, 1985) and develops a sense of common identity (Bluedorn & Denhardt, 1988). Intraentrainment creates a shared mental model (Standifer & Bluedorn, 2006) among alliance and acquisition departments regarding resource planning, scheduling, communicating, resource sharing and activity sequencing. The combined effect is far from additive but rather interwoven in a systematic order, which creates complexity for competitors to understand. Thus, intraentrainment of internal activities speaks to the resource-based view, i.e., synchronization becomes an integrated element within firms’ activity systems that, jointly, is hard to imitate, socially complex and causally ambiguous (Barney, 1991).

Hypothesis 3: Firms that intraentrain the rhythm of acquisition activity with the rhythm of alliance activity achieve higher levels of performance.

Methodology

Industry context

Specialty pharmaceuticals are firms mainly dealing with expensive medications that treat rare, chronic diseases afflicting a small proportion of people (*Employee Benefit News*, 2005). Such diseases include, but are not limited to, hemophilia, hepatitis C, some types of cancers, HIV/AIDS and nephrotic syndrome, which are classified as orphan diseases. (In the United States, diseases where less than 200,000 people have the condition are classified by the federal government as an orphan disease.) We adopt a broad definition of specialty pharmaceutical firms to include generic drug firms, which is in line with practitioner definitions. For instance, Bank of America’s specialty pharmaceutical report includes both specialty firms and generic drug companies (Shi, 2008). Our control for branded versus unbranded products was not significant.

We selected this industry for reasons consistent with our theoretical logic. SME specialty pharmaceutical firms’ growth strategy is largely driven by acquisition and alliance activity. The acquisition and alliance growth-driven strategy provides an ideal context for firms to develop a rhythm in their strategic initiatives and intra and extraentrainment routines. Specialty pharmaceutical firms often do not possess the requisite complementary resources for in-house development activities;

they instead rely on partners for important resources such as marketing and manufacturing (Lee, Lee, & Pennings, 2001).⁸ The lack of internal capabilities to develop critical resources essential for growth suggests that they search for targets or partners proactively.

Sample and data collection

All sample firms have value chain activity in the pharmaceutical industry (US Department of Commerce code SIC 2834). Through a search of company websites, annual reports and major pharmaceutical industry journals and proceedings, we identified key words such as “special drug,” “specialty pharmacy,” “special patients’ need” and “niche” that distinguish the selected firms from traditional pharmaceutical giants. The firms are listed on the NYSE or NASDAQ to ensure that we have access to relevant financial data through COMPUSTAT. Our procedure generated 58 companies in the global specialty pharmaceutical industry. As a validity check, we had two pharmaceutical industry managers provide an assessment of our selection process ($r = .98$). We obtained alliance and acquisition data from Thomson Financial Security Data Company’s (SDC) database (Carow, Heron, & Saxton, 2004; Oxley & Sampson, 2004). We used annual reports and 10-Ks to corroborate SDC data.⁹ We obtained information regarding firms’ growth stage through interviews with industry experts, industry journals, annual reports and company websites.

The time period spans the years 1985 to the end of 2003. Prior to this period, two important events occurred that shaped the evolution of the specialty pharmaceutical industry. First, the enactment of the Orphan Drug Act in 1984 created incentives to develop products for diseases affecting a relatively small numbers of patients. Second, the US Drug Price Competition and Patent Term Restoration Act of 1984, referred to as the “Hatch-Waxman Act,” standardized US procedures for recognition of generic drugs.

We establish the following criteria to select alliance and acquisition deals. Only completed deals are included. We delete cases that were pending, intended or ambiguous (rumor). For acquisitions, we do not include cases that suggest self-tender.

Internal development, Greenfield investment and reorganization are less central in our sample relative to other contexts. Many of our firms do not have commercial infrastructures and consequently, are largely conducting R&D. As a robust check, we included R&D intensity and patent count as proxies for internal development to control for its potential impact.

Our final sample consists of 57 listed firms¹⁰ with 421¹¹ observations over the period from 1985 to 2003. Since some of our sample firms were established after 1985, not every firm has coverage for 19 years. Our method accommodates this reality.

Variables and measures

Rhythm. We measure rhythm as a variability of acquisition and alliance frequency in two ways to establish construct reliability. First, we operationalize rhythm as the kurtosis of the first derivative of the number of acquisitions and alliances over time. This measure has been used in the international management literature where scholars examine foreign expansion process (Vermeulen & Barkema, 2002). The kurtosis of the distribution is:

$$kurtosis = \left\{ \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum \left(\frac{x_i - x_m}{s} \right)^4 \right\} - \frac{3(n-1)^2}{(n-2)(n-3)}$$

Where n is the number of observations, x_i is the number of strategic actions (acquisitions and alliances) in year i , and s is the standard deviation of the number of strategic actions. We standardized

the time periods over which the kurtosis-based rhythm measure is determined.¹² We use the inverse of kurtosis where a low value means more of the variance is due to infrequent extreme deviations (event pace). An even pace and therefore low variability rhythm will result in a relatively higher value. An even-event paced rhythm falls between the two.

Second, we use the number of acquisitions and alliances as a dependent variable and regress it on time over the period from 1985 to 2003. We then divide the standard error of the regression slope coefficient by its mean value (Dess & Beard, 1984). This measure reflects the dispersion about a trend line when controlling for the absolute number of firm actions. The measure takes the ordering of data points and the trend line of time into consideration, which is theoretically in line with our focus on time as a causal variable.

Intraentrainment. Methodologically, the concept of intraentrainment is similar to the fit perspective (Venkatraman & Prescott, 1990). We adopted the “fit as matching” perspective. When variables are endogenous or when they are subject to managers’ design or control, the “fit as matching” perspective is preferable (Powell, 1992). The variability in the rhythm of two internal processes, namely acquisitions and alliances, can be interpreted from a matching perspective. The concept of entrainment implies that different processes adopt a similar variability. The deviation score analysis method is based on a premise that the absolute difference between the scores of two variables indicates a lack of fit and the performance implications of fit is tested by examining the impact of this difference (Venkatraman & Prescott, 1990). The formal equation is:

$$Y = a_0 + a_1X + a_2Z + a_3(|X - Z|) + \varepsilon$$

Where X is the rhythm of acquisitions, Z is the rhythm of alliances and Y is Tobin Q . If is negative and statistically significant, then a “fit as matching” hypothesis is supported.

Extraentrainment. We define external competitors as those firms in our sample that are in the same stage of development as a focal firm. Theoretically, firms in different stages have different needs for information and resources (Aldrich & Ruef, 2006). We assigned our sample firms to one of three stages, i.e., established, developmental and emerging, by linking interviews with industry experts, industry journals, annual reports and company websites with the scholarly literature. Stage of development has been shown to be an important contingency impacting performance and survival (Aldrich & Ruef, 2006). Firms in the established stage are mature and have well-defined organizational routines, structures and managerial capabilities. Firms in the developmental stage have clear structures; however, many procedures are still in the process of adjustment. Finally, firms in the emerging stage have a short organizational history. Their structures, routines and norms are less developed and are strongly influenced by the external environment or internal blind variation (Aldrich & Ruef, 2006). For the classification of firms to stages of development, we found significant differences across the stages in terms of assets, growth, profitability, financial leverage, R&D investment and Tobin’s Q (see Table 1).

Since our measure of competitors’ rhythm is created by averaging the rhythm of proximal competitors (in terms of firms’ stage), the reliability of the difference score is reduced because the focal firm’s rhythm may share some variance with its competitors’ rhythm. In this case, polynomial regression analysis is a better alternative to difference score analysis (Edwards, 2002). In essence, polynomial regression replaces “differences scores with a component measure that constitutes the difference and higher-order terms such as the squares and product of these measures” (Edwards, 2002, p. 2). Polynomial regression takes the following form:

$$P = b_0 + b_1R + b_2E + b_3R^2 + b_4RE + b_5E^2 + \varepsilon$$

in which P represents firm performance, R is firm's rhythm for acquisitions (alliances) and E is the competitors' rhythm of acquisitions (alliances).

Because competitors' average rhythm is a higher level of analysis than that of the focal firm, we incorporated polynomial regression within hierarchical linear modeling (HLM) to control for the shared variance—a technique referred to as cross-level polynomial regression (Jansen & Kristof-Brown, 2005). The HLM model indicates that firm performance is influenced by the focal firms' rhythm, their competitors' rhythm, their product and their square term. The cross-level equations indicate that the data are nested by year and stage of development.

Performance. We used the market-based performance measure, Tobin's Q, computed as the sum of market value of equity (common shares outstanding \times the closing stock price), the liquidation value of preferred stock and the book value of debt divided by the book value of assets (Chung & Pruitt, 1994). Many of our firms are small compared with pharmaceutical giants and generate negative returns, which is not unusual. Performance measures based on return on sales, equity or assets do not accurately capture the ability of these organizations to create value.

The Tobin's Q ratio reflects a firm's ability to create efficiency and measures strategic performance (Chakravarthy, 1986). To facilitate causal inference, we lagged Tobin's Q by one year.¹³ Tobin's Q tends to be skewed; so we used a log transformation. Some scholars (Laitner & Stolyarov, 2003) espouse that Tobin's Q is suitable for measuring strategic performance when a firm's assets contain a large amount of intangibles such as in the bio-pharmaceutical industry. As a validity check, we include ROA (one-year lag) and expect non-significant results.

Control variables. We measure firm size by assets (log)¹⁴ since previous studies have indicated that it influences performance (Kuperman, Skiggs, & Youndt, 2004). Tobin's Q is influenced by firms' growth potential. Firms with higher growth momentum are perceived by investors as valuable and more profitable in the long run. We therefore use the percentage of asset growth in year i compared with year $i - 1$ to capture this effect.¹⁵ We control for internal development measured by R&D intensity.¹⁶ In addition, we use patent count as a proxy for internal development in lieu of R&D intensity. Our results do not change. Patent count is highly correlated with R&D intensity ($\gamma_{pr} = 0.89$). Firms' growth stage is a control because it may impact market value. Firms in the emerging stage are subject to liability of newness and vulnerable to environment selection. We controlled for inter-temporal trends with year dummy variables and firm's acquisition and alliance experience by the accumulated number of acquisitions and alliances conducted each year.

The remaining controls include profitability measured by ROA, debt-to-equity ratio as a measure of financial leverage, and product characteristics (whether it produces branded or generic products) since these two types of firms might be evaluated by investors differently. In the specialty pharmaceutical market some firms' primary SIC code is 2834 (pharmaceutical) while others are 2836 (biopharmaceutical). We controlled for industry effects using a dummy variable. Since there is a tendency for alliance and acquisition activity to co-align during time periods when an industry sector is booming and market valuations are high (McNamara, Haleblan, & Dykes, 2008), we use the percentage change of Dow Jones' middle and small cap biopharmaceutical index to control for overall sector's movement and mood. Finally, to control for information-based imitation, we created two variables: industry-wide imitation of acquisitions and alliances, respectively. For these controls, we define competitors to include all firms in our sample since information-based imitation is based on industry-wide legitimacy concerns. We then calculated the average rhythm of our

sample firms. The variables' imitation of acquisitions and alliances are the absolute value of focal firms' rhythm minus the average rhythm of all competitors.

Data Analysis

To test our rhythm (H1a, H1b) and intraentrainment (H3) hypotheses, we use feasible generalized least square (FGLS) regression. FGLS regression deals with autocorrelation within panels (AR1) and heteroskedasticity across panels (Greene, 2000).¹⁷ We prefer FGLS because the FGLS estimator addresses more complex heteroskedasticity problems.¹⁸ When we test different scores between the rhythm of acquisitions and alliances, each firm has a different number of acquisitions and alliances, resulting in complex heteroskedasticity issues arising from variances among firms and non-constant variance over time.

For firms that enter our sample after 1985, their fewer observations might create biased results. Our panel dataset is unbalanced and thus we use the *xtpcse* function and *np1* option in Stata. These functions calculate panel-corrected standard error (PCSE) estimates for linear cross-sectional time-series models where the parameters are estimated by Paris-Winsten regression and specify that the panel-specific autocorrelations are weighted by the number of observations in each panel (Greene, 2000). Both sets of results are consistent.

To test an inverted U relationship, we use the square term of rhythm. For hypotheses 1a, 1b and 3, we test models using Tobin's Q (models 1–5) and ROA (models 6–10). To test the extraentrainment hypotheses 2a and 2b, we use cross-level polynomial regression.

Our estimates are unbiased only if self-selection bias and omitted variables bias are accounted for. To assess these issues, we employed a two-stage Heckman selection procedure (Heckman, 1979). The results are consistent and the inverse Mills ratio is not significant, indicating that self-selection bias and omitted variables bias do not impact our results.

Results

Table 2 presents the correlation matrix and descriptive statistics. With the exception of rhythm and its square term and the branded and stage variables, there are no extremely high correlations. We use the centering solution to reduce multicollinearity among rhythm and its square. For models testing an inverted U relationship, we subtract the mean from the rhythm variable value before creating the product term. Models including and excluding the stage variable produced consistent results. The average VIF is 2.70 (max. 9.07; min. 1.04), which is lower than the threshold level 10 for the presence of multicollinearity (Chatterjee, Hadi, & Price, 2000).

The results of hypotheses 1a, 1b and 3 are presented in Table 3. Model 1 is the base model. We find support for hypothesis 1a (model 3: $\beta_{ac} = .112, p < .001, \beta_{acs} = -.010, p < .01$), indicating that the rhythm of acquisition has an inverted U effect on performance. The result for the rhythm of alliances and performance (1b) is not significant (model 3).

For hypotheses 2a and 2b, when firms extraentrain their rhythm of acquisitions and alliances with competitors we predict that it enhances performance. Table 4 reports the fixed effects estimates of the fit parameters. The slope and curvature along the lines of fit ($R(focal\ firm) = E(competitors)$) and misfit ($R = -E$) were calculated using equations specified in Edwards and Parry (1993) and annotated in Table 4. Statistical significance of these slopes and curvatures was determined by testing their linear combinations within SAS using CONTRAST statements. To facilitate interpretation, we draw on response surface methodology (Khuri & Cornell, 1996), which permits precise evaluations of three-dimensional surfaces corresponding to polynomial regression

Table 2. Descriptive statistics and correlations

	Mean	S.D.	1	2	3	4	5	6	7
1 Tobin's Q	4.446	5.281	1.000						
2 Rhythm of acquisitions	1.386	2.161	-0.106*	1.000					
3 Rhythm of alliances	1.216	1.486	-0.023	0.152*	1.000				
4 Internal synchronization	1.431	1.970	-0.010	0.679*	0.359*	1.000			
5 Competitors' rhythm of acquisitions	1.382	0.951	-0.174*	0.445*	0.178*	0.279*	1.000		
6 Competitors' rhythm of alliances	1.213	0.658	-0.098*	0.177*	0.446*	0.185*	0.398*	1.000	
7 Number of acquisitions	2.854	5.044	-0.146*	0.236*	0.169*	-0.064	0.372*	0.267*	1.000
8 Number of alliances	1.446	1.843	0.012	0.119*	0.397*	0.082	0.228*	0.177*	0.491*
9 Asset	572	1005	-0.155*	0.219*	0.108*	-0.014	0.398*	0.202*	0.719*
10 R&D intensity	1.121	2.474	0.116*	-0.125*	-0.071	-0.025	-0.220*	-0.162*	-0.174*
11 Profitability	-0.114	0.344	-0.414*	0.196*	0.072	0.021	0.274*	0.086	0.199*
12 Industry	0.900	0.301	-0.081	0.117*	0.091	0.063	0.033	0.109*	0.147*
13 Stage	1.754	0.764	-0.250*	0.118*	0.136*	-0.100*	0.269*	0.314*	0.368*
14 Growth	0.441	1.117	0.058	0.127*	-0.052	0.102*	0.054	-0.081	-0.053
15 Leverage	0.303	6.401	-0.043	-0.013	0.011	0.013	-0.008	0.008	0.004
16 Branded	0.652	0.477	0.102*	-0.062	-0.032	0.103*	-0.129*	-0.154*	-0.201*
17 Bio-pharm Index	0.091	0.290	-0.056	0.275*	0.035	0.225*	0.607*	0.069	0.232*
18 Industry-wide imitation of acquisitions	1.372	1.669	-0.034	-0.003	0.071	-0.048	0.137*	0.099*	0.142*
19 Industry-wide imitation of alliances	1.081	1.018	-0.025	-0.026	-0.004	-0.011	0.063	-0.014	-0.022

* $p < 0.05$

8	9	10	11	12	13	14	15	16	17	18	19
1.000											
0.470*	1.000										
-0.092	-0.196*	1.000									
0.046	0.227*	-0.470*	1.000								
0.185*	0.119*	0.020	0.068	1.000							
0.063	0.289*	-0.391*	0.482*	0.258*	1.000						
-0.066	-0.005	-0.008	0.117*	-0.071	-0.088	1.000					
0.036	0.031	-0.008	0.065	-0.007	0.011	0.132*	1.000				
0.033	-0.107*	0.273*	-0.319*	-0.127*	-0.631*	0.065	-0.015	1.000			
0.134*	0.340*	-0.037	0.057	-0.082	-0.073	0.045	-0.057	0.076	1.000		
0.114*	0.125*	-0.052	0.089	0.039	0.124*	-0.041	-0.002	-0.085	0.053	1.000	
0.095	0.019	-0.059	0.071	-0.132*	-0.026	-0.034	0.009	-0.031	0.108*	-0.001	1.000

Table 3. Feasible generalized least square regression

	Tobin's Q_{t+1} (Log)									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Control variables										
Intercept	1.209**	1.289**	1.534***	1.722***	1.705***	-0.098	-0.089	-0.065	-0.091	-0.116
Acquisition experience	0.001	-0.001	-0.006	-0.003	-0.005	-0.001	-0.001	-0.002	-0.003	-0.004
Alliance experience	0.035	0.039	0.044 ^a	0.013	0.022	-0.006	-0.004	-0.005	-0.009 ^a	-0.009
Asset (log)	-0.234***	-0.238***	-0.267***	-0.223***	-0.240***	0.008	0.006	0.001	0.009	0.013
R&D intensity	-0.053 ^a	-0.052 ^a	-0.057*	-0.059 ^a	-0.061 ^a	-0.047***	-0.047***	-0.047***	-0.048***	-0.049***
Profitability	-0.151	-0.152	-0.173 ^a	0.006	0.009	0.490***	0.489***	0.496***	0.472***	0.406***
Industry dummy	0.033	0.004	-0.064	0.035	0.015	0.018	0.013	0.012	0.039	0.034
Stage	0.098	0.101	0.129	0.030	0.057	0.016	0.019	0.025 ^a	0.033*	0.042*
Asset growth	0.026*	0.025*	0.032**	0.013	0.016	0.003	0.002	0.002	0.006	0.003
Leverage	0.001	0.001	0.001	0.002	0.002	-0.002	-0.002	-0.001	-0.001	-0.001
Branded	0.118	0.110	0.077	0.032	0.015	-0.019	-0.019	-0.019	-0.009	-0.012
Bio-pharmaceutical index	0.001**	0.001*	0.001*	0.006***	0.006***					
Year dummy (1986–2003)	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Main effect										
Rhythm of acquisition		0.024	0.112***		0.023 ^a		0.006	0.015 ^a		0.009 ^a
Rhythm of alliance		-0.003	-0.006		-0.008		-0.004	-0.001		-0.003
Rhythm of acquisition square			-0.010**					-0.001		
Rhythm of alliance square			0.001					-0.001		
Internal synchronization between acquisition and alliance				0.068*	0.062*				0.012	0.017
Num	365	365	365	365	365	365	365	365	365	365
Wald Chi ²	177.17***	184.35***	199.62***	169.87***	167.47***	339.61***	343.14***	345.22***	336.12***	335.72***
Log likelihood	-345.29	-342.88	-337.84	-203.64	-204.37	-10.16	-9.23	-8.69	-10.89	-11.12

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.001$

Table 4. Cross-level polynomial regression results of firm's performance (Tobin's Q) on firm's rhythm and competitors' rhythm

Fixed effect coefficients	Unbundled acquisitions and alliance	
	Model 11 (alliance)	Model 12 (acquisition)
Controls		
Intercept	2.425***	2.427***
Total number of acquisitions	-0.004	-0.004
Total number of alliances	0.040	0.045
Asset	-0.203***	-0.221***
R&D intensity	-0.019	-0.015
Profitability	-0.474**	-0.493***
Asset growth	0.034	0.043
Leverage	0.004	0.004
Branded	0.030	0.059
Industry dummy	-0.081	-0.114
Bio-pharm index	0.001 ^a	0.001*
Industry-wide imitation of acquisition	0.002	0.002
Industry-wide imitation of alliance	-0.001	-0.001
Rhythm of acquisition (R)	0.074*	
Rhythm of acquisition (squared)	-0.006	
Rhythm of competitors' acquisition (E)	0.167**	
Rhythm of alliance (R)		0.100*
Rhythm of alliance (squared)		-0.014*
Rhythm of competitors' alliance (E)		-0.050
Fit variables		
R	0.094*	0.062
E	-0.03	0.170
R ²	-0.017	-0.003
R*E	0.029	0.001
E ²	-0.243**	-0.122 ^a
Response surface features		
<i>R = E fit line</i>		
Slope (R + E)	0.064	0.232*
Curvature (R ² + R*E + E ²)	-0.231**	-0.124 ^a
<i>R = -E misfit line</i>		
Slope (R - E)	0.124	-0.108
Curvature (R ² - R*E + E ²)	-0.289*	-0.126
Total variance explained ^b	0.294*	0.292*

^a $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ^btotal variance explained = $1 - (\text{residual variance of full model} / \text{residual variance of null model})$, significance was determined by Chi Square difference across models

equations (Edwards & Parry, 1993, p. 1578). In Figures 1 and 2 the fit line runs across the floor of the graph from front to back (white line), and the misfit line runs across the floor of the graph from left to right (black line).

Our hypotheses predicted that performance would be highest along the line of fit and lowest when a focal firm's rhythm and competitors' rhythm differ. We find extraentrainment effects for alliances (hypothesis 2b), but not for acquisitions (hypothesis 2a). In model 11 (alliances), the

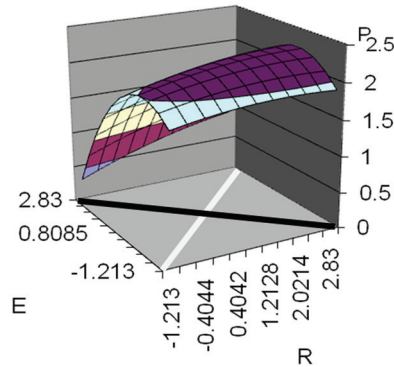


Figure 1. Surface graph of firm performance based on the fit between a firm's rhythm of alliances and competitors' rhythm of alliance (extraentrainment)
P: Performance, E: Competitors' rhythm, R: Focal firms' rhythm

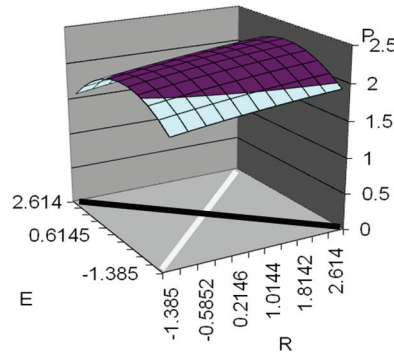


Figure 2. Surface graph of firm performance based on the fit between a firm's rhythm of acquisitions and competitors' rhythm of acquisitions (extraentrainment)
P: Performance, E: Competitors' rhythm, R: Focal firms' rhythm

surface along the line of fit ($R = E$), had a downward curvature ($\beta_{\text{Curvature}} = -0.231, p < .01$) and its slope at the point $R = 0, E = 0$ did not differ from zero ($\beta_{\text{Slope}} = 0.064$). This suggests that performance increased as the rhythm of the focal firm (R) and its competitors (E) both increased and leveled off as R and E reach their maximum levels. Along the misfit line, the surface was curved downward ($\beta_{\text{curvature}} = -0.289, p < .05$) and essentially flat at the point of fit (based on the insignificant slope coefficient along the $R = -E$ line). These results provide evidence for an extraentrainment effect for alliances (2b).

In model 12 (acquisition), we found the surface along the fit line ($R = E$) had a significant downward curvature, such that performance increased as a focal firm's acquisition rhythm and competitors' acquisition rhythm both increased and leveled off. However, along the misfit line ($R = -E$), the curvature of the surface does not significantly differ from zero, indicating the surface was not downward. The coefficient of slope along the misfit line is also insignificant. These results fail to provide support for an extraentrainment effect for the rhythm of acquisitions (2a).

Hypothesis 3 predicts a positive relationship between intraentrainment and Tobin Q. Both models 4 and 5 support our hypothesis. In model 4, the coefficient of intraentrainment is positive and significant ($p < .05$), suggesting the smaller the difference between the rhythm of acquisitions and alliances, the better the performance. Consistent with our expectation, none of the coefficients are significant with ROA.

Most control variables show predicted relations with performance. In most models, asset growth shows a positive and significant association with Tobin's Q but not ROA. Assets, per se, are negatively related to Tobin's Q, suggesting that investors tend to discount larger firms due to inefficiencies. This conclusion is further inferred from the fact that profitability is negatively related with Tobin's Q. R&D intensity shows a negative relationship with both Tobin Q and ROA, suggesting investing in internal R&D will not only generate expense that lowers short-term performance, but also hurts long-term performance. Investors do not reward small firms for large internal investment since drug development is a risky business. The odds of developing a successful or blockbuster drug are very low and manufacturing and marketing activities can be outsourced. Stage of development, industry effects, leverage, branded or unbranded products and alliance or acquisition experience do not have significant effects on Tobin's Q. The percentage change of the overall biopharmaceutical sector has a positive and significant impact on performance. Finally, neither of the information-based imitation control variables shows a significant effect on performance. Our second measure of rhythm—the instability measure—generates very similar results, suggesting that our temporal constructs are reliable.

Discussion

We advance a temporal view of acquisitions and alliances by theoretically exploring the temporal rationales underlying rhythm, entrainment and their performance effects for repetitive acquisition and alliance initiatives. Repetitive acquisition and alliance initiatives are cyclical processes for which firms build routines and manage interdependencies based on the need to coordinate scarce resources, knowledge and learning (Wang & Zajac, 2007). Our findings have significant implications for scholarly research and why firms need to differentially manage acquisition and alliance temporal routines. Repetitive acquisition initiatives are best managed using an even-event rhythm in which firms follow an improvisation strategy (Cunha, 2004). In contrast, a firm's alliance-based routines should be synchronized with its competitors' alliance initiatives to enhance performance. Finally, firms that synchronize the rhythms of their acquisition and alliance initiatives achieve superior performance. Below we explore the temporal implications of our findings, limitations and promising future research directions.

Rhythm and organizational improvisation

We contribute to the emerging temporal research stream that emphasizes the performance consequences of rhythm (Klärner & Raisch, in press; Laamanen & Keil, 2008; Shi & Prescott, 2011; Shi et al., 2012; Vermeulen & Barkema, 2002). Employing the continuum of temporal heterogeneity (Bluedorn, 2002) where a firm's acquisition or alliance rhythm can range from an even to even-event to event pacing, we were able to test whether the form of the rhythm–performance relationship is characterized by an inverted U. We theorized that an even-event rhythm minimizes the negative impact of blind spots, ritualized behavior, limited diversity in absorptive capability and reduced complexity in the sequence of action while enhancing the development of an entrainment quotient. We found supporting evidence for acquisitions but not for alliances.

For acquisitions, an even-event paced rhythm is consistent with organizational improvisation (Brown & Eisenhardt, 1997; Cunha, 2004; Crossan & Sorrenti, 1997; Eisenhardt & Brown, 1998). Improvising firms focus on restricted flexibility where they engage in even-paced activity yet are responsive to events (Crossan et al., 2005). This is an important finding because it refocuses a central debate in the acquisition literature from one where these initiatives are framed as a dichotomy between planned or opportunity driven to a dialectic discourse where a synthesis between the approaches is the objective (Cunha, 2004). Intuitively, this conclusion makes sense. As a means of growth, firms that follow an even-event paced rhythm undertake acquisitions when it makes strategic sense, rather than being subject to a bandwagon effect or succumbing to pressures from powerful stakeholders. A question that needs to be answered is: What is involved with developing a dialectic approach to acquisition programs?

A plausible rationale for our finding is that acquisitions involve greater resource commitments and risks while alliances can be disbanded more easily if they do not work (Yang et al., 2010; Yin & Shanley, 2008; Zollo & Reuer, 2010). As such, acquisitions require more careful consideration of targets and post-integration management. In the case of alliances, probably what matters most is that firms entrain with their partners and competitors due to rivalry-based imitation (as H2b suggests), rather than following a particular rhythm. However, firms that intraentrained their acquisition and alliance rhythms enhanced their performance (H3). Together, these findings indicate the complexities of designing effective acquisitions and alliances rhythms since managers must walk a tightrope balancing internal coordination of activity cycles with external pacers that can often be in conflict. Indeed, our set of interviews provided anecdotal evidence that managers do think of their acquisitions and alliances initiatives in rhythm-related terms and struggle to achieve a balanced approach. A productive future research direction would be to conduct detailed case histories to assess how managers craft and coordinate rhythm-based acquisition and alliance programs.

A related interesting research area is to better understand the degree to which the underlying dynamics of even-event pacing is driven by opportunities as opposed to being a lower level of variability than event pacing. While we were not able to tease out this information from our data, research examining how opportunities impact the rhythm of alliance and acquisition behavior is a promising research direction.

The study of rhythm also contributes to the extensive literature on the relationship between acquisition/alliance experience and firm performance. In our sample, acquisition or alliance experience (Haleblian & Finkelstein, 1999) was not as significant as the temporal structure of these experiences. We found that controlling for experience, rhythms mattered. This indicates that time matters beyond the experiences that time may provide. In other words, accumulating acquisition and alliance experience may not be as effective as knowing how to strategically structure these experiences along the temporal line (Klarner & Raisch, *in press*).

Entrainment

A core feature of the entrainment perspective is to understand the extraentrainment of firm activity cycles with components of their ecosystem. We identified a rivalry-based imitation mechanism that explains the extraentrainment of alliances. Competition among our sample firms is based on access to resources rather than vying for similar customers because they compete in small orphan drug markets and with firms within the same stage of development. As Lieberman and Asaba (2006) theorize, competition based on resources leads to rivalry-based imitation oriented towards maintaining competitive parity. In their highly uncertain context, firms look for signals, cues and benchmarks as ways to identify and access critical resources. Alliancing with other organizations in a

firm's ecosystem is a well-established approach for gaining access to resources and limiting excessive competition among rivals.

To explore an alternative explanation that our sample firms formed alliances with each other and therefore synchronized their rhythms to enhance coordination, knowledge transfer and learning objectives we conducted a post-hoc analysis.¹⁹ We identified only two marketing agreement alliances (2.5%) among our sample firms that strongly suggest that the alternative hypothesis is not supported. The remaining alliances (97.5%) are of two types. The first is marketing or license agreements with large pharmaceutical firms to manufacture, market and sell their products. Specialty pharmaceutical firms usually lack resources needed to develop downstream activities. The second type is with research institutions, hospitals or technology firms in an effort to co-develop specific compounds, drug delivery systems and drug testing. All three types of alliance involve the synchronization of activity cycles across firm boundaries to access resources critical to firm growth. Since the formation of alliances is visible to all competitors, extraentrainment with a firm's competitors' alliance rhythm is a manifestation of rivalry-based imitation.

Prior entrainment research has almost exclusively focused on the individual and team levels of analysis (George & Jones, 2000; Marks et al., 2001; Montoya-Weiss et al., 2001). Our study is among the few that apply the entrainment perspective at the organizational level (Khavul et al., 2010; Pérez-Nordtvedt et al., 2008). Our study provides an example of multi-level (Ofori-Dankwa & Julian, 2001; Pettigrew, 1990) extraentrainment. The performance benefits of synchronizing a focal firm's alliance rhythm with their competitors' alliance rhythm is evidence that firms need to attend to multi-level activity cycles in their external environment. We would expect that research exploring how the activity cycles of governments, regulators, investors, suppliers and customers extraentrain firm-level activity cycles would provide core insights into how the strategic behavior of firms is shaped and constrained.

Strategic fit and change

Broadly speaking, the entrainment model contributes to the strategic fit literature by providing an explanation of why a temporal fit (Khavul et al., 2010; Montoya-Weiss et al., 2001) among multiple activity cycles enhances firm performance. From an entrainment perspective activities are embedded and interdependent and, to some extent, a dynamic fit (Zajac, Kraatz, & Bresser, 2000) is achieved by matching different activity cycles along a time dimension. Prior research has tended to focus on one type of strategic initiative (acquisitions or alliances), which limits the simultaneous exploration of complex temporal topics such as extra- and intraentrainment (Perez-Nordtvedt et al., 2008). Our findings indicate that the performance implications of a firm's alliance rhythm is not only affected by their competitors' rhythm, but also constrained by the internal rhythm of its acquisition program (Dushnitsky & Lavie, 2010; Keil et al., 2008; Porrini, 2004). This raises an interesting question as to whether there is a positive performance-based interaction effect between extra- and intraentrainment. We did not find a significant interaction effect. In other words, extra- and intraentrainment have independent and different effects in our context. Given the boundary conditions of our resource-constrained sample where growth is driven by acquisition and alliances, this finding is most likely context specific. Future research exploring interaction effects of entrainment in other settings will be productive.

Our ideas build on and extend the conceptualization of phase misfit developed by Perez-Nordtvedt et al. (2008). A phase misfit occurs when two activity cycles are "not align(ed) at the same time intervals" (p. 3). However, two activity cycles can have different phases but be sequentially entrained. Synergies created by sequential resource and knowledge sharing across activity

cycles reduce the need to create organizational buffers (Standifer & Bluedorn, 2006). Sequential phase intraentrainment smoothes the resource allocation process by deploying scarce resources to the "right activities at the right time."

While the definition of the beginning and end of an activity cycle is important, there are important incidents of sequential entrainment. Just-in-time activity cycles between suppliers and customers are sequentially entrained. Suppliers complete their production cycle and then deliver products to their customers. Sony and Microsoft releasing new versions of gaming consoles at the beginning of the holiday season can be interpreted as an example of sequential entrainment. The production cycle of gaming consoles occurs before the purchasing cycle of consumers. The tolerance range concept of misfit introduced by Perez-Nortvedt et al. (2008) is important since most, but not all, production is completed before just-in-time delivery or the holiday season and these cycles can repeat within and across years.

As we thought about simultaneous and sequential entrainment, two ideas emerged. First, entrepreneurial firms have developed business models based on changing their industry's entrainment norms.²⁰ In the e-book market, production (electronic delivery of the book) has been simultaneously entrained to the on-demand buying activity cycles of customers. Traditional book publishing is sequentially entrained to specific customer buying periods such as the summer and holiday seasons. Second, we think the temporal fit question is best addressed from a contingency perspective, drawing on Thompson's (1967) typology of interdependence. That is, research should begin to catalogue which organizational and environmental activity cycles exhibit simultaneous phase entrainment while others require a sequential or reciprocal phase entrainment.

Finally, our findings contribute to the stream of research on strategic change that examines firms' repetitive actions and strategic momentum (Amburgey & Miner, 1992; Klarner & Raisch, *in press*; Orlikowski, 1996). Specifically, Amburgey and Miner found evidence for the presence of repetitive momentum (when organizations repeat previous strategic actions), positional momentum (when organizations take actions that sustain or extend existing strategic positions) and contextual momentum (when general traits, such as organizational structure, shape strategic action in a consistent fashion). These repetitive strategic actions, in fact, are the pre-condition for the development of an acquisition and alliance rhythm. In other words, these authors examined first-order temporal constructs and we focus on second-order temporal constructs, i.e., organizations develop a rhythm when they repeat acquisitions (and/or) alliances. Rhythm reflects a type of variability in these repetitive actions.

An important managerial implication involves learning how to leverage the timing of strategic activities. To this end, the issue lies far beyond experience effects of conducting acquisitions and alliances, but rather in when, how and under what conditions should a firm accelerate or slow down the process. Speeding up or slowing down certain processes at the wrong time may result in internal or external synchronization mismatches.

Limitations

Both our sample firms' characteristics and industry context constitute important boundary conditions that may limit the generalizability of our findings. For example, we explore intraentrainment in the context of SMEs, who are usually resource-strapped (Lu & Beamish, 2006; Oliver, 2001). Large multinational corporations often undertake acquisition and alliance initiatives at the business unit level and each business unit may have its own alliance function or acquisition team. Under this situation, the challenge of sharing knowledge across different strategic initiatives is how to coordinate units located in different geographic regions characterized by different time zones, cultures

and possibly temporal orientations (Das, 2006; Pandza & Thorpe, 2009). Future research should explore various integrating mechanisms (such as a centralized alliance function, informal communication channels, managerial rotation, global acquisition/alliance teams, and so on) that are needed for achieving effective intraentrainment. Similarly, we focused on publicly listed firms whose top management teams are more likely to pay attention to external stakeholders such as competitors. In other words, privately held firms may be less concerned about synchronizing their acquisition and alliance initiatives with their competitors.

Our industry context is also an important boundary condition. Within the specialty pharmaceutical industry, firms' growth is highly driven by acquisitions and alliances with limited international sales during our study period. Certain industries, however, may be driven by other strategic initiatives such as global expansion through greenfield or wholly owned subsidiaries. For example, when global expansion dominates industry growth, firms are more likely to entrain with important customers (Khavul et al., 2010). Future research that compares entrainment across a variety of industry settings can enhance the validity of theoretical claims, and further fine-tune the rhythm and entrainment approach in strategy. A temporal perspective of acquisitions and alliances and their performance implications is still in its formative stage. As such, drawing normative implications needs to be done with caution. Thus one of our primary purposes is to stimulate academic scholars and practitioners to further theorize and empirically study acquisitions and alliances from a temporal perspective.

Acknowledgments

This study is based on the first author's dissertation in 2008. We appreciate helpful comments and insights from two anonymous reviewers, Editor-in-Chief David Courpasson, Co-Editor David Arellano Gault, Professors Susan Cohen, Gregory Dess, John Hulland, Suzanne Lane, Ravi Madhavan, the strategy research group at the University of Pittsburgh, the seminar participants at Weissman Center for International Business at City University of New York, and the management departments at Zicklin School of Business, Baruch College—City University of New York.

Funding

Support for this project was provided by a PSC-CUNY Award (60031-39 40), jointly funded by the Professional Staff Congress and the City University of New York.

Notes

1. Gene Collier, *Pittsburgh Post-Gazette*, July 29, 2007. According to Collier, "His (Tomlin's) thoughtfully non-rhythmic remark was crafted to explain that (training) camp schedule is designed to make players uncomfortable and unable to anticipate any pattern to the tasks, the better to sharpen their cognition and adaptability..." In our context, we extend his meaning to reflect an even-event rhythm to the players, other teams and coaches in the NFL. See hypothesis 1.
2. We acknowledge caution is needed when borrowing concepts from other disciplines. Organizational science, as a discipline, has several notable examples including population ecology and evolutionary economics.
3. We frame the limitations for an even-paced rhythm since it has been the focus of research. However, an event-paced rhythm has corresponding limitations. When there are distinctions we note them. The inverted U is the result of relatively greater limitations for either an even- or event-paced rhythm as compare to an even-event paced rhythm.
4. A thoughtful anonymous reviewer suggested the entrainment quotient.
5. Our position is not without face validity. In answer to the question "Do you think firms align their multiple acquisitions and alliances with their competitor along a temporal line?", George Lasezkay, one of our interviewees, stated the following: "Works more in this way. That company over there. We are interested

in diabetes (therapeutic area). They are interested in diabetes (therapeutic area). They just did two deals in diabetes (therapeutic area) for two interesting technologies. Did we look at these deals? Why don't we look at these deals? Are we looking at some other deals that are better than these deals? It drives in that way. You know, they did 20 deals last year, we only did ten and what's wrong with us?" This position is consistent with rivalry-based imitation (Lieberman & Asaba, 2006).

6. We thank two thoughtful anonymous reviewers for suggesting this alternative hypothesis, pushing us to sharpen our logic and to control for information-based imitation.
7. We thank a thoughtful anonymous reviewer for suggesting this possibility as per the real options perspective.
8. George Lasezkay, former Corporate Vice President (Business Development) at Allergan also pointed this out during our interview.
9. The annual report on Form 10-K provides a comprehensive overview of the company's business and financial condition and includes audited financial statements. Although similarly named, the annual report on Form 10-K is distinct from the annual report to shareholders which a company must send to its shareholders when it holds an annual meeting to elect directors.
10. We drop one firm because it was obviously a division (subsidiary) of a larger diversified company.
11. We used 365 observations in our analysis since we lagged our dependent variable for one year.
12. We used three-year panels, five-year panels and the entire time period for a firm up to the observation point. Results are consistent. We reported our analysis using the entire time period for a firm up to the observation point.
13. We also used three-year forward moving average Tobin's Q (log) and the results do not change significantly.
14. We also replaced asset with number of employee (log) and no significant change was found.
15. We also used growth of sales and the number of employee. The results are quite similar. Since sales and assets are highly correlated, we only report the asset findings.
16. We used a one-year and three-year moving average of R&D intensity. Results do not differ.
17. In Stata, we use the option corr (ar1) force and panel (hetero) to model autocorrelation and heteroskedasticity effects. We did not model cross-sectional correlation effects since it only makes sense to assume that the error terms are correlated when panels are balanced and when the number of time periods is greater than the number of panels.
18. GLS estimator only deals with basic heteroskedasticity problems that are relevant to panel data per se, i.e., assuming each firm has a different value of mean, but the same value of variance, although such a variance is not constant over time.
19. We thank a thoughtful reviewer for suggesting this analysis.
20. For an example of switching from a sequential to simultaneous phase entrainment in the fashion industry see Zara: Fast Fashion—HBS case #703497.

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