

Chaos Theory in Strategy Research

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Scholars in several fields contended that instability, dynamicity, evolution, and change have become in the very nature of organizations. This proposal argues that such traits are indeed, embedded in the organizational characteristics whether they are an outcome or input. Organizations are always subject to constraints, threats, imposed changes, voluntary changes. We argue that organizations exist in a chaotic domain, their realization is largely affected and influenced by many factors, and therefore their courses of actions are strategically subject to change and adjustments to the extent of their comprehension. The realization depends largely on the ability to trace initial conditions, required configurations after strategic actions, and the attractiveness of the stranger attractors exist along the way of their path in the chaotic domain. We apply these concepts of chaos theory in the strategic alliance context. We argue that firms may ignore very small changes that may cause a misunderstanding and incomplete realization of the necessary course of actions. Furthermore, firms should not expect similar results of their prior strategic actions, unless they are able to control many variables which seems to be difficult. Firms will be prone to shocks, ups and downs with respect to their performance, depending on their ability to control the path and undergo the required course in response to uncontrollable forces in their surroundings.

Key Words: Chaos theory, strategy research

"I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me." -Sir Isaac Newton.

Introduction

Chaos theory implies that Chaos, wherever occurs, is viewed as a beneficial and healthy component of any formation process. However, this is contingent upon whether a new order would be the resultant of such chaos, and whether the new order would be beneficial, to whom, and how?

It's pretty much like the outcome of both regular and irregular moves, planned and unplanned actions, micro-moves and macro-moves, individuals or entities all count for the ultimate end. In a joint research between U.S and U.K researchers, its suggested that some of the prograde orbits moons are eliminated by the giant moon as they approach closer to the planet, thereby the huge number of retrograde moons around Jupiter is no longer a vague phenomenon (Planetary science; chaos theory helps explain origin of new moons.2003).

Smith (2007) defines Chaos theory as "Chaos theory is the study of the way tiny changes in the way things are now can have enormous consequences in the future". He offers a real life examples of how the growing chaos, even if unseen, would lead to global warming, and uses the theory to explain how weather conditions change continually. The strategic moves, in this sense, by firms lead to unpredictable, yet, could be controllable consequences once the firm has figured out the chaotic path and what conditions have changed, and of these conditions what are the sensitive ones that contributed the most to the change. It's also known that sensitivity to initial conditions makes the outcome unpredictable, or inaccurate and changeable, but it's also true that this sensitivity would enable controllability through establishing control interventions over the changing circumstances at the right time (Garfinkel et. al., 1992).

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In its very nature, chaos theory informs us that production and reproduction of some patterns are caused by many different forces, among these forces are the very important initial conditions which is also referred to as the butterfly effects. Economically speaking, without holding every other variable fixed, large systems are difficult to predict with complete accuracy due to the many other unnoticed variables. Examples on the use of such theory are boiling of water on a stove and the allocation and starts structures in the sky at night (Seland, 2012).

It would be appealing to know whether the changes occur over time, responses outside the internal environment, the new culture, and any other associated changes would lead to new formation, strategy change, environmental shifts, and how would these factors affect firm performance.

The use of interfiled theories has been phenomenal in science in the recent years. Darden and Maul (1976) contended that incorporating theories from different field into another field is legitimate as long as a basic background knowledge exists between the two fields. The authors of this paper which was published in 1976 argue that this application of interfields' theory may provide answers and understanding of snags which arise in one field, that otherwise could not be answered within the field itself. It also draws the attention on sphere substances that were ignored or treated as minor issues. And finally it may enhance the ability to predict new matters in the neighborhood of both fields. In this seminal paper, Darden and Maul explains the mechanism for this by stating that there ought to be central problem in a domain that comprises of facts taken as facts while they may not be.

It is the essence of this paper to focus on the resources need-motivated strategic interchanges. Namely; strategic alliances, mergers, and acquisitions. Firms have long used such strategies in order to reach an ultimate goal of improved performance. Yet, some firms have successfully achieved what they strived for, some failed, and some break-even. The firms start their search when they are short of a specific component whether this is tangible or intangible such as knowledge, tech, distinguished human factor, and other physical resources. Yet, the initiators of such moves are said to be known. The initial circumstances under which the need arises pushed towards the search for the alternatives available in the near neighborhood. Bases have been figured out, upon which the search is made. Once the matching process is complete, the negotiation begins and eventually ends with an agreement. All fine and soft, planned and organized, neat and well-studied so far. However, the human body for instance, refuses to absorb

any stranger ingredients in its very nature, the formations process would be expected so.

In that sense, the initial conditions of alliance formation, strategic alliances decisions are presumably assumed correct. However, over the time, the engaged parties are unconsciously ignoring or disregarding the small changes that take place at both sides starting from the organizational culture, and up until the new entity is broken down or even expanded.

Resource based view of the firm (Barney, 1991), for instance suggests that firms seek alliance to create value through pooling together alliances' resources. The inter-firms resources are utilized and aligned together to create additional value or greater value based on four categories: supplementary, surplus, complementarity, and wasteful according to Das & Teng, (2000). However, alliances start with initial conditions under which firms seek the formation of partnership with other parties that can complement their lack of specific resources and or knowledge to create greater benefit for both firms. The initial conditions of forming an alliance are divided into the following categories:

The process of formation itself may not seem to partners as chaotic as it could actually be at the bigger level, say strategic group, sub-industry, or industry level. The tempo of competition, the previous informal relationships with other players (firms), suppliers, customers, governmental entities, and so on would now begin to change as a result of the alliance. The alliance would definitely be easily said to have some sort of prediction for the after alliance processes and outcomes, based on the alliance literature and the resource based view perspective. The initial conditions now have entered a second stage at the alliance level, but also we are disregarding the external environment take on this. There is a little in the literature on how could the other constituents in the same space or sector perceive this new entity. In chaos theory, the initial conditions under which a prediction can be made is critical and in dynamic systems any slight and small change would yield unpredictability for the item being studied.

For instance, in the context of merger and acquisitions, which is a strategic move as alliances, Datta et al., (1992) have stated that the gains are, for the most part, accrued to the target firms and not to the bidding firms. This study among others in the literature suggest that there are initial conditions under which firms make the call and these initial conditions are unstable, changing, and deceptive which leads to chaotic decisions that its outcomes are not as precise and good as the decision intended.

Merger and acquisition literature suggests that there are five factors that can help understanding why some acquisitions succeed and other fail: regulatory

changes such as tax reforms, number of buyers of target firm which increases attractiveness of target that yield negative effect on the gains accrued for stockholders of the bidding firms, bidder's approach merger or tender offer; target firm prefers tender offers due to increased competition because of the announcement that attracts more bidders, mode of payment cash or stock, or a combination of the two; cash preferred as stock issuance is seen negatively in the market, type of acquisitions, related acquisitions is associated with positive gains. All these variables represent comprehensive system of evaluation, initial conditions, baseline, and they tend to change over time. However, it's not quite clear whether these baselines have a consistent patterns over time.

The notion of chaos is that the parties involved in strategic actions are initiating their moves based on spontaneous judgments that take into account baseline conditions. The conditions are not the same over the time due to external, as well as, internal factors. I suggest that these initial conditions can be classified under some categories and then determine which of them are more likely to hold, and which are not likely to hold.

What is Chaos Theory?

Chaos theory is the study of non-stable, highly dynamic, nonlinear and sensitive systems, the theory was first introduced by Lorenz (1963). Lorenz was running a simulation to predict the weather and flow of fluids. Major onset of chaos or butterfly effect is that it signifies the initial conditions under which prediction is made. In the most dominant example of explaining the butterfly effect which is the weather forecast, the butterfly wings small and unseen moves continue to occur until it causes some unexpected and huge impact somewhere else in the world.

The premise of chaos theory is that systems are located in the hub of chaotic galaxy. The interactions of the systems and their components generate outcome, but the outcome is unpredictable nor the direction of the movements subsequent to the initial moves. This notion applies to those systems that have greater degree of complexity and dynamicity. The theory contends that not all systems obey randomness, some systems can be defined and bounded by mathematical functions, depending on the controllability of initial and subsequent conditions.

Djulbegovic & Hozo (2014) contend that about half of the published research findings cannot be replicated with the same findings. They postulate a model that adopt the butterfly effect through which even small changes over time would make it difficult to predict the same findings. For instance, if the values

of all the I.Vs are changing, the D.V value (predicted value) would not hold even with small changes. However, they also believe that if the rate of change to be minimal and put under control, especially the baseline conditions, the reproducibility of findings could be possible.

In the recent years, chaos theory which is also labeled as butterfly effect has been heavily used to explain the sensitive dependence on the initial conditions. Being such a phenomenon allegory stimulates scholars from several disciplines to explore the theory more deeply, and come up with applications and mechanisms through which it can be applied in other social sciences arenas. When Lorenz (1963) was running the simulations to predict the weather conditions, he had already entered the numeric values of the selected variables that would affect the weather and the flow of fluids. However, he did generate outcomes and had forecasted some predictions. Lorenz changed some values at the fourth decimal place, which is mathematically insignificant presumably, it turned out the results had changed significantly and predictions were totally different. That said, Lorenz concluded that even small changes that seemingly random and unimportant or ignorable, may lead to big changes and events somewhere else either in the neighborhood of the phenomena being predicted or in a related or even unrelated field.

Systems are generally defined as "a regularly interacting or interdependent group of items forming a unified whole". System could be any part of whole as well. For instance, a human body can be said to be a system where parts are interacting in a meaningful manner to produce human behavior and so do other systems regardless the components. The degree of complexity and dynamicity of systems depend on its components, interdependency among those components, the degree of interaction and engagement with external systems, and the forces that govern the mobility and dynamicity of the systems. For example, the sprinkler of water is a system, it sprays out the water, and the water comes out as nonlinear and at high speed depending on the speed, strength, and distance from the point of origin where the flow begins.

The interpretation of what we see depends mainly on how have we shaped our perceptions, what our beliefs are, what our goals are, and what is our stake in the matter being noticed. Complexity theory which is parallel to chaos theory is a representative of the status quo or a snapshot at any system if taken isolated from other affecters or players. As Myra Wilson put it "offers anew lens with which to view the world. It does not deny the scientific theory of the past and the enormous contribution of Newton and others, but looks beyond individual systems and sub-systems and acknowledges the importance of inter-

relationships and context” (Cumming, 2012). To that end, the chaos theory can be viewed as a complimentary theory to complexity, a way to better understand phenomenon that don’t conform to normality and linearity, and offers new lens through which a new order can be claimed to have arisen out of seemingly chaotic engagement. A small change in one system can lead to greater change in some other systems of the systems can have a much larger change elsewhere, the magnification process is then the channel through which the small change can create some bigger change either in the system or somewhere else. However, I am interested in the amplified effect created inside the system in which these changes occur. Lipsitz & Goldberger (1992) argue that the physiological aging is associated with loss of complexity in the dynamics of organ system function, and that this loss leads to inability of adaptation to physiologic stress.

It is the conception of chaotic systems that the predictability and the behavior is these systems are highly dependent on the sensitivity of the initial conditions. Now, one might say why would we make the change willingly, and we could have left the value as it was. That is true, but this is the case if we are controlling everything, in other words this might be possible in a lab experiment where we can control things completely and fully. Notwithstanding, systems in real life are actually, for the most part, uncontrollable in the sense that many factors are not accounted for whenever we study these systems. We neglect many variables that seemingly perceived as unimportant, but the fact is that these variables account for significant effect that is ignored and lead to new orders whenever they change throughout the course of actions and behavior the system follows (Ayers, 1997). The underlying assumption of chaos theory makes the predictability of behaviors inaccurate and short-lived. Errors that are mostly ignored will eventually fade the power of predictions and weaken the outcomes over the time. The confounding variables that do interact with each other and with the system known variables have the ability to invalidate the results as long as the system has a sensitive depend-

ency on these variables that are not accounted for (Eve, Horsfall, & Lee, 1997).

It should be noted then, that there is a huge difference between a completely random courses and a chaotic system. The former having no underlying orderings, assumptions, and leads to nowhere except for unexpected and pure randomness in events. While the latter does have causal determinism mechanisms. These mechanisms enact the subsequent events which are dependent on the priori status of the object of matter (Franklin, 1968).

Chaos perspective signifies the interactions of the factors that matter, as well as those which seemingly and presumably don’t matter. Responses from the environment surrounding the system, including all entities that contribute the behavior of the whole system (Eve et al., 1997; Ivanović, Cupić, Janković, Kolar-Anić, & Anić, 2008; Seland, 2012; L. A. Smith, 2007). Moreover, the theory contends that at some point, after the system has gone through a particular process, and the predictions had already been made based upon initial circumstances; the system starts leaning towards a new and might be totally different behavior that would yield totally different outcomes based upon a changing course of movement that was caused by what the theory calls “strange attractors”. As stated in (Ayers, 1997), there are four possible course of movement in this respect: first. Fixed-point attractor would attract the system, at which the system will stabilize and move like a plumb until the complete stop before starting a new phase. Second. Sporadic attractor through which the system is prone to cyclic behavior. Third. The number of patterns of behavior increases as the system behavior starts repeating itself. And lastly, the strange attractor where the system can never repeat a certain behavior after having been looped into the strange attractor space. Figure 1 illustrates the patters that a system behavior would take as result of initial conditions, and then the change in the course of movement throughout the process of continuity for the system as long as the system is non-linear and more importantly dynamic and complex in the sense that many factors are able to affect its course of movement.

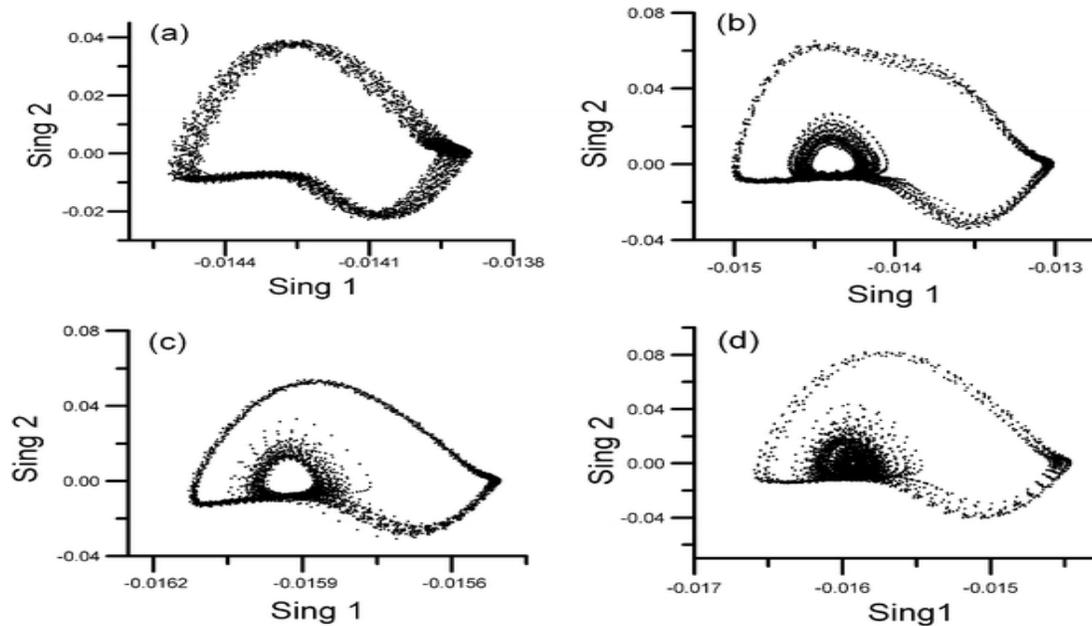


Figure 1.

Ivanović et al., (2008) elaborates more on the mechanisms through which a system behavior tends to start acting differently and in a new direction, leading to either repeated or new pattern of movements.

On major assumption in chaos theory is that the system be dynamic. Dynamic system means that the system is subject to continuous change and multifacets phases through which deterministic formulas govern the course and the degree of change over time which is often associated with uncertainty (Schweppe, 1973).

What distinguishes chaotic behavior is that it becomes non-periodic once the stranger attractor comes into effect and influences the movement of the system behavior, contrary to periodic behavior under which motions are repeated with no apparent irregularities and the system returns to a point of origin.

Throughout the course of movements, the system might experience the sudden change, which would be as a shock if not dealing appropriately with the given initial conditions, this sudden change is a resultant of either voluntary modification or imposed modification of at least one of the parameters that were initially used to predict the pattern and the outcome of the system in terms of its seen or observable state, this doesn't imply necessarily a new pattern, rather it implies double motions, threefold state, one might be close to the point of origin, the others might be closer to the other point of origin that was reached right

before the system experienced the parameter change which the chaos theory proponents call "Bifurcation".

Chaos theory in the Social compass disciplines

Chaos and its concepts are being applied to psychology by researchers from cognitive, developmental and clinical psychology, (Bonting, 2005; Eve et al., 1997; Freeman, 1987; Guastello, Koopmans, & Pincus, 2009) among many other scholars have utilized chaos theory in the field of psychology, sociology, physiology and all behavioral fields. The applications ranges from neuroscience to clinical psychology. Barton (1994) argues that it is very crucial for scholars to consider the concepts of non-linear and dynamic systems, chaotic actions and reactions, fast-paced and chaotic movements when studying psychological behavior, although the author does admit the difficulty often encountered when it comes to empirical testing of some of the concepts and generalizable operationalization of the constructs underlying these concepts.

Chaos theory has proven its applicability in many subfields in the psychology literature. Skinner (1989) for example applied the chaos theory concept of dependence on initial conditions, environment interactions effect in his study on alcohol addiction. The author spurs discussion and calls for application of theory concepts that allow developing a model

where determinism can be halted and conditions can be controlled to allow for discontinuity effects. The application of chaos theory doesn't stand flawless according to some scholars. (Faber & Koppelaar, 1995) provides a critical review of applying chaos and its mathematical constructs and models in the social science fields. The authors argue that the application of chaos models in analyzing and predicting social marvels lack assertion beyond doubt as the observations will always have measurements errors, unless controlled fully.

Mosko and Damon (2005) provides a useful and extensive review on the applications of chaos theory in the social and natural sciences. Their book explains how what used to be inconsistent and divergent, can actually be transformed into what they termed it as "common" and "complex" orientation for the problematic behaviors that are central to social sciences. In particular, they explore the problem of order and disorder, using the anthropological theories combined with chaos theory to fill the gap that has long existed that divides the sciences and humanities, including the resulted behaviors of both separately and their interactions. They consider the time and the space, attractors, and the change of courses of actions as major influencers on any system's behavior which may cause the absence of order in that when a system doesn't recognize the true causes or the sensitivity of the changing conditions, it is likely that the system will be facing an absence of order state that, if not understood and correctly digested, might lead to destructive chaos that would create the trouble for the system. Yet, if it were to be decorously perceived, digested, and analyzed the system is likely to respond in orderly manner, which creates a new state of the system that differentiates it from other systems in the neighborhood and the surrounding environment (Mosko & Damon, 2005; Eve et al., 1997; Skinner, 1989).

Chaos theory arguments can be extended to apply for any variety of objects and systems that form systems in its existence such as individuals, groups, organizations, countries, and whatsoever (Gregersen & Sailer, 1993). Thus, many of the unresolved problems, challenges, phenomenon in the social sciences can be reframed in a different shape, and we therefore can make the fit to the problem under consideration and make better judgment, evaluation, analysis, and prediction which is the hub of any research process. It is often the case that scholars in the strategy field use cross-sectional data that don't really and deeply dig in the nature and the changes that occur in the surrounding environment of the variables. Here comes the importance of a better qualitative understanding of the nature of the objects we deal with, and the inevitable fact that what we often simplify is

actually much more complicated, especially in the changing parameters of the variables used to operationalize the major components and factors of any phenomenon, in other words, our independent and dependent variables.

How relevant chaos theory is for strategy?

Salter and Weinhold (1979) proposed that there is a link between the acquisition of key skills or product market positions and the potential for value creation, the value is said to be created through the fortification of crucial skills and situations of the pooled businesses which was referred to as related acquisition. This is consistent with Penrose (1959) who was the first to introduce the RBV, and argued that firms cannot reach optimal balance of utilization of resources, they will seek actions to overcome any surplus, shortage, underutilization, or overutilization through acquisitions for example.

Merger and acquisition literature suggests that there are five factors that can help understanding why some acquisitions succeed and other fail: regulatory changes such as tax reforms, number of buyers of target firm which increases attractiveness of target that yield negative effect on the gains accrued for stockholders of the bidding firms, bidder's approach merger or tender offer; target firm prefers tender offers due to increased competition because of the announcement that attracts more bidders, mode of payment cash or stock, or a combination of the two; cash preferred as stock issuance is seen negatively in the market, type of acquisitions, related acquisitions is associated with positive gains. All these variables represent comprehensive system of evaluation, initial conditions, baseline, and they tend to change over time. However, it's not quite clear whether these baselines have a consistent patterns over time.

Scholars have used chaos theory in the strategy arena. Strategy has long strived for unlocking the conditions under which firms can improve their performance through gaining competitive advantages. Levy (1994, 2007) used chaos theory to illustrate how crucial managerial understanding, perception, and translating for complex systems are to make the right decisions and innovative solutions for arising challenges throughout the course of their evolutions. Levy uses computer simulation methodology to study the effect of managerial understanding for complexity in the industry, the apparent chaotic interactions among industry actors and the potential effect on firm performance with regard to its supply chain management.

Chaos theory has stimulated thoughts about all aspects of social and pure sciences. From the field of weather forecasting all the way to the medicine and

nursing fields. In fact, the term “change” which has been dominant in almost all scientific field and to which everyone seems to strive, and of course the positive side and the upward direction, is one of the dominant associated terms with chaos theory. In the lenses of competitive advantage literature, it is always the case that firms seek change to create, maintain, or update their competitive advantages.

Brown and Eisenhardt (1998) put it more straightly “the best firms employ a competing-on-the-edge strategy to change routinely, relentlessly, and rhythmically over time”. From a chaos perspective, firms will always compete on the virtue for capturing every possible potential for superior advantage.

When firms compete, they indeed gather information, analyze it, make judgment, evaluate alternatives, make decisions, and take actions. However, it should be mentioned that all firms do so, in all possible manners, with different approaches and different decision makers, and different level of intended goals depending on their resources sufficiency. When all these firms’ actions are put in place, I argue that the picture for observers, including us as academicians would look very much like chaotic process that are unpredictable in its whole. This is well-supported by the individual scholarly work in the business arena as no single field can cover all the faces of the coin, that seems undergo a continued changing rules and conditions (Brown & Eisenhardt, 1998; Bechtold, 1997). Hence, if managers are to differ in their perceptions of opportunities and challenges present in their surrounding environment, the expected patterns of their actions- which produces the behavior of the system- would be divergent and irregular due to their differing actions, which are in the first place influence by their capabilities.

Bechtold (1997) contends that there are burgeoning need for managers to acclimate to the fast-paced business environment that changes relentlessly. Bechtold argues that in order for action and outcome to be strategic, it has to meet the prerequisite of bendiness, adjustability to alterations in settings, and that necessitates echoing strategic philosophy that takes into account more variables than what frequently used.

Heimeriks et al., (2015) argues that corporate structure for example affects alliance portfolio configuration, depending on the degree and breadth of the structure. They argue that firms may need consider multiple solutions that are adaptive to both more or less structure in order to realize synergies and rents from alliances. The author stresses on one of the prevailing paradoxes in the strategy field that firms remain to engage in alliances notwithstanding the datum that the vast majority of these alliances appear to have failed triumphing the envisioned goals

(Heimeriks, Bingham, & Laamanen, 2015). It is the major goal of this paper in which I strive to develop a more advanced, yet complicated framework through which the motives, conditions, and all that matters can be incorporated into a model whereby the chaos theory can play key role in advancing our understanding and provide more sound solutions to one of the central paradoxes in the strategy.

Organizations do have the properties that qualify them to be individually systems, and also part of bigger system. In the course of the organizational life span, organizations undergo lots of changes, go through processes that lead convergence and divergence, stability and instability (Thietart & Forgues, 1995). Strategy and organization scholars have a consensus that organizations do function in a chaotic domain (Gregersen & Sailer, 1993; Levy, 2007; 1994; W. Smith, 2001; Thietart & Forgues, 1995) among other have reached the same conclusion.

Strategic choice, change, and chaos

Organizations -in their very mission- seek to create value for the shareholders. When firms exist in a domain that is dynamic, complex, and unstable; they will face challenges brought up by the environment constraints and bounded rationality of those who make decisions (Van de Ven, & Poole, 1995). Van de Ven & Poole critics the utilization of individual theories in understanding how organizational development and change.

The question often raised in literature is why organizations undergo courses of actions that correspond to intended or mandated change. Yet, Van and Poole contends that single theory would only provide partial explanation for this phenomena. It’s undeniable that organizations do get affected and affect their surrounding environment, it’s the environment that supplies the firms with their necessities and basic needs, including resources, human capital and customers, as well as regulations.

However, Child (1972) argues that these supplies by the environment, which is typically argued as putting constraints on the organizations, and therefore leading to required actions, are not necessarily the only initiators of change. Child argue that decision makers play as significant role as the environment itself. Thus, integrating the structural decision making process into the existing theoretical models of structure variation among organizations weakens constraints upon structural choice to the extent that 1. Design has limited effect on performance 2. Contextual variables have limited effect on structure 3. Managers may influence environment positions to the extent that serves their preferred structure without causing serious loss to their org. 4. Decision makers

may prefer to make trade-offs between structure and performance standards 5. Conflicting implications from contextual variables and combinations may lead to some degree of structural choice. Similar argument made by Delmas and Toffel (2008), in the sense that both managers and environment influence strategic change decisions at the organizational level, leading to new developmental processes.

In the context of strategic alliances: Alliance formation in literature is said to be based upon resources munificence and fit. Partner selection favors firms with abundant resources. Firms embedded through prior ties in a social context is favorable in selection. Misalignment of partners' resources and interests may cause withdrawal through resistance.

Power inequality in the network may lead to withdrawal as well, which is depicted in low Embeddedness. Therefore, withdrawal is seen as function of both embeddedness and friction.

Firms are subject to relation, network, and market level influences. An explanation logical model of withdrawal captures cohesion as result of social relations and friction as result of instrumental concerns of goal conflict and task implementation. Conflict between cohesion and friction forces can be named as force field, when the balance is altered, it restrains forces against change or drives them for change. Withdrawal occurs when frictions overcome cohesive forces (Greve et al., 2010). The notion proposed by the authors is that with higher cohesion and cooperation, more contacts in multi-markets, firms are more likely to hold their alliances. However, this may seem contrary to what is strategy is all about. Suppose that firm A has formed an alliance with another firm say firm B to gain specific knowledge resource that is inimitable and unavailable in open market say resource Z. Now, the two firms will share all the necessary resources to make the most benefit out of the alliance, and that the initiating firm had initial conditions on which it based the decision of allying with firm B. two scenarios come into the mind: if firm A had experienced a change in the TMT for example, and that the new TMT has a different strategy that is based on many factors including their personality and the potential of any other opportunities they see valuable in the market; it is likely that firm A will tend to change its strategy and shift its interests either because of managerial orientations change, or because of new opportunities arise in the environment. Both can correspond to what chaos theory call as "stranger attractor".

Nonetheless, stranger attractor can be anywhere in the organizational space. Now, depending on the position an organization occupy in its environment, it is noteworthy to look at the nature of relationship between the position an organization occupies and

the possibility of changing its strategy due to the existence of new stranger attractor.

Motives for Alliances, Initial Conditions: when firms do engage in strategic alliance, they seek to compliment an asset they have, and think that they are better off when they do so. The evaluation depends on many factors such as their alternatives in the neighborhood near their position. And the fact that most strategic alliances don't end up succeeding might be a resultant of the unsuitability of the selected partner. Besides, the alliance would somehow change the parameters of both firms that were actually taken into consideration when forming the alliance. The organizational fit, cultural fit, employees' engagement and resistance, specific appropriateness of the shared assets in relative to the intended goal, all these are some of the conditions that would differ throughout the implementation stage, leading the firms to new positions along the paths of their movement in the organizational space.

Implementation limitations and knowledge sharing extents are of great importance when addressing the success and failure of strategic alliance. For instance, Nordtvedt et al., (2008) argue that Culture and language differences make it harder in the international acquisitions context and that there are four dimensions that determine the efficiency and effectiveness in the process of knowledge transfer which are 1.comprehension: extent to which transferred knowledge is fully understood. 2. Usefulness: extent to which such knowledge is relevant and salient to org success. 3. Speed: how rapidly the recipient acquires new insights and skills. 4. Economy: costs and resources associated with the transfer of knowledge. 1 and 2 represent effectiveness, 3 and 4 represent efficiency (Nordtvedt et al., 2008).

The four possible course of movement in for firms with respect to chaos theory are: first. Fixed-point attractor would attract the system, at which the system will stabilize and move like a plumb until the complete stop before starting a new phase. Second. Sporadic attractor through which the system is prone to cyclic behavior. Third. The number of patterns of behavior increases as the system behavior starts repeating itself. And lastly, the strange attractor where the system can never repeat a certain behavior after having been looped into the strange attractor space. So if a firm with medium degree of competitiveness in the market, medium degree of innovativeness, and medium size involve in alliance with another firm in the surrounding neighborhood. The resultant is a different firm indeed, in the sense that the new circumstances have changed and therefore the firm may need to realize that it has left the traditional path it used to be on prior to its engagement in the alliance.

Changes may not be realized quickly, there might be irresponsiveness and inability to deal with outcomes of the alliance, as in part it might be due to the unpredictability of the outcome based on the prior form of the firm and its new form resulted from the alliance. If firms, however, could quickly absorb the shock, realize the needed change, and address the issue, they might continue on the same path with their typical plan. But this may not improve performance, as in the surrounding environment, other firms may have already captured new capabilities and technologies that would enable them to outcompete the allied firms and drive them far below the line that they used to occupy in the environment.

Potential Area for Research: Implications for Alliances

Haeussler & Higgins, (2014); Doz and Hamel, (1997); Hagedoorn and Narula, (1996); among other scholars studied the strategic alliance in the international arena and the domestic context as well. The findings indicate that firms undertake wide range of international R&D investment activities that vary depending on the purpose of the alliance (Owen & Yawson, 2015). Cross-border R&D based alliances established via self-directed subsidiaries, joint ventures, strategic alliances, partial and full acquisitions. When firms have highly valuable R&D assets, highly valuable core competencies, and factors that can be brought from regular factor market, they may seek alliances with firms overseas under the condition of similarity. This condition will have inherent issues such as patent and intellectual properties concerns over which decisions will be based. For instance, the U.S highly R&D based firms will try to avoid countries where patents and valuable knowledge may be jeopardized. As suggested by Heimeriks and colleagues (2015), firms will have concerns over their knowledge be shared with partners, and thus the way the alliance is managed in this regard is highly influenced by the valueability of the knowledge assets. The authors find that the partner management phase, reliance on codified knowledge is less beneficial and can be even negatively related to performance (Heimeriks, Bingham, & Laamanen, 2015).

Stern, Dukerich, & Zajac (2014) found that executives in technology based industries are influenced by founders' reputation and status when they seek alliances. With newly established firms, which supports my notion that newly established firms will be perceived less considerably unless founded by already known members. This argument and their findings suggest important effect of the age

of the organization, managerial tenure and the also the level of technology and R&D intensity (Stern, Dukerich, & Zajac, 2014)

Gu and Lu (2014) for instance found that firm reputation does affect the firm's propensity in initiating alliance, in the sense that opportunity existence and need for alliance will be partially affected by the contingencies of whether alternatives are available in the local market, and also whether an institutional environment is developed enough to encourage risk taking. Thus, the firms with high reputation are likely to be options for each other. However, I argue that this may not hold true across different contexts as firms may still be able to form alliances with other firms that don't have high reputation but still get the sole need of alliance and then the alliance can be ended (Gu & Lu, 2014). The performance of engaged parties then will be influenced by the overall sum of benefits during all stages including formation, processing and the outcomes after the alliances.

Vandaie & Zaheer, (2014) argue that small firms that engage in partnering relationships with larger firms will experience less growth than larger ones. The authors argue that accounting for the effect of differential estimate in the internal capabilities between firms engaged in the alliance along with the external perspective promises result in better understanding of the nature of the benefits realized for both sides and that smaller firms will not benefit as much (Vandaie & Zaheer, 2014).

Consistent with the previous study, Schilke and Cook (2015) studied 171 alliances based on a survey study. The authors argue that the contractual safeguards has stronger predictive power of performance implications and outcomes as well as the trustworthiness of the selected partner with respect to knowledge and resource sharing. When the partner lacks a favorable reputation. In contrast, the organizational culture predicts trustworthiness more strongly when familiarity with the partner organization is high, suggesting that a more integrated studies are needed in better our understanding of the chaotic, yet, continued strategic alliances (Schilke & Cook, 2015).

Previous research has much focused on the appropriate balance between exploration and exploitation which would, in my argument, lead to chaotic processes that would shape the position of the firm, however, taking into account several factors including its R&D level, level of diversification, and it's industry's nature (Stettner & Lavie, 2014). Seeking either exploration or exploitation would be likely implemented by differing modes. There will always be a need for interplay between the two mechanisms in order for organization to grow in the

right directions and keep fit and sound in its domain. This, however, may lead to conflicting strategic choices that would initially be based on the age of the organization, and its strategic strength, and then would confuse its core resources. Organizations in that regard will have conflicting routines and conflicting specializations to some extent, which would depend again on their level of strategic positioning and their strengths. Firms then can reach an optimal level of balance by studying and analyzing the best alternatives available and by knowing exactly where they stand. However, this may seem chaotic and random, and it does if managers and TMTs don't appropriately have clear and precise vision for their future directions and goals. For example, Stettner & Lavie, 2014 found that U.S software firms that undertook exploring via externally oriented modes such as acquisitions or alliances, while exploiting via internal organization, enhanced their performance (Stettner & Lavie, 2014). Suggesting that contingencies always exist based upon the nature of the business that the firms do in their domain, and that firms may be forced to switch from one domain to another domain based upon the external moves in their industries.

Yang et al., (2014) argue that exploitation alliances with large firms will have higher positive effect on small firms than exploration alliances with large firms because of the amplified risk of arrogation in exploration alliances. The authors also note that if small firms have the appropriate governance, they will increase their valuations from exploration alliances with large firms (Yang, Zheng, & Zhao, 2014). This suggests that the stranger attractor features can be indeed diverse and influence the choice, depending on the other contingencies such as the governance structure, the age of the firm, and level of diversification, and several other relative factors that typically are linked to firm performance. A deeper thought and thorough look at alliances yield a chaotic behavior that cannot be understood without tracing the conditions backward and forward, upon which alliances decisions are made.

Also, the level of R&D and innovation is argued to highly influence and impact performance, yet consensus findings are not reached. Lahiri & Narayanan (2013) argue that alliance portfolio size, as well as the level of innovation have several and differing effects depending on the level of innovation for the focal firm. They argue that at higher level of innovation, increased size of alliance portfolio size would worsen the performance. They also argue that vertical scope of integration would play important role in understanding varying performance across firms with different sizes and levels of innovation, which suggests that non-linear effects exist in the

variety of potential combinations in the formed alliances across and between firms (Lahiri & Narayanan, 2013).

Baum et al., (2014) argues that any strategic prescriptions and their performance effect doesn't necessarily hold true. This is due in part to the nature of evidence provided which is based upon pooled cross-sectional data and findings. The authors suggest that firm characteristics do actually influence the mean and the variance of the firm performance. The study by these authors focuses on the findings of the network effects, which includes the strategic alliances (Baum, Cowan, & Jonard, 2014).

Multiple factors are found to be influencing the success of the alliances. For instance, partner selection has been argued as one of the most influential factors that do influence the success of the after-alliance stages (Shah & Shwaminathan, 2008). Generally, the previous literature in the context of alliances assumes several assumptions including, trust, commitment, and complementarity) on which partner selection decision is made. However, there are always contingency specifics that managers do take into considerations when they make their decisions of selection. One factor, is that the age of the organization and its strategic positioning at that point of time. Also, the level of discretion that would affect the purpose of the strategic alliance as there is a trend in the literature suggests that managerial discretion does affect strategic actions and strategic outcomes. Also, the path a firm has been on in the very recent track of its organizational age would highly influence the strategic choices made by the managers. Support for this notion is extended from the findings of Shah & Swaminathan (2008) study in which the authors finds strong support for the argument that alliance partner selection, which is the first stage of alliance formation and commonly believed to be most influential), is highly influenced by several, yet, varying factors depending on manageability and interpretability of the processes and outcomes of the selection. I argue that managerial discretion is crucial in the sense that managers would also try to maintain their advantages and information asymmetry, they will choose alliance that best maintain their positions, which would bound their choices (Shah & Swaminathan, 2008).

Managers seek greater latitude of action (Hambrick & Abrahamson, 1995). Top managers are appointed with the goals of improving performance and creative effectiveness (Barker, Patterson, & Mueller, 2001). Agency advocates argue that managers would seek alternatives, even when its not appropriate, to maximize their benefits. The age of an organization, the stage at which the managers decide to seek an alliance, and the nature of the need upon

which a decision of seeking alliance has been made are all crucial elements that would determine the pool of alternatives. The chaos theory suggests that even random events that occur in the context of an organization would seemingly be perceived random may lead to establishing pattern that would also bound the alternatives, resulting in double-bounded alternatives and doubled limitations. The course of actions that have been adopted most recently would be the most appropriate and picked mode on which scholars may look into to figure out the future potential choices an organizations may choose to undertake. The position the organization has reached based upon its recent courses of actions can influence then the available alternatives, put together with the contingent effect of the managerial level of discretion would make the domain of alternatives very specific. As seen in figure 1, a firm which has, lets say, a medium size, medium age, with high level of discretion available for managers would pick a partner that has low level of discret it is critical to understand what constrains leaders and, alternatively, to understand what enables them to influence organizational outcomes.

There are several forces that play significant role in imposing changes either intended changes or unintended ones. Market positions will be altered based upon the fact that firms are highly affected by their environments. The number of previous alliances, mergers, acquisitions, and any relative strategic choices made by previous managers or even the current TMT would be of influence in the sense it determines the level of flexibility in the strategic choices that are to be made later on on another point of path or the track. Thus, the better the performance or the strategic position of a firm, the more likely it is to engage in full acquisition as it will not put the firm's core competencies at jeopardy by sharing these core resources with alliance as the success will be contingent upon the accumulated experience, the managerial approach, and the level of discretion as well as the governance effectiveness of the board (Niederkofler, 1991).

The alternatives for domestic alliances are determined by many factors. It is argued that firms prefer joint ventures over contractual agreements when the degree of complexity increases (García Canal, 1996). The joint ventures are more preferably appropriate when the firm has low level of uncertainty, the number of units and functions it runs is low, the coordination efforts are manageable and controllable. Whereas organizations that has larger degree of complexity will have already went through several chaotic circles and have gained experiences in their chaotic positions through out the course of their growth.

We argue that organizations that are new or recently entered a market or have been established newly businesses will seek first to position themselves in the market, root their organizational presence, and then start exploring and expanding. Thus, short-age organizations are likely to use exploitation approach at their early life stage, seek not to leave the current path and engage in highly chaotic and complex domain, and therefore will choose the most simple form of alliances, and will choose similar partner in age and level of complexity (Balogun, Jacobs, Jarzabkowski, Mantere, & Vaara, 2014; Lin & Darnall, 2015)

These firms will likely be single product or service provider, they will have very little need for knowledge acquisition at this stage, and they will seek maximum optimization of resources and follow economy of scales approach. The partner selection then will be influenced by the age of the organization, the level of complexity, and the managerial discretion.

Managers in larger organizations will have more influence than managers in smaller organizations. Size has been argued to influence strategy and managerial orientations (DeTienne, McKelvie, & Chandler, 2015).

Propositions

Proposition 1: the earlier the firm establishment, the larger its need for establishing exploitation strategy, the more likely it is to engage in simplest form of alliance, such as joint venture with firms that have similar traits such as age and size.

Proposition 2: The firms that have been recently established and have experienced CEOs with higher level of discretion will likely engage more complex alliances, with firms that have different size and traits

Proposition 3: Firms with deep experience and higher level of R&D intensity, and higher levels of innovation will less likely to engage in alliances and will prefer to fully acquire partners that the organization thinks it will benefit from their capabilities.

Proposition 4: Firms with TMT that have long organizational tenure will likely engage in alliances that is influenced by the governance structure as follows.

The higher the boards independency, the more likely the firms will engage in risky exploration forms of alliances that are necessary for performance improving, the better the selection, the more benefit potential the organization will experience.

The higher the managerial discretion, the higher the likelihood of self-serving behavior, the more likely the firms will engage in complex alliances, but not performance-improving guaranteed alliance.

Proposition 5: The Chaotic actions that have been previously proven unsuccessful will eventually accumulate an optimal level of chaotic experience, yet, patterned that will shape the strategic domain from which the firm can select its alliances, and can influence and be influenced by. Firms that function in a stable environment will have lower likelihood of alliance success unless it leaves the path it has been positioned on, which is in turn influenced by the risk-taking orientation by the managers. Thus, managers who have lower tenure, will engage in risky and knowledge acquiring alliances that will lead to better chances of getting out of the strategic positioning and improve the firm overall performance.

Discussion and Future Directions

The topic of strategic alliance has been one of the hottest topic in the management arena. The motives of alliances have been extensively studied in the literature and no consensus have been reached among scholars, yet the results are conflicting and in most cases alliances fail and end dramatically (Chao, 2011). The effect of accumulated experiences have not been given as much importance in the literature except for few studies. In this theoretical paper, I try to shed lights on important facts regarding alliance motives, formation, partner selection, and the sensitivity of the firm-specific knowledge and R&D level and try to propose some theoretical propositions for later empirical research. It is noteworthy to take into account firm-level factors as well as environmental and institutional factors, and also distinguish between domestic alliances and international alliances. This can lead to better understanding of why alliances are formed and why don't reach optimal level of satisfaction with respect to performance. In this paper also I try to shed light on the possible effect of the organization age as it has been recently drawing the attention of the management scholars as to whether it has significant effect on the nature of the alliance and any implications for performance. Also, the role of managerial discretion seems still under-researched in the context of alliances and networks. It could open a new avenue for incorporating the upper echelons theory and the agency theory into the alliance formation taking into account the differences seen from both theories lens with respect to the managements involved in the alliance formation and the role of governance structure. Also, reputation and CSR of engaging firms may have some important implications that need to be looked into and explored more to see whether these constructs do influence the selection of partners, and how do they influence the formation and whether they have performance implications.

Future research could look into strategic alliances through the lens of chaos theory by adding up the accumulated momentum a firm gains throughout its lifetime. It could also consider the attractiveness of the attractors and their reachability, fit, and their value for the firm. Research also could consider the firm size, age, industry, and managerial role in building up the firm future alternatives and its ability to move flexibly between different paths in its domains.

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