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CORPORATE STRATEGY REVISITED: A VIEW FROM COMPLEXITY THEORY

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Abstract

Despite its long tradition and well known contributions, corporate strategy research is yet far from being mature. This paper proposes an innovative framework that approaches the field from the theoretical perspective provided by complexity theory. We propose to see the corporate level of the organization as the *driver*, *pacer* and *framer* of the overall firm's evolution process. *Drive* is provided by the cognitive representation of the corporate fitness landscape that is implicit in the firm's corporate plan. *Pacing* is a consequence of the kind of strategic initiatives ("search strategy") developed by the company. *Framing* is achieved through the architectural design that the corporate level implements for the firm.

Keywords: corporate strategy; complexity theory; self-organizing

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1.- Corporate Strategy Research at a Crossroads

After thirty years of abundant research, the field of corporate strategy is not yet mature. There is still considerable disagreement around some key and long-standing research questions such as whether diversification can be used to build long-run competitive advantage and, if so, how and when (Markides and Williamson, 1994). Several studies from the field of Financial Economics, under the agency cost hypothesis (Morck, Shleifer, Vishny, 1990; Lang and Stulz, 1994; Hoskisson, Johnson, Moesel, 1994; Amihud and Lev, 1981, 1999), found diversification discounts in stock quotations of diversified companies, concluding that diversification affects performance negatively. However, recent studies that acknowledge the existence of self-selection in the decision to diversify (Campa and Kedia, 1999; Villalonga, 2000) found that, after controlling for endogeneity of the diversification decision, those discounts turn to premiums. Moreover, studies performed outside the U.S. in highly industrialized countries (Gedajlovic and Shapiro, 1998; Lins and Servaes, 1999) as well as in emerging markets (Khanna and Palepu, 1997, 2000, 2001; Ghemawat and Khanna, 1998; Guillén, 2000) found that effects of different diversification postures on performance show mixed results across countries, highlighting the dangers of "exporting" U.S. developed theories to any country at face value.

Another important stream of research within this field was the one aimed at isolating and assessing the contribution of company, industry and corporate effects on performance (Schmalensee, 1985; Rumelt, 1991; Mc Gahan and Porter, 1997). These works aroused a strong dispute on whether firm or industry effects are the most important, but left clear that corporate effects appeared to be negligible. However, this "truth" has also been questioned by recent findings (Brush and Bromiley, 1997; Chang and Singh, 2000; Bowman and Helfat, 2001), leading to the conclusion that studies within this tradition appear to be strongly affected by apparent and difficult to fix sampling biases and methodological flaws. Biases depend on factors such as which database was used or the level of aggregation chosen by the researcher (Chang and Singh, 2000; Bowman and Helfat, 2001) and methodological criticisms relate to the inappropriateness of variance decomposition as a way to assess corporate effects on performance (Brush and Bromiley, 1997; Bowman and Helfat, 2001).

As a result of this persistence of mixed results in such important lines of research, there is increasing agreement around the idea that *new approaches to the study of the field would be welcomed.* The creation of corporate advantage may be a phenomenon of a subtlety not captured by cross-sectional database statistical studies (Bowman and Helfat, 2001). Bowman (1995) suggested that a better understanding of the design issues in corporate strategy will open a possible future for the field.

This work is an attempt to take a step forward in this direction. In order to approach the field innovatively we draw on the theoretical tradition of behavioral evolutionism (March and Simon, 1958; Cyert and March, 1963; Nelson and Winter, 1982), recently enriched by the contribution of complexity theory. In particular, we focused on the application of the work of Kauffman (1993), in the field of biology, to organization theory (Boisot & Child, 1999; Gavetti and Levinthal, 2000; Levinthal, 1997; Levinthal and Warglien, 1999; McKelvey 1997, 1999; Siggelkow & Levinthal, 2002). Led by these theoretical lenses, we developed a framework of corporate strategy in turbulent environments. These environments are characterized by their high level of dynamism (showing nonlinear positive feedback), complexity and uncertainty (Crossan, Nanjad and Vera, 2001).

This paper is organized in the following way. First, we will define and discuss complexity and self-organization and review Kauffman's (1993) NK(C) framework and its extensions to management theory. Then, we will introduce a framework of corporate strategy characterized by three interdependent processes: the development of a cognitive representation of the fitness landscape; the positioning of the firm in such landscape; and the architectural design of the firm. Finally, we will discuss how this framework can help to approach empirical research.

2.- Complexity and Organizations

Complex systems and the phenomena of complexity have indeed received much attention from the scientific community recently in disciplines as different as physics, biology and economy. A complex system is a system (whole) comprised of numerous interacting entities (parts), each of which is behaving in its local context according to some rule(s) or force(s). In responding to their own particular local contexts, these individual parts can, despite acting in parallel without explicit inter-part coordination or communication, cause the system as a whole to display emergent patterns, orderly phenomena and properties, at the global or collective level. In some complex systems, the constituent parts are not themselves complex systems and are governed by unchanging rules. In more complicated complex systems, these parts can themselves be complex systems, governed by rules that evolve. These parts are referred to as "adaptive agents", guided by "internal models", giving rise to a whole referred to as a "complex adaptive system" (Holland, 1995, cited in Maguire and McKelvey, 1998). In these systems, it is possible for a mutually consistent ecology of parts, along with the internal models and rules guiding them, to emerge or *self-organize* from what is effectively a decentralized bottom-up process of codesign. This process is better described as coadaptation or coevolution, rather than adaptation (Maguire and McKelvey, 1998).

Self-organizing. The idea that order can emerge spontaneously, or that systems may "self-organize", is a central one in complexity theory. Self-organizing is a process in which the components of a system spontaneously communicate with each other and abruptly cooperate in coordinated and concerted common behavior (Stacey, 1993). Through self-organization, the behavior of the group emerges from the collective interactions of all the individuals. Although they may follow "simple rules" of action (Eisenhardt and Sull, 2001), the resulting group behavior can be surprisingly complex and remarkably effective.

However, while processes of self-organization are quite powerful, they do not negate the possibility of design influences. By manipulating the context or organizational landscape, one may indirectly affect the dynamics of the process. A principal architectural design tool is the manipulation of interdependencies between the parts of the system. The underlying idea

is that designing the surface on which adaptation takes place, by manipulating the interdependencies and by influencing the relationships between individual action and payoffs, one may affect the quality of the adaptive process without the need to directly specify individual behavior. Architectural or landscape design conserves the focus on interdependencies of traditional organizational design theories, but puts the stress on the manipulation of interdependencies which are not "a given" (Levinthal and Warglien, 1999).

3.- Fitness landscapes. Kauffman's NK model

Metaphorically, firms have long been viewed as organisms, gathering resources from, and adapting to the imperatives of, some environment. More recently, organizational ecologists have imported models from biology to explain the forces and variables underlying organizational funding, change and mortality. As a result, the notion of organizational fitness is well accepted (Hannan and Freeman, 1977). Though typically associated with selectionist arguments and what is referred to as the environmental school of strategy (Mintzberg, Ahlstrand and Lampel, 1998), where it is argued that it is the environment that optimized the design of key organizational features, the notion of "fit" is also found in the design school of strategy (Mintzberg, Ahlstrand and Lampel, 1998), which emphasizes strategic choice and views firms as actively seeking strategic fit. Levinthal (1991) stated that the opposition of these two arguments is artificial. The exploration of the managerial issues related to adaptation and strategizing, therefore connecting both approaches, can be done drawing on Kauffman's NK model (Kauffman, 1993; Maguire and McKelvey, 1998).

Kauffman's contribution. For the twentieth century, biologists have assumed that "order" was due to the effects of selection, as developed under the general label of Darwinian selectionist theory (McKelvey, 1999). Kauffman (1993) challenged the unquestioned universal applicability of selectionist theory by suggesting that in sufficiently complex systems, selection cannot avoid the order exhibited by organisms as a result of their self-organizing properties. In such situations, order is present "not because of selection but despite it" (Kauffman, 1993). For the purpose of explaining the relationship between selection and self-organizing, he used the fitness landscape metaphor.

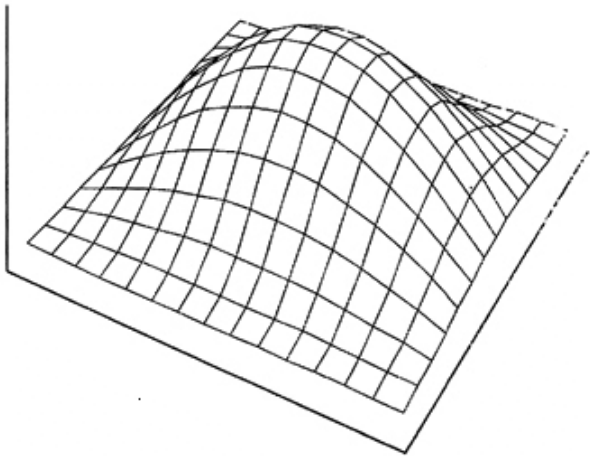
Fitness landscapes. Following Levinthal (1997) and McKelvey (1999), we will accept the premise that Kauffman's assumptions apply equally well to firms. Organizations adapt by modifying their existing form in an attempt to enhance their fitness in a payoff surface or "fitness landscape" (Sewell Wright, 1931, 1932, cited in Levinthal, 1997). A fitness landscape consists of a multidimensional space in which each attribute of the organization is represented by a dimension of the space and a final dimension indicates the fitness level of the organization. In organizational studies, fitness can be represented by profit or by a mix of variables related to the organization's goals (Levinthal and Warglien, 1999).

In the context of population genetics, Kauffman (1993) demonstrates that the typology of the fitness landscape is determined by the degree of interdependence of the fitness contribution of the various attributes of an organism. The topography of the fitness landscape depends upon the degree to which the payoff of a given choice is dependent on other choices. Increasing the density of interdependencies affects the complexity of the landscape and, consequently, the emergent patterns of behavior. Levinthal (1997) mentions, as prominent examples of such interdependence in the management literature, Chandler's (1962) work on the relationship of a firm's strategy and organizational structure and McKinsey's 7S framework (Peters and Waterman, 1982), while McKelvey (1999) uses Porter's (1985) value chain for a similar purpose.

The NK model. Kauffman characterizes fitness landscapes with, essentially, two structural variables: N, the number of elements that characterize the entity (genes in the context of Kauffman's work, actions or policy choices in the context of organizations), and K, the number of elements of N with which a given attribute interacts. Each attribute can take on two possible values. Therefore, the fitness landscape consists of 2^N possible policy choices, the overall behavior of the firm being characterized by the vector $N\{X_1, X_2,...,X_N\}$, where each X_i takes on the value of 0 or 1.

Interactions between attributes affect the shape of the landscape. When there are no interactions between the different attributes, the landscape tends to assume a single-peak configuration. If the contribution of each actor is independent from that of others, there is an optimal behavior independent of others' behavior (**Figure 1**). In this situation, local improvement in performance always leads to global improvement, implying a situation of universal "best practices" (Levinthal and Warglien, 1999). In a single peak (K=0 or similar) world, local incremental adaptation is a satisfactory solution to the dilemma between exploiting past experience or exploring alternative bases of action (March, 1991).

Figure 1. A "smooth" or single-peak fitness landscape



However, as interactions increase, the landscape becomes more rugged or multipeaked. Multiple peaks are the direct result of interdependences among a set of policy choices. Each attribute can take on 2^{K+1} different values, depending on the value of the attribute itself (either 1 or 0) and the value of K other attributes with which it interacts.

The implications of a rugged landscape (**Figure 2**) are very much a function of the search behavior of actors moving on the landscape. If actors were omniscient and could readily search globally, then the behavior on a smooth surface (K=0) or a rugged surface would not fundamentally differ. In both instances, actors would identify the global peak. However, a more realistic analysis developed within the behavioral tradition of intelligent local search (March and Simon, 1958; Cyert and March, 1963) assumes that actors are intelligent but their intelligence is local to their position on the landscape. Thus, actors are assumed to be able to identify the positive and negative gradients around their current position, but not capable of making similar judgements for more distant ones[1].

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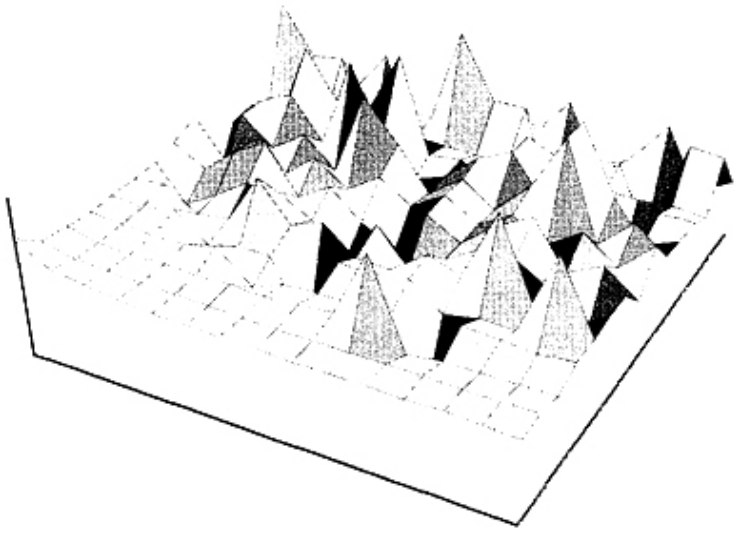
[1] Levinthal (1997) observes that the implicit assumption of most empirical analyses is that K is always equal to zero. In other words, organizations have an additive fitness structure in which the fitness contribution of each element of the organization is assumed to be independent of other attributes of the organization.

Figure 2. A "rugged" or multipeak fitness landscape



However, in a rugged landscape, such incremental search procedure will lead only to the local peak closest to the starting point of the search process, regardless of its height relative to other peaks in the landscape. As a result of this locking in to the first available solution, a strong form of path dependence is observed and, on average, modest performance ("competency traps"). One mechanism to overcome such "traps" is to engage in "long-jumps", random explorations of more distant portions of the landscape. Long jumps involve the simultaneous alteration of many elements of N. Long jumps emphasize sample variation, preventing the company from falling into competency traps, and are more valuable in turbulent environments in which the value of current knowledge diminishes, making exploitation less relevant. However, such distant efforts, by not exploiting wisdom gained by past experience, are likely to result in a deterioration of performance. So, the problem of adaptation strategies in rugged landscapes can be reframed as a familiar dilemma: how to get the benefits of exploration without losing the advantages of exploiting acquired knowledge (March, 1991). At least a partial solution to this dilemma lies in search strategies that recombine elements of existing solutions, as Galunic and Eisenhardt's (2001) idea of patching may suggest, i.e., to combine building blocks from distant regions of the landscape. A recombination strategy allows whole blocks of existing solutions to be changed rather than modifying them piecemeal. A recombination is a shift in position that exploits knowledge without being trapped by this knowledge.

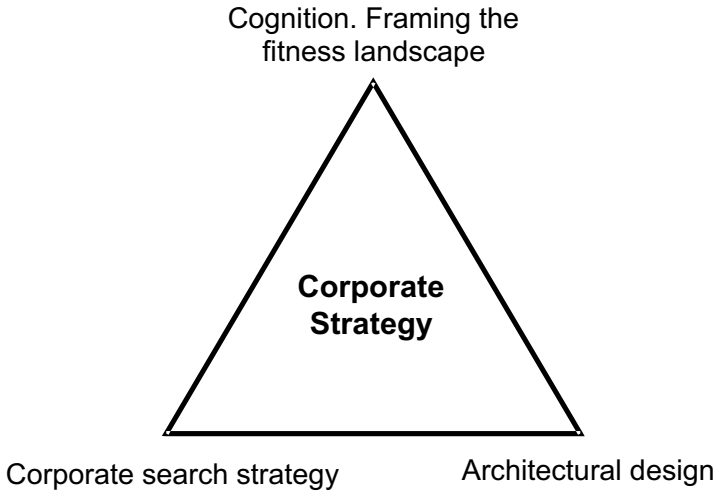
4.- A framework for corporate strategy[2]

Based on our previous discussion, next we introduce a dynamic framework of corporate strategy based on three interlinked sets of processes (**Figure 3**). Although the

[2] The development of this framework was grounded with the help of a longitudinal case study focused on the corporate strategy of Lujan, a car component manufacturing company, from 1986 through 2001. This case is discussed in detail in the dissertation "Creating Corporate Advantage in Turbulent Environments" (Caldart, 2003).

processes mutually reinforce each other, for descriptive purposes we will describe them sequentially.

Figure 3. The Corporate Strategy Triangle



We conceive the corporate strategy of the firm as the decisions made by the corporate level with the purpose of *driving*, *pacing* and *framing* the firm's overall evolution process.

First, Corporate Management develops a representation of the interfirm fitness landscape (to *drive* evolution). Then, according to that representation, organizations position themselves climbing a basin of attraction towards a peak, using different kinds of evolution strategies, such as incremental search, long jumps or recombination (to *pace* evolution). Finally, the architecture of the firm is designed by manipulating the context of self-organizing through the management of interdependences (to *frame* evolution).

4.1.- Developing a cognitive representation of the fitness landscape

Cognition is a forward-looking form of intelligence that is premised on an actor's belief about the linkage between the choice of actions and the subsequent impact of those actions on outcomes. Such beliefs derive from the actor's mental model of the world or "dominant logics" (Prahalad and Bettis, 1986). In contrast, experiential wisdom accumulates as a result of positive and negative reinforcement of prior choices (Levitt and March, 1988).

Because managers are rationally bounded (Simon, 1997; March and Simon, 1958, Cyert and March, 1963), cognitive representations are grounded on the actual landscape, but constitute simplified caricatures of the decision context that show lower dimensionality than the actual landscape. Levitt and March (1988) mention, as usual limitations of cognition, the human tendency to overestimate the probability of events that actually occur and of events that are available to attention because of their recency or saliency, insensitivity to sample size, the tendency to overattribute events to the intentional actions of individuals, the use of simple linear and functional rules, the association of causality with spatial and temporal contiguity and the assumption that big effects must have big causes. For instance, Pascale's

(1984) case description of Honda's penetration of the U.S. motorcycle market, in contrast with a Boston Consulting Group (BCG) report, offers an enlightening story that reveals a widespread tendency to overlook the process through which organizations experiment, adapt and learn. We tend to impute coherence and purposive rationality to events when the opposite may be closer to the truth.

This assumption is consistent with the normative traditions of the management literature that offer low-dimensional typologies such as the Boston Consulting Group or GE matrixes (Hax and Majluf, 1984) and generic strategies (Porter, 1980; Treacy and Wieserma, 1995, Hax and Wilde, 2001) to help structure the choice of firm strategy. These analytical representations of the fitness landscape that reduce the dimensionality and, in turn, the cognitive complexity of the space provide a strong guide to action. However, to the extent that the representation does not capture the essential structure of the real fitness landscape, it will be a mistaken guide (Levinthal and Warglien, 1999).

In our model of corporate strategy under the NK framework, representation of the interfirm fitness landscape is *the corporate level's representation of the nature and prospects of alternative corporate configurations that the corporation may adopt in the fitness landscape.* The set of possible corporate configurations is defined by the different combinations of firm's attributes (N) and nature and intensity of the interrelationships between them (K).

Therefore, *driving* refers to developing a cognitive representation of the business landscape that is used by the corporate office as a basis for the definition of the corporate value creation model that specifies the role of businesses in such corporate framework. This corporate value creation model is complemented by the other dimensions in the triangle.

Shifting cognition. Cognitive representations provide not only a powerful suggestion for an initial choice of organizational form, but also a useful discipline on subsequent efforts at experiential search. However, with a fixed cognition, the organization immediately identifies the global peak with respect to its cognitive representation. In turbulent environments the need to shift the initial cognition becomes more crucial for two reasons. First, because rapid changes in the environment require the organization to adapt and change more frequently, and second, because in an uncertain business landscape, the quality of the cognitive representations will tend to be lower.

Changing cognitive representations can be an important form of adaptation in two different respects. First, the new representation may consist of a better mental model of the actor's environment, reflecting weaknesses of the prior representation or environmental shifts that render a previously adequate representation less effective. Second, shifting cognitive frameworks effectively results in a sequential allocation of attention to different facets of the firm's environment. The set of performance metrics and an organization's structure importantly influence actors' perceptions of their problem space. Only by offering a fresh perspective with a shift in performance metrics is further improvement possible.

The shift in policies prompted by the new representation may result in the loss of the experiential wisdom accumulated in the context of the prior representation. However, with dramatic changes in the fitness landscape, prior experiential wisdom is rendered largely obsolete. In the face of dramatic environmental change, the ability to rapidly indentify attractive regions in the landscape, via a cognitive process resulting from a shift in cognitive representation, can compensate for the loss associated with forgone experiential wisdom.

4.2.- Landscape search strategy

Cognitive representations have been shown to be a critical determinant of managerial choice and action (Fiol and Huff, 1992; Walsh, 1995). A firm's choice of strategy is often a by-product of managers' representation of their problem space.

Guided by its cognitive representation and its experiential learning, the corporation tries to "climb" a basin of attraction towards a peak. According to the way the company balances the trade-off between exploration and exploitation activities, hill climbing strategies can take several forms. As illustration, below we discuss the local or incremental search, the non-incremental search or "long-jumps", and the recombination of building blocks.

Local or incremental search. Search is local when the company aims at innovating within its current corporate model. In terms of Kauffman's model, local search takes place when the set of business attributes are varied only incrementally. Then the company engages in local "hill-climbing" or neighborhood search (March and Simon, 1958) towards a peak, where the height of the hill reflects the fitness value of the associated organizational form. In other words, the company aims at improving its position through experiential learning within its current cognitive representation.

This strategy allows high explotation, as most elements of N remain unchanged, but limited exploration, as learning is constrained by the local topography on which the actor lies, increasing the risks of suffering the pathology labeled by Levitt and March (1988) as "competency trap", or climbing towards a local peak that is unattractive. Local search is advisable when local peaks are attractive (Levinthal and Warglien, 1999) and low turbulence permits to keep the value of current experience.

Local search is equivalent to the static efficiency concept developed in Ghemawat and Ricart (1993) and therefore represents one extreme in a continuum of choices. The other extreme, dynamic efficiency, corresponds to the non-incremental search presented next.

Non-incremental search or "long-jumps". In contrast to local search, long jumps involve the adoption of a new corporate business model or simultaneous alteration of many elements of N. The literature distinguishes two bases for radical changes: failure-induced search and innovative activity (Levinthal, 1997). This strategy is characterized by high exploration but limited exploitation and emphasizes sample variation in the search for dynamic efficiency. Long-jumps permit to prevent the company from falling into competency traps, and are more valuable in turbulent environments in which the value of current knowledge diminishes, making exploitation less relevant. However, the impact of alternative sampling strategies varies dramatically depending on whether the evaluation mechanism is one of on-line experimentation or off-line cognition (Gavetti and Levinthal, 2000). If the evaluation of alternatives is off-line, the variation in the sample is generally an attractive property. If low outcome draws can be costlessly discarded (or at low cost), the greater variance in the sample, holding the mean constant, increases the expected value of the draws that are adopted, therefore encouraging long jumps. Real options (Amram and Kulatilaka, 1999), cooperation strategies for risk sharing such as strategic alliances, and hedging strategies such as venture capital investments are examples of how firms aim at absorbing complexity through low-cost, multiple and sometimes conflicting representations of environmental variety. In a process of "on-line" experimentation, however, such variation may prove fatal because the actor experiences the consequences of each experimental draw.

Off-line experimentation is one form of locating the search strategy in between the two extremes. As elaborated in Ghemawat and Ricart (1993), there is a tendency to move

towards the extremes, making the intermediate cases difficult to reach. Off-line experimentation is one alternative; recombination as explained next is another, as it could be possible to think of temporal arrangements that periodically move from one extreme to the other. All these solutions and others that may be developed will create important organizational tensions (Ghemawat and Ricart, 1993).

Recombinations. At least a partial solution to the dilemma of how to get the advantages of exploration without losing the benefits of exploitation through "on line" experimentation is the recombination of elements of existing partial solutions (Levinthal and Warglien, 1999) by manipulating the interdependencies (K) between different elements of N. Entrepreneurs do not randomly sample the space of alternatives, but find new, unforeseen combinations of known but previously distant elements. Galunic and Eisenhardt (2001) propose "chartering", a competitive process between units that enables the recombination or "patching" (Eisenhardt & Brown, 1999) of product-market domains between business units in response to market changes. Patching allows to engage in long jumps and exploit existing building blocks of knowledge without being trapped by this knowledge. In this way, the company obtains *intertemporal economies of scope* (Helfat and Eisenhardt, 2001), arising from the replacement of old businesses that used a particular resource by a new business that does so, in response to changing market conditions.

If *driving* represented the corporate view of the landscape, *pacing* is the definition of the key search strategy to transform the corporate value creation model into action. Together they identify the way the corporate level adds value to the business portfolio. The architectural design closes the model by defining the key organizational elements to implement such value creation model.

4.3.- Architectural design of the firm

Several authors have warned about the paradox that organizations have to face between the need to innovate and the need to be stable and ordered (Miller, 1990; Pascale; 1990; Stacey; 1993; Brown and Eisenhardt, 1998). Going too far in the search for innovation and creativity results in a rule-breaking culture, loose structures and processes that obscure responsibilities, and excessive but ineffective communication, leading to the "chaos trap" (Brown and Eisenhardt, 1998) or "error catastrophe" (Kauffman, 1993). Conversely, going too far in the search for tight structures, schedules and processes results in a loss of flexibility, poor innovation and a predictable strategy, leading to the "bureaucratic trap" (Brown and Eisenhardt, 1998) or a "complexity catastrophe" (Kauffman, 1993). The paradox between innovation and order is addressed in Kauffman's model by the value of the variable K. Designs with low interdependence (low K) and, as a result, with clear attractors, i.e. stable performance metrics, keep the level of interactions low. In this context, change through the alteration of one or a few components of N is effective, as it has low suppressing[3] effects across other components. However, flexibility comes at the expense of poor diversity.

In contrast, with higher levels of K, high levels of interactions promote intraorganizational learning as diversity of behavior rises with interdependencies, but lowers the effectiveness of organization level change. Tightly coupled systems (high K) have great difficulty in adapting even to modest change. They cannot engage in exploration without forgoing the benefits of exploitation (Levinthal, 1997).

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[3] An initiative is said to suffer suppressing effects when there is a reaction to that initiative that prevents it from producing the desired effects.

Through its architectural design the firm broadly matches the variety of the environment it has to face. Therefore, the more turbulent the environment becomes, the more interdependent will be the architectural design, as the firm tries to increase internal knowledge and activity sharing. This assumption is consistent with Ashby's law of requisite variety[4] and Lawrence and Lorsch's (1967) Integration and Differentiation framework. In other words, in turbulent environments the organization cannot allow divisions –especially those that are related because they have common customers or technologies– the "luxury" of running totally autonomously, as very valuable knowledge and cost-sharing opportunities would be sacrificed, leading to an "error catastrophe".

Emergent "self-organized" interunit cooperation initiatives are, by definition, "ad-hoc" and loosely coupled. Conversely, centrally imposed interdivisional collaboration initiatives tend to be formally structured, generating tight couplings affecting all the divisions, regardless of their real needs. Eisenhardt and Brown (1998) point out the important role of self-organizing as a process that solves this paradox, placing the company "at the edge of chaos", through activities loosely constructed but possessing critical structure points, a culture of frequent change in a context of strict rules and channels for real-time fact-based communication within and across groups. Cross-unit communication appears to work better when initiatives emerge from the interested units themselves than when they are imposed by the corporate center. The superiority of self-organizing processes as opposed to tight control as a way to release the creative forces of the organization and its sensitivity to design influences leaves the corporate center with the role of designing "simple rules" (Eisenhardt and Sull, 2001), i.e. objectives or policies, that frame self-organizing. Corporate executives are the best candidates to perform this role, as they are more likely than others to have a broad architectural knowledge of the firm (Galunic & Eisenhardt, 2001). Similarly, Stacey (1993) proposes that corporate management create the context in which collaboration can happen by bringing managers together to talk and perhaps find collaborative opportunities. In their recent multiple case study, Chakravarthy, Zaheer and Zaheer (2001) also suggest that the transfer of knowledge related to the company's core competencies appears to be more effective when business units relate to each other without direct corporate intervention. Finally, Goold and Campbell (2002) propose that multibusiness companies be seen as "structured networks" in which corporate intervention is only desirable as a means to remedy the "difficult links" or coordination problems that the network cannot solve effectively through self-organizing. We can interpret self-organization in an organization as the process of political interaction and group learning from which innovation and new strategic directions for the organization may emerge. (Stacey, 1993).

Chakravarthy et al. (2001) view as factors that increase the opportunities to share knowledge the following: the existence of strategic interdependencies (eg., common customers), a structure promoting interdependence, systems and processes that disseminate information across units (eg, a firm-wide intranet), routine strategic planning meetings, the depth (across multiple levels) and breadth (across multiple functions) of ties, the participation of one business unit in the strategic review of another, high mobility across divisions and opportunities to meet informally.

However, recent literature on knowledge sharing suggests that the best initiatives for synergy development appear to be those that come from individual divisions' willingness to cooperate and not those that are identified and developed company-wide directly by the corporate level, as this behavior may increase the development of a higher-than-necessary

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[4] "The real key to regulation is to be able to match the variety of exogenous disturbances to the system" (Scott, 1992 on Ashby's law).

level of interdependencies. These interdependencies may result in important suppressing effects, leading the company towards a "complexity catastrophe" (a very high K) that makes it incapable of dealing with rapid and unpredictable change. Therefore, the solution requires that the corporate level be indirectly involved in promoting collaboration opportunities by developing an architectural design that encourages business units to self-organize, identify such opportunities and implement the ones that they judge most valuable.

As seen, the organizational architecture fits the cognition and search strategy to implement the underlying corporate value creation model. In this architecture it is key to define the level of organizational design vs. self-organization that frames corporate strategy.

4.4.- Conclusions

The motivation of this paper was to shed some light on the long-lasting but stalled debate on corporate strategy. For this purpose, we opted to approach the field innovatively. We grounded on the theoretical guidance provided by complexity theory and, particularly, on Kauffman's NK model. This theoretical approach offers very promising avenues for improving our formal understanding of social processes, characterized by non-linearity, positive feedback and sense-making, features not captured by the tradition of database studies developed in our field.

The insights provided by the Corporate Strategy Triangle permit us to affirm that undoubtedly *corporate strategy matters.* The Triangle enabled us to visualize how corporate performance is a result of the complex interplay between the cognitive representation of the firm's payoff surface, materialized in the Strategic Plan, the kind of evolutionary moves or corporate strategic initiatives performed by the corporation and the architectural design chosen in order to address environmental variety.

The research findings obtained in this dissertation led us to conceive corporate strategy as *the decision level that "drives", "paces" and "frames" corporate-wide evolution through the choice, at the corporate level of the firm, of a particular equilibrium configuration of cognition-evolution pattern-architectural design.*

Evolution is *driven* by choosing a cognitive representation that leads the organization towards a particular area of the fitness landscape.

Pacing is achieved by shifting between gradual local search strategies, characterized by strong exploitation, and long jumps that make the company explore a different area of the landscape or, in other words, develop a different business model.

Framing concerns the development of broad organizational arrangements that ease the emergence of fruitful, self-organized, loosely coupled processes as sources of corporate advantage.

The equilibrium configuration of the *driving-pacing-framing* chosen by the corporate level may lead to high or poor performance, but, undoubtedly, has a substantial impact on this variable.

These ideas can help also to reinterpret the mainstream literature in the field in different ways. First, conceiving corporate strategy as the choice of an equilibrium

configuration of cognition-corporate initiatives-architectural design highlights the fact that corporate strategy is not just a matter concerning diversified firms, as many definitions of the field implicitly or explicitly assume, but a decision level that exists in every firm, and previous to any business strategy.

Second, we can also reinterpret the well known notion of "parenting advantage" (Goold & Campbell, 1994). This advantage can be understood as the extent to which a particular business fits with the configuration of cognition-evolution pattern-architectural design of the corporation. For instance, a company having a portfolio of businesses competing in highly stable industries probably will benefit from a strictly disciplined application of the strategic plan, based on a smart cognitive representation of the rather predictable kind of payoff surface that these businesses face. For this group, a business competing in a highly turbulent environment may not be a good choice for a diversification decision, as the corporate logic of strict discipline, combined with a poorer cognitive representation as a result of the dynamism of this business's environment, and the consequent need for a more complex architectural design, would provoke a strategic mismatch leading to poor performance. Thus, businesses that are related in terms of Compustat SIC-codes may not be good diversification choices if they do not fit the corporate equilibrium configuration of the triangle. Contrarily, apparently unrelated businesses may be smart choices for diversification if they match the corporation's particular configuration of the corporate strategy triangle.

The framework developed in this paper formalizes a dynamic view of corporate strategy. The corporate role is divided into three interrelated actions. Driving defines the cognitive representation of reality. Pacing sets the search strategy experimentation. Framing defines the necessary architectural design. Seen together and evolving in time, they define the corporate role as that of dynamically crafting businesses by driving, pacing and framing the corporate value creation model. Corporate office is constantly shifting among these three roles to increase the value of its business portfolio.

Furthermore, this framework can be used as the theoretical cornerstone for the development of empirical research. Agent-based simulations based on Kauffman's NK model might permit to capture and generalize the Triangle's key properties. Describing the evolution and relative performance of different configurations of the corporate strategy triangle would permit to reach more general conclusions on how this interplay of cognition-search strategy-architectural design works[5].

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[5] See Caldart (2003) for an analysis of how the quality of cognition and the degree of discipline during the execution of the corporate strategy impact on the performance of firms competing in stable and in turbulent environments.

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