Adaptation on Rugged Landscapes: Competitive Strategies in the Presence of a Common Objective

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Abstract

This paper examines the ability of companies to change their organizational forms in an effort to obtain higher performance. We use the concept of fitness landscapes and we expand the notion of attributes to include not only the capabilities, but also the purpose organizations attempt to serve – usually the market. We decouple the fitness a form represents from the actual fitness an organization that incorporates it will experience due to the effect of competition for the common objective, creating a dynamic landscape. The extended model incorporates the notion of feedback from the environment in a twofold manner: the structure of the underlying landscape and the interaction among rival organizations. On one hand, the feedback helps organizations into making decisions based on increased information and on the other hand, the outcome of those decisions is no longer entirely predictable. We examine two different rules of transformation, namely the local adaptation, and the distant adaptation. The results indicate that the proposed scheme can more accurately explain the variation observed in real environments than previous models. In addition, it can serve as a means of predicting the possible reforms of rival organizations on a common landscape.

Keywords: Organizational Adaptation, Organizational Forms, Fitness Landscape, Dynamic Competition

1. Introduction

Adaptation is one of the basic phenomena of biology (Williams 1966); it is the process whereby an organism becomes better suited to its habitat (Dobzhansky 1968). This fundamental process is present in all living organizations, and as such, we expect to observe it in any organization that can be considered as a living one, with companies being an ideal candidate. In this paper, we have examined the evolutionary process of companies in an effort to be better suited to their operating environments. We used Wright's work (1931, 1932) to efficiently define the operating environment within which the companies move and try to adapt to: a fitness landscape consists of a multidimensional space in which each attribute (gene) of an organism is represented by one dimension of the space and the final position in the space indicates the fitness level of the organization (Levinthal, 1997). The fitness is defined as the overall expected performance of a company that follows a specific organizational form.

A central premise of resource-based theory is that rival firms compete on the basis of their resources and capabilities (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991; Amit and Schoemaker, 1993; Collins and Montogomery, 1997). This notion is also central in the work of Levinthal (1997), which we have used as the basis of our study. All organizations search for the form that will give them the highest fitness; that is the optimal combination of states of the available attributes (resources and capabilities). The performance of each organization depends entirely on its own capability of identifying this optimal combination – the highest peak on the landscape. Since the actions of rivals are irrelevant, all organizations behave as if they were alone on the landscape; the search is limited in a self-focused effort.

It is trivial to see that under market conditions the self-focused search is highly unlikely to prove efficient. In our research, we expand the notion of attributes to include not only the capabilities, but also the purpose the organization is attempting to serve – usually the market. Different attributes will represent different customer target groups and the value of one attribute will denote if that group is served or not. Firms are rivals to the extent that their products satisfy the same basic customer needs (Kotler, 2000); they serve the same purpose in the mind of users. We examined the case that the fitness that a form represents is decoupled from the actual fitness an organization that incorporates it will experience. Under this scheme, one form offers a potential fitness; the actual benefit an organization that adopts it will experience is directly correlated to the forms adopted by all other organizations that operate on the same landscape. As a result, the fitness landscape is transformed into a dynamic one. While the landscape alone is constant, each organization is facing a different version of it, a version that depends heavily on the actions of other organizations. Furthermore, the implications of moving into a new form cannot be accurately predicted. If another organization moves into the same new form (or a very similar one), then the actual fitness each will experience will be much less than the one expected when making the original assessment. Our study shows that when such an interaction is taken into account, organizations engage into a dynamic process of strategy consideration, which eventually leads to increased variety of adopted forms.

Several studies in the literature provide extensions to Levinthal's (1997) work on different aspects. Some of the most important ones include the way interactions help create and sustain competitive advantage for an organization (Porter and Siggelkow, 2008) and how interactions are influenced by other external activity choices made by a firm, evaluation of strategies under a NK(C) model of coupled landscapes that could potentially lead to competitive advantage (McKelvey, 1999), organizational consequences occurred by misperceiving the interaction effects between activity choices when decision makers are facing complex systems (Siggelkow, 2002) and implications under the assumption that actors can interact with the landscape they are adapting to (Levinthal and Warglien, 1999). The work that is closer to ours uses the concept of fitness landscapes as a basis for identification of current and future competitors that may attempt to acquire market share in the market that a company already operates in (Peteraf and Bergen, 2003).

This study offers a different extension that, to the best of our knowledge, is not present in the current literature: decision making based on competition status. For the inclusion of the market response we have followed a scheme similar to the ones adopted in management literature (Montgomery and Wernerfelt, 1991, Erickson, 1992, Bolhmann, Golder and Mitra, 2002, Nguyen and Shi, 2006, Erat and Kavadias, 2006); customers value both the quality and the variety of what is offered in a market. The market feedback creates closed loops that affect the expected fitness of all organizations on the same landscape. These closed loops follow the principles of interdependence as described in the literature of systems thinking (Forrester, 1994, Sterman, 1994). The outcome of one organization's actions is directly correlated with the actions of other organizations on the same environment; an individual action can provoke external reactions that jointly may alter the expected result of the original action, in an unpredictable manner. Figure 1 offers a representation of the causal loop diagram as identified in the current literature; the success of the search effort for an organization depends entirely on its own ability identify the path to the highest point on the landscape (Search Effort of (i) Loop). An organization examines the neighboring points on the landscape in a search for a location that offers higher expected fitness. Once one is identified, the organization adopts the discovered form and after all competitor organizations have performed their respective search, the final payoff is calculated – in this case the final payoff is equal to the expected one. Figure 2 corresponds to the causal loop diagram of the proposed dynamic scheme. The identification of a point with higher fitness is directly correlated with the search efforts of all other organizations on the same landscape (Search Effort of (j) Loop) through a number of Competition Influence Between (i) and (j) Loops equal to the number of existing competitor organizations (all j for $j \neq i$). The logic of the Search Effort of (i) loop remains the same, with a small difference that the number of neighboring locations that offer higher fitness is affected by the current position of the competitors. The difference under the new scheme is that the payoff from adopting one form is a function of the adopted forms of all competitors and is no longer equal to the expected one. Both Search Effort of (i) and each Search Effort of (j) loops are balancing, gradually leading towards an exhaustion of alternative locations with higher expected fitness for their corresponding organizations. On the contrary, Competition Influence Between (i) and (j) Loop can be either balancing or reinforcing: if both organizations (i) and (j) chose to move closer to or further from each other, the loop becomes reinforcing, while if one gets closer while the other moves away, respective to the positions they had in the beginning of the decision process, the loop becomes balancing. Eventually the effect of all loops is equalized and the system reaches equilibrium where no more adaptations take place.

The rest of the paper is organized as follows. First, we will be presenting Kauffman's (1993) NK model as well as our proposed scheme and different types of adaptation processes on the landscape. Then, we will be looking into the simulation results of the adaptation process. In the last section we will be discussing the results and their respective possible managerial implications.

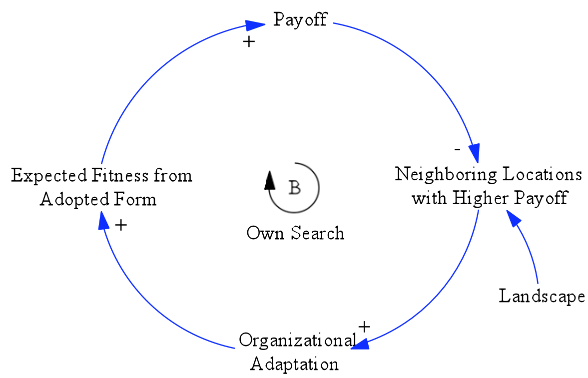


Figure 1. Causal Loop Diagram of a typical scheme in current literature

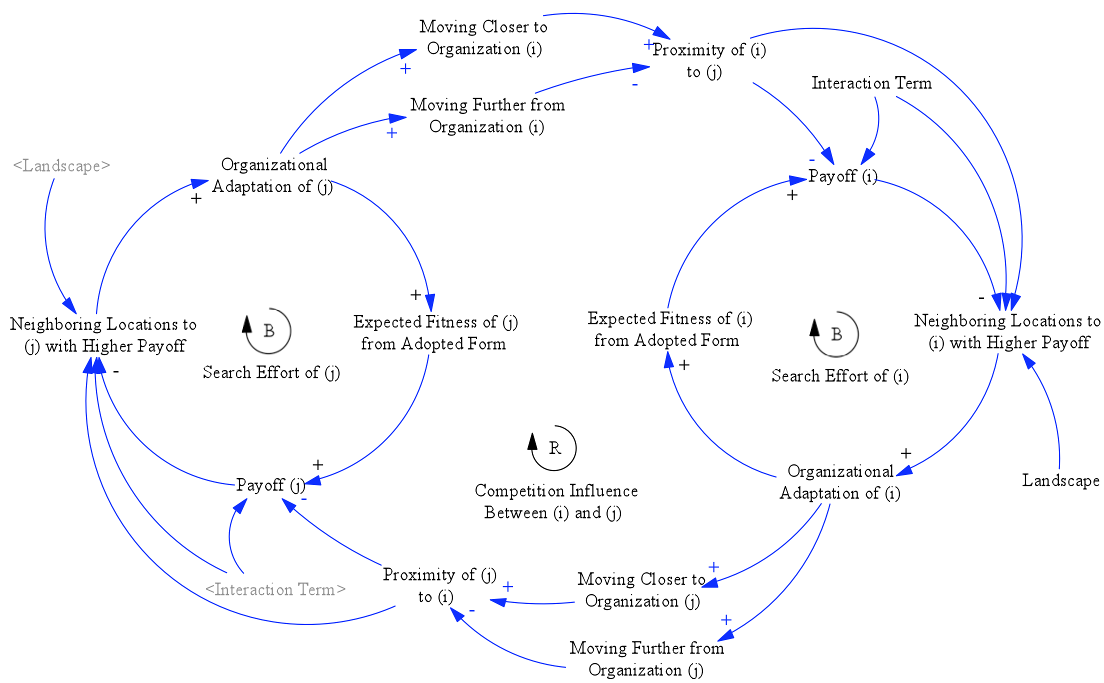


Figure 2. Causal Loop Diagram of the proposed scheme with dynamic interaction

2. Background information and models formulation

Fitness Landscape under Kauffman's NK model

An organizational form consists of various attributes and is defined by their combination. Each of these attributes affects the overall performance of the organization according to its individual contribution. The NK model (Kauffman 1993) focuses on the simple binary case that an attribute either exists or is absent from the organization, or a high-low state of it. In general, an organizational form consists of N binary attributes, resulting in a space of 2^N possible forms. The fitness of a form is defined as the overall expected performance of an organization that has adopted the specific form. The contribution of a given attribute to the overall fitness of the organization is assumed to be influenced by K other attributes. In biology, the notion that the fitness contribution of genes has such interdependence is referred to as epistatic interactions (Smith 1989). In particular, when there is no epistasis, the landscape tends to assume a single-peak configuration (Figure 3), while as such interactions increase the landscape becomes more multi-peaked (Figure 4).

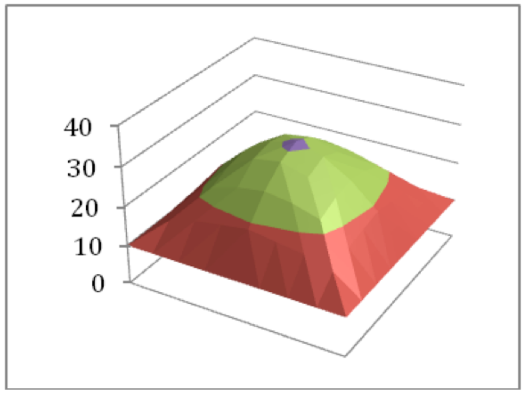


Figure 3. Fitness Landscape for K=0

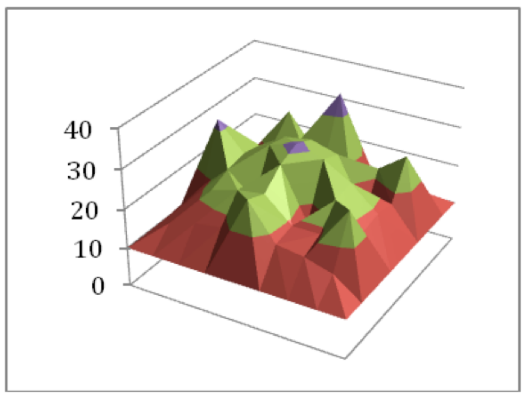


Figure 4. Fitness Landscape for K>0

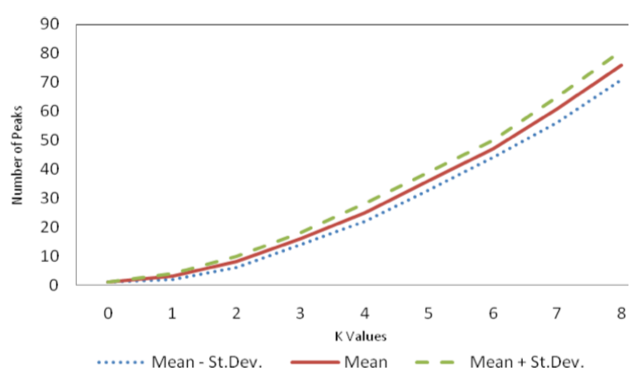


Figure 5. Number of Peaks as a function of K

The variable K specifies the degree to which the fitness of the organization depends on the interaction effects among the attributes. If K equals to zero, the contribution of each element of the organization is independent of all other attributes; a change in a single attribute leaves unchanged the fitness contribution of the other N-1 attributes. At the other extreme, if K equals to N-1, then the fitness contribution of any one attribute depends on the value of all other attributes. As K increases, the landscape becomes more rugged (Figure 5). This framework specifies the intensity of interaction effects via the parameter K, but provides no restrictions on the particular functional form of the interaction effect.

Fitness Landscape under the expanded model

Under the new scheme, the performance is a combined result of efficiency and intensity of rivalry (Schmalensee, 1987). If an organization is alone on the landscape, then its fitness depends entirely on its own actions. However, things become more complicated when more organizations appear. If there is little differentiation among the attributes of the organizations, to the eyes of the customers they are essentially identical; the market will be divided in equal pieces. It is easy to understand that under the new scheme, the fitness landscape is converted into a dynamic one. While its original form remains constant, each organization is facing a different version of it, one with lower fitness. The original landscape now represents a maximum potential fitness; the one the organization would experience if it were the only one on the landscape. The real fitness is a function of how different are the forms that other organizations on the same landscape have adopted. The more different the forms, the less similar the organizations are identified as from the customers and the less they influence negatively each other; the forms difference is represented by their distance on the landscape.

In order to incorporate this notion of dynamic landscape in our model, we need to quantify the interactions among the forms adopted by different organizations. For doing so, we introduce the following notation:

f_{ik}	Fitness of organization i when form k is adopted
F_k	Maximum fitness of form k
I_{ij}	Interaction between organizations i and j
d_{ij}	Forms difference of organizations i and j

The fitness organization i will experience, if form k is adopted, will be equal to:

$$f_{ik} = \frac{F_{ik}}{1 + \sum_j I_{ij}} \qquad (1)$$

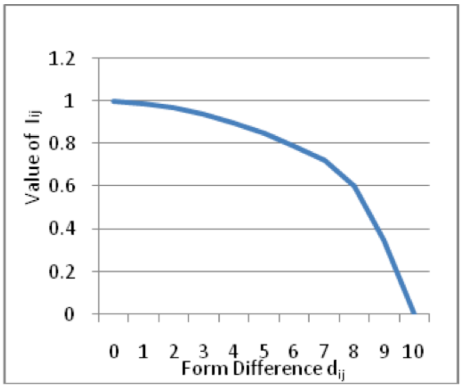
The Interaction Term I_{ij} is a function of the forms organizations have adopted; the more different the forms are, the less is the interaction between them; that is, the less they negatively influence each other. In order to capture the effect of the interaction term, we applied the generalized logistic function:

$$I_{ij} = \frac{1}{\left(1 + \delta e^{-\beta\left(\left(N - d_{ij}\right) - \gamma\right)}\right)^{\frac{1}{\nu}}} \qquad (2)$$

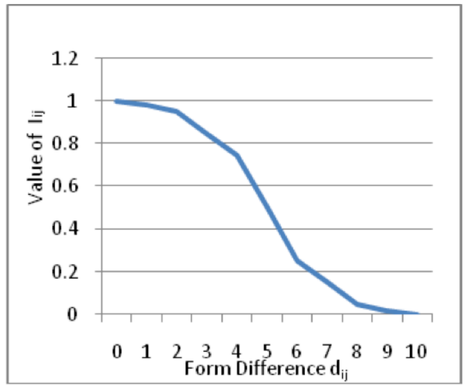
d_{ij} is the forms difference, the number of attributes that have distinct values. By changing the values of the parameters β,γ,δ,ν, one obtains different shapes of the generalized logistic function. We have used several combinations of parameters in order to test the effect of different forms of interaction to the behavior of the individual organizations.

When a firm changes of form, both parts of its fitness equation (1) change: the potential fitness of the new form, i.e. the numerator of the fitness equation, and the relative distance to the rest of the organizations changes the interaction term between firms – the denominator of the fitness equation. The shape of the landscape and the shape of the interaction term define whether a change of form would result into a higher fitness. When the shape of the interaction term is fairly flat, the interaction effect becomes insignificant, leaving the main role to the numerator. If the landscape is also almost flat, then a change is possible, but if the landscape is steep, then a change to a point with lower potential fitness is improbable. On the contrary, when the shape of the interaction term is steep, a change in the value of one attribute drastically reduces the denominator. In this case, even if the landscape is steep and the new form has lower fitness, reducing the numerator, the expected fitness of the new form can be higher than the fitness of the current form. In general, steeper shapes of the interaction term for small form differentiation will tempt organizations to move away from the rest, increasing dispersion of positions on the landscape. Rugged landscapes have the characteristic that different parts of the surface have different steepness, increasing the probability of a successful reorganization. Figure 6 offers a graphical representation of the different effects of the interaction term on the fitness over form differentiation, for each possible pair of organizations.

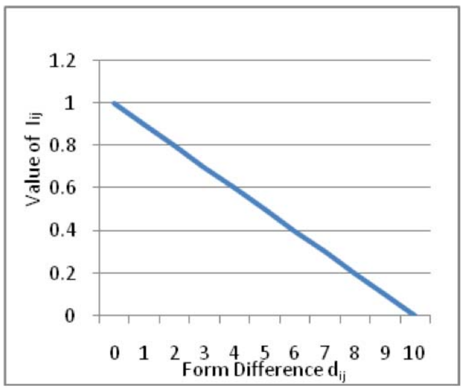
The non-responsive shape of the interaction term corresponds to the case that customers either cannot perceive or are indifferent to small variations in the forms of the companies. In their eyes, the companies remain essentially identical. The responsive shape of the interaction term corresponds to the opposite case, where customers value even the tiniest variation among the companies and reward them for doing so. All other shapes of the interaction terms used in this study correspond to intermediate cases.



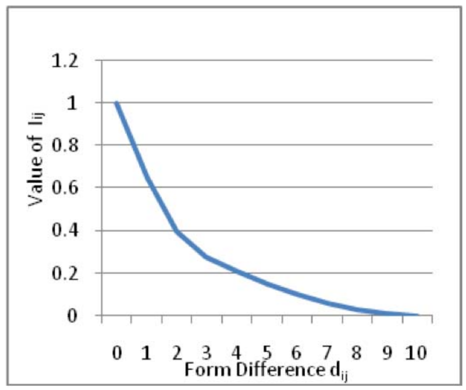
Non-responsive: δ=6, β=0.8, γ=1, v=1, N=10



S-Shape: δ=0.5, β=0.7, γ=45, v=0.8, N=10



Linear: δ=8, β=0.6, γ=5, v=2, N=10



Responsive: δ=1, β=3, γ=50, v=5, N=1

Figure 6. Effect of the interaction term on fitness over distance

Organizational change

An organization can change its form by either Local or Distant Adaptation. In each of these cases, the organization chooses one of the available options and compares the fitness of the current form to the fitness of the proposed form. The number of available options depends on the type of rule that is active. Under the local adaptation scheme, an organization can change only one attribute per time (March and Simon 1958,Cyert and March 1963). There are a total of 2N available options at any given moment; a restricted space compared to the total landscape. It is trivial to demonstrate that previous decisions made by the organization heavily affect its next decision, forming a path dependence state (Holland 1975). Under the distant adaptation scheme, an organization can change its form to any different form of the space (Tushman and Romanelli 1985). This change is called a jump, as the new form need not be a neighboring one; multiple attributes might change value simultaneously. While it is very easy for a company with low fitness to identify a new form with higher fitness, the difficulty increases after every successful jump. The probability of identifying a form with a higher fitness is equal to the division of the number of forms with higher fitness over the total number of possible forms (March and Simon 1958, Nelson and Winter 1982).

3. Simulation

The first procedures of the simulation initialize the fitness landscape; following the principles of the NK model, the contribution of each attribute $\boldsymbol{a_s}$ depends on the values of the K successive attributes. This dependence creates 2^{K+1} possible combinations, each of which is assigned a contribution value, which draws from a random uniform distribution ranging from zero to one. The list of N attributes is considered to follow a cyclic rule: the successive attribute for a_1 is a_2, while for $\boldsymbol{a_N}$ is $\boldsymbol{a_1}$. The fitness value of an organizational form is the sum of the individual contributions C_s of its elements (attributes):

$$F_k = \sum_{s=1}^{N} C_s(a_s \mid a_{s+1}, \dots a_{s+K}) \qquad (3)$$

Once created, the Maximum fitness landscape is fixed. Organizations may change their attributes, and hence their own fitness and the fitness of their neighbors, but the Maximum fitness value of any given form remains constant for the duration of the simulation. The result of this process is a model of tunable complexity. One can set a specific level of complexity by choosing the corresponding combination of the parameters that control it, run the experiments, and then adjust the complexity. By repeating the same experiments, it is easy to identify the way complexity affects the outcome of the experiments in question.

Once the landscape is specified, 100 organizations are placed on it in a random manner. The values of their attributes are randomly assigned to either zero or one with equal probability. Had only one organization been placed on the landscape, it would have obtained the Maximum fitness of its corresponding form as specified earlier. If two or more organizations exist on the same landscape, the fitness they will experience will be a function of the similarities between them, or given otherwise how different their forms are, and the interaction term.

After this initialization, the organizations engage in either local or distant search efforts, in an attempt to identify a form that will offer them higher fitness. Each organization will compare its current fitness to the fitness of a new form and will then decide whether to move to that position or not. Single criterion for the decision to move is if the expected fitness form the new form is higher than the fitness offered from the current form. Once all organizations have decided, movements take place. Organizations engage in their own search simultaneously and individually. That is, each organization will decide whether to move to a different form given the current positions of the rest of the existing organizations, while being unaware of their respective search efforts. As a result, a company that adopts a new form may experience fitness different than the assessed one.

Base Case scenario: No interaction between the organizations

In order to gain confidence in our model, we first briefly replicate the findings of Levinthal (1997). Figure 7 shows the number of different forms adopted by 100 organizations throughout the simulation period with N=10 under local and distant adaptations and for K equal to 0, 1 and 5. As we can see from the graphs, the simulation replicates in a very close manner the results of the original paper. Under local adaptation, and for K=0, all organizations end up identifying and adopting the exact same form, while for K=1 the organizations concentrate on few different positions and for K=5 they are much more disperse.

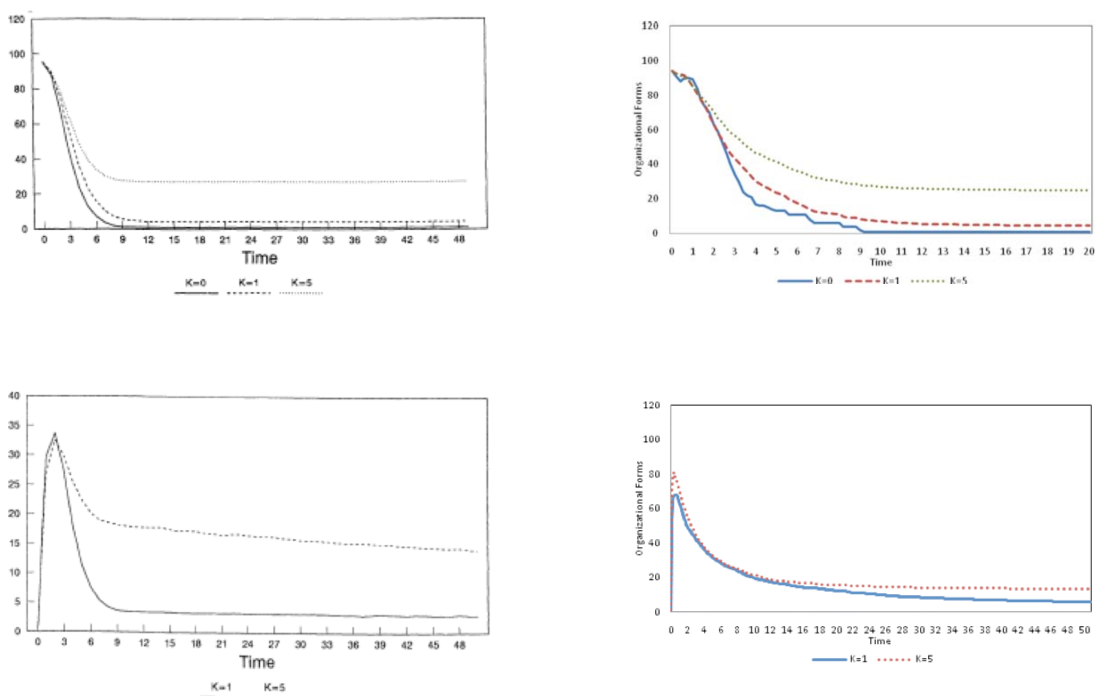


Figure 7. Results from Levinthal's (left) and our (right) simulations.

The commonality between our model and Levinthal's one provides confidence that the results from the simulations for the extended model are directly comparable to the original findings. Our aim is to observe the behavior of the organizations under the new scheme where actions of the different organizations are reflected on all others on the same landscape. In order to be able to draw conclusions from the behavior under the dynamic landscape scheme, we have examined 24 different scenarios, resulting from the combinations of the following characteristics:

- 3 values of K (0, 1, 5)
- 4 types of interaction (non-responsive, linear, s-shaped, responsive)
- 2 forms of adaptation (local, distant)

We observed the behavior of the organizations using two main metrics:

- the number of different forms the organizations adopt over time, and
- the average distance between the organizations

The combination of the two metrics provides an indication of how disperse the organizations position themselves on the landscape. We allowed the simulation to continue until the system of organizations reached equilibrium on the randomly generated landscape. We defined as equilibrium the state at which none of the organizations is able to find a form that will offer a higher fitness and as a result, no changes are performed any longer; the final state is essentially a Nash Equilibrium(Axelrod et al. 1995).

For each set of parameter values examined, one hundred different landscapes and population histories are examined. The results reflect the average behavior of a hundred runs of the simulation where for each run there is a distinct fitness landscape and a distinct population.

Simulation under the Dynamic Fitness scheme

Local Adaptation

Table 1 summarizes the results of the simulation for the 12 scenarios under local adaptation and the dynamic scheme. The number of adopted forms in equilibrium grows as the effect of the interaction form is decreasing for short distances: a non-responsive shape will slightly increase the number of forms, followed by an s-shaped one, a linear and finally a responsive one. Especially for the case of the responsive relation, the number of forms grows substantially, resulting into a state at which very few organizations choose to share forms. The average distance between them follows a slightly different growth rate, with the order being: non-responsive, linear, s-shaped and finally responsive.

Mean (StDev)	Number of Forms			Average Distance between Companies (d_{ij})		
Interaction Type	K=0	K=1	K=5	K=0	K=1	K=5
None	1 (0.00)	4.48 (1.92)	25.1 (6.17)	0 (0.00)	2.48 (0.49)	4.96 (0.07)
Non- Responsive	2.89 (3.40)	10.01 (5.46)	11.09 (5.26)	0.45 (0.46)	3.48 (0.64)	5.03 (0.02)
S-Shaped	11.28 (5.12)	8.39 (3.44)	8.23 (4.11)	2.98 (0.37)	4.82 (0.14)	5.02 (0.03)
Linear	29.12 (9.12)	45.59 (10.96)	37.21 (10.35)	2.12 (0.35)	4.37 (0.28)	5.04 (0.01)
Responsive	88.13 (2.82)	88.03 (4.32)	73.85 (8.17)	3.92 (0.07)	4.81 (0.09)	5.04 (0.00)

Table 1. Simulation results of the mean and standard deviation in equilibrium state under local adaptation and dynamic landscape (100 replications)

Looking into more rugged landscapes, for K=1, we see that the order for the first metric changes. Non-responsive and S-shaped shapes for the interaction terms give similar results, while linear and responsive shapes substantially increase the number of forms being adopted in the equilibrium state. The intuition behind this event is that an organization that is forced to move away from the rest of the companies can get "lucky" and identify a different hill to climb. These phenomena are repeated for very rugged landscapes (K=5), where the high number of hills increases this probability of "luck".

Distant Adaptation

Table 2 summarizes the results of the simulation for the 12 scenarios under distant adaptation and the dynamic scheme. On a smooth landscape, we observe the same effect on the number of forms as in local adaptation: a non-responsive shape will increase the number of forms the lesser, followed by an s-shaped one, a linear and finally a responsive one. The average distance between follows the same pattern as local adaptation as well, with the order being: non-responsive, linear, s-shaped and finally responsive. Looking into more rugged landscapes, for K=1, we observe that the order for the first metric changes. Non-responsive and S-shaped shapes for the interaction terms give similar results, while linear and responsive shapes increase the number of forms being adopted in the equilibrium state, with the responsive case being substantially more influential. These phenomena are repeated for very rugged landscapes (K=5).

Mean (StDev)	Number of Forms			Average Distance between Companies (dij)		
Interaction Type	K=0	K=1	K=5	K=0	K=1	K=5
None	1.49 (0.51)	2.7 (0.57)	13.2 (4.56)	0.16 (0.01)	0.26 (0.19)	4.70 (0.89)
Non-Responsive	13.83 (1.97)	15.31 (1.62)	14.44 (1.79)	1.47 (0.09)	4.02 (0.66)	5.04 (0.01)
S-Shaped	18.57 (2.69)	16.18 (1.95)	15.72 (1.65)	3.37 (0.19)	4.79 (0.15)	5.04 (0.01)
Linear	27.03 (8.25)	29.9 (9.19)	22.94 (7.02)	2.16 (0.32)	4.43 (0.26)	5.04 (0.00)
Responsive	90.42 (2.57)	87.84 (5.44)	70.9 (10.24)	3.91 (0.06)	4.81 (0.09)	5.04 (0.00)

Table 2. Simulation results of the mean and standard deviation in equilibrium state under distant adaptation and dynamic landscape (100 replications)

An important observation in the results of both local and distant models is that for K=5, the average distance between companies d_{ij} is essentially equal to 5 with a minimum standard deviation (0.001 – 0.07) under all interaction term assumptions. This is attributed to the fact that the landscape is closed, with limited points. If two organizations move together away from a cluster of other organizations, their difference to the cluster increases, but the difference between them decreases. As more and more organizations tend to move further from the cluster, this phenomenon is multiplied and in the equilibrium state the average distance becomes the central point in the scale 0–10 of form difference.

4. Discussion

Under the non-responsive assumption (small differentiation in forms is not distinguished by the clients), we can clearly distinguish a pattern of imitation of the leader. All organizations attempt to copy as close as possible the form of the one with the highest fitness in their surrounding area. This imitation behavior leads to equilibrium states of minimum dispersion. Some dispersion will always be present under the dynamic scheme since the return on identically copying the most adopted form is diminishing over increasing number of organizations with identical form. We can observe this phenomenon in markets of mature products: there is usually little variation between the products offered by different companies. The products themselves represent the decisions companies have made and the somewhat equal distribution of the market share among them corresponds to similar fitness.

On the contrary, a pattern of maximum dispersion is clearly observed under the responsive shape assumption (even the tinniest differentiation in forms is recognized by the clients). Any additional differentiation in forms is awarded with a diminishing increment and organizations attempt to adopt a form that is far enough from the immediate neighbors, but concurrently not extremely far from the form with the highest potential fitness. This behavior helps explain phenomena where, even though the form that would offer the highest fitness is clearly visible, a lot of companies decide to operate in a distinct manner because that form is already adopted by a rival. The advantage of the first-mover is more than essential.

A very important implication of a dynamic landscape is that under local adaptation an organization may be trapped into its current form. Each position on the landscape has N immediate neighbors at which the organization can change to. If all those neighboring forms are adopted by a high enough number of competitors, then all restructure attempts of an organization in the central point would result into a negative gain. Unless some neighboring organizations move into more distant points, it is impossible for the central one to make any successful changes. It is obvious that under distant adaptation such traps are not possible to exist; an organization can jump to a distant point on the landscape and escape the unfavorable environment. Most managers would find this form of traps familiar; it is the case that a company is considering investments that would improve its position in the market. It is very common that selective investment in only one aspect of the company is not expected to return any worthwhile gains. Instead, extensive reorganization of the whole company is required, in order to totally reposition itself in the market – a reorganization that usually requires large investments and skilled people.

Throughout all simulation scenarios there are three parameters that remain constant: the number of attributes N associated with the creation of an organizational form, the values that each attribute can take (0 for a low state and 1 for a high state) and the number of organizations to be set up on the landscape. The number of distinct attributes N controls the size of the landscape; it is an N-dimensional space. The binary scheme of values for the attributes results to having 2^N points on the landscape, each representing a different combination of values. These two parameters along set the points on the landscape an organization can lay on, and as a result, the total search space for the organizations. The model can be extended to an arbitrary finite number of possible values of an attribute, but the qualitative properties of the model are robust to such a generalization. Increasing the number of organizations on the landscape does not alternate their overall behavior either, as long as their number is less than the total number of points on the landscape. If that condition is no longer true, then the organizations are obliged to share forms.

Conclusions

All living organizations are prompted by nature in a constant search of improving their own characteristics; an evolutionary process that if not followed may lead to difficulties of survival. Organizations, however, are not alone in this search. One's efforts do not guarantee increased performance; the final outcome is significantly correlated with the efforts of all other organizations in the same environment. The extended model presented here incorporates the notion of feedback from the environment in a twofold scheme: on one hand the feedback helps organizations into making decisions based on increased information and on the other hand the outcome of those decisions is no longer entirely predictable. Using Kauffman's (1993) and Levithal's (1997) revolutionary work as a basis, we extended their models into incorporating more realistic characteristics. We found that by doing so, the observed behavior of the organizations varies from the original findings, up to an extend that depends on the assumptions regarding the interaction relationship among them.

The present work aspires to offer insight in understanding the variation in survival among firms. The proposed dynamic scheme can serve as an identifier of both current and imminent states of an environment. On one hand, the results indicate that part of the variation observed in real environments can be more clearly explained under the proposed scheme. On the other hand, it can serve as a means of predicting the possible reforms of rival organizations on the same landscape. Observing the actual state, one can infer scenarios regarding the forthcoming reorganizations, along with the corresponding probabilities. An organizational form as described in the context of this study represents the set of decisions a manager has to make, while the fitness of the organization represents the performance of the company. Managers attempt to identify the ideal combination of decisions that will offer the highest fitness to their company, under different sets of difficulties, represented by the underlying fitness landscape. We tightly connect the performance of a company to the view on the eyes of the client it attempts to serve; the means used for serving the purpose is indifferent to the client that is only interested on how well their needs are satisfied. Organizations that appear similar to the eyes of the customers will experience similar results.

It is important to realize that both local and distant search methods used in this study are myopic. Each organization is comparing the fitness of its current form to the expected fitness of a new form – a positive gain will lead into adopting the new form, while a negative gain will reject the proposed reorganization. It would be interesting to examine the behavior of the organizations if a certain degree of flexibility is allowed: the ability to make decisions that result into an originally lower but eventually higher fitness. An organization may decide to move into a position that will offer a lower fitness if such a change will allow the possibility to consecutively move into a previously inaccessible position with a much higher fitness. Practitioners should find such a scheme familiar; sacrifice a little in the present in order to gain more in the future. Incorporating notions from game theory could offer another interesting approach. Knowing the options of the rival organizations along with their respective realization probabilities transforms the expected fitness from re-organizing into a stochastic one. Organizations would then engage in a search of higher fitness while in consciousness of the best response of their rivals.

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