REVIEWING, REVISITING, AND RENEWING THE FOUNDATIONS OF ORGANIZATION DESIGN

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INTRODUCTION

A long tradition of research has examined the determinants and consequences of organization design. Scholars in this field have mainly been concerned with the extent of empirical variation in organizational structures and the factors driving such variation (Chandler, 1962; Child, 1972; Donaldson, 2001). This stream of research has also charted the role that organization design plays in orchestrating a firm's overall decision making and in the organizational behavior that follows (Burton & Obel, 1984; Galbraith, 1977; Mintzberg, 1979; Puranam, 2018; Simon, 1947).

This extensive body of work draws its explanatory power from a variety of theories: behavioral theory of the firm, structural contingency theory, resource dependence, information processing, social networks, the knowledge-based view, and team theory. At the same time, organization design research is united as regards two key observations — namely, that the central problems of design are: (1) how best to divide the organization into subunits and (2) how best to integrate or coordinate those subunits in support of the firm's overall goals (Lawrence & Lorsch, 1967). This work accordingly acknowledges that there is no single template for "good organization," much of which depends on the external environment and the firm's own interdependencies (Thompson, 1967).

Although the essence of design's fundamental problems is still a touchstone in contemporary research, much is changing. Research on organization design has grown in the last decade as academics and managers have become increasingly preoccupied with the relevance of design for organizational strategy,

innovation, and performance. Underlying this growth − and, perhaps, motivating it − are advancements in both theory and empirics as well as changes in technology (e.g., big data, machine learning, and artificial intelligence) and a proliferation of alternative organizational forms (e.g., ecosystems, communities).

So even as fundamental problems retain their importance, we are seeing a shift in focus. The retrenchment of contingency theory has been offset by the increased attention given to microstructures (Puranam, 2018), which is concerned with more microlevel mechanisms and their aggregation, rather than more macro-level organizational forms. Also on the rise is a greater focus on the behavioral implications of structural arrangements (Keil et al., this volume; Keum & See, 2017; Reitzig & Maciejovsky, 2015) and to approaches that account for the multidimensional nature of design choices and their interactions (Burton, Obel, & Håkonsson, 2015). Supporting this shift in theoretical focus is a greater use of agent-based models (e.g., Baumann & Siggelkow, 2011; Christensen & Knudsen, 2010; Csaszar, 2012; Levinthal & Workiewicz, 2018), experiments (Raveendran, Puranam, & Warglien, 2015), and case-based studies of organizations (Dobrajska, Billinger, & Karim, 2015; Jacobides, 2007; Srikanth & Puranam, 2014) in addition to the more creative use of archival data to document important design phenomenon (Joseph, Klingebiel, & Wilson, 2016; Obloj & Sengul, 2012; Srikanth & Puranam, 2011).

Our goal in this volume of *Advances in Strategic Management* is to reflect these emerging trends and complement contemporary research in the field of organization design. Our call for papers sought to attract scholars interested in bringing together perspectives or mechanisms and in examining topics that might otherwise be considered too exploratory, risky, or unusual for mainstream journals. We emphasized our openness with regard to disciplines, methods, levels and units of analysis, and the examination of organization design as both an LHS and RHS variable. In short, we seek to move the science of organization design in new directions that can inform and also inspire new research in this field.

We were fortunate to have received many excellent manuscripts, of which the best are included here. From our perspective as editors, it has been a joy to work with such researchers in crafting this volume. These chapters reflect current thinking on the subject of organization design and the great diversity in scholarship exploring this important topic worldwide. While the foundational concerns remain central, we are now starting to see a change that offers a deeper understanding of the foundational problems of organization design. In particular, the research in this volume, and in the field, is now far more nuanced and sophisticated than in earlier research.

More specifically, the chapters in this volume reflect a renewed focus on the subject of *integration* and, by extension, *differentiation*. Unlike earlier work, which focused primarily on integration via hierarchical supervision, this new stream of research considers integration from a variety of theoretical perspectives; it addresses multiple integration mechanisms simultaneously (e.g., both formal and informal, both top-down and bottom-up) as well as their overall fit. These chapters also give greater attention to certain types of integration − such as culture and process − that have previously been less studied and to the implications of

those mechanisms for coordination, innovation, and performance. The studies published here employ a wide variety of theories and research designs.

In what follows, we briefly *review* the evolution of organization design research. We then *revisit* the key themes in organization design and use text analysis to uncover changes in the design-related themes that typify management research over the last half century. Next, we consider what might have driven these changes. We posit that research has shifted because of changing near decomposability of organizations, rising importance of alternative units of analysis, and a corresponding greater interest in dynamics as embodied by adaptation and learning. Finally, we discuss the chapters and show how they contribute to this volume's theme and the *renewal* of organization design research.

REVIEWING THE FOUNDATIONS

Motivated by an interest in the phenomenon, efficiency, and effectiveness of organizations, more than a century of research has been dedicated to understanding the foundations of organization design. Early work by Taylor (1911), Weber (1978), and Barnard (1938) helped to establish task design and formal organizational structure as important domains of inquiry and to articulate, for the scholars who followed, the fundamental problems that their research agendas should address. These pioneers, through their rich documentation and detailed understanding of organizations, identified the domain's central concerns.

Many of these researchers were especially interested in formal hierarchy. For instance, Weber's (1978) classic study charts the characteristics of a bureaucratic enterprise and thereby highlights the features of specialization and coordination through hierarchical authority and formal rules. Barnard's (1938) concern was that of a practitioner − in other words, the *management* of organizations − and so he devoted considerable effort to examining formal hierarchies and ways to motivate cooperation. For Simon (1947), the role of hierarchy was to enable vertical specialization and to establish decision premises for decision-making units at lower levels in the organization. Chandler (1962) detailed the division between line and staff functions and, in particular, between managers of operating units and executives in the corporate office. For Chandler, the corporate hierarchy's role was to increase the decision-making capacity of executives in a multibusiness firm.

During this same period, sociologists began contrasting the formal hierarchy with the informal organization and mechanisms of coordination. Blau (1955), Gouldner (1954), Selznick (1949), and Burns and Stalker (1961), among others, recognized organizations as cooperative, social, and political systems that adapted as they interacted with their environment. These authors depicted organizations not only as formal hierarchical structures but also as being characterized by organic structures, informal interactions, and horizontal (in addition to vertical) coordination activities.

Laying the foundations for a contingency theory of organizations, Lawrence and Lorsch (1967) and Thompson (1967) brought attention to the idea that the most effective structure would vary with the organization's circumstances. These

authors were the first to conceive of the structure as reflecting two key design features: differentiation and integration. Lawrence and Lorsch (1967) defined *differentiation* as the "state of segmentation of the organizational system into subsystems, each of which tends to develop particular attributes in relation to the requirements posed by its relevant external environment" (p. 4), and *integration* was defined as the "quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment" (1967, p. 11). Lawrence and Lorsch concluded that firms operating in complex environments were more likely to have a more differentiated structure and to devote more resources to coordination; those operating in simpler environments were apt to be less differentiated and, in general, more integrated.

Contingency theory provided the conceptual scaffolding for an influential stream of strategy research. Thus, the emphasis pivoted away from formal hierarchies (and from hierarchical authority) as the central feature of organization design. Instead, scholars focused on design configurations that supported information processing (Galbraith, 1974; Tushman & Nadler, 1978) and achieving fit through both mutually reinforcing internal activities and also by the matching of an organization's structural characteristics to its environment, technology, and size (Drazin & Van de Ven, 1985; Mintzberg, 1979).

Despite the reduced prominence of contingency theory during the 1980s and 1990s, interest in an organization's *fit* became more prominent and sophisticated (Burton & Obel, 2004; Siggelkow, 2001). Organizational and strategy scholars sought to model more complex organizations, and new agent-based computer modeling techniques led to a new field of research that could account for multiple design choices simultaneously (Siggelkow, 2011). With these new tools, it was possible to undertake systematic explorations of the trade-offs and performance implications of a greater number and variety of designs. Organizational scholars enthusiastically adopted these methods, which led to a resurgence in work on the design aspects of strategy and organization theory.

Among the most notable of these efforts were those using simulations to articulate sets of high-performing design choices as well as their underlying mechanisms and boundary conditions (Burton & Obel, 1980a,1980b; Levinthal & Workiewicz, 2018; Siggelkow & Levinthal, 2003, 2005; Siggelkow & Rivkin, 2006). Several of these studies adopted an information-processing perspective (Christensen & Knudsen, 2010; Csaszar, 2012), and dealt explicitly with cognitive limitations and the imperfect representations embedded in various structures (Csaszar & Levinthal, 2016; Ethiraj & Levinthal, 2009; Fang, Lee, & Schilling, 2010; Siggelkow, 2002). Some research dealt directly with differentiation and integration (Carroll & Burton, 2000; Menz, Kunisch & Collis (2015)) and their interrelationship (Kretschmer & Puranam, 2008), whereas other authors focused on how design choices affect the processes of organizational adaptation (Baumann & Siggelkow, 2011).

Concurrently with these developments, a group of empirical researchers began using advanced archival methods to break new ground in the study of integration. Examples include work on the integrative features of common goals, plans, or expectations (Gulati, Puranam, & Tushman, 2012;

Ketokivi & Castaner, 2004) and of resources (Karim, 2012) in addition to research aimed at revisiting well-established integration mechanisms such as hierarchy (Jacobides, 2007). Other scholars focused on such bottom-up mechanisms as communication channels (Joseph & Ocasio, 2012), executive mobility (Karim & Williams, 2012), and social networks (Kleinbaum & Tushman, 2007; McEvily, Soda, & Tortoriello, 2014).

The field of design, then, is experiencing a renaissance. New work at the intersection of strategy, organization theory, and organization design has been especially remarkable. The combination of theoretical advances and sophisticated modeling techniques has yielded breakthrough findings on complex adaptive systems (see e.g., Baumann, 2015). Notwithstanding the continued centrality of organization design's foundational problems, researchers are striving to uncover the microfoundations (Puranam, 2018) and behavioral roots of structure's effect on organizational decision making (Joseph & Gaba, 2018).

REVISITING THE FOUNDATIONS

To complement our historical overview and provide a more systematic analysis of the foundations of organization design, we used text analysis to examine the themes instantiated by organization design research published in leading management journals. Given the large number of abstracts − which were our data source − and the need to identify the themes addressed by each one, our analysis relied on probabilistic topic modeling (Blei, 2012). *Topic models* are algorithms that analyze the words in a set of documents toward the end of identifying the topics or themes that run through them. Such models analyze the co-occurrences of words in a document (and so rely on more than word counts). Each topic is represented as a combination of words that co-occur across a collection of documents, so the source of variation in topics or themes is these different combinations; thus, the meaning of a given word may differ depending on the other words with which it occurs.

To conduct the analysis, we first developed a vocabulary list of 96 words related to organization design − including hierarchy, interdependence, differentiation, and integration − as culled from key texts in the field (e.g., Burton et al., 2015; Galbraith, 1974; Puranam, 2018). We then collected all abstracts from *Academy of Management Journal*, *Academy of Management Review*, *Administrative Science Quarterly*, *Journal of Organization Design*, *Organization Science*, and *Strategic Management Journal* (for this purpose we used Python to "scrape" the journals' respective websites). Abstracts were collected beginning with the first issue of each journal, starting with the 1958 edition of the *Academy of Management Journal*. This process yielded 2,273 abstracts published from 1958 through 2018. After cleaning and then eliminating unrelated chapters, we were left with a sample of 1,495 abstracts.

We followed standard text analysis procedures when preparing our raw corpus for analysis (see cf. Croidieu & Kim, 2018; Grün & Hornik, 2011). Across abstracts, we grouped all common words by truncating them to their respective roots. We omitted non-meaningful words and also words that would probably

not be assigned to topics; examples include the so-called stop words (e.g., "the") and low-frequency words (i.e., those appearing fewer than three times in our corpus).

We adopted a topic modeling approach based on the Bayesian technique of latent Dirichlet allocation (LDA). In LDA, the goal is to calculate the conditional distribution of the topic structure given the observed documents (here, journal abstracts). Formally, that distribution is written as $P(\beta_{1:K}, \theta_{1:D}, z_{1:D} \mid w_{1:D})$; here β is a distribution over the vocabulary words, θ is the topic proportion over documents, z is the topic assignment over the words, and w represents words observed in the document. The terms K, α, and β are parameters of the topic model; K is the number of topics, α is a *topic*-smoothing parameter (which affects the shape of the Dirichlet distribution), and β is a *term*-smoothing parameter. A smaller value of α indicates that the documents are more likely to consist of only a few topics, and a smaller value of β indicates that the topics are more likely to consist of only a few words. Following prior work and based on the size of our corpus, we generate results using parameter estimates of 10, 0.01, and 0.01 for (respectively) K, α, and β.

Results of the Topic Modeling

The topic frequencies and distribution of topics over the period of study are plotted in Fig. 1. This figure reveals that, across periods, *contingency* (topic 1) was the most frequent, followed by *resource dependence/stakeholders* (topic 2) and *fit* (topic 3). There was a fairly even balance of topics in the early years. Though all the numbers are small in the 1960s, *job/task design* (topic 5) received the most attention. Thereafter, *contingency* predominated and remained the most popular topic across all periods. *Resource dependence/stakeholders* was the second most frequent topic for many years, although its frequency declined after 2010. The topic of *fit* was the third most popular, and it has received even greater attention since 2010.

We then compared the frequency of topics in the period before 2001 with their frequency after 2000 to gain a clearer understanding of the focus of more recent research; see Fig. 2 for an illustration of the percentage change in topic frequency. With respect to the two periods considered, topics experiencing the greatest growth were *alliances* (topic 7), *interdependence/communication* (topic 8), and *integration* (topic 10). The greatest increase (86.7% since 2000) was for the topic of *integration*.

Sources of Change in Organization Design

There are a variety of environmental factors driving the resurgent interest in the concept of integration, but three of these factors may be (at least partially) endogenous: (1) decreasing decomposability of formal organizations, (2) increasing relevance of alternative units of analysis, and (3) increasing difficulty of organizational adaptation and learning. It follows that the coordination requirements have increased for organizations, which require that we broaden our
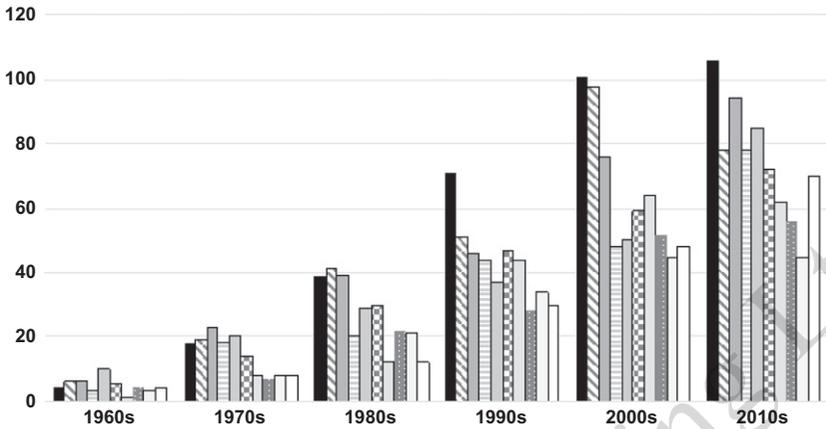
Topic #	Topic
1	Contingency/technology/ diversification
2	Resource dependence/ stakeholders
3	Fit
4	Methods
5	Job/task design
6	Innovation
7	Alliances/collaboration
8	Interdependence/ communication
9	Executives
10	Integration

Fig. 1. Frequencies of Organization Design Topics in Management Journals, 1960−2018.

understanding of integration, consider multiple forms of integration, and examine the causal relationship between differentiation/integration and a greater variety of outcomes. In this endeavor, we must also elaborate a theory to account for the various integration mechanisms that inform the development and application of novel theories, methods, and approaches.

Decreasing Decomposability of Organizations

According to Simon (1962), complex systems consist of many parts that interact in a non-simple way. These hierarchical systems are nearly decomposable in the sense that there are more interactions within than between subsystems. Simon recognized that the primary benefit of such systems is their capacity to adapt. That is, decomposability prevents perturbations in one part of the organization
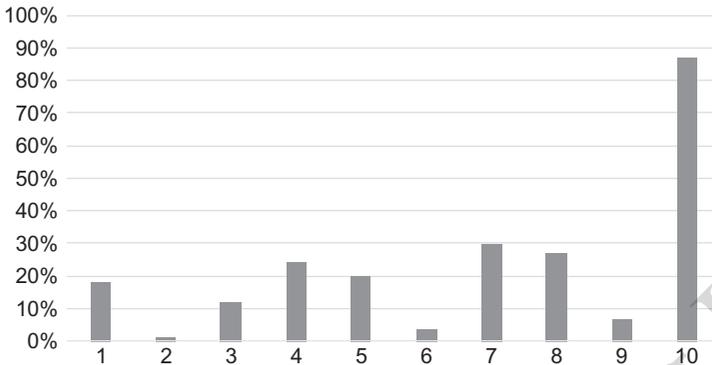
Fig. 2. Percentage Growth in Articles, by Topic, Since 2000. *Note*: See the Key to Fig. 1 for topic names.

from affecting the rest of the organization. Themes related to decomposability appear in studies of modularity and innovation (Baldwin & Clark, 2000; Sanchez & Mahoney, 1996), strategy making (Brusoni, Marengo, Principe, & Valente, 2007; Gavetti, Levinthal, & Rivkin, 2005), and the performance of multidivisional firms (Burton & Obel, 1980a,1980b).

However, the phenomenon of near decomposability may be waning. The "empty world hypothesis," whereby most entities are only weakly connected with most other entities, may be less true today than during the period when many theories of design were proposed. A rise in the use of functional, matrix, and flat organizational structures reflects greater interdependencies inside the firm and has accordingly increased the necessity of coordination. An illustrative example is that scholars chronicling nonhierarchical formal organizations, or *holocracies* − firms that have no formal hierarchy, no job titles, and no job descriptions (Puranam & Håkonsson, 2015) − have noted that "alternative modes of coordination, based on mutual adjustment, are emerging in place of the traditional top-down mode" (Birkinshaw, 2015, p. 8). At the same time, we are witnessing multi-divisional bellwethers (e.g., General Electric) being challenged by activist share-holders for failures related to, inter alia, their organizational structure.[1]

As reflected in greater interdependencies within organizations, decreasing decomposability leads to increased reliance on ways of integrating agents and activities within the firm. Organization designs intended to accommodate this trend are themselves composed of multiple elements that interact with one another in complex ways (Siggelkow, 2001). These developments require changes in how we understand information processing, firm capabilities, and resource-based advantages. Compounding this complexity is the multi-dimensionality of individual design elements. For instance, a hierarchy serves as a structure not only for authority but also for tasks. Interdependence may involve tasks, agents, or both (Puranam, Raveendran, & Knudsen, 2012). The mechanisms of information processing involve screening (Csaszar, 2012),

knowledge sharing (Foss, Lyngsie, & Zahra, 2013), and attention (Joseph & Wilson, 2018).

Greater interdependence can pose a series of managerial problems as well. First of all, integration may become more difficult. Managers might simply be unable to comprehend fully the firm's own set of integrative activities and how they interact. This shortcoming may obfuscate the true source of a firm's advantage and thus render intractable the task of linking differentiation, integration, and desired behaviors and activities (Rivkin, 2000). In the second place, increased interdependence requires that managers balance the resulting interrelationships among integration, specialized knowledge, and attention; it also heightens the potential for conflict within the organization. Goals, interests, and preferences may clash more often, tensions may increase, and conflict resolution may require more than a single structural adjustment.

Increasing Relevance of Alternative Units of Analysis

The notions of ecosystems, platforms, communities, and crowds have all become more popular among practitioners. Each concept represents, in part, an alternative organizational form that brings together multiple actors who are attending to individual and collective goals while contributing to value creation (Adner & Kapoor, 2010; Faraj, Jarvenpaa, & Majchrzak, 2011; Puranam, Alexy, & Reitzig, 2014; Sproull & Arriaga, 2007). These alternatives have grown as areas of scientific inquiry despite the absence of a common set of concepts, mechanisms, or methodological practices for understanding how they relate to the key concerns of organization design (Kapoor, 2018).

In many cases, these organizational forms are "new," by which we mean that they address core design concerns by translating − in a novel way − individual efforts into collective action. As a group, however, these organizational forms are also distinct from the traditional bureaucratic hierarchy. Rather than being characterized by vertical integration and sequential interdependence, they feature "pooled" interdependence (Casteñer and Ketokivi, this volume), "epistemic" interdependence (Puranam et al., 2012), horizontal collaboration (Foss, Frederiksen, & Rullani, 2016), and the hyper-specialization of agents. It is worth noting that ecosystems harken back to the notion of Gulati et al. (2012) that meta-organizations comprising networks of firms or individuals are not bound by authority based on employment relationships but are instead characterized, in part, by a systems-level goal. For organization design scholars, this shift indicates the increased importance of a supra-organizational unit of analysis. As Baldwin (2012, p. 20) argued:

> But individual corporations are no longer adequate to serve as the primary unit of analysis. Over the years, systems of distributed innovation − so-called business ecosystems − have become increasingly prevalent in many industries (Adner & Kapoor, 2010; Von Hippel, 1988; Iansiti & Levien, 2004). Ecosystems generally encompass numerous corporations, individuals, and communities that might be individually autonomous but [are] related through their connection with an underlying, evolving technical system. In the future, I believe the key problem for organization design will be the management of distributed innovation in such dynamic ecosystems.

These concepts are important for strategy scholars because they challenge fundamental perspectives in the field with regard to large vertical hierarchies, contracts, and decisions about organizational boundaries. The challenge is compounded by ecosystems, which transcend the traditionally dyadic interactions between suppliers and buyers, upstream and downstream relationships, and alliance partners (Kapoor, 2018). Different units of analysis may also suggest new dimensions of firm heterogeneity, which will impel researchers to approach strategy with different theoretical and analytical tools.

Finally, novel concepts − and the lens through which the consequent forms and activities are viewed − may also constitute new cognitive "frames" that can help managers identify new opportunities for value creation (Boynton & Ocasio, 2018; Tripsas & Gavetti, 2000). These concepts and their associated attributes provide managers and researchers alike with a means for making sense of organizational composition, redefining competition, and ultimately guiding strategic action (Sengul, this volume). For many leading-edge firms (e.g., Google, Amazon, Tencent, and Alibaba), the basis for competitive interactions is no longer conventional product markets, SIC codes, or "strategic groups" but rather the business models they employ and the ecosystems in which they are embedded.

Increasing Difficulty of Organizational Adaptation, Learning, and Problem Solving

The trends of firms' decreasing decomposability and the increasing prominence of meta-organizations make it more important than ever to incorporate dynamics into design-related theories and empirics. Issues related to search and learning are crucial for the evolution of complex systems (Baumann & Siggelkow, 2011) and hence for understanding the fundamental questions of design. Managers may adapt by adjusting the levels of differentiation and/or integration within their organizations; they may alter the roles of specialized actors or divisions and might also modify the many ways of coordinating activities and promoting cooperation. In light of the two trends just described, however, enacting such changes will likely require a different perspective from which to view adaptation. The reasons are that (1) mutual adjustments made by interdependent actors may actually be detrimental to the organization and (2) cognition that is distributed and "situated" may well lead to a proliferation of emergent structures and strategies.

Tightly coupled systems usually require simultaneous learning by several interacting actors, which may prove to be difficult in a noisy environment (Lounamaa & March, 1987). Successful adaptation depends on favorable properties of mutual adjustment (Mintzberg, 1979), as when one actor can accurately predict the actions of another (Puranam et al., 2012). That is, actors must make mutual adjustments in their own tasks and must also coordinate with each other through informal communication or routinized expectations. Yet adjustments made by one actor who seeks adaptation to changing environmental conditions may have deleterious effects on other actors who are simultaneously making

their own adjustments. Hence it may be difficult to identify the optimal combination of design choices that will achieve desired outcomes. So even though researchers have found that increasing coordination between agents helps in such instances by reducing mutual confusion, they have also found that increasing coordination can lead to a "joint myopia" that limits search options and outcomes (Knudsen & Srikanth, 2014). This tension underscores the complexity of adaptation under mutual adjustment as well as the need to model multiple design choices simultaneously and to assess their impact over time.

That said, meta-organizational trends point to decision making of a more distributed nature (i.e., *across* ecosystems, platforms, or communities). Distributed decision making implies that an organization's decisions will be less subject to clearly articulated (collective) goals that could guide problem solving and the search for solutions. As a result, decisions are likely to be shaped both by the local choice opportunities that arise and by those attention structures guiding individual actors within the overall meta-organization. Thus the problems, solutions, and choices to which participants ultimately devote their time will reflect the situated attention of actors within the system. To the extent that issues and initiatives are matched within communication channels, such attention patterns will lead to more evolutionary shifts in search and strategies (Ocasio & Joseph, 2005).

All the trends that we have identified emphasize the idea that organizational structures are a function not only of organization designers' deliberate planning efforts but also of responses that emerge from interdependent, distributed, and situated decision making. That organizations reflect planned design has long been an underlying assumption of the field. However, organizations are only *partly* designed (Ron Nicol, interview); it is more accurate to say that they *emerge* as the result of incremental assemblages that arise from both planning and the pursuit of new opportunities (Penrose, 1959), from problem solving (Cyert & March, 1963), from acquisitions (Zollo & Singh, 2004), from directed attention (Joseph & Wilson, 2018), and/or from obtaining and allocating resources (Burgelman, 1991). Although deliberate reorganizations do occur (Karim, 2006), alternative organizational forms can be viewed as reflecting an evolutionary process: the outcome of cognitively limited designers (Ethiraj & Levinthal, 2004), competitive pressures, novel technologies, and organization members with shifting priorities, preferences, and expectations. Thus distributed and situated interactions most often lead to emergent, rather than planned, organizational structures. That both planned and emergent structures may be equally important, and the adaptive challenge for organizational designers is growing.

RENEWING THE FOUNDATIONS

The three sources of change detailed in the previous section suggest new opportunities for research on organization design, many of which are explored in this volume. More specifically, they call for a greater understanding of how multiple integration mechanisms fit together, the configuration of those mechanisms, and implications for coordination and control of the firm. Included in this agenda

are both formal and informal mechanisms of integration as well as both top-down and bottom-up drivers of integration.

We remark also that the resulting changes have implications for the literature on how structure affects competition and performance. Research should therefore aim to articulate more clearly the relationship between structure and strategy. In other words, we must uncover the origins of design differences between firms and do a better job of linking design heterogeneity to performance heterogeneity. Moreover, the preceding discussion highlights the gaps in our knowledge of how internal structure shapes the internal competitive environment and manifests as competitive interactions.

Finally, these ascendent trends have implications for alternative organizational forms and the need for a more complete picture of adaptation. We should like in particular more insight into such mechanisms as aggregation patterns, feedback, attention structures, and learning opportunities as well as into exactly how they support problem solving, search, and organizational learning. The chapters in this volume address these issues and should help us renew the foundational concerns of organization design.

Fit and Coordination

Several papers bring together different approaches to integration to form a coherent theory of organization design. Özgecan Koçak and Phanish Puranam (in "Designing a Culture of Collaboration: When Changing Beliefs Is (Not) Enough") explore the fit between a task environment (as represented by its underlying interdependence structure) and different methods of achieving integration by the design of organization cultures. They define *cultures* as the means by which agent beliefs are modified − in this instance, so that the organization can achieve desired collaborative outcomes − and consider three different ways to design such a culture: (1) a top-down process of imposing values and beliefs, (2) a bottom-up of interaction among organization members, and (3) a selection-driven process that admits only those members who hold compatible views. These authors use a game-theoretic approach to model not only common interdependence structures but also members' initial beliefs about payoffs from collaborative (and noncollaborative) actions that are reinforced by learning from feedback; they then assess whether these different approaches to designing cultures can yield collaboration.

Kocak and Puranam find that top-down approaches are inherently limited in situations involving conflicts of interest and may therefore need to be buttressed by other approaches. Their chapter is one of the first to show how different ways of achieving collaboration by influencing cultures (or agent beliefs) may be appropriate for different kinds of organizations − in other words, for different types of collaboration problems as characterized by unique interdependence structures. This approach raises the question of where designers' efforts are best invested: in changing the culture (i.e., shaping beliefs) or in changing the context of belief formation (i.e., shaping the nature of interdependence) in a given collaboration problem.

Xavier Castañer and Mikko Ketokivi (in "Toward a Theory of Organizational Integration") make the strong claim that the current approach to organizational integration as a topic of study is incomplete and has led to faulty understanding and misguided prescriptions. In order to derive a more holistic perspective, they examine the entire array of available integration tools without the constraints of adopting any one theoretical perspective. These authors derive propositions regarding how different configurations of mechanisms can be used for different kinds of integration challenges, and they arrive at the counterintuitive conclusion that pooled interdependence can at times be more challenging to coordinate than is sequential or even reciprocal interdependence — especially when it comes to maintaining organizational integrity (Selznick, 1957).

An interesting aspect of this study is its melding of the three principles of integration — which involve tasks, beliefs, and identities — and its prescription for when these principles should be used in conjunction. Hence, this work addresses a long-standing issue: whether knowledge of how designers can achieve fit, coordination, and control amounts to understanding how designs (structures) can shape agents' emergent behaviors toward desirable outcomes. Of special interest are the following three questions (cf. Schein, 2004). Can (or should) organizations design cultures in a top-down fashion? Should the organization facilitate the emergence of a culture via interaction and learning among members? How does the combination of members' interactions and learning shape coordination and control within organizations?

Configuration and Control

The broad theme of this section is addressed by Laura B. Cardinal, Sim B. Sitkin, Chris P. Long, and C. Chet Miller (in "The Genesis of Control Configurations during Organizational Founding"), who investigate how configurations of control mechanisms are designed. *Control systems* are the means by which managers seek to align agents' activities, beliefs, and knowledge in support of the organization's goals (Cyert & March, 1963). In their comprehensive review of the control systems literature, these authors argue that control research has failed to keep up with the dramatic changes in organizations. They also claim (as we have discussed vis-à-vis organizational integration more generally) that studies on control systems most often examine the influence of individual elements and seldom seek to understand overall effects of the "configuration" of control systems that a firm puts in place.

Using a decade-long case study of an organization since its founding, Cardinal et al. aim to extend our understanding of organizational control design by considering how discrete control elements are combined to form distinct configurations of organizational control systems. An advantage of studying a new organization is that one can see how new control elements are adopted *before* they become part of a prevailing pattern. The specific control elements studied include both formal and informal control on each component of employee control. Two key insights derived from this study are: (1) that configurations of control mechanisms are effective for only a limited period of time, after which they

must be abandoned in favor of other configurations and (2) that different configurations are more effective at different stages of the organization's development. To explain how control configurations are designed, this research also blends two aspects of control research: control elements and "ideal types."

Besides the issues of coordination and control, or *internal* fit, organization design as a field also concerns *external* fit: the relationship between an organization and its environment. Of considerable interest is how best to design organizations so that profitability improves while also enabling future growth and survival − a topic of special importance in turbulent environments. Scholarly work on these enduring challenges of current efficiency and future adaptability has increased markedly since March's (1991) article on the exploration−exploitation trade-off and in response to Tushman and O'Reilly's (1996) article on how organizations achieve ambidexterity.

There is now a wide research stream addressing the different mechanisms that an organization can use to further its ambidexterity as well as how these mechanisms may differ depending on, for example, the organization's size and the type of environmental shocks to which it is subject (for reviews, see Junni, Sarala, Taras, & Tarba, 2013; O'Reilly & Tushman, 2013). For instance, O'Reilly and Tushman suggest that structural (resp. temporal) ambidexterity is more suitable for larger (resp. smaller) firms. They also suggest that *contextual* ambidexterity is probably more suitable for a firm subject to relatively incremental changes in its environment, whereas *structural* ambidexterity is more likely to benefit a firm facing environmental shocks of a more radical nature. These ideas have yet to be tested empirically, and the mechanisms that could support their claims have not been fleshed out.

It is in this context − and building on foundations similar to those in the Cardinal et al. chapter − that Karl Aschenbrücker and Tobias Kretschmer (in "Balanced Control as an Enabler of Organizational Ambidexterity") suggest another means of achieving ambidexterity: *balanced control*. Such control is achieved by allowing decentralized decision making in combination with formalized processes, thus directing attention, goals, and resources in a manner that yields the "tight−loose" mode of decision making that simultaneously facilitates execution and flexibility. Empirical testing in the context of mid-sized German manufacturing firms suggests that a balanced control design for achieving ambidexterity is more suitable for smaller than for larger organizations. An intriguing contribution of this chapter is showing how the design of control mechanisms, rather than activities by themselves, can allow for achieving organizational ambidexterity.

Division of Labor and Organizational Learning

The relation between design and learning merits (as mentioned previously) concerted study, and two of the chapters in this volume focus on that topic. These studies address different aspects of *specialization*, which drives both differentiation and the requirements for integration. In particular, they articulate the relationship between the division of labor and organizational learning − more specifically, problem-solving behavior. The authors also explore various aspects

of the division of labor: Keil et al. consider how "role structure" affects the psychological processes underlying responses to negative feedback, and Yi et al. study the knowledge specialization associated with "task structure."

Thomas Keil, Pasi Kuusela, and Nils Stieglitz (in "Exploration and Negative Feedback – Behavioral Learning, Escalation of Commitment, and Organizational Design") examine the effect of organizational roles on behavioral learning and responses to negative performance feedback. This chapter reconciles contrasting perspectives in the literature, which suggest that firms tend to (respectively) terminate or escalate their commitment to failing innovation projects, and suggests that the design feature of organizational roles may explain those contrasting results.

These authors argue that organizational roles are critical determinants of how decision makers learn from and also respond to feedback. Such roles are important because they reflect and promote specialization and individual goals as well as the corresponding search processes. Roles that emphasize responsibility for *individual* projects will likely strengthen both self-justification and loss avoidance mechanisms, thereby increasing the odds that managers will maintain or even escalate their commitment to failing projects. In contrast, a manager who is responsible for a *portfolio* of projects is less committed to any one project and so will more readily terminate those that are failing. Keil et al. also consider the contingent effects of aspiration levels, goal ambiguity, time horizons, and contracts.

Sangyoon Yi, Nils Stieglitz, and Thorbjørn Knudsen (in "Differentiation and Integration in Organizational Learning: A Garbage Can Model") examine how task allocation structures – namely, project participation and the matching of knowledge to projects – influence organizational learning. Thus they examine how structural differentiation and the integration of joint activities shape the distribution of learning opportunities in problem solving.

Much like Keil et al., these authors are especially interested in the internal division of labor (and, by extension, integration) and its effect on learning. Yi et al. draw on the Garbage Can Model to examine how an organization's structure determines who deals with what problems and thus shapes not only those members' learning opportunities but also subsequent knowledge accumulation and application. These authors argue that restrictions on project participation (i.e., specialization) create, among organization members, diversity and also overlap in their knowledge and the scope of their tasks. In this way, some individuals develop broader knowledge and solve a wider range of problems whereas others become relatively more focused on certain areas. Of particular importance is that Yi et al. identify *problem allocation* as a potent and dual-pronged force: specialized members help the organization (including its generalists) adapt its members' knowledge while dealing efficiently with the problems it faces.

Structure and Strategy

The challenge of understanding how *variation* in structure affects strategy is the subject of two contributions. Structure, or organization design, has traditionally been viewed as an enabler of strategy. Yet Chandler's famous dictum – structure

follows strategy − is only half the story. Metin Sengul (in "Organization Design and Competitive Strategy: An Application to the Case of Divisionalization") and Florian Englmaier, Nicolai J. Foss, Thorbjørn Knudsen, and Tobias Kretschmer (in "Organization Design and Firm Heterogeneity: Toward an Integrated Research Agenda for Strategy") posit that, at least in part, structure determines strategy. This proposition constitutes the other half of the relationship between strategy and structure (Hall & Saias, 1980).

The importance of structure as a determinant of strategy brings a different perspective on how strategy is developed and how it can be realized. The authors argue that it opens up a new area of research in strategy, one in which the independent variable is structure or organization design while the dependent variable is strategy: competitive strategy in the Sengul chapter and heterogeneity of successful strategy in the Englmaier et al. chapter. Hence, their approach turns the "structure follows strategy" dictum on its head − though this implies not that the traditional approach is incorrect but rather that it covers only half of the relationship.

In the traditional strategy−structure−performance paradigm, strategy is defined as "what to do" and also as "what *not* to do." So while *strategy* amounts to selecting − from myriad alternatives − what the firm should do, *structure* encompasses how best to enable and follow through on a chosen strategy. Finally, *performance* reflects how well the strategy is actually realized. Thus the starting point is choosing a strategy, after which one designs a structure to accomplish that strategy toward the end of obtaining good performance. In contrast, the view presented in these two chapters is that structure determines what the firm can do well (and not so well). Hence a firm that chooses a structure has also chosen a strategy it can implement (i.e., from all the strategies at its disposal). In short, structure determines strategy. Sengul develops the structure for a competitive strategy; Englmaier et al. outline the heterogeneity of structures.

In studying how organization design is related to competitive strategy, Sengul develops an external focus of organization design − in contrast to the traditional focus (of Chandler, Williamson, and others) of design as an internal mechanism for improving efficiency. Thus Sengul treats organization design as a "commitment device" for positioning the firm in a competitive landscape, an approach that also affects the actions of rivals in that landscape. Here the choice of organization design is seen in a new light: as a competitive choice. Rather than a singular design dedicated to efficiency, the firm now chooses heterogeneous designs in response to its competition. This shift makes choosing an organization design a choice of competitive strategy.

Sengul then analyzes the M-form organization by using the internal competition among a firm's divisions to illustrate how design affects both innovation and external competition. With this framing of the goal and effect of organization design for competitive advantage, the optimal choice of an organization design and its performance is externally focused for competitive advantage rather than internally focused and a function of efficiency. Strategy following structure in this way has the effect of broadening the scope of interesting research questions.

Englmaier et al. propose a framework for organization design thinking that emphasizes performance heterogeneity among firm characteristics in a strategy field. Although structure determines *how* tasks are accomplished, it also affects *what* should be done (i.e., the choice of activities) − and done well to obtain good performance. That is, a successful strategy depends on the structure afforded by organization design, especially when firms are heterogeneous with regard to their human capital, relational contracts, and practices. There is a good reason for this dependence, as organization design can be an element in persistent performance differences among firms. This hypothesis generates a wide variety of research questions that focus on organization design in strategy. An additional contribution of the Englmaier et al. chapter is to propose an agenda for this research.

These chapters present a novel view of the relation between structure and strategy, whereby the traditional strategy−structure−performance paradigm is modified to become a structure−strategy−performance paradigm. However, this change involves more than simply transposing the independent and dependent variables; in particular, it leads to a substantially different understanding of the role played by organization design in strategy. Whereas structure was once seen as a device that enables efficient implementation of a chosen strategy, structure is now viewed as a factor that drives not only how things are done but also what things are done − and done well if the goal is to secure a competitive advantage. No longer devoted solely to internal efficiency, structure is presented as an external mechanism whose variations drive performance under different circumstances. Thus structure, and more generally, organization design, is an open and ambitious agenda to broaden and enrich strategic options.

New Organizational Forms and Problem Solving

The chapters in this category are concerned with novel organizational forms, or ways of organizing individuals for collective action, and with how they can contribute to solving both new and "traditional" problems. Felipe A. Csaszar (in "Limits to the Wisdom of the Crowd in Idea Selection") uses a formal model to study how crowds (i.e., large collectives of independent individuals) can be leveraged to select alternatives, such as ideas or projects, via majority voting − that is, in lieu of top management or some committee making those decisions. Because it substitutes a large number of nonexperts for a smaller number of experts in the problem domain at hand, the crowd clearly represents a new organizational form with its own design challenges. More specifically, this chapter focuses on the key design variable of crowd *size*. Csaszar employs a formal model to show that larger crowds are not always more accurate and that near-optimal performance can often be obtained using much smaller crowds. That said, large crowds are more attractive to the extent that (1) a firm has difficulty recruiting the most accurate individuals into the crowd and (2) the population of potential crowd members consists of relatively inaccurate individuals.

This chapter addresses a crucial aspect of problem-solving search: the evaluation of possible solutions to the presenting problem. Because search is an inherently uncertain process, organizations run the risk of accepting inferior solutions

and/or rejecting superior ones. It follows that an important question is: How should the evaluation process be organized so as to minimize both types of wrong decision? Csaszar's study leverages a novel organizational form in which independent assessments of solution quality are aggregated through majority voting. A key contribution of this research is documenting how relatively small crowds can yield performance that is nearly optimal.

Børge Obel, Dorthe Døjbak Håkonsson, Charles C. Snow, and Lars Bach (in "Forming a Collaborative Community: An Agent-based Simulation Study of the Effects of Membership Composition") address the topic of collaborative communities, an organizational form that has gained importance in contexts such as crowdsourcing. In these contexts, solution seekers pose problems to a community whose members can self-select into solving those problems. This chapter studies how member composition affects the dynamics of a community at the outset of its life and, ultimately, the community's survival. The authors find that, owing to an initial "purging" process by which solution seekers and providers may be induced to leave the community, effective communities are eventually characterized by a large gap between skill levels of community members and skill requirements of challenge providers.

In examining the role of community composition, the study by Obel et al. addresses a central aspect of finding solutions: the *matching* process between problem providers and problem solvers − and how to ensure the sustainability of that process through ongoing recruitment into both roles. Whereas traditional organizations usually allocate problems to agents by hierarchical means, novel organizational forms such as crowdsourcing platforms allow for self-selection into both roles: that dynamic facilitates scaling of the process.

Riitta Katila, Raymond E. Levitt, and Dana Sheffer (in "Systemic Innovation of Complex One-off Products: The Case of Green Buildings") study how systemic innovations, or novel components that require adjusting other components and/or the overall product architecture, are integrated in the construction of complex "green" buildings. Such buildings are one-off products developed by a distributed network of highly specialized teams yet without a well-resourced systems integrator. In other words, a newly assembled organization is faced with a novel problem for which it is poorly equipped: integrating a systemic innovation. The authors use a data set of 112 energy-efficient US buildings to demonstrate how project integration − whereby one firm designs and installs a component, or designs and/or installs multiple components − can mitigate some of the challenges encountered and thus enable an innovation to be integrated successfully.

This chapter addresses the critical juncture of developing solutions, since the project firms face the challenge of designing (and then installing) complex components for a large building. In such projects, it is typical for one firm to act as the systems integrator: assuming responsibility for the overall architecture, coordinating the different specialists' inputs, and ensuring that everything fits together. In this sense, the solution described by Levitt et al. can be seen as a novel organizational form because the task allocation process − which they refer to as "project integration" − does seem to achieve the effective integration of

efforts even when *none* of the firms in the network serves as a systems integrator.

CONCLUSIONS

Our review of the organization design literature traced the history and emphasis of research in this field. We asserted — in accord with foundational work — that the fundamental concerns of organization design reflect choices about the division of labor and about grouping and linking structures that promote the integration of effort. However, the literature's initial focus on bureaucratic structure and hierarchical authority in formal organizations has given way to a plethora of theories, perspectives, and integration mechanisms. Breakthroughs in methods are helping to chart new directions for the field.

In revisiting the literature, we demonstrated that contingency and fit remain a major focus. Yet of all the topics addressed, integration has evidenced the most growth within management journal articles since 2000. We argue that this trend is due to several factors: the decreasing near decomposability of organizations, the increasing relevance of alternative units of analysis, and the corresponding need for a greater understanding of adaptation and the emergent properties of organizational structures. We suggest that these factors challenge our knowledge of the fundamental questions of organization design and open up new opportunities for research.

We therefore "renew" foundational concerns while providing a summary, by topic, of the chapters that follow. Thirty years ago, Simon et al. (1987) remarked that:

> there are no more promising or important targets for basic scientific research than understanding how human minds, with and without the help of computers, solve problems and make decisions effectively, and improving our problem-solving and decision-making capabilities.

For students of organizations and organization design, that call is more relevant now than ever before. We believe that this volume makes a significant contribution to these aims and, more generally, to current developments in organization design and strategy.

NOTE

1. https://www.nytimes.com/2018/06/26/business/dealbook/ge-nelson-peltz-trian.html

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