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Escaping real (non-benign) competency traps: linking the dynamics of organizational structure to the dynamics of search

Nicolaj Siggelkow University of Pennsylvania, USA

Daniel A. Levinthal University of Pennsylvania, USA

Abstract

Focusing on the effect that organizational structure exerts on organizational search, we show under which conditions a change in structure increases performance even in stable environments. We model five different organizational structures (centralized, decentralized, ambidextrous, hybrid and team-based) and study with the help of an agent-based simulation whether transitions among these structures are beneficial. We find that sequences of structures can achieve higher performance than fixed structures. Alternative structures differ in their competency traps or sets of sticking points, that is the sets of points at which a search process in a given structure will terminate. As a result, a shift in structure may dislodge an organization from its current configuration of choices and provoke further search. Changes in organizational structure effectively differentiate between settings in which remaining at a competency trap is in fact a trap and settings in which remaining at a competency trap indicates competence. In particular, a shift in organizational structure differentially sorts among more or less favorable sticking points, as sticking points that are common to two structures tend to be higher-performing. Thus, behavior that remains inert when structures change will tend to be associated with particularly high-performing sticking points. Moreover, behavior should be dislodged from the prior sticking point, this provides a favorable starting point for subsequent search. Consequently, a shift in organizational structure need not be a response to new environmental contingency, but a mechanism to overcome the challenge of competency traps as well.

Key words • adaptation • competency traps • exploration • organizational structure • search • simulation model

The 'Carnegie' tradition in organizational theory has provided a view of organizations as problem-solving entities engaged in processes of search and discovery (March and Simon, 1958; Cyert and March, 1963). A particular challenge associated with such adaptive processes is the need to balance the exploitation of the intelligence of current practices with the opportunity to explore other possible bases of action (March, 1991; Levinthal and March, 1993). Likewise, the literature on organizational structure has long assessed the relationship between alternative structural forms and the adaptiveness of organizations by proposing a number of organizational forms that are particularly suited for either exploration or exploitation (Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Mintzberg, 1979). More recent work directly addresses the challenge of managing the conflicting demands posed by the dual imperatives of exploration and exploitation. Organizational forms such as the ambidextrous structure (Tushman and O'Reilly, 1996), internal hybrids (Zenger, 2002) and team-based forms (Grant, 1996) all incorporate aspects of both exploration and exploitation.

While structures can be devised that attempt to simultaneously deal with exploration and exploitation, a different stream of work has pointed to a further, temporal dimension by which the dual challenge of exploration and exploitation might be managed: changes in organizational structure may facilitate organizational adaptation, even in stable environments (Carley and Svoboda, 1996; Galunic and Eisenhardt, 1996; Eisenhardt and Brown, 1999; Nickerson and Zenger, 2002; Siggelkow and Levinthal, 2003; Gulati and Puranam, 2004).

In this article, we develop a formal representation of a variety of organizational structures. We model some relatively pure structures with a set of design features that reinforce a particular mode of search (exploration or exploitation) and other more mixed structures that combine design features that speak to both the need to engage in exploratory search efforts and the importance of exploiting existing solutions. The formalization allows us to pursue two interrelated objectives. First, we show in a very explicit manner how organizational structure can affect search. Second, we are able to gain insights into why sequences of structures can achieve higher performance than fixed organizational forms, even forms that incorporate elements of both exploration and exploitation.

More broadly, while earlier work has noted that changes in organizational structure can lead to improved performance, we are not aware of any explicit modeling effort that has tried to probe in a fundamental way the question of which transitions between structures are beneficial. The main contribution of our study lies in identifying an underlying mechanism that influences whether a transition from one organizational structure to another is beneficial or not. In short, we find that shifts in organizational structure can help firms overcome the problem of settling into an inferior solution (March, 1991), or getting caught in a competence trap, a relatively attractive action pattern that precludes the search for even better possibilities (Levinthal and March, 1981; Levitt and March, 1988). At the same time, shifts in organizational structure can preserve high-performing action patterns that had been previously found. Changes in organizational structure are shown to effectively differentiate between settings in which remaining at a competency trap is in fact a trap compared with settings in which it is a virtuous steady-state.

While the literature has recognized the limitations of local search processes and the dangers of competency traps, it is less clear how to respond to these challenges. Simply introducing mechanisms that elicit renewed search when some sort of equilibrium state is reached does not distinguish among more or less attractive locally stable states. We show that shifting organizational structures, once a locally stable state has been reached, does in fact intelligently sort among more or less high-performing local equilibria. Firm behaviors that are particularly high-performing will tend to be robust to shifts in structure, while locally stable states with poor performance – non-benign competency traps – are likely to be disturbed. Moreover, the set of behaviors associated with the steady-state induced by a particular structure tends to be a useful starting point for subsequent search if in fact the shift in organizational form does elicit a renewal of the search process. It is important to note that little global knowledge is necessary to engage in such an intelligent renewal of search. The firm only needs to observe that its performance has been constant for a number of periods, that is, that it has reached a sticking point. Thus, our analysis implies that a change in organizational structure is a form of adaptation that can have benefits beyond those associated with adapting to environmental change. Organizational change need not be coupled solely to environmental contingency.

The driver behind our results is that organizational structures differ in their sets of 'sticking points' (Rivkin and Siggelkow, 2002), that is, configurations of activities from which a firm has a hard time dislodging itself given its current structure. Sticking points that are common to multiple structures, rather than unique to an individual structure, tend to have superior performance. When a firm reaches a sticking point that is unique to its initial organizational structure, and therefore is on average a less attractive steady-state, a shift in organizational form effectively creates a new set of criteria by which alternatives are judged by actors in the organization, which facilitates a renewal of the search process. In contrast, when a firm reaches a joint sticking point, that is, an attractive steady-state, a sequence of structures does not lead to any behavioral change on part of the organization. Thus, such inertia need not indicate some dysfunctional resistance to change in the organization, but rather may reflect the strength of the existing practices.

As an example of how organizational structure can affect organizational search, and how a sequence of organizational structures can overcome problems generated by fixed structures, consider, for instance, the initial reactions to internet brokerage by Merrill Lynch and Charles Schwab. Merrill Lynch approached internet brokerage with a fairly centralized search process that sought to exploit its existing distribution resources. As a result, its eventual offer was well integrated with its existing activities, yet perhaps not as innovative as that of other providers. In contrast, Charles Schwab created a 'proudly independent e.schwab group' (McFarlan, 2001) that came up with an innovative combination of service and pricing, an offering well attuned to the new business landscape but very much in conflict with its existing discount brokerage business. In both cases, the organizational structure, which guided the search process and provided the decision rights to implement new ideas, had an important effect on the outcome, yet in both cases the outcome was not without its problems. To deal with misfits that were created between e.schwab and its mother firm, Charles Schwab eventually changed its organizational structure and reintegrated e.schwab. This new structure allowed Charles Schwab to build off the original ideas created by the independent division but to take better advantage of the interdependencies among the internet brokerage and the traditional discount brokerage businesses. In this case, a sequence of structures (while probably not planned *ex ante*) allowed Charles Schwab to achieve an eventual activity configuration which it likely would not have achieved with a fixed structure.

The rest of this article is structured as follows. In the following section, we formally model a number of organizational structures that capture key design characteristics of previously described organizational forms and show how their search behavior on a high-dimensional performance landscape differs. We then turn our attention to sequences of organizational structures. With the help of an agent-based simulation model, we show which sequences of organizational structures are particularly beneficial and identify the underlying drivers for the results. A simulation set-up is especially suitable for this analysis because it naturally models the temporal unfolding of search processes and the associated performance implications.

Organizational search induced by different organizational structures

Firms have to make choices along many dimensions. For instance, they need to decide on their product lines, their distribution channels, their manufacturing set-ups, their human resource policies, and their research and development activities. Many of these decisions interact with each other, making firms complex and highly interdependent systems of choices (Milgrom and Roberts, 1990; Porter, 1996; Levinthal, 1997; Whittington et al., 1999; Rivkin, 2000; Siggelkow, 2001, 2002). These choices are usually resolved by a large number of decision-makers (who we will call managers). Organizational structure plays a key part in orchestrating the overall decision-making process and hence the outcomes. Indeed, as Mintzberg (1979: 2) noted, 'The structure of an organization can be defined simply as the sum total of the ways in which it divides its labor into distinct tasks and then achieves coordination among them.'

Building on this perspective, we envision firms as composed of managers who have to make decisions concerning the choices that are under their respective purview. For instance, a sales manager will contemplate whether or not to offer a discount, a production manager will have to decide whether or not to invest in new machinery, etc. For the choices under their respective control, each manager searches for improvements. Given cognitive limitations of each manager and the complexity of the overall decision problem (in which many of the decisions of different managers are interdependent), each manager's task is more akin to searching for improvement than to optimizing a particular choice. Our conceptualization follows the tradition of March and Simon (1958) that views organizations as comprised of boundedly rational actors engaged in problem-solving search efforts.

As managers search for improvements in their individual departments, the firm as a whole experiences different overall sets of choices. We can visualize this search process with the framework of performance landscapes (Kauffman, 1993; Levinthal, 1997). A performance landscape is a mapping of all possible sets of firm choices on to performance values (such as a profitability measure). If a firm's choices are described by a vector of N choices, then the performance landscape consists of N dimensions depicting the firm's alternatives along each dimension and an N + 1th dimension depicting the resulting performance associated with each different vector of N choices. As managers implement their choices, the firm as a whole traverses the performance landscape. Organizational structure has an important effect on the overall search process on performance landscapes, and thereby on the sets of choices that a firm will experience and eventually settle on.

Search processes are driven both by the diversity of alternative actions that are generated and by the basis by which alternatives are evaluated. In this context, exploitation corresponds to both a narrow range of alternatives being generated and a conservative, status quo bias in the evaluation of proposed actions. Conversely, exploration suggests a diverse alternative set and a willingness to experiment with initiatives that may or may not enhance near-term performance of the organization. The design features that we model attempt to capture the central elements of these processes of alternative generation and selection.

For instance, a firm that considers only alternatives that lie close to the status quo and implements these incremental changes only if they are beneficial for the firm as a whole would possess a structure primarily geared towards exploitation. A firm in which local alternatives are initiated and evaluated at a central decision-making unit would lead to such search behavior. For sake of exposition, we will call such a form 'centralized' in the following discussion.

At the other extreme, a firm focused primarily on exploration would search more broadly. To achieve this, such a firm might divide up decisions among managers to alleviate the cognitive limitations of individual managers and give them free rein to implement alternatives they believe are beneficial for their departments, even if such delegation might lead to a short-term performance decline for the firm as a whole. We label such a firm as 'decentralized'.

Other organizational forms attempt to achieve both exploration and exploitation simultaneously. Hybrid organizations attempt to create broad search by delegating decisions to separate managers (similar to the decentralized firm), but create coordination among decision-makers and achieve exploitation by providing firm-level incentives, such as pay closely tied to firm performance with, for example, a heavy emphasis on stock options. Ambidextrous organizations, as well, establish 'teams that are structurally independent units' (O'Reilly and Tushman, 2004). In these organizations, it is not incentives that create co-ordination, but 'strategic integration … occurs at the senior team level' (Benner and Tushman, 2003). Lastly, stressing the increased importance of knowledge and knowledge-sharing, a number of team-based structures have been proposed, in which specialists are given considerable autonomy within their departments, yet have to confer with specialists of other departments before they can implement any changes (Grant, 1996).

To show how these different organizational structures lead to different organizational search behaviors and outcomes, a formalization of organizational structure and search on performance landscapes is useful. The formal model will allow us to display the search behavior induced by the organizational structures described above and, in the subsequent section, the search behavior of firms that adopt sequences of these organizational structures. The model builds on earlier formalizations of organizational search on performance landscapes (Levinthal, 1997; Marengo et al., 2000; Rivkin and Siggelkow, 2003; Siggelkow and Levinthal, 2003; Siggelkow and Rivkin, 2004).

Modeling performance landscapes

Conceptualizing firms as systems of choices, we assume that a firm has to make decisions concerning N choices, $a_1, \ldots, a_N$.[1] For simplicity, it is assumed that each choice can take on two states. For instance, a_1 may represent the decision to increase sales by offering a sales discount ($a_1 = 1$) or not ($a_1 = 0$), while a_2 may represent the decision (potentially under the purview of a different manager) to decrease the finished goods inventory ($a_2 = 1$) or not ($a_2 = 0$). A performance landscape is a mapping of any possible vector of firm choices $A = (a_1, a_2, \ldots, a_N)$ to performance values V(A). We create performance landscapes with a variant of the NK-model (Kauffman, 1993), which has been employed in a number of organizational studies (for a survey, see Sorenson, 2002). The value of each individual choice a_i is affected by both the state of the choice itself and the states of a number of other choices $\mathbf{a}_{-i}$. For instance, the benefit of a sales discount is likely to be affected by the current inventory level. Denote the value of choice a_i by $c_i(a_i, \mathbf{a}_{-i})$. For each landscape, the particular values of all possible c_i's are determined by drawing randomly from a uniform distribution over the unit interval, that is, $c_i(a_i, \mathbf{a}_{-i}) \sim u[0, 1]$. The value of a given set of choices A is then given by

$$V = [c_1(a_1, \mathbf{a}_{-1}) + c_2(a_2, \mathbf{a}_{-2}) + \ldots + c_N(a_N, a_{-N})]$$

The identity of $\mathbf{a}_{-i}$, that is, the set of choices that affect each choice a_i, is given by the interaction structure of the firm's decision problem. In this article we assume a highly interdependent setting, in which each choice is affected by all other choices. (The intuition behind our results is, however, robust to a range of different degrees of interdependencies; see below.)

Modeling organizational structures

Our choice of modeled organizational structures is motivated by a desire to capture salient forms discussed in the literature. Since our aim is to identify an underlying mechanism that makes the transition between structures more or less effective – rather than finding the best possible sequence of structures – it suffices to examine this limited set of salient forms. Regardless of organizational structure, we assume that managers working in organizations are boundedly rational, in the sense of the behavioral tradition of intelligent local search (March and Simon, 1958; Cyert and March, 1963). As Levinthal and Warglien (1999) put it, 'Actors are assumed to be intelligent, but that 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 judgments for more distant locales.'

Local search is a principal feature of the structure primarily geared towards exploitation, that is, the centralized structure. In this firm, in every period, randomly picked local alternatives – alternatives that differ in only one choice element – are evaluated and the best alternative that is found is implemented. We denote the number of alternatives that are evaluated in every period with ALT. For instance, if $N = 8$, $ALT = 2$ and the current choices are 00000000, the alternatives 01000000 and 00000001 might be evaluated, and the alternative that yields the highest performance for the firm is implemented. This new alternative would form the starting point for search in the next period. If no evaluated alternative achieves higher performance than the status quo, the firm retains the status quo.

In all subsequent organizational structures, valuations and decisions are not all performed at a central unit, but split between managers. In particular, we assume that decisions are split between two 'division' managers. In the decentralized structure, in each period, each division manager evaluates ALT local alternatives and implements the alternative she finds most attractive for her department. For instance, if the firm has to make eight decisions, the first four of which are assigned to manager A and the second four to manager B, then manager A evaluates alternatives by computing

$$V_A = [c_1(a_1, \mathbf{a}_{-1}) + c_2(a_2, \mathbf{a}_{-2}) + c_3(a_3, \mathbf{a}_{-3}) + c_4(a_4, \mathbf{a}_{-4})]$$

while manager B computes

$$V_B = [c_5(a_5, \mathbf{a}_{-5}) + c_6(a_6, \mathbf{a}_{-6}) + c_7(a_7, \mathbf{a}_{-7}) + c_8(a_8, \mathbf{a}_{-8})]]$$

Each manager would then implement the alternative that yields highest V_A and V_B, respectively.

In the hybrid structure, each division manager also evaluates ALT local alternatives in every period. In contrast to the decentralized structure, though, managers are assumed to be concerned with firm-wide performance, due, for example, to the intensive use of stock options. In this firm, managers would use the firm-wide payoff, V, to evaluate and rank alternatives, rather than the division payoffs V_A and V_B.[2]

In the ambidextrous structure, each division manager is again given full control, leaving managers to search for alternatives that are helpful for their divisions. Each manager evaluates ALT alternatives and is allowed to implement the most attractive alternative for their division – however, with a caveat. The senior management team, in trying to avoid negative externalities that one division might exert on the other division, and which would lead to a decline in overall firm performance, has the right to block any division's proposed change. Senior management can choose whether or not to allow either, both or none of the divisions to implement their proposals, allowing only the combination that is best for the firm as a whole.

In the team-based structure, coordination between the divisions is achieved by communication between the managers. Each manager informs the other manager about an intended change in their department. Both managers then evaluate their divisions' performance if both changes were implemented. If this evaluation reveals that one division's performance would decline, both proposed changes are scuttled. In each period, this evaluation process occurs ALT times. Among all evaluated pairs of proposals that are acceptable to both managers, the managers implement the one that yields the highest firm performance.

Organizational structure and organizational search: an example

To visualize the effect of how different organizational structures induce different organizational search behaviors, an example with three choices is helpful, since all eight (= 2^3) possible choice configurations can be depicted on a cube (see Figure 1). Each vertex of the cube represents a different choice configuration, such as 000, 100, or 111 (represented in bold type). Movement up or down corresponds to changing the first choice (e.g., to move from 000 to 100 one has to move up); movement left or right corresponds to changing the second choice; movement front or back corresponds to changing the third choice. Vertices that are connected to each other are local to each other in the sense of differing in only one choice. At each vertex, the contribution values of each underlying choice and the overall value of the choice configuration are reported. Given that all choices are fully interdependent, each contribution value at every vertex is an independent draw from a uniform distribution over the unit interval. For instance, the value of 000 is (0.05 + 0.15 + 0.1) = 0.3. (Since in later examples we assign the first two choices to one manager and the third choice to the other manager, we also report the divisional payoffs at each vertex. For the case of 000, these would be 0.2 (= 0.05 + 0.15) and 0.1, respectively.)

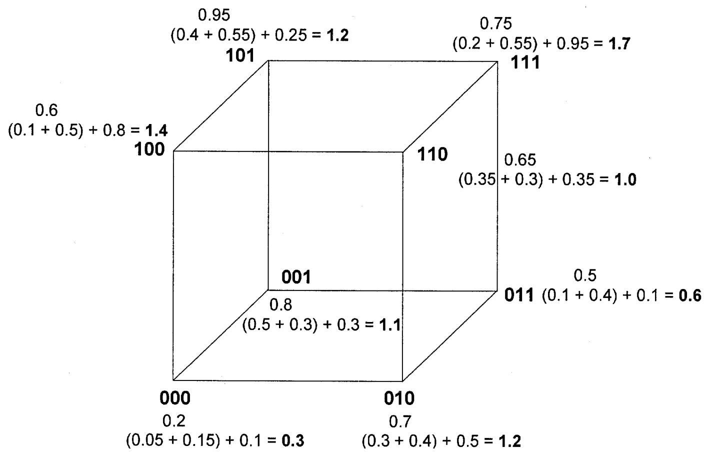

Figure 1 Example of a performance landscape

To put names on the abstract labels, one could imagine this example to represent the following: choice 1 corresponds to offering no product warranty (0), or offering a warranty (1); choice 2 corresponds to offering a sale (0), or not offering a sale (1); and choice 3 corresponds to keeping inventories low (0), or high (1).[3]

Figure 2 displays the search behavior on the performance landscape depicted in Figure 1 of a centralized structure in which in each period all local

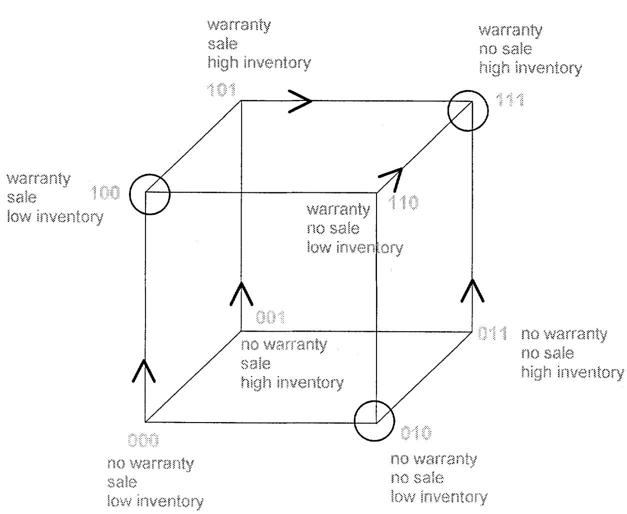

Figure 2 Search behavior induced by the centralized structure

For every choice configuration (i.e. for each vertex) of the payoff landscape represented in Figure 1, this figure displays the next move that a firm with an integrated structure would undertake. A circle denotes that the firm would not move off this point, i.e. circles represent sticking points for this organizational structure.

alternatives are evaluated (ALT = 3). At each vertex, an arrow shows the next move that this firm would make. For instance, at 000 ('no warranty–sale–low inventory'), the firm would evaluate the three local alternatives 100, 010 and 001, find that 100 is the most profitable option, and move to 100 (i.e. start offering a warranty). At 100, the firm would evaluate 000, 101 and 110, and find that no local alternative has a higher performance than 100. As a result the firm would stay at 100 ('warranty–sale–low inventory'). In other words, the choice configuration 100 is a 'sticking point' for this organizational structure (Rivkin and Siggelkow, 2002).

In panels A–D of Figure 3, the search behaviors induced by the four other organizational structures on this particular performance landscape are displayed. In these structures, manager A (the 'marketing manager') is responsible for the first two choices (offering warranties or sales), while manager B (the 'production manager') is responsible for the third choice (increasing or decreasing inventory).[4]

As Figures 2 and 3 show, each organizational structure induces a different search behavior on the same performance landscape. Structure affects search in three ways: which choice configurations are considered by the firm as a whole; which configurations are acceptable to the relevant decision-makers to be implemented; and resulting from the first two, on which configurations firms ultimately get stuck. Using an ecological metaphor, structure affects the variation, selection and retention of choice configurations (Burgelman, 1991).

Consider the variation of alternatives first. Compare, for instance, the decentralized firm with the centralized firm. Due to the bounded search of individual managers, the centralized firm is restricted to evaluating alternatives that are only incrementally different from the status-quo choices. In contrast, with two managers who can move simultaneously, the decentralized firm as a whole is able to loosen the local search constraints of the individual managers. While each manager still can only evaluate and implement local changes, the firm as a whole might move non-locally. For instance, at 011, manager A reasons that given manager B is currently at 1 ('keeps high inventory'), a change from 01 to 00 in his or her department (i.e. having a sale) would be beneficial, increasing divisional performance from 0.5 to 0.8. Likewise, at 011, manager B reasons that given that manager A is at 01 ('no warranty–not having a sale'), a move to 0 ('reducing inventory') would be beneficial, increasing his or her divisional performance from 0.1 to 0.5. As a result, both managers implement their changes and the firm ends up at 000, 'no warranty–sale–reducing inventory', a configuration that is two steps away from the starting configuration 011.

The division of decisions can further affect which alternatives are evaluated by the firm as a whole, since managers might have the ability to screen out alternatives. For instance, consider configuration 101 (warranty–sale–high inventory). A centralized firm with this choice configuration would evaluate alternatives 100, 001 and 111, and move to 111, the global peak. In the ambidextrous firm, however, the alternative 111 would never be discussed.

Recall that in the ambidextrous form divisional managers have autonomy in making proposals. In this case, manager A would not suggest to change his or her division's configuration from 10 to 11 (or to 00), because either change would lower his or her division's performance. As a result, starting at 101, the

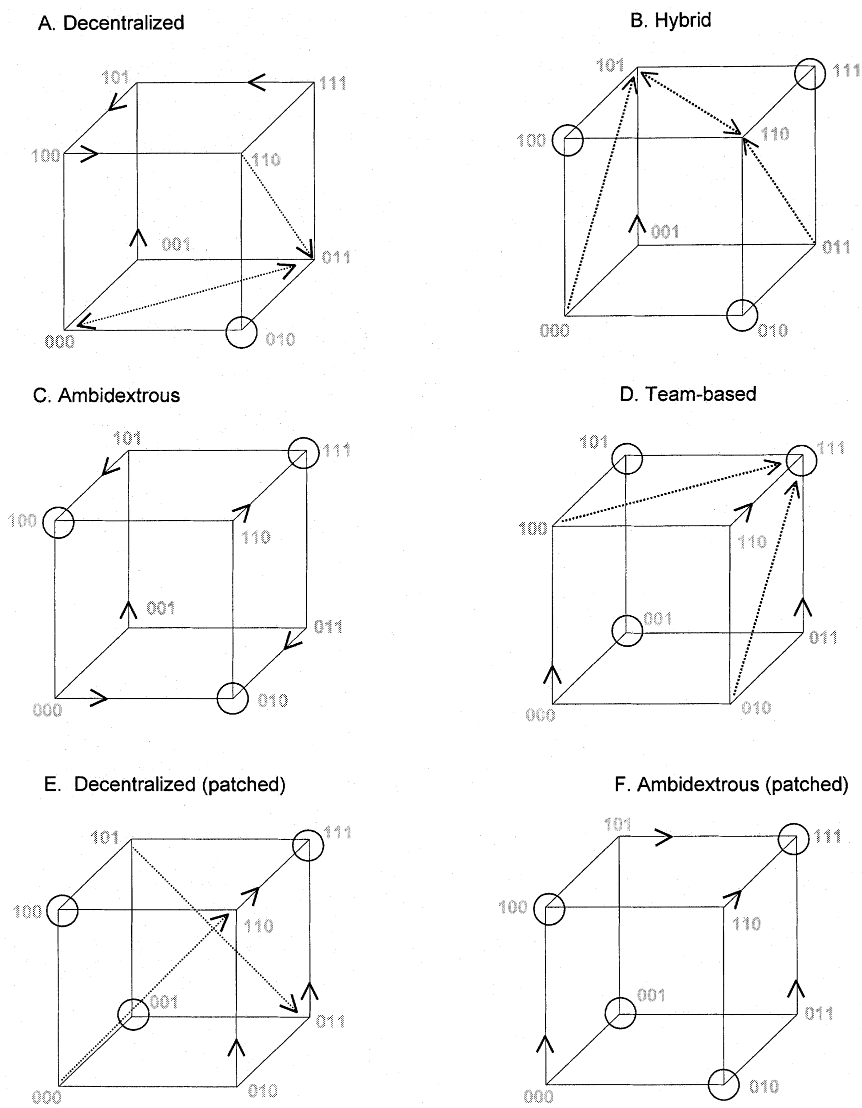

Figure 3 Search behavior induced by different organizational structures

For every choice configuration (i.e. for each vertex) of the payoff landscape represented in Figure 1, this figure displays the next move that a firm with the respective organizational structure would undertake. A circle denotes that the firm would not move off this point, i.e. circles represent sticking points. Dashed lines indicate non-local moves. For instance, a firm with a team-based structure (D) would move from 010 to 111, a move involving two changes.

firm as a whole would never evaluate a move to the right, to the global peak 111.

The selection of alternatives is also greatly affected by structure. Consider, for instance, firms located at the global peak 111. With a decentralized structure, manager A is attracted to move left ('offer a sale') to 101 since at that configuration his or her departmental profits increase from 0.75 to 0.95. Manager B, considering his or her alternatives, does not want to change the configuration of the department's activity, as moving to the front ('lowering inventory') would reduce departmental profit. Consequently, the decentralized firm selects the choice configuration to the left, that is, moves to 101. In contrast, a centralized firm would not select to move to 101, since overall firm performance would decline, and would remain at the global peak 111.

The interplay of variation and selection of alternative configurations leads ultimately to the set of configurations from which firms do not move, that is, their set of sticking points. Consider, for example, 001. A centralized firm would move from this configuration to the local neighbor 101, since performance increases from 1.1 to 1.2. A firm with a team-based structure, however, would remain stuck at 001. All alternatives that the two division managers would discuss (000, 010, 011, 100 and 101) are unacceptable to at least one of the managers who would veto the proposal. As a result, the firm would remain at 001.

More generally, a firm is at a sticking point when no other choice configuration can be found that would find approval from enough actors to be implemented. Since structure affects both which alternatives will be evaluated and which find approval, structure affects sticking points.[5] The notion of a sticking point, while having a narrowly defined meaning in our set-up, is not unique to our model but has been discussed in various guises in the literature, such as in the concept of a 'truce' (Nelson and Winter, 1982), a 'competency trap' (Levitt and March, 1988), a 'local peak' (Levinthal, 1997), or a 'core rigidity' (Leonard-Barton, 1992).

A sound understanding of the sticking points that are created by a particular organizational structure is important in order to assess when transitions from one structure to another structure can yield benefits. Consider, for instance, a centralized firm with choice configuration 100, which yields a performance of 1.4. For a firm with this structure, 100 is a sticking point. As a result, this firm would not be able to find the even higher-performing configuration 111, yielding 1.7. A decentralized firm, in contrast, would move off 100. The firm would move to 110, then 011, and finally move back and forth between 011 and 000. While this firm is able to move off 100, its eventual performance would only be an average of 0.6 and 0.4, the performance of 011 and 000. Now consider a decentralized firm that switches to a centralized structure after the first or the second period. This firm is able to escape from 100. At the same time, once it has reached 110 or 011, the centralized structure would lead the firm to the global peak 111. Thus, this sequence of structures would outperform either fixed structure.

This example provides us with a first intuition of when a transition between two structures can be beneficial. One of the structures must be able to lead the firm away from configurations on which the firm would have got stuck with the other structure. In contrast, if both structures have the same set of sticking points, or if the sticking points of the first structure are a subset of the sticking points of the second structure, little or no benefit will be derived from transitioning from one structure to the other.

In the next section, we will investigate this intuition in more depth. In particular, we will study the effect of transitioning between the five structures (centralized, decentralized, hybrid, ambidextrous and team-based) discussed in this section. One further type of transition has been described in the literature. Eisenhardt and Brown (1999) point out that firms can potentially increase their search capabilities by re-assigning choices, a process they term 'patching'. In performance landscape terms, re-assigning choices changes the 'sub-scapes' – the relevant performance landscapes as seen through the eyes of the division managers – and, as a result, the overall search behavior. In the examples above, we assumed that manager A had control over the first two choices (left/right and up/down), while manager B had control over the third choice (front/back). If choices are reassigned, for example by giving manager A control over only the first choice, and manager B control over the second and third, division managers will make different decisions. Consider, for instance, the decentralized firm at 001. With the prior choice allocation, manager A found a move to 101 beneficial, as his or her division payoff increased from 0.8 to 0.95. With the new allocation, however, manager A's division payoff would decrease from 0.5 to 0.4; as a result, manager A will not change the first decision. In this example, manager B would also not change his or her decisions, and the firm would remain at 001. Thus, 001, which under the previous choice allocation was not a sticking point, is a sticking point given this choice allocation, even though the structure (decentralized) has not changed. As illustration, in panels E and F of Figure 3, we show the search behavior of firms with a decentralized and an ambidextrous structure that have reallocated their decisions. Similar to changes between structures, reallocations of choices can yield to expanded search when sets of sticking points are altered. In the following analysis, we will include this type of transition as well.

Sequences of organizational structures

In this section we use a simulation set-up to study in more depth the effects of various sequences of organizational structures. In the analysis, firms have to make eight fully interdependent decisions.[6] Using the NK methodology, we create 1000 performance landscapes. On each landscape we place a number of firms, giving each firm the same, randomly chosen starting location. Each firm switches its structure in period 75. For instance, a firm might start out with a centralized structure and switch to a team-based structure. Likewise, a firm might start with a decentralized structure and switch the allocation of decisions after period 75 (a transition we would call 'decentralized patching'). We measure the performance of each firm in period 200. The performance of firms is measured relative to the highest performance possible in each landscape. Thus a firm that reaches the global peak would have a performance of 1.00. Period 75 was chosen as the switching period, because at this time practically all firms have reached a sticking point, that is, would not improve their performance any further with the existing organizational structure.[7] Similarly, by period 200, each restructured firm has reached a sticking point. (Our results are robust to other switching periods as discussed below.) In all firms, managers evaluate three alternatives in every period (ALT = 3). In this section, we frequently report that one firm has significantly higher performance than another firm. All such reported differences are significant at the 5 percent level or better.

In total, our analysis encompasses 24 different sequences. Each of the five structures (centralized, decentralized, hybrid, ambidextrous and team-based) can transition to one of the remaining four, or can retain its structure and reallocate decisions. The only exception is the centralized structure, which cannot reallocate decisions, since all decisions are made by a single decision-making unit.

Results

To gain a sense of the results, it is helpful to start with a few sequences. Figure 4 contains the average performance paths of the four sequences that start with a centralized structure. As these results show, not every transition is equally valu-

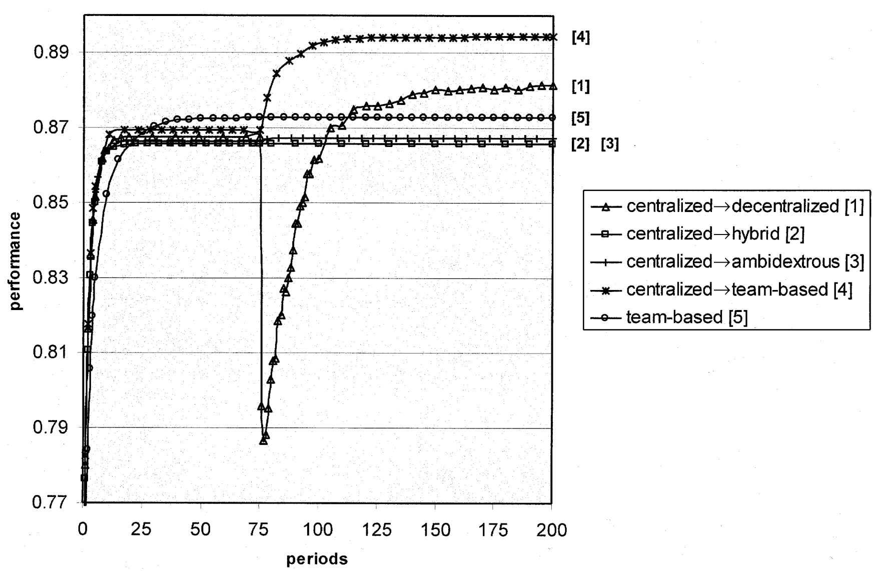

Figure 4 Transitions from a centralized starting structure

able. While a switch to a team-based structure significantly improves the performance of a previously centralized firm, switches to a hybrid or an ambidextrous structure yield no subsequent performance improvements. A switch to a decentralized structure entails a substantial short-term performance decline, while the eventual performance is significantly higher than the performance that could have been achieved by the centralized structure alone.

We further observe that a transition from one structure to another structure cannot only improve on the first structure's performance, but also on the second structure's performance had the firm started with this structure. In addition to the four sequences, Figure 4 also contains the performance of a team-based firm that does not change its structure over the 200 periods. As can be seen, the sequence of centralized to team-based improves not only on the centralized firm's performance, but also on the performance of the team-based structure.

As shown in Figure 5, it is not simply the case that some structures are generically poor structures to transition to. Figure 5 contains the five sequences that start with a decentralized structure. Here, unlike after the centralized structure, the hybrid form leads to a significant performance increase if used as second structure.

In general, these results raise two questions for sequences from structure A to structure B. First, which transitions are beneficial for firms with structure A? In other words, does the sequence A→B outperform a firm with fixed-structure A? Second, does it make sense for a firm that eventually plans to adopt structure B to first adopt structure A, that is, does the sequence A→B outperform a firm with fixed-structure B? We call the first performance difference *delta first* [performance(sequence) – performance(first structure)] and the second performance difference *delta second* [performance(sequence) – performance(second structure)].

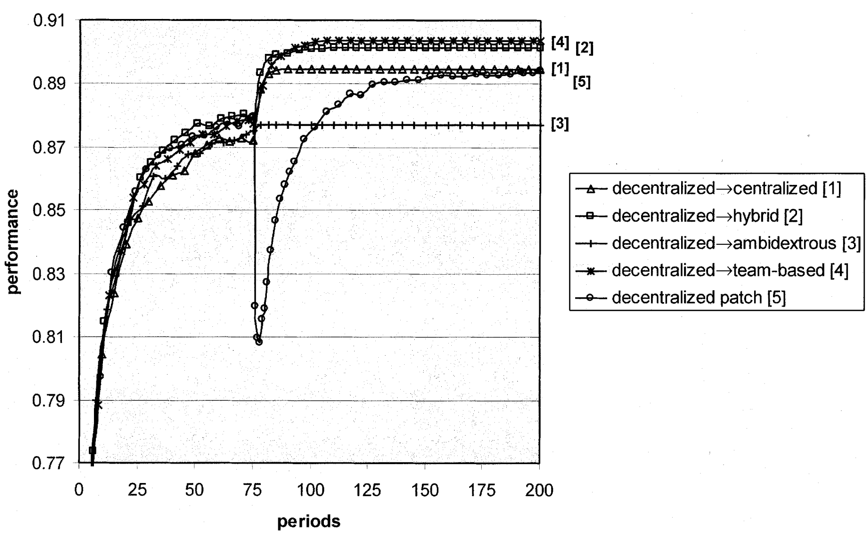

Figure 5 Transitions from a decentralized starting structure

Simulations of all 24 transitions allow us to compute the average values of these two variables for all transitions (see Figure 6).

While Figure 6 succinctly answers the two questions concerning the benefits of sequences that were raised in the paragraph above, the challenge is to explain these results. The example discussed in the last section provided already some intuition for why a transition from one structure to another structure can be beneficial. After a number of periods of search, a firm gets stuck. Adopting a new structure can be beneficial if the new structure allows the firm to escape from this sticking point, which can only happen if the sets of sticking points for the two structures are different. In contrast, if the set of sticking points of the second structure is equal to or completely contains the set of sticking points of the first structure, the second structure would not allow the firm to escape its present sticking point. Thus, the number of sticking points of the first structure

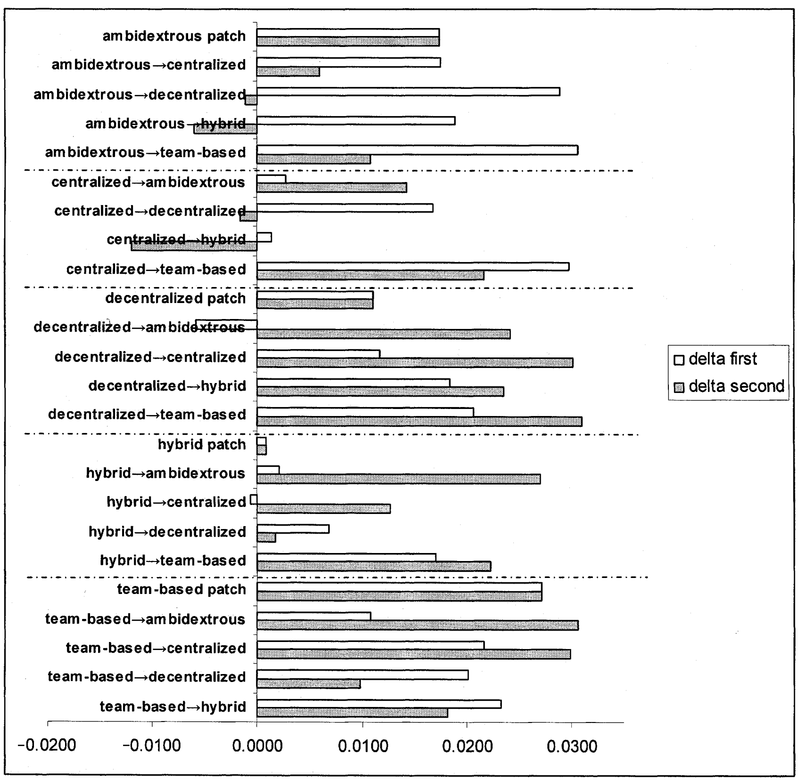

Figure 6 The benefits of different sequences

This figure reports for each sequence of organizational structures A → B two performance differences:

delta first = performance of sequence – performance of A
delta second = performance of sequence – performance of B

where performance is measured in period 200 that are not sticking points of the second structure is likely to be correlated with the benefit that a firm would derive from transitioning to the second structure.

Recall the results of Figure 4. A centralized structure did not benefit from transitioning to a hybrid structure but benefited from transitioning to a team-based structure. Let us consider the set of sticking points for these three firms. The centralized firm engages in purely local search and takes firm-wide implications into account. As a result, a firm with a centralized structure gets stuck on configurations for which no alternative configuration exists that differs in only one element and that yields higher firm performance. In the hybrid structure, division managers evaluate local alternatives in their respective departments. Since they operate under firm-wide incentives, they will implement changes in their division only if it improves firm performance given the other division's current choices. If a firm is on a sticking point for a centralized firm, by definition, no local, firm-performance-improving alternative exists. Consequently, neither manager in the hybrid firm would be able to find a local alternative in their departments that would be performance-improving, and the firm, after adopting the hybrid structure, would remain stuck on this configuration. In sum, all sticking points for the centralized firm are also sticking points for the hybrid firm. A centralized firm that is stuck will not become unglued from this configuration by adopting a hybrid structure: the benefit from transitioning from centralized to hybrid is zero.

Contrast this situation with the team-based structure where a manager informs the other manager of his or her intentions and they jointly evaluate alternatives for both departments. As a consequence, they consider alternatives for the firm that might differ from the status-quo choices in more than one element, that is, they contain simultaneous choices for both divisions. If changes to both divisions are beneficial, a firm with this structure, thus, might move off a sticking point of a centralized firm.

One final piece of the puzzle of why sequences can outperform fixed structures is still missing: Why is it beneficial that a second structure moves a firm off a sticking point that it reached with a first structure? For every two structures A and B, it is helpful to distinguish between two types of sticking points: sticking points that are unique to either structure A or B, and joint sticking points. If a firm with structure A gets stuck on a joint sticking point, the firm will not move after it has transitioned to structure B. Thus, the sequencing firm will only move off those sticking points that are unique to structure A. Unique and joint sticking points differ, however, in one important aspect. Joint sticking points tend to have much higher performance than unique sticking points. For instance, the joint sticking points of the centralized and the team-based structures have an average performance of 0.865, while the sticking points that are unique to the centralized structure have only a performance of 0.781. This performance difference makes intuitive sense. A configuration of choices for which two different structures cannot find performance-improving alternative is likely to have a fairly high performance. Conversely, since the unique sticking points of structure A can be improved upon by structure B (otherwise they would also be sticking points for structure B), they tend to have fairly low performance relative to joint sticking points. In sum, on average it is beneficial for structure B to dislodge a firm from unique sticking points generated by structure A, because the firm gets another chance to find a higher performing choice configuration. Moreover, this new search starts from a good location: relative to a random starting point, this choice configuration already has a fairly high performance level and, since it is not a sticking point for the new structure, it offers the opportunity for further improvement. At the same time, if the firm had reached a (high-performing) joint sticking point, the firm would retain this choice configuration even after changing its structure, thereby preserving the previously found, high-performing practices.

Thus, the transition in organizational form is a useful mechanism to address the challenge of sticking points (and analogously local peaks and competency traps), not because it blindly precipitates further search, but in part because it allows for an intelligent sorting through the set of sticking points and effectively helps identify those settings in which further search is most likely to be useful. If a configuration of choices is a sticking point for both organizational forms, then it will tend to be a particularly high-performing position in the performance landscape. The intelligent sorting among sticking points generated by the shift in organizational forms does not require some global understanding of the value of alternative configurations by any one actor. Rather, the sorting emerges as a by-product of the robustness of superior configurations of choices to changes in organizational form. A further implication of this result is that the model is fully consistent with instances in which elements of the formal structure of an organization change and yet behaviorally the firm appears inert. The analysis suggests that inertia in such settings need not be dysfunctional, but rather may reflect the robust wisdom of the existing set of choices.

The transition from the centralized to the team-based structure is a good example of these processes. If firms with a centralized structure would not change their structure, about 80 percent of these firms would end up on a joint sticking point.[8] However, if the centralized structure is followed by a team-based structure, this new structure is able to dislodge the remaining 20 percent of firms that got stuck on a unique sticking point. Subsequently, by period 200, 96 percent of all sequencing firms end on joint sticking points while only 4 percent are on sticking points unique to the team-based structure. Not only does sequencing allow more firms to be channeled on to high-performing joint sticking points, but the 20 percent of dislodged firms also go on to identify particularly favorable choice configurations, reflecting these firms' propitious starting points. As a result, firms that sequence from a centralized to a team-based structure achieve on average a performance of 0.894, while firms with a fixed centralized structure achieve only a performance of 0.864.[9]

To recapitulate, a sequence from structure A to structure B will be beneficial when structure B has the opportunity to dislodge firms of structure A from sticking points that are unique to structure A and, more subtly, to differentially sort out more or less superior sticking points that emerged from structure A. This intuition leads us to hypothesize that the benefit from sequencing is correlated with the number of unique sticking points that structure A possesses (where 'uniqueness' is determined relative to structure B).

For every pair of structures in our analysis, Figure 7 displays the unique and the joint sticking points, as well as the average heights of these points. The pattern noted for the centralized/team-based example holds for all pairs: the performance of joint sticking points is higher than the performance of unique sticking points. Moreover, the data in Figure 7 allow us to test our hypothesis concerning the potential benefit of transitioning from structure A to B. For instance, we see that the centralized structure has only 0.65 unique sticking points when paired with the ambidextrous structure. As a result, one would expect that transitioning from the centralized to the ambidextrous structure would yield hardly any benefit, a finding we were able to observe in Figure 4. More generally, across the 24 transitions we analyze, the correlation between *delta first* (the performance improvement relative to the first structure of moving from structure A to B) and the number of unique sticking points of structure A is 0.65 and highly significant ($p < 0.001$).

The analysis so far was concerned with firms that have a particular structure and that wonder whether transitioning to a different structure would be beneficial. Now we allow firms to choose their first structure. If a firm intends to end with structure B, the question is which structure A would create a benefit if it were adopted first. That is, should the firm precede structure B with a different structure A? Figure 6 provides again the numeric answer to the above question for all transitions, since variable *delta second* describes the benefit of the sequence A→B relative to the fixed structure B.

The intuition why a sequence A→B can outperform a fixed structure B is similar to before. Firms with fixed structure B would end up both on unique and joint sticking points. Using the example of team-based/centralized, 30 percent of firms with a fixed team-based structure would end up on unique sticking points. However, 19 of the team-based 39 sticking points are unique, that is, are not sticking points for the centralized structure. If a centralized structure is used first, the centralized structure is able to carry the firm across these sticking points, thereby creating a more favorable starting position once the firm switches to the team-based structure. Indeed, only 4 percent of firms that start with a centralized structure and then transition to a team-based structure end up on sticking points that are unique to the team-based structure.

Following this intuition, we hypothesize that the benefit of having first structure A and then structure B, relative to having only structure B, is correlated with the number of unique sticking points of structure B. Indeed, analyzing the data from Figures 6 and 7 shows that the correlation between *delta second* and the number of unique sticking points of the second structure is 0.79 and highly significant ($p < 0.001$).

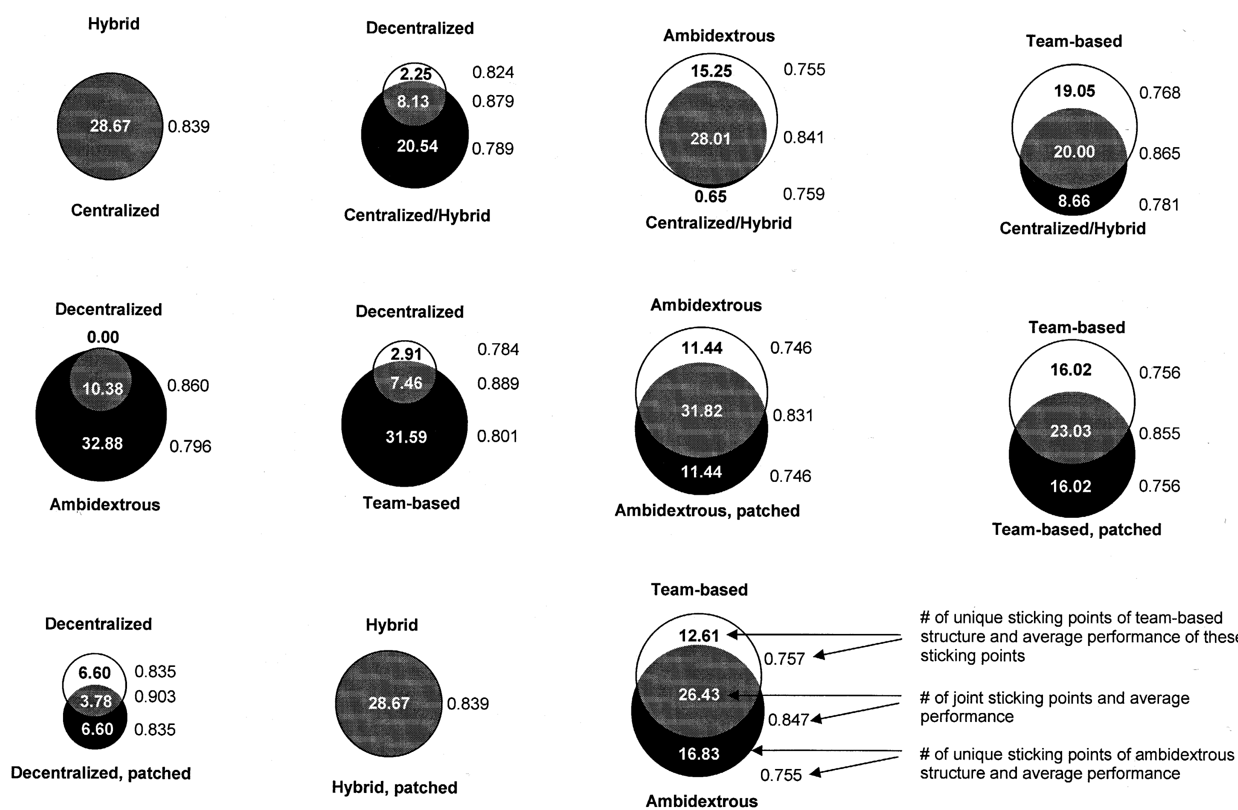

Figure 7 Unique and joint sticking points between different pairs of organizational structures

To summarize, at the core of our results is the degree to which the sets of sticking points of two organizational structures differ. Transitions are only beneficial to the extent that a new structure allows a firm to move to new configurations of choices.

The relationship between organizational structures and their sets of unique sticking points is, however, not as straightforward. As we have seen, structures that are quite different, such as the centralized and the hybrid structure, can have identical sets of sticking points, making it not beneficial to transition from one to the other. Likewise, some structures' sticking points are merely a subset of another structure's set. For instance, all sticking points of a firm with a decentralized structure are also sticking points of an ambidextrous structure: if managers in the decentralized structure cannot find any alternative that improves their division's performance, they will also not suggest any new alternative in the ambidextrous structure either. As a result, transitioning from a decentralized to an ambidextrous structure yields no benefit.[10]

In the Appendix, we provide an explanation for each pair of structures for why one structure is able to move off a sticking point of another structure, that is, why we see the overlaps or lack of overlaps in the sets of sticking points as reported in Figure 7. We note here a few key patterns and refer the reader to the Appendix for more details.

1 Firms with centralized or hybrid structures are able to move off sticking points of other structures because parochial interests can be overcome that can hinder the discussion or implementation of alternatives that are detrimental to one division but improve firm-wide performance.
2 Firms with decentralized structures are able to move off sticking points of other structures because managers are not tied to firm-wide considerations.
3 Firms with ambidextrous structures are able to move off sticking points of other structures because the top management team can overcome potential resistance by division managers (e.g. as in the team-based structure).
4 Firms with team-based structures are able to move off sticking points of other structures because managers, when evaluating alternatives, can take into account the intended actions of the other managers; this leads to different evaluations than when managers need to base their evaluations on the current choices of the other managers.

Cost of transitions and vacillation between structures

In our analysis, the benefit of sequences was measured by focusing on the final outcomes of the search processes, i.e. by comparing period-200 performance. Two types of costs can arise, however, from transitioning between two structures. First, the current performance of the firm might decline. For instance, as shown in Figure 4, when a firm with a centralized structure switches to a decentralized structure, performance initially declines precipitously. Similarly, as shown in Figure 5, a decentralized firm that re-assigns choices encounters a severe, temporary performance decline.[11]

Second, the transition itself may be costly, as changing from one organizational structure to another will generally not be a trivial process. While these costs are outside the scope of our model, a few examples highlight the types of costs that can arise and the potential cost differences among different transitions. Consider, for example, transitions that start with a decentralized structure. A transition to a team-based structure, in which managers still have final say over their own divisions but conduct decision-making jointly in brainstorming sessions might involve relatively little cost, such as extra joint meeting times, yet could lead to the disgruntlement of managers who in the new structure have to live with vetoes by other managers.

A transition to a hybrid structure may also involve relatively little cost. Here, the main structural difference is the adoption of a new incentive system that stresses firm-wide performance. Yet in order for division managers to be able to evaluate alternatives in a way that takes firm-wide considerations into account, managers also need to have access to relevant information about other divisions. While in the decentralized structure they have to know only how alternatives affect their own division, in the hybrid structure they also need to assess the externalities of their actions on the other divisions. This additional information will not be costless.

A transition to an ambidextrous structure avoids these information costs at the division level, but requires this information at the top team level. Thus, this structure requires another managerial level, requires additional approval meetings, and can lead also to disgruntled division managers who might be blocked by top management from implementing alternatives that are good for their divisions (but harmful for the firm as a whole).

Reassignment of decisions, either among divisions as in the patching transition, or to a single division, as in the transition to a centralized structure, might lead to even greater resentment at the level of division managers than the occasional veto in the ambidextrous structure. Thus, these transitions might be particularly difficult and costly, unless they are supported by a strong company culture that makes reassignments (and loss of decision control) a 'normal' part of organizational life (Galunic and Eisenhardt, 1996).

These different costs would have to be weighed against the gross benefit of transitioning that our analysis has highlighted. For instance, if indeed the transition from a decentralized to a team-based structure is less costly than a transition to an ambidextrous structure, then both costs and gross benefits would favor the transition to a team-based structure. Figure 8 lists the gross benefits of all transitions included in our analysis. Differences in transition costs, which are likely not only transition- but also firm-specific, would then have to be balanced against the differences in gross benefits (where the listed gross benefits would have to be extrapolated beyond period 200 and appropriately discounted).

The issue of the inherent cost of transitions becomes particularly important if a firm considers not only one transition but a number of transitions, for instance by vacillating between two structures, as suggested by Nickerson and Zenger (2002), who describe a case in which firms want to achieve an organizational state that lies between two discrete organizational forms. In their model, by switching the formal organizational structure, a firm is able to achieve at least temporarily this desired state, since the informal structure of the firm is assumed to adjust only with a lag. In Figure 9, we show the (gross) performance implications that arise in our set-up of vacillating between a decentralized and a centralized structure, the focal case of Nickerson and Zenger's exposition. In particular, the figure displays the performance trajectory of three firms: a decentralized firm with a fixed structure; a firm that transitions once at period 50 from a decentralized to a centralized structure; and a vacillating firm that switches between a decentralized and a centralized structure every 50 periods.

As the trajectories show, a vacillating firm temporarily achieves slightly higher performance than a firm that switches only once. The different episodes of search under the different organizational structures successively dislodge firms from the unique sticking points of the previous structure. Yet the marginal benefits of these improvements decrease over time. Moreover, each decentralized episode of search has an associated short-term performance decline. Thus, in the current model, not even taking into account the direct costs of changing the organizational structure, it seems unlikely that a firm would find it beneficial to vacillate for long.[12]

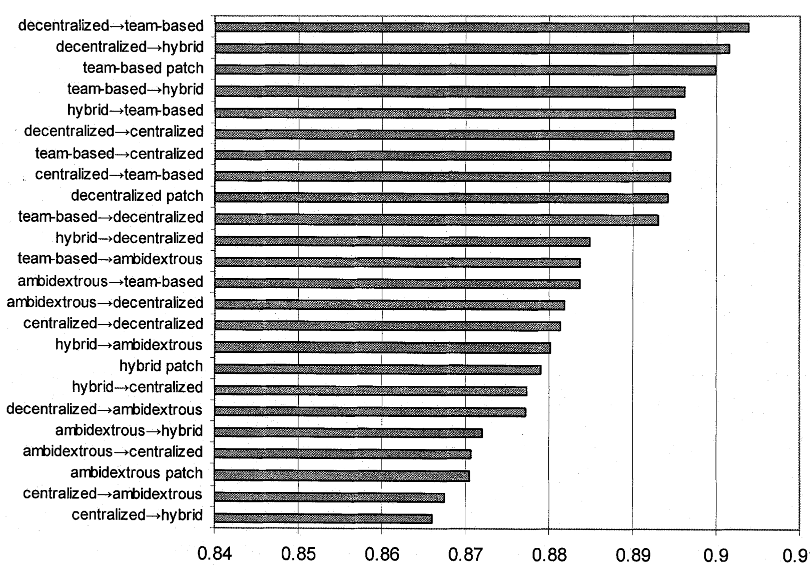

Figure 8 Final performance of all sequences

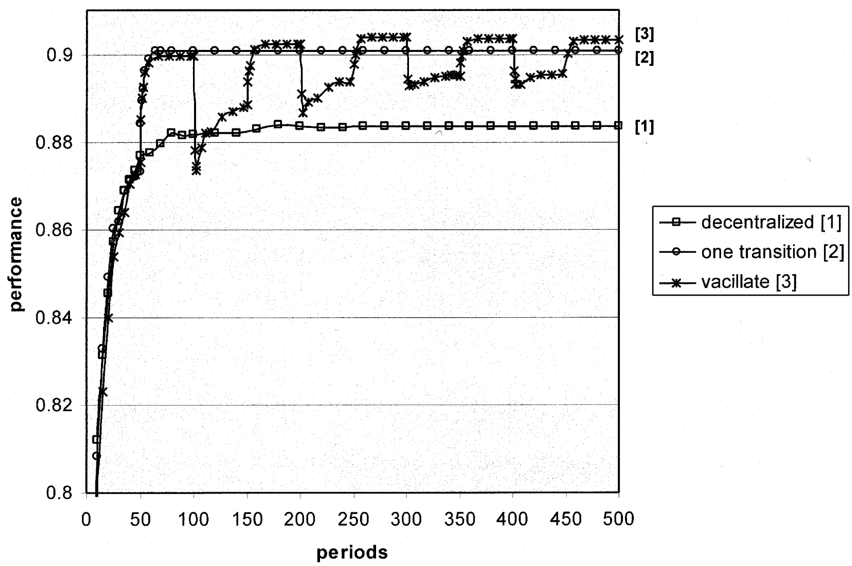

Figure 9 Vacillation between a decentralized and a centralized structure

Robustness

The main intuition for the benefit of transitioning from one structure to another structure is that the second structure can dislodge the first structure from its unique sticking points. In our main simulations, firms were assumed to switch their structure after period 75. By this period, practically all firms have reached a sticking point. Transitions after period 75, thus, would lead to identical long-run results, since firms would simply remain stuck between period 75 and the new transition period. Likewise, an endogenous switching rule prompting firms to switch their structure once they do not (and cannot) improve their performance anymore with the old structure, that is, once they are on a sticking point, would lead to identical long-run results.

Transitions before period 75 can lead to less benefits, because the first structure has not enough time to channel at least a few firms on to joint sticking points. If the transition occurs too early, the second structure will lead many firms on to unique sticking points for its own structure, which also have relatively low performance. While the absolute value of the benefit of each sequence decreases with earlier transition periods, the relative value of one sequence versus another type of sequence remains similar, however, since the underlying reason – a sequence is more beneficial if it dislodges more firms from unique sticking points – still holds.

Another premise of our simulation was a high degree of interaction among the choices of each firm. As the degree of interaction becomes smaller, the number of sticking points for each firm decreases (Rivkin and Siggelkow, 2002). As a result, the absolute benefit of sequencing organizational structures is declining as interactions become sparser. In the extreme, if no interdependencies among choices exist, all organizational structures included in our analysis would lead firms to the global peak and keep firms stuck on this best configuration. Clearly, in this case, no benefit of transitioning exists. While again the absolute value of the benefit of sequences is affected by the degree of interaction, the relative benefit of one sequence over another sequence remains stable as the same underlying mechanisms are still at work.[13]

Discussion and conclusion

As our model made visible, organizational structure affects organizational search and adaptation by influencing the variation, selection and retention of alternatives. Transitioning from one structure to another structure can have benefits if the new structure has the potential to unglue a firm from relatively low-performing sets of choices that the firm would otherwise be unable to escape from. It is important to note that it is the potential for a new organizational structure to induce further search that is critical, not that the new structure will necessarily imply further search. Shifting from one organizational structure to another allows for the intelligent sorting among the set of sticking points of the previous form. Particularly high-performing configurations of choices, those that are sticking points for both structures, will continue to be enacted after the change to the new form. Thus, as often is the case in evolutionary arguments, inertia is as important a part of the process as is change. Furthermore, when the change in structure does precipitate further search, the renewed search effort commences from a relatively attractive starting point – the sticking point identified as a result of search under the earlier structure. Lastly, one should note that the informational demands to achieve the intelligent renewal of the search process – classifying stable performance as competency traps or as competence – are very modest. Stable performance as an indicator that a sticking point has been reached suffices as a trigger for structural change.

At the level of organizational design, the focus on sequences also broadens the traditional contingency logic that has guided organizational design choices. This logic usually tries to find a direct mapping between environmental conditions and appropriate organizational design (Lawrence and Lorsch, 1967). Our analysis adds to an emergent stream of work which suggests that thinking beyond a set of pure and hybrid organizational structures can be helpful. By eschewing the conceptual constraint of having to find a mapping from environmental conditions to a single, permanent appropriate form, the study of sequences of organizational structures allows for new degrees of freedom in conceptualizing appropriate organizational design.

The sequencing of organizational structures leads to a further effect. A change in structure is not always preceded or accompanied by an environmental change. A change in structure may simply signal that a firm has reached a different stage in its search effort. In this view, structural change is used explicitly to affect the subsequent behavior and search by individuals in the organization. Thus, a second-order structural change may precede first-order changes at the activity level that are executed in a given structural context.

Our analysis stresses that the process of adaptation itself requires some degree of change in structure. Changes in structure are important since organizational structures and practices both guide and constrain the direction of the search process. Sequences of organizational structures can broaden organizational search while providing the required stability to exploit the outcomes of broad search. The adaptation of structure to focus the locus of search processes is thus an important mechanism of adaptation. As a result, what constitutes an appropriate structure is not simply a mapping to some existing external context, but is also a facilitating device to guide the organization to some unknown but potentially superior choice configuration.

Acknowledgements

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Notes

1 Our model assumes that N is given for a particular firm, that is, our model does not address the issue of firm boundaries.

2 Our model stresses the coordinative effects of firm-wide incentives, rather than their effects on the effort level, a central focus of models in organizational economics (Milgrom and Roberts, 1992).

3 It is important to note that these labels and the performance values are purely for illustrative purposes. In particular, one should not overinterpret the particular assignment of performance values to choice configurations in this example. The simulation set-up employed below allows us to model situations that exhibit similar interaction structures (e.g. situations in which all choices affect each other) yet differ in the details of the performance values. By evaluating search outcomes over hundreds of similar performance landscapes, we are able to assess how different organizational forms deal on average with situations of a particular type, rather than with a particular, specific case.

4 For illustrative purpose, it is assumed that managers evaluate all local alternatives that are under their control. As a result, at each vertex there is a unique next move.

5 A further effect of structure is that some structures may engender ‘cycling’ between activity configurations, that is, firms may not end up on a sticking point. For instance, in the current performance landscape, a decentralized firm would cycle back and forth between 000 and 011.

6 Our results are robust to other choices of N. If N is chosen too small (say 1 or 2), the landscapes become relatively easy to scale for any organizational structure, leading to very small

performance differences among all structures. Larger values of N increase the computational burden of the simulations but not the results.

7 Decentralized firms are either stuck on a particular configuration or stuck with a particular cycle between configurations.

8 About 30% of the centralized structure's sticking points are unique (8.66 out of 28.66) and 70% are joint. Joint sticking points, however, have on average a higher performance than unique sticking points. In general, the higher the performance of a sticking point, the more likely it is that a firm will get stuck on it. As a result, about 80%, rather than 70%, of firms with a fixed centralized structure end up on joint sticking points.

9 In this case about half of the benefit from sequencing is generated by firms that simply hold on to the high-performing joint sticking points they achieved with the centralized structure and half the benefit is generated by firms that are dislodged from unique sticking points. The dislodged firms, now with a team-based structure, start their new search with an average performance of 0.803 and achieve a final performance of 0.922. This final performance is significantly higher than the performance that is achieved by team-based firms that start at random starting points and it is also significantly higher than the performance achieved by team-based firms that start at randomly chosen starting points that have the same starting height of 0.803. Unique sticking points are good starting points not only because they are high (relative to random starting points) but also because they are, by definition, not a sticking point of the new structure. Indeed, team-based firms starting on randomly chosen points that have average heights of 0.803 and that are not sticking points for team-based firms achieve also a final performance of 0.92.

10 As Figure 6 reports, the sequence decentralized → ambidextrous has actually a slightly lower performance than a fixed decentralized structure. After the transitioning, the ambidextrous structure gets the firm quickly caught in one of the ambidextrous firm's many low-performing unique sticking points (while, in contrast, the fixed decentralized structure does not have any unique sticking points relative to the ambidextrous structure).

11 The overall benefit of the sequence could be computed by integrating firm performance over all periods and discounting each period's performance appropriately. Further assumptions about the organization's life span, that is, for how long a firm would enjoy its period-200 performance, would have to be made, however.

12 The key difference between our model and Nickerson and Zenger's (2002) model is that Nickerson and Zenger assume that the desired organizational state remains constant over time and that a firm's performance is a function of how close a firm is to this desired state. As a firm drifts away from the desired state, the benefit from switching always reaches a critical value and the firm switches. In our model, the search that a firm engages in leads to progress in what the firm actual does (i.e. an improvement in its choice configuration). As a result, as long as the environment is stable (as in Nickerson and Zenger), the benefit from transitioning declines over time.

13 Since the focus of this article is on the benefits of sequences, we do not address the issue which pure organizational structures might be particularly appropriate for different environments that are characterized by different values of K. For an analysis of this issue see Siggelkow and Rivkin (2004).

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Appendix: Explanations for unique sticking points

For each pair of structures A and B, this table contains an explanation for why one structure is able to move off a sticking point (SP) of another structure. To the right of the column 'unique SP for structure A' one finds the explanation for why these sticking points for structure A are not sticking points for structure B.

Centralized vs. hybrid	Unique SP for centralized	No unique SPs exist, since in both structures all local alternatives given the other (division's) choices are checked for firm-wide performance improvements.
	Unique SP for hybrid	
Decentralized vs. centralized or hybrid	Unique SP for decentralized (Why are these SPs not SPs for a centralized or hybrid firm?)	An alternative in one division exists that improves firm performance but that is not beneficial for the manager who has control over this choice in the decentralized structure.
	Unique SP for centralized/hybrid (Why are these SPs not SPs for a decentralized firm?)	One manager finds an alternative that improves his/her division's performance (but that decreases firm performance).
Ambidextrous vs. centralized or hybrid	Unique SP for ambidextrous	An alternative in one division exists that improves firm performance (but that is not beneficial for the manager who has control over this choice and thus would never suggest it in the ambidextrous structure).
	Unique SP for centralized/hybrid	Both managers implement beneficial changes in their divisions, leading to a non-local move that might not be achievable sequentially by the centralized or hybrid structure.

Appendix continued

Team-based vs. centralized or hybrid	Unique SP for team-based	A local alternative in one division exists that improves firm performance (but that is not beneficial for one of the managers who would veto it in the team-based structure).
	Unique SP for centralized/hybrid	Both managers implement beneficial changes in their divisions, leading to a non-local move that might not be achievable sequentially by the centralized or hybrid structure.
Decentralized vs. ambidextrous	Unique SP for decentralized	None; if managers in the decentralized structure cannot find any alternative that improves their division's performance, they will also not suggest any alternative in the ambidextrous structure.
	Unique SP for ambidextrous	One manager finds an alternative that improves his/her division's performance (but that decreases firm performance and would therefore be vetoed by the top management team in the ambidextrous firm).
Decentralized vs. team-based	Unique SP for decentralized	In the team-based structure, both managers take into account the intended changes by the other manager; as a result a beneficial move might be detected.
	Unique SP for team-based	One manager finds an alternative that improves her division's performance but that decreases performance in the other division (and therefore would be vetoed in the team-based structure).
Ambidextrous vs. team-based	Unique SP for ambidextrous	In the team-based structure, both managers take into account the intended changes by the other manager; as a result a beneficial move might be detected.
	Unique SP for team-based	One manager finds an alternative that improves his/her division's performance, decreases performance in the other division (and therefore would be vetoed in the team-based structure) but increases overall firm-performance (and thereby is adopted by the ambidextrous firm).
Patching		Patching changes each manager's division payoff structure; as a result patching only has an effect if managers do not base their decisions on firm-wide benefits.

Nicolaj Siggelkow is Associate Professor of Management at the Wharton School, University of Pennsylvania. His current research focuses on the strategic and organizational implications of interactions among a firm's choices of activities and resources. His work analyzes organizational design, the evolution of activity systems, firms' adaptations to environmental changes, and the strategic consequences of contextual interactions among activities. Recent publications include 'Why Focus? A Study of Intra-Industry Focus Effects', *Journal of Industrial Economics* (2003), and with Jan Rivkin, 'Balancing Search and Stability: Interdependencies Among Elements of Organizational Design', *Management Science* (2003). *Address*: Wharton School, 2211 Steinberg-Dietrich Hall, Philadelphia, PA 19104, USA. [email: siggelkow@wharton.upenn.edu]

Daniel Levinthal is the Julian Aresty Professor of Management and Economics at the Wharton School, University of Pennsylvania. His research interests focus on issues of organizational adaptation and industry evolution, particularly in the context of technological change. Recent publications include G. Gavetti and D. Levinthal, 'Strategy Field from the Perspective of *Management Science*', *Management Science* (2004) and J. Denrell, C. Fang and D. Levinthal, 'From T-Mazes to Labyrinths: Learning from Model-Based Feedback', *Management Science* (2004). *Address*: 2000 Steinberg-Dietrich Hall, Wharton School, University of Pennsylvania, Philadelphia, PA 19104, USA. [email: Levinthal@wharton.upenn.edu]