NEW FRONTIERS IN STRATEGIC MANAGEMENT OF ORGANIZATIONAL CHANGE

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INTRODUCTION

Why and in what direction do organizations change?[1] Early responses to these questions generally fell into two camps. Adaptationist scholars proposed theories based on the assumption that organizations have wide latitude to change their structure, strategy, and scope. In the adaptationist view, organizations are able to change in the direction dictated by their environment or by the choices of organizational decision makers, whether in the pursuit of rational action (e.g., Lawrence & Lorsch, 1967; Williamson, 1985) or blind action (Weick, 1979). In its extreme form, the adaptationist view implied that firms can and do adapt nearly frictionlessly, suggesting that if there is a performance penalty associated with inappropriate organization, misaligned firms will change so as to reduce or eliminate this misalignment. Alternatively, selection-based theories, notably structural inertia theory within organizational ecology, contended that inertial forces tend to stymie attempts at organizational change (Hannan & Freeman, 1984). In its extreme form, the selectionist view implied that firms can rarely change successfully; instead, if there is a performance penalty associated with misalignment, misaligned firms will be "selected out" of the population.

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Research in the early 1990s provided a middle ground between these two views by exploring how some firms do change under certain environmental conditions (e.g., Delacroix & Swaminathan, 1991; Kelly & Amburgey, 1991; Haveman, 1992, 1993). Instead of positing the primacy of selection or the ease of change, research in organizational ecology explored the extent to which various types of change generated a liability for survival. In other words, the research recognized that organizations can and do change but such changes increase the risk that the firm may be selected out of the population. This intermediate position advanced a more useful understanding of the risks of organizational change but left undeveloped the underlying reasons for organizational change and offered only ad-hoc apparatus for predicting the nature and direction of the change.

How can organizational economics contribute to advancing theories of organizational change? In at least two ways: First, extant organizational change literature tends to focus on the process of change and rarely predicts whether the content of a particular change will generate beneficial or harmful effects (Barnett & Carroll, 1995; for an exception, see Zajac, Kraatz, & Bresser, 2000). For example, most studies of organizations' expansion of product lines or alteration of publication frequency remain agnostic about the underlying value of these content changes. The content effect of change is evaluated after the fact (if at all) by the organization's performance after the change (Amburgey, Kelly, & Barnett, 1993; Baum, 1996). As Barnett and Carroll (1995) argued, this ad-hoc approach to defining the content of organizational change ignores the potential for applying organization theory to make predictions about the costs and performance effects of the change itself and hence the potential for predicting why and whether firms change. Transaction cost economics (TCE) offers at least one equilibrium-based theory that can generate predictions to advance understanding of the *direction* of change.

Second, prior research on the cost and risk associated with organizational change suggests that it should occur only rarely, and usually in response to environmental change. Yet this flies in the face of an interesting empirical fact: many organizations change frequently – and in fact repeatedly iterate back and forth among previously used forms. For example, Hewlett-Packard (HP) has shifted between centralized and decentralized organization form five times during the last 20 years (Nickerson & Zenger, 2002). Process theories of organization change are unable to explain this; indeed, unless one makes heroic assumptions about shifts in the environment or management fads, it is difficult to make sense of this with any theory. However, insights from TCE may inform this conundrum. Specifically,

TCE relies on the principle of discrete structural analysis – that is, there is not a continuum of viable organization forms, but rather a limited set of discrete organizational forms each of which has certain advantages and disadvantages, and among which managers must choose. Given this, one plausible reason for iterating between two organizational forms may be to achieve, at least during the transition between forms, an organization that is closer to optimal than either of the forms that are viable in equilibrium. Thus, TCE can advance our understanding of *why* organizations change.

Research in this vein is relatively recent. In two publications early in this century, we applied the above reasoning to the challenge of organizational change. In "Why Firms Want to Organize Efficiently and What Keeps Them from Doing So: Inappropriate Governance, Performance, and Adaptation in a Deregulated Industry," (Nickerson & Silverman, 2003a), we took seriously Barnett & Carroll's call for application of equilibrium-based organization theory to inform the likely direction of organizational change. In "Being Efficiently Fickle: A Dynamic Theory of Organizational Choice," (Nickerson & Zenger, 2002), one of us applied the discrete structural approach to understand the motivation for organizational change. Below we describe each briefly, lay out subsequent extensions, and highlight directions for future research.

IN WHAT DIRECTION DO ORGANIZATIONS CHANGE?

Nickerson and Silverman (2003a) (hereafter NS) theoretically link TCE and structural inertia theory to predict the direction, rate, and performance implications of change. Both approaches allow for costly adaptation, although the two theories accord different weights to these costs. Combining these two perspectives, NS develop a model of organizational change in which the impetus for change is the inappropriate governance of a core transaction.

Specifically, NS draw upon TCE to argue that those organizations that govern transactions appropriately (i.e., in accordance with TCE prescriptions) will exhibit higher profitability than those that do not govern transactions appropriately. Should organizations have misaligned transactions, they have an incentive to change the organization so as to reduce the degree to which their transactions are inappropriately aligned. Hence, the TCE lens offers insight into the direction of change, as organizations strive to move toward the organizational form that will be most efficient in long-run equilibrium.

However, firms are constrained in their efforts to realign because of "adjustment costs," which are a key source of inertia. Firms that face large adjustment costs will tend to delay adaptation whereas firms with small adjustment costs will be able to adapt quickly. Thus, adjustment costs, which vary with organizational features, will affect the rate and level of adaptation. What features influence the magnitude of adjustment costs? NS argue that relevant features relate to the level of asset specificity and the extent to which exchanges are characterized by deep commitments. Therefore, NS argue that the rate and amount of organizational change in the governance of a particular transaction decreases with the degree to which the transaction is characterized by investment in specific assets or deep contractual commitments.

Taking advantage of a natural experiment in the U.S. interstate trucking industry – deregulation in 1980 – NS examined these predictions in an empirical test of motor carriers' reliance on company drivers versus owner-operator drivers. Their analysis showed that misaligned firms underperform relative to better-aligned rivals. Specifically, trucking firms that govern transactions in accordance with TCE prescriptions exhibit higher profitability than firms whose transactions did not accord with TCE principles. More relevant to organizational change, after deregulation firms systematically adapted their organizational structures in the direction of reducing this transaction cost-related misalignment. The adaptation occurred even after controlling for alternative factors such as changing so as to mimic important reference organizations (e.g., Haunschild & Miner, 1997). Further, the rate and extent of such adaptation was constrained by organizational features associated with asset specificity and deep contractual commitments. For instance, the more that a trucking firm carries less-than-truckload traffic (which requires a geographically fixed hub-and-spoke system and specialized investments in information technology), the less rapid and more shallow is that firm's adaptation. Specific investments appear to slow and lessen the amount of adaptation.

Unionized firms, which represent organizations with contractual commitments, adapted less quickly and less completely than nonunionized carriers. Similarly, "over-integrated" carriers (firms that would have to replace employee drivers with independent contractors to achieve alignment) adapted less quickly and less completely than "under-integrated" carriers (those that would have to replace contractors with employees). NS additionally find that it took approximately three to five years for adaptation to be completed, which may suggest limits on recent prescriptions to implement organizational change as rapidly as possible

(Brown & Eisenhardt, 1998), and may also indicate how inertia can constrain the speed of adaptation, which is a central premise of the next section. NS's key conclusion is that change in the direction predicted by transaction cost economizing is desirable; but managers must weigh the speed with which they change the organization against the costs of adjustment.

NS's findings support the premise that firms change their organizations in the direction of more efficient structures. In the trucking industry, a shock to the environment created the impetus for change. Yet, exogenous shocks may not be the only stimulus for restructuring an organization. The following discussion explores the potential of endogenous change in an organizational economics framing.

WHY DO FIRMS CHANGE? ("GETTING THERE IS HALF THE FUN")

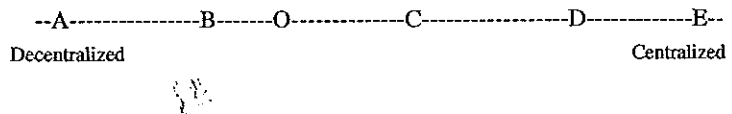
A central theme in organization theory is that organizational forms are chosen to "fit" environmental conditions, market strategies, or exchange conditions. Whether contingency theory, resource dependence theory, the configuration literature, organizational ecology, TCE, etc., these and other various theories of organizational design focus on fit – an equilibrium notion of static alignment that predicts the alignment between organizational forms and various antecedents or conditions. A key assumption in all of these literatures is that there exists one optimal organization form to fit a given environmental circumstance, and a key implication is that organizational change will chiefly occur when a shift in environmental conditions dictates a new organizational form.

But what if the optimal form for a given environment is not sustainable? Consider the continuum of organization forms that frequently populates textbooks and scholarly articles, with purely decentralized organizations on one end and pure centralization on the other:[2]

Decentralized — Centralized

If every point on this continuum represents a feasible organizational form, then the conventional views of organization theory are appropriate. If a firm finds that the environment has changed such that it needs to adopt,

say, "epsilon" more centralization, then it can do so. However, if only some points on this continuum represent feasible structures, as is suggested by Holmstrom and Milgrom (1994) and Williamson (1985) – and as is described in greater detail below – then a firm might find that the optimal level of centralization lies between two feasible organizational forms:



where A, B, C, D, and E represent feasible organizational structures and O represents the optimal structure.

In such a case the firm could adopt the organization form that is closest to the optimal form (in this case, B), and write off the remaining inefficiency as the least bad outcome. However, if an organization were to change form from B to C, or vice versa – and if the organization were to travel along the continuum during the transition period – then the organization would be closer to the optimal point during much of the transition than while at either feasible steady-state structure B or C.

Armed with this insight, Nickerson and Zenger (2002) (hereafter NZ) draw on three well-established assumptions to argue that efficient organization may dictate modulating between or among discrete governance modes (i.e., structural modulation) even though environmental conditions may remain stable over time. Indeed, a logical conclusion of NZ theory is that many if not most organizations (at least those in environments in which innovation is important to a firm's prosperity and survival) are never in static alignment. Instead, organizations not only periodically alter their formal structure from one discrete mode to another mode but, in so doing, also create an informal organization that is almost constantly in flux as the workers respond with inertia to the demands of one organization form or the other.

To ground their study, NZ describe a 20-year history of HP. Between 1980 and 2000, HP undertook five fundamental organizational shifts of core activities from decentralization to centralization and vice versa. While NZ do not claim that HP's history can be used to reject alternate explanations, the history nonetheless captures a phenomenon of vacillation between structures every four to five years that is not easily explained by conventional theories of organization. However, this observed vacillation is consistent with the notion of endogenously motivated organizational change

in which the firm's formal and informal structures, in essence, are constantly changing.

NZ's theory to explain vacillation is predicated on three assumptions. First, they maintain that a choice of formal organization for a given activity is largely discrete. The idea of discreteness emerges from a variety of literatures the most recent of which is the economic theory of complementarities among organizational elements (Holmstrom & Milgrom, 1994; Milgrom & Roberts, 1995). The idea of complementarities is present in TCE' focus on discrete comparative analysis (Williamson, 1985, 1991), theories of punctuated equilibrium (e.g., Gersick, 1991; Tushman & Romanelli, 1985), the organizational configuration literature (e.g., Mintzberg, 1979; Miles & Snow, 1978), and even in Weber's (1946) discussion of ideal types. Once one accepts the notion of discrete structures, a logical implication is that the movement between discrete structures might bring an organization (temporarily) closer to its ideal configuration.[3]

The second assumption maintains that the actual functionality of an organization is embedded in the informal organization and that informal organization changes only slowly in response to sharp changes in formal organization (put differently, informal organization is characterized by greater inertia than an organization's formal structure). Although managers have direct control over the formal mechanisms of structure, it is the informal organization by which outcomes are obtained. Patterns of communication, influence, and decision making within the firm ultimately are determined by the informal organization, which responds to changes in the formal structure but with inertia. This inertia generates a lag between changes in the formal structure and changes in the information structure. For instance, switching from a formally decentralized structure to a formally centralized one involves the establishment of low-powered incentives, greater administrative controls, fewer decision rights, and different reporting relationships. Yet as NZ (2002) describe this "[c]entralization of a particular function neither immediately severs cross-functional ties nor immediately destroys communication patterns, routines, patterns of information flow, normative standards, and political influence patterns established while decentralized. Rather, under pressure from the structural incentives of the new organizational mode, the close ties, routines, and patterns of influence associated with the old governance mode atrophy while at the same time new ties, routines, and patterns of influence form." To the extent that informal organization is important and is more inert than formal structures, the transition period between discrete structures will be lengthened – and this

can be a beneficial result if the organization is closer to its optimal point during transitions.

The third assumption asserts that structural change is costly and incurs one-time up-front costs as well as dynamic costs that diminish as interpersonal conflicts and role uncertainties under the new organizational mode recede. That organizational change is costly is obvious and a consistent theme across the organizational literature. Costs associated with change imply that switching from one mode to another should not be taken lightly and without a thorough understanding of the costs and benefits of the change.

Based on these three assumptions, NZ argue that under certain conditions a firm can achieve efficiency gains dynamically by modulating between or among alternative organizational forms. For example, a decision to shift to a decentralized from a centralized mode initiates a pattern of changes in communication, influence, and decision making thus alters the functioning of the organization. As management initiates decentralization and the firm begins to benefit from higher-powered incentives, it still enjoys, albeit temporarily, benefits from the patterns of social communication that accompanied centralization. Over time, however, the structure and incentives of decentralization reconfigure to create new social connections that undermine prior connections. This reconfiguration alters the corresponding functionality that existed under the centralized structure. Consequently, managers essentially simulate an intermediate level of functionality and achieve dynamic efficiency gains by modulating between discrete organizational modes. The greater the inertia in informal organization, the longer the benefits of the transition will be enjoyed.

Large firms such as HP appear to modulate roughly every five to six years with smaller firms modulating over shorter time periods. Moreover, managers may modulate without a long-run understanding that they are doing so simply by responding to the short-run needs of the organization.

NZ's theory yields intriguing implications for the relationship between content decisions, structural inertia, governance, and performance. First and foremost, NZ argue that organizational change, while costly, can be beneficial even when a firm's strategy and the environmental conditions that it faces have not changed. NZ's theory runs contrary to most organization theories that predict a static fit between organization and environment. Indeed, even "in *stable* environments with a *stable* set of managers pursuing a *stable* market strategy, efficiency considerations may dictate modulating between or among organizational choices" (Nickerson & Zenger, 2002, p. 548, emphasis in original).

Second, the combination of vacillation and inertia can generate positive performance implications by allowing the coexistence of elements of multiple organization structures, and thus generating a beneficial blend of organizational performance. Consider, for example, how vacillation within a diversified corporation might reduce the classic tension between exploitation and exploration, both of which are desirable to an organization (March, 1991). As noted by Argyres (1996) and Argyres and Silverman (2004), organizing the R&D function under the aegis of business unit management is likely to facilitate exploitation, as researchers will be pressed to develop "capabilities-deepening" innovations that extend the unit's product lines. Unfortunately, such a structure typically undermines exploration and the new opportunities that accompany it; as researchers are not provided with the time, resources, decision rights, or information useful for exploration. In contrast, an R&D function that is separated from the business unit and instead reports directly to corporate headquarters is likely to facilitate exploration by encouraging search for new opportunities that lie across or between existing business units, thus generating "capabilities-broadening" innovation. Yet such organization can divorce R&D from the pressing needs of each business unit's customers, and thus undermine exploitation.

NZ's theory points out a potential solution to the dilemma of managers wanting to achieve both exploration and exploitation. Modulating between business-unit R&D and corporate R&D, while costly, can deliver benefits that under certain circumstances will exceed the costs of change. Inertia causes the informal structure to respond to formal changes with a lag that enables the information structure to dynamically deliver both exploration and exploitation for a time.[4] If firms were able to instantly change their organizational structure, both formal and informal, then intermediate levels of functionality (i.e., exploration and exploitation) would not be feasible because of organizational discreteness. In the presence of informal-organizational inertia, however, modulation between business-unit R&D and corporate R&D can achieve a functional outcome that neither organizational structure can deliver in equilibrium. More generally, in steady state any organizational structure delivers distinct content, with attendant advantages and disadvantages: Better exploitation at the expense of exploration; better accountability at the expense of innovation, etc. Modulation between structures, such as centralization and decentralization, can yield the best of both worlds for a time.

IMPLICATIONS FOR FUTURE RESEARCH (IN WHAT DIRECTION MIGHT RESEARCH ON ORGANIZATIONAL CHANGE CHANGE?)

Thus far, the primary impact of Nickerson and Silverman (2003a) has been its contribution to the burgeoning literature on the governance–performance relationship (e.g., Leiblein & Miller, 2003; Sampson, 2004; Macher, 2006; Stern & Novak, 2008; Forbes & Lederman, 2009). Nickerson and Zenger (2002) has primarily impacted the debate about organizational forms and processes that support organizational ambidexterity (e.g., O'Reilly & Tushman, 2008; Gulati & Puranam, 2009). There has been little subsequent published research that extends the papers' insights regarding organizational change per se. Nevertheless, we believe that these two papers suggest new horizons for research on the dynamics of organizational choice and change. Below we discuss three broad categories of potential areas for future research: the use of TCE for predicting the content of organizational change; the elaboration of discrete structural alternatives available to firms, and the role that inertia plays in the interplay of formal structural shifts versus informal structural shifts.

Predicting the Direction of Organizational Change

The aforementioned studies demonstrate that TCE may be useful for predicting content decisions with respect to organizational change. Specifically, firms that are misaligned according to the precepts of TCE are likely to underperform and thus will be motivated to change so as to reduce their degree of misalignment. But how can a researcher measure changes in misalignment? Nickerson and Silverman (2003a) employ a two-stage empirical approach in which the first stage predicts reliance on company drivers as a function of several TCE-driven variables, and then uses the residual for each firm-year observation as a measure of the firm's misalignment in that year. One challenge with this approach is that it relies on an assumption that the population of firms overall is behaving in accordance with TCE – in other words, a firm's residual indicates how far it deviates empirically from the "average" firm in the sample with its characteristics, so if the "average" firm is not behaving according to TCE prescriptions then this measure will not accurately capture deviation from TCE prescriptions. Although Nickerson and Silverman (2003a) employ

multiple steps to reduce the concern surrounding this, a useful advance would be to theoretically identify various strategic positions and use these positions as a basis to theoretically assess the extent to which firms are misaligned. For example, Forbes and Lederman (2009) study relationships between airline "majors" (e.g., Delta Airlines) and "regionals" (e.g., Comair). Building from theory that predicts a role for vertical integration when there is a need for ex-post adaptation, they argue that such relationships are best governed by vertical integration when the regional operates from airports that are plagued by volatile weather (which increases the likelihood of noncontracted schedule adjustments) and by contract when the airports enjoy mild weather. They operationalize misalignment as deviation from this theoretically derived prescription, and find that such misalignment is negatively associated with airline performance.[5] Extension of such an approach to study changes in misalignment holds the promise to extend both our understanding of organizational change and of the underlying content-based theory.

A second avenue for future research is to widen our understanding of the dimensions that an organization can choose to change. Nickerson and Silverman (2003a) assume that each motor carrier maintains the same strategy throughout the post-deregulation period of study, and changes its organizational structure to accommodate the strategy. But it is also possible that a firm could change its strategy to accommodate its organizational structure. Although Chandler (1962) famously argued that "structure follows strategy," debate on this point continues to this day. Indeed, the finding that certain types of investments or contractual commitments constrain a firm's range of movement (Argyres & Liebeskind, 1999; Nickerson & Silverman, 2003a; Rungtusanatham & Salvador, 2008) suggests that a firm may need to alter its strategy to conform to such structural constraints. A way to further engage that debate is to compare the relative extents to which firms reduce misalignment by changing their organizational form versus by changing their competitive strategies.

Finally, there exist a range of alternative theories that generate predictions about organization forms in equilibrium. An additional avenue for future research would entail exploring the degree to which these also predict the direction and extent of organizational change.

Elaboration of Discrete Structural Alternatives

Nickerson and Zenger (2002) explore the implications associated with a firm's having a limited set of discrete structural alternatives for

organization. One logical path for future research in this vein would be to elaborate the range of alternatives that exist, and on the factors that constrain enactment of other alternatives. What really are the feasible options along, say, the centralization–decentralization continuum? Relatedly, scholars could further elaborate the various dimensions along which activities can be centralized or decentralized. In a study of the performance effects associated with different ways of organizing the R&D function in large diversified firms, Argyres and Silverman (2004) break up the continuum into R&D units that are purely controlled by corporate headquarter, those that are purely controlled by business units, and three "hybrid" variations that involve joint control by corporate headquarters and business units. They find that, at least on some dimensions of innovative performance, the hybrid forms fare less well than either pure form of R&D organization. They also note that the R&D function can be influenced through both direct authority relations (i.e., the R&D function reports directly to a business unit executive or directly to a corporate executive) and budgetary controls (i.e., the R&D function receives funding directly from the business unit or from corporate headquarters). These dimensions of organizational influence appear to interact as substitute forms of control, perhaps allowing for a greater range of feasible structural alternatives. Future studies could further identify the range of organization options and identify theoretically and/or empirically the performance implications associated with each, as well as identify the dimensions along which structures can vary. Once the viable alternatives are understood, scholars will be in a better position to predict and assess modulation among them.

A second avenue for future research on the range of discrete structural alternatives might explore the question: why are there so few (or so many) feasible alternatives? At this stage, it would be useful simply to categorize industries by the range of alternative governance forms that exist. Armed with data on the variation across industries and across time about these forms, scholars would be in a better position to explore why industry X is characterized by fewer alternatives than industry Y.

Inertia and the Interaction between Formal and Informal Organization

A final intriguing research opportunity is to further explore the extent and significance of inertia in the evolution of informal organization – specifically, the existence of a lag between changes in formal and informal structure. While the concept of inertia is found in several domains of research, very little empirical research explores the dynamics between shifts in these two structures (a recent exception is Gulati & Puranam, 2009). There is a wide spectrum of opportunity for a scholar interested in exploring these concepts.

For instance, what aspects of the informal structure respond quickly or slowly? How quickly does the informal social network reconfigure around the specified tasks of the formal structure? When does the lag between formal and informal structural change yield the best of both worlds, and when does it generate inconsistencies that harm organizational performance?

Another way forward would be to consider carefully alternate mechanisms that might plausibly explain the diminishing utility of a particular organizational form over time. There is anecdotal evidence that some organizational mechanisms such as incentive systems lose effectiveness over time as people learn to "game the system" (e.g., Rieley, 2000). One can infer similar implications from the branch of simulation-based NK-modeling research that explores subgoal pursuit when parts of an organization learn over time (Baum, 1999) or when decision makers in the middle levels of the organization are particularly fast learners (Rivkin & Siggelkow, 2003). Research that can disentangle the inertia-based propositions from the learning-to-game-the-system propositions would contribute significantly to this area of study.

Empirical Challenges

Scholars pursuing the above research avenues will face several empirical challenges. For research on the direction of change, the classic large-sample approach will require panel data sets that provide information on a range of firm characteristics that can serve as appropriate proxies for precise theoretical constructs derived from TCE or other organization economic theories. Commonly used data sets such as COMPUSTAT provide enormously detailed resources for analysis of entry and exit in industries, expenditures in key areas such as R&D and marketing, performance, and other relevant organizational factors, but are not well suited for studies of organizational change. The enterprising scholar will need to find or assemble an industry-specific data set, which typically entails a healthy combination of luck, skill, and perseverance. On the bright side, such effort can yield a unique data set that can support a productive stream of research.[6]

For research on discrete structural alternatives and on the role of informal organization, the empirical challenges are more daunting. No systematic

and expansive data set exists for tracking formal organizational structure decisions. Although some idiosyncratic databases may lend themselves to empirical exploration of some research questions relative to discrete structural alternatives (see, e.g., Argyres and Silverman's (2004) use of the Industrial Research Institute's 1994 survey of members' R&D functional structures), a more plausible route forward is to assemble data on formal structures from organization charts, the limited information available in annual reports, surveys, or field research. Further, by definition an informal organization structure will leave few fingerprints in secondary data.

In the face of these challenges, there appear to be two empirical routes forward. The first is to accumulate corporate histories of organization structures, their alteration, and the corresponding performance outcomes. Nickerson and Zenger's (2002) study of HP over a 20-year time span offers a step in that direction. Efforts in this direction will mark a return to the research methodology employed by Alfred Chandler, who tracked organizations over substantial time periods. With the proper access to corporate archives, a scholar could in principle track formal structures well back into the past, as well as observe current changes as they occur. For informal organization, field research can measure current conditions, but archival corporate records may not offer much insight into past. A scholar examining changes in informal organization will likely be committed to revisiting the same organization at intervals to measure changes in the informal structure. Recent research that uses surveys to codify social networks within organizations may offer prescriptions for conducting such research.

The second option entails finding creative ways to dust for the fingerprints of informal organization. For example, there exists finely detailed data on every patent issued in the United States, including the identity of the inventor(s) and the prior patents that the patent cites. Some scholars have conceived of coinvention with a colleague or citation of a colleague's patent as evidence of informal (or supra-formal) connections among scientists (Tzabbar, 2009; Nerkar & Paruchuri, 2005). To the extent that such patterns do indeed reflect connections among people beyond those captured in formal organization charts, one could use such data to map informal organization at one point in time and changes to that organization over time. A second promising source might be the pattern of e-mailing among employees within a firm (Kleinbaum, Stuart, & Tushman, 2008). To the extent that the e-mail patterns reflect actual communication and influence channels, rather than those implied by formal organization charts, such data can also be used to map states and levels of informal organization.

SUMMARY

In sum, TCE and other theories of organizational economics can contribute substantially to research on organizational change. We hope that this chapter inspires at least some readers to engage one of the research avenues outlined above or, better still, to pursue a research question even more ambitious than the above-described gleams in our eyes.

NOTES

1. The first three paragraphs of this chapter draw heavily on the introduction of Nickerson and Silverman (2003a).
2. Note that this could be equally true of the continuum between pure market and hierarchy.
3. Not all scholars agree with the idea of discreteness. The assumption is controversial because many organizational scholars, particularly those from psychological and social psychological perspectives, argue that organizational structure can be adjusted in nearly continuous degrees (Galbraith, 1977; Lawrence & Lorsch, 1967). Nonetheless, discreteness of formal structure is present in most modern theories of organizational design.
4. An alternate solution to the challenge of generating both exploitation and exploration might be imposition of a "hybrid" R&D structure, that includes corporate and business-unit oversight over subsets of the firm's R&D effort. However, as noted below, Argyres and Silverman (2004) find that hybrid R&D structures underperform the polar forms in several respects. This raises questions about the feasibility of generating such benefits from a hybrid R&D form, and may also be interpreted as evidence of the discrete structural nature of organization.
5. Specifically, they exploit the fact that while ownership decisions will be based on average weather patterns at an airport, the relative returns to integration over nonintegration will change with daily weather. The fact that organizational form decisions cannot respond to daily fluctuations in weather allows them to estimate whether the performance advantage of integration increases on precisely those days when the need for ex-post adaptation is likely to be the greatest. Note that while this gives them a way to measure "misalignment" on a given day, airlines are not making governance "mistakes" in their context.
6. For example, our assembly of the U.S. trucking data, which entailed the combination of two existing data sets on motor carriers, ultimately supported four articles, on efficient governance (Nickerson & Silverman, 2003b), the link between governance and performance (Silverman, Nickerson, & Freeman, 1997), organizational change (Nickerson & Silverman, 2003a), and how strategic position and performance buffer a firm against ecological pressures (Nickerson & Silverman, 1998). From our point of view, this investment in data was repaid handsomely.

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