

A Temporal Perspective on Learning Alliance Formation

Ming Piao

School of Business & Leadership, Regent University, Virginia Beach, USA.
Email: mpiao@regent.edu

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ABSTRACT

When to enter the first learning alliance has strategic implications for firms' long term success. However, research on timing of the first learning alliance is rare. As one of the few empirical studies on this issue, this paper aims to fill the gap by asking what the implications are when firms launch their first learning alliance at different points of time. Empirical results support the central proposition that if firms enter the first learning alliance too early or too late, they tend to rush into a second learning alliance in a short period of time. In the long run, they will lose the ability to innovate. Overall, this study has fundamental implications for organizational learning in particular and theory building in general.

KEYWORDS

Time; Learning Alliance Formation

1. Introduction

In the past few years, several major management journals have published papers calling for an explicit attention to time-related issues in theory building and theory testing [1-6]. They contended that firm strategies and actions are embedded in time, and temporal embeddedness may have a great bearing on firm performance. Several empirical studies have evidenced the temporal embeddedness in different contexts, such as situated interactions [7], temporal boundaries of work and family life [4], punctuated equilibrium in group dynamics and limited temporal sustainability of marketing and R&D investment [8].

However, no equivalent work on learning alliance formation has been reported. While the extant research has well illustrated what the learning alliance is, why it is important, with whom to forge learning alliances, and how to make the most out of the learning alliance, it failed to address the question: when firms should enter learning alliances. As Whetten [9] emphasized, all the five dimensions—what, how, why, who, and when—are essential for theory building; the absence of the time dimension often leads to a research design that lacks a longitudinal

perspective, which will severely undermine the validity of the proposed theory. Recently, scholars further stressed the indispensability of the time dimension on theory building and theory testing [1-6]. Hence, to extend and validate this emerging temporal embeddedness perspective, we empirically investigate the timing issue of learning alliance formation and provide one of the first empirical supports for this emerging perspective in the learning alliance context.

Specifically, this study aims to tackle the “when” question by asking: When firms should form the first learning alliance and what the impacts are on firms' subsequent learning alliance behaviors and innovation outcomes. I argue that firms should enter their first learning alliance only when they can optimize this learning experience. Timing is a critical issue here because it connotes firms' developmental stage in certain knowledge domains. Initiating the first learning alliance at different stage will have both short term impacts and long term consequences. While one may think that the negative implications can be corrected by the second or the subsequent learning alliances, the study shows that the consequences are usually enduring and lasting regardless of firms' follow-up actions.

2. Theory and Hypotheses

As early as sixth century B.C., philosopher Lao Tzu has asserted, in his *Tao Te Ching*, that: “The excellence of a residence is ... that of (the conduct of) affairs is in its ability; and that of (the initiation of) any movement is in its timeliness.” It connotes the essential wisdom that excellence derives from timeliness. A good timing is indispensable for actions to be fruitful. Despite the traditional wisdom, however, scholars have lost sight of time dimension until the twenties century. They gradually realize that time dimension is inherent in many constructs. It consists of an evolving process along which the construct emerges, progresses, and diminishes; it defines a period within which the construct is valid and effective; it connotes a progression of the construction from past, to present and future; and it accentuates the basic assumption that theory building entails an evolutionary view of the construct over time [1-6]. On top of these views is the recognition that different timing for the same construct may trigger different outcomes.

Take learning alliance for instance, forming the first learning alliance at different time may induce different learning behaviors. While most extant literature has advocated a positive relationship between learning alliance and firm performance [10-14], they fail to recognize that there is a time dimension along which the relationship unfolds. Along the time line, firms’ learning behavior takes its own course. Depending on which point of time the first learning alliance takes place, it may either instigates more innovations or suppress innovative behaviors in the first place. Once on track, firms may find it difficult to transcend the implications that are inherent in the time table. Good or bad, the implications will be fundamental and lasting.

Nevertheless, underneath the timetable of the first learning alliance is a simple and straightforward rule: optimization of organizational learning. Firms should go for the first learning alliance only when they are capable of optimizing their learning experience. Deviation from the optimization may subject the firms to unsatisfactory outcomes such as underdeveloped learning capability or retarded innovative behaviors. Ideally, optimization means firms can fully acquire, assimilate, and utilize their partners’ knowledge for their own ends. This notion is akin to Cohen and Levinthal’s [15] conceptualization of absorptive capacity. The only difference is that absorptive capacity is a means, while this study looks more into the ends the absorptive capacity can accomplish.

Specifically, how much a firm can learn from its partner is premised on one major consideration: its knowledge profile. It mainly concerns whether the firm has established its own knowledge domains, how comprehensively it has consolidated its knowledge domains, and to what extent it is exploring the other knowledge do-

ains before it enters its first learning alliance. Timing is at issue here because a firm should neither enter its first learning alliance when it has no clear knowledge domain established yet, nor should it do it when it has its knowledge domains well-established. At either stage firms are least receptive to external knowledge, and forming the first learning alliance may subject them to long term liabilities.

2.1. Entering the First Learning Alliance at an Early Time

When firms enter their first learning alliance at an early time, they are least prepared to absorb external knowledge. For many firms, like small startups at this stage, their knowledge system is hardly well established. They are exploring for possibilities and alternatives, they are trialing for potential products with optimal or at least satisfactory outlooks, and they are seeking external hands for a business boost. Though they may have a broad vision on their business activity, they are at a relatively chaotic and random stage that any twists or thrusts may potentially shift their business focus and consequently redefine their potential knowledge domain [16].

When they rush into the first learning alliance at this stage, they are not only ill-equipped to learn from their partner [12,15,17,18], but also under the risk of having their weak knowledge base reshuffled. In the end, this may intensify their chaotic state by losing focus on establishing their knowledge domains. And because of this, firms will have to take even longer time and efforts to recollect themselves in order to redefine and reestablish their knowledge domains. They are losing big time to their competitors, and their limited resources further press them to quickly pick a solution at least cost. They may end up entering a second learning alliance and so on cursorily to remedy their loss from the first learning alliance and to make a big turnaround. However, this is usually the continuation of a bad cycle [19], and in the long run they will have only fragile knowledge system established and few innovation outcomes produced.

2.2. Entering the First Learning Alliance at a Late Time

At the other extreme, when firms enter their first learning alliance at a late time, they are also less receptive to new knowledge. While it’s somewhat contradictory to absorptive capacity argument, it makes perfect sense to competency trap theme. As Levinthal and March contended, firms tend to have an escalating commitment to the knowledge domains they excel in. “As they develop greater and greater competence at a particular activity, they engage in that activity more, thus further increasing competence and the opportunity cost of exploration. [19]”

Overtime, they will become less attentive to new knowledge and gradually lose vision to alternative opportunities. They are deeply enmeshed in their competency trap that they lose rigor to actively acquire, assimilate, and apply new knowledge [20].

If they enter the first learning alliance at this stage, they won't have much drive to acquire new knowledge. They will be confused about what to do with this new knowledge and how to fit it into their existing knowledge system [21]. Instead, they may simply perceive the learning alliance as a temporary vehement to leverage their partner's expertise [22,23]. With little learning efforts involved, they tend to enter the second learning alliance fast. In the meanwhile, they may also be subject to the "lockout" effect—they will lose the capacity to acquire, assimilate, and utilize the new knowledge in the long run due to their lack of commitment to the new knowledge in the first place [15]. They have to constantly rely on external resources such as learning alliances to complement their knowledge deficiency. By the time, however, when they are pressured to internalize the knowledge, it will take much longer time for them to pick up and to form subsequent learning alliances. It's all at the cost of low productivity of innovations.

2.3. Entering the First Learning Alliance at Halfway

When firms enter the first learning alliance at the middle stage between the two extremes, they are best prepared for the first learning alliance. For firms at this stage, they already have their knowledge domains established and their absorptive capacity developed. They are proficient in absorbing and exploiting new knowledge. Yet, they haven't deeply rooted themselves in these knowledge domains that they are less subject to the competency trap. They are still receptive to new knowledge and they are flexible to explore new territories. After all, the exploration cost is far from overwhelming that they are entitled to invest in these new opportunities.

If firms enter the first learning alliance at this stage, they will be impelled to acquire as much new knowledge as they can. They will strive to think out of the box, to creatively combine the old and the new knowledge, and to come up with innovative solutions. Nevertheless, they will encounter challenges in terms of the new knowledge assimilation and application. Especially when the new knowledge runs conflict against or devalue the firms' existing knowledge domain, the tension tends to lengthen the learning process. Even if the new knowledge is simply independent of the firm's existing knowledge base, the firms are still pressured to strive to compromise the two knowledge streams [21,24-26]. As long as the preexisting knowledge base is still the main source of revenue, it will all add up to the complexity of the learn-

ing process. Hence, these firms tend to take longer time to form the second learning alliance. Overtime however, when the new knowledge gradually shakes the dominant role the preexisting knowledge plays, these firms will be more liberated to absorb new knowledge. The flexibility plus the accumulated knowledge profile will endow the firms with great potential for innovating new products.

In light of the above arguments, I predict that:

Hypothesis 1: There is an inverted-U-shaped relationship between the time the firm takes to enter its first learning alliance and the time it takes to enter its second learning alliance.

Hypothesis 2: There is a U-shaped relationship between the time the firm takes to enter its first learning alliance and the average time it takes to form each subsequent learning alliance.

Hypothesis 3: There is a U-shaped relationship between the time the firm takes to enter its first learning alliance and the average time it takes to apply for a new patent in the subsequent years.

3. Method

3.1. Sample

The primary data are drawn from the database of the Securities Data Company (SDC). The data collection starts with a list of all companies that issued initial public offerings from year 1980 to 2002 in New Issues database of SDC. Among these firms, I retained those that are founded in year 1980, 1981, 1982, and 1983. All the rest of the firms are deleted from the sample. The remaining sample is further processed based on industry types. Most of the firms are excluded from the sample unless they are in a semiconductor and electronics industry, computer hardware industry, computer software industry, communications industry, biotechnology industry, consumer related industry, medical and health industry, and industrial energy industry. The remaining sample consists of 130 public entrepreneurial firms.

For each firm, I looked into the Joint Venture/Alliance database of SDC to identify the first learning alliance it has formed since 1980 and the non-learning alliance if it's formed before the first learning alliance. For those firms without learning alliances, they are eliminated from the sample. Remaining sample consists of 95 observations. Besides SDC data base, I also tap into the database of COMPUSTAT for information on firms' annual sales from year 1980 to 2002.

3.2. Measurements

Dependent variable:

Time for second learning alliance is measured as duration of years between a firm's first learning alliance announcing date and its second learning alliance announce-

cing date.

Average time for learning alliance is measured as number of learning alliances a firm formed between 1980 and 2002 divided by time duration of years between the year the firm announced its first learning alliance and the year of 2002.

Average time for patent application is measured as number of patents a firm applied between year 2002 and three years after the firm announcing its first learning alliance, divided by the same time duration.

Independent variable:

Time for the first learning alliance is measured as duration of years between a firm's founding date and its first learning alliance announcing date.

Control variables

Size is measured as a firm's average annual net sales (MM\$) in three years before the firm forms its first learning alliance.

Alliance experience is measured as a dummy variable. It's coded as 1 if a firm has non-learning alliance experiences before it forms its first learning alliance, or as 0 if otherwise.

Nation is measured as a dummy variable. It's coded as 1 if alliance firms are from the same country, or as 0 if otherwise.

Joint venture is coded as a dummy variable with value 1 if the alliance structure is defined as a joint venture, and with value 0 if otherwise.

Industry is measured as multiple dummy variables with industrial/energy industry as a reference variable. Semiconductor and electricity industry, computer hardware industry, computer software industry, communications industry, biotechnology industry, and medical and health industry are coded as six dummy variables.

3.3. Model Estimation

Like most event analysis data, censoring imposes as the basic concern for this study. Among the 95 firms in the sample, 28 of them are right censored on time to enter the second learning alliance, and 31 are right censored on patent application. That is, 28 firms haven't formed the second learning alliance and 31 firms haven't applied any patents by the end of the observation period. This generates great difficulty when trying to analyze the data using traditional statistical models such as OLS or GLS. To correct the censoring problem, this study employs Cox Proportional Hazard Model [27,28].

One of the main assumptions of the Cox proportional model is proportionality. That is, for any two firms, their hazard functions should be strictly parallel. To verify that the model satisfies the assumption of proportionality, this study tested the proportionality for each predictor. The test didn't find any violations of this assumption.

4. Results

Table 1 provides descriptive statistics for the variables, including means, standard deviations, and correlations. On average, it takes almost 11 years for a firm to form its first learning alliance. Though not reported in the table, the data shows that it may take as short as 4 years or as long as 18 years for a firm to form its first learning alliance. In terms of the second learning alliance, it takes much shorter time, averaging about 1.23 years. But in general, the average duration between two adjacent learning alliances is around 4.16 years.

In addition, about 53% of the firms have alliance experiences before they enter their first learning alliance. 85% of the firms formed learning alliances with partners from the same nation. And among the 95 firms, only 7% of them selected joint venture as their alliances' governing mechanism. The average annual net sale for these firms is about 48.78 million dollars. As shown in **Table 1**, the magnitudes of the correlations do not suggest that multicollinearity is an issue.

Table 2 reports Cox regression models on time to enter the second learning alliance, on average time for learning alliance, and on average time for patent application. Hypothesis 1 predicts that there is an inverted-U-shaped relationship between the time the firm takes to enter its first learning alliance and the time it takes to enter its second learning alliance. This prediction finds significant support from the statistical results. As Model 1 shows, if firms enter the first learning alliance too early or too late, they tend to take shorter time to enter the second learning alliance. And the optimal time to enter the first learning alliance appears to be $1.739/(2 * 0.079) = 11$ years since the founding date. For firms entering the first learning alliance around this point, they tend to take longer time to optimize their learning experience before they step into the second learning alliance.

Hypothesis 2 predicts that there is a U-shaped relationship between the time the firm takes to enter its first learning alliance and the average time it takes to form each subsequent learning alliance. The prediction finds no statistically significant support from results in Model 2, which implies that, over the long run, the timing of the first learning alliance exerts no impact on firms' subsequent learning alliance behaviors.

Hypothesis 3 predicts that there is a U-shaped relationship between the time the firm takes to enter its first learning alliance and the average time it takes to produce a new product in the subsequent years. The statistical results show strong support for this hypothesis. As Model 3 reveals, firms tend to take longer time to come up with each innovation if they enter the first learning alliance either too early or too late. However, if firms enter the first learning alliance at year $0.655/(2 * 0.029) = 11.29$,

Table 1. Means, Standard Deviations, and Correlations^a.

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Time (2nd)	1.23	1.12	1.00													
Time (LA)	4.16	3.32	0.20	1.00												
Time (patent)	1.19	1.99	-0.05	0.14	1.00											
Time (1st)	10.98	2.75	-0.30	0.12	-0.03	1.00										
Size	48.78	105.17	-0.19	-0.29	-0.15	0.01	1.00									
Alliance experience	0.53	0.50	-0.15	-0.01	0.06	0.30	-0.01	1.00								
JV	0.07	0.26	0.16	0.04	0.13	-0.24	-0.07	0.03	1.00							
Nation	0.85	0.36	-0.09	0.03	-0.07	0.18	-0.11	-0.04	0.01	1.00						
Software	0.24	0.43	-0.12	0.18	0.08	0.12	0.03	-0.01	-0.16	-0.11	1.00					
Hardware	0.44	0.50	0.25	-0.01	-0.04	-0.14	0.02	-0.01	0.07	0.07	-0.50	1.00				
Bio	0.16	0.37	-0.05	0.05	-0.12	-0.01	0.07	0.01	0.10	0.02	-0.24	-0.39	1.00			
Semi	0.08	0.28	-0.16	-0.16	0.15	0.02	-0.03	0.06	0.06	0.02	-0.17	-0.27	-0.13	1.00		
Medical	0.04	0.20	-0.08	-0.10	-0.05	-0.05	-0.11	-0.01	-0.06	0.09	-0.12	-0.19	-0.09	-0.06	1.00	
Comm.	0.02	0.14	-0.01	-0.13	-0.08	0.13	-0.07	-0.01	-0.04	0.06	-0.08	-0.13	-0.06	-0.04	-0.03	1.00

Table 2. Results of Cox Regression on Time to Enter the First Learning Alliance.

Variable	Model 1		Model 2		Model 3	
	Time for 2 nd learning alliance	Haz. Ratio	Time for Learning alliance	Haz. Ratio	Time for patent application	Haz. Ratio
Time (1st learning alliance)	1.739***	5.69***	-0.621	0.450	-0.655*	0.519*
Square [Time (1st learning alliance)]	-0.079***	0.92***	0.022	1.030	0.029*	1.029*
Size	0.003*	1.00*	0.007***	1.008***	0.006***	1.006***
Alliance experience	0.354	1.43	0.170	0.979	-0.330	0.719
Joint venture	-0.390	0.68	-1.198	0.320	-0.662	0.516
Nation	-0.168	0.85	0.179	1.114	-0.695	0.499
Industry						
Log likelihood	-149.76	-149.77	-113.93	-113.94	-135.05	-135.06
□□	21.71	21.72	28.16	28.17	20.10	20.11

*p < 0.1 **p < 0.05 ***p < 0.01.

they will be much better off by producing each innovation at the fastest pace.

5. Discussion

Overall, the study brings to light the temporal issues that have long been ignored in organization studies. It postulates that time is an invisible but nevertheless essential element that has a far-reaching impact on firm’s behaviors. Specifically by looking into firms’ learning al-

liance behaviors, the study illuminates the central theme that when to enter the first learning alliance has both immediate and long-lasting impacts. If firms form their first learning alliance too early or too late, they tend to take shorter time to enter the second learning alliance; but longer time to come up with a new product.

The results indicate that when firms enter the first learning alliance at an early stage, they are ill-equipped to learn from their partner. The knowledge gains can be minimal, but the confusion looms large. These firms tend

to be disoriented by losing focus on certain knowledge-domains. Their random and chaotic efforts leave them a fragile knowledge system which tends to bear few innovation outcomes. With limited resource and time pressure, they will rush into the second learning alliance for a quick solution. But these efforts tend to be less effective. Over the long run, they will gradually lose the capability to innovate new products.

When firms enter the first learning alliance at a late stage, they also become less receptive to new knowledge. They fall into the competency trap so deeply that they lose orientation towards new opportunities. They have no appreciation of new knowledge and they lack the urge to explore new possibilities. They may simply perceive the first learning alliance as a temporal outsourcing effort to leverage their partners' expertise. With less learning efforts involved, they tend to quickly jump into a second learning alliance. However, no effort, no gain. It will become more and more difficult for them to come up with innovative products.

However, when firms enter the first learning alliance at a middle stage, they are most receptive to new knowledge. While their existing knowledge base certainly endows them with proficient absorptive capacity to assimilate and exploit new knowledge, their under-developed competency in certain knowledge domains also partly free them from competency trap. They are flexible and receptive to new knowledge, and they are motivated to explore new possibilities. They will exert substantial efforts to learn from their alliance partner, which tend to delay their entrance into the second learning alliance. However, they gain what they pay. In the long run, they will be able to come up with more innovations at a faster pace.

Surprisingly, the study didn't find support for the U-shaped relationship between the time a firm takes to enter its first learning alliance and the average time a firm takes to form subsequent learning alliance. On the flip side, the finding may also imply that optimization of learning experience may not be the sole agenda most firms have before they form learning alliances. Their decisions to enter learning alliances may be motivated by multiple considerations besides learning optimization. Nevertheless, the result does show that the timing of the first learning alliance does have a long lasting impact on firms' patent behaviors regardless what kinds of learning actions firms may take.

5. Conclusion

This study provides one of the first empirical evidences that learning alliance behaviors are temporally embedded: When to enter the first learning alliance has a long lasting impact on firms' learning behaviors. The findings are noteworthy because most extant literature has ignored

that there is a time dimension along which relationship between the learning alliance and its performance implications unfolds. However, without looking into the time table, it would be presumptuous to simply assume that the relationship is either positive or negative. By explicitly investigating the temporal agenda, the study clearly shows that time dictates the nature of the relationship. Good timing of the first learning alliance triggers fortune and bad timing summons trouble. Overall, this is the first empirical study that highlights the notion that timing of the first learning alliance has strategic implications for firms' long term success. It calls for a prudent attitude that firms should neither rush into a learning alliance nor be too conservative. It's always wise to be prepared, but not overdone.

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