Meta-Organizational Design: Rethinking Design in Inter-Organizational and Community Contexts

Citation

Gulati, Ranjay, Phanish Puranam, and Michael Tushman. "Meta-Organizational Design: Rethinking Design in Inter-Organizational and Community Contexts." Special Issue on Strategy and the Design of Organizational Architecture, edited by R. Gulati, P. Puranam, M. Tushman. Strategic Management Journal 33, no. 6 (June 2012): 571–586.

Published Version

http://onlinelibrary.wiley.com/doi/10.1002/smj.1975/abstract

Permanent link

http://nrs.harvard.edu/urn-3:HUL.InstRepos:9932096

Terms of Use

Share Your Story

META-ORGANIZATION DESIGN:

RETHINKING DESIGN

IN INTER-ORGANIZATIONAL AND COMMUNITY CONTEXTS

Ranjay Gulati
Harvard Business School

Phanish Puranam
London Business School

Michael Tushman
Harvard Business School

ABSTRACT

This paper provides conceptual foundations for analyzing organizations comprising multiple legally autonomous entities, which we call *meta-organizations*. We assess the antecedents of the emergence of such collectives and the design choices they entail. The paper identifies key parameters on which such meta-organizations' designs differ from each other. It also presents a taxonomy that elucidates how such forms of collective action vary and the constraints they must address to be successful. We conclude with implications for research on meta-organizational design.

INTRODUCTION

The world of organizations has evolved substantially since the foundational theories of organizational design were first postulated. We have undoubtedly learned much from the array of theories developed to address the emergence of increasingly complex organizational forms over the course of the twentieth century. Each era's theories in part reflected the managerial preoccupations of the times and coevolved with them, beginning with the work of Barnard (1938) and Coase (1937), who documented the rationale for and management systems underlying increasingly large integrated organizations. The work of Simon and his colleagues at Carnegie Mellon (Simon, 1947; March and Simon, 1958; Simon, Thompson and Smithburg, 1950) opportunely addressed the increase in informational complexity and foreshadowed the growing sophistication of information technologies within organizations. Later the work of Thompson (1967), Lawrence and Lorsch (1967) documented that the patterns of division of labor and integration of effort within firms were associated with the environmental context in which they are located.

The domain of organizational design arrived at an empirical hiatus after the 1970s as much theoretical and empirical attention shifted to outside the firm (e.g. ecological and institutional pressures, inter-firm relationships). The topic of organizational design receded from attention as a productive line of inquiry for organizational scholars just as the managerial challenges of organization design were becoming more complex (though see exceptions like Bartlett and Ghoshal, 1989; Milgrom and Roberts, 1995; Nadler and Tushman, 1988). More recently, we have since seen an increase in interest in the topic of organizational design triggered by a range of design challenges such as agility (Doz and

Kosonen, 2008), resilience (Gulati, 2010), customer-centricity (Galbraith, 2001), social responsiveness (Kanter, 2009), balancing innovation and efficiency (Tushman and O'Reilly, 1997; Brown and Eisenhardt, 1997; Gulati and Puranam, 2009), and environmental sensitivity (Henderson and Newell, 2011).

In the same spirit, we point to an increasingly important phenomenon that begs careful theoretical consideration by organization design scholars. This phenomenon has two manifestations, the first of which has been in plain sight for a while. Since the 1980s we have witnessed a dramatic increase in the frequency with which firms enter into collaborative relationships; such partnerships typically span geographies, industries, and value chains (e.g. Reuer, 2004; Gulati, 1995, 1998, 2007). This signals a trend toward greater specialization as firms increasingly rely on partners to execute work central to their success, often despite significant transaction costs. Similarly, the rise of strategic outsourcing more broadly (Gulati and Kletter, 2004) and business-process outsourcing more particularly (Srikanth and Puranam, 2010) is another indicator of the strength of this phenomenon.

Building on earlier work on external communities (eg Von Hipple, 1988), a second component has become visible as the internet and related technologies have become tools of both knowledge production and dissemination; this has hastened the recognition that actors outside the traditional boundaries of the firm possess unique knowledge that may be applicable within the firm (von Hippel, 1988, 2005; Benkler, 2006; Vanhaverbeke, 2006; Jeppesen and Lakhani, 2010; Chesbrough, 2003). Task modularization and the

involvement of a wide distribution of actors with unique knowledge are helping to displace the locus of work that was formerly considered core to the firm (such as innovation) to outside its boundaries (Baldwin and Von Hippel, 2011). Such strategic contingencies as knowledge distribution, the decomposability of tasks, the intrinsic motivation that tasks generate, and the ease of re-aggregation of tasks all appear to be novel antecedents of firms' boundary choices (see also Grandori, 2001; Nickerson and Zenger, 2004; O'Mahony and Lakhani, 2011; and Lakhani, Lifshitz, and Tushman, in press).

A few examples of this tendency for firms to "shrink their core" while "expanding their periphery" (Gulati and Kletter, 2004) may be useful to highlight the underlying unity of these phenomena: Consider Apple, which has reduced its own direct internal inputs into some of its devices, while launching an immensely successful Apps Store, virtually none of whose products it produces but 30 percent of whose revenues it captures. Apple has also moved the kernel of its core operating system to an open community even as it partners with Intel for aspects of its hardware (see Lakhani, Lifshitz, and Tushman, in press). Apple is not an isolated instance. Industries like pharmaceuticals, once tightly vertically integrated, have witnessed the outsourcing of key tasks ranging from R & D to clinical trials and manufacturing (Azoulay, 2004). Nor is the phenomenon restricted to high technology industries or indeed the for profit sector. Organizations that have embraced this externalization of key tasks range from behemoths like Proctor & Gamble, which dramatically reorganized its research activities with its "connect-and-develop"

initiative (Huston and Sakkab, 2006), to public-sector organizations like NASA (Lakhani, Lifshitz, and Tushman, in press).

Yet, while the world of practice has been changing dramatically in a direction that places ever greater importance on coordination beyond the boundaries of the firm (Gulati and Singh, 1998; Gulati, Lawrence, and Puranam, 2005; Reuer, 2004), our theories of organization design, with their strong intra-firm bias, continue to emphasize elements like formal authority (embodied in contractually specified employer-employee relationships), the design of incentives like salary, bonuses, benefits, and promotion opportunities, and the collocation of individuals performing highly interdependent activities. These elements are inconspicuous, if not entirely absent, in clusters of firms and open communities that work effectively as single organizations.

We argue that the increase in close collaboration between formally independent firms and in open communities of legally autonomous actors poses challenges for our thinking about organizational design. In brief, if prominent forms of economic organization increasingly involve multiple firms as well as communities of non-contractually linked individuals, an emphasis on intra-firm design may be out of date, or at the very least incomplete. Due to the open and peer nature of these communities, the traditional design logics of control, hierarchy, formal roles, and pecuniary incentives have less traction (Lakhani, Lifshitz, and Tushman, in press).

WHAT IS A META-ORGANIZATION?

To facilitate the necessary conceptual transition we introduce the concept of a *meta-organization*, defined as an organization whose agents are themselves legally autonomous and not linked through employment relationships. An agent in this definition could itself be an organization (within which there may well be employment relationships), but which can be treated as a unitary actor for purposes of analysis. Thus, *meta organizations comprise networks of firms or individuals not bound by authority based on employment relationships but characterized by a system-level goal*. As in a traditional organization, the existence of a system level goal does not imply that the constituent agents share it; profit maximization may be the goal of the business firm but not necessarily of all its employees. Thus, even in a meta-organization, each agent has its own motivations, incentives, and cognitions, but unlike in a traditional business firm, they are not linked via a framework of formal authority associated with employment contracts.

Meta-organizations resemble biological super-organisms, a multitude of individual organisms that coexist, collaborate, and co-evolve via a complex set of symbiotic and reciprocal relationships which together form a larger organism (Tautz and Heilmann, 2008). However, in contrast to purely self-organized systems, in a meta-organization, this system-level goal corresponds to the goals of its architects. For instance, when one examines the meta-organizations surrounding P&G, Toyota, Apple, or the founders of Wikipedia, there is little doubt whose goals shape those of their respective meta-organizations -indeed, that is how these meta-organizations are informally identified (also

see West and Lakhani, 2008), on the role of leading firms and individuals in meta-organizations like the Linux kernel community). Meta-organizations represent a particular kind of technology of organizing—specifically, how to organize relations among legally autonomous entities, whether firms in a network or individuals in a community, without recourse to authority inherent in employment contracts (though other forms of contract may well play a role).

  The defining feature of a meta-organization is the absence of formal authority arising from an employment relationship in the relationships between constituent entities. Authority is legitimate power to dictate actions, and authority created via the employment relationship has long been recognized as a defining feature of traditional business organization (Weber, 1922; Coase, 1937; Simon, 1951). Authority that emerges through the employment relationship plays a key part in shaping an organization's design, which arises from fundamental choices about the division of labor and about the grouping and linking structures that promote integration of effort (Simon, 1951; Simon, Thompson and Smithburg, 1950). In meta-organizations, formal authority as embodied in an employment relationship may exist within the boundaries of individual constituent organizations but it does not extend to the ties that connect them.

Neither business groups nor multi-national firms are meta-organizations because central actors exercise formal authority over constituent firms through their controlling ownership stakes (Khanna and Palepu, 2000). Similarly, the web of exchange surrounding any economic actor does not correspond to a meta-organization (since both

an architect and a system level goal are missing). Dyadic relationships such as outsourcing relationships and strategic alliances also do not necessarily feature the network of entities we see as characterizing a meta-organization.

Yet, central actors actively shape the design of meta-organizations. Consider Toyota or Li & Fung (the Hong Kong-based consumer-goods multinational) in their supply networks (in most of which they have no ownership stakes), or Apple in its ecology, or, indeed, Linus Torvalds in the Linux open-source community. What are the substitutes for formal authority that these actors wield to influence the design of meta-organizations?

First, even if the architects of meta-organizations lack formal authority based on an employment contract, they may possess significant informal authority based on expertise, reputation, status, gatekeeping privileges (whereby they regulate who gets in), or control over key resources or technology (Blau, 1964). Status and informal authority in open-source projects, for example, are rooted in perceived technical competence and associated contributions (Raymond, 1999; Lee and Cole, 2003; Lakhani and von Hippel, 2003; Dahlander and O'Mahony, 2011).

Second, bargaining power arising from asymmetric dependence promotes outcomes similar to those that formal authority enables (Gulati and Sytch, 2007). For example, Li & Fung or Toyota can ask for and obtain adherence to its policies from suppliers almost as a corporate HQ in a multi-business firm can (Dyer, 1996; Dyer and Singh, 1998; Dyer

and Nobeoka, 2000; Gulati and Sytch, 2007). Indeed by maintaining both internal and external suppliers, firms are able to enhance their bargaining power with both (Puranam, Gulati, and Bhattacharya, forthcoming). The basis of this ability is not formal authority rooted in the employment relationship, but the bargaining power these firms command over members of their meta-organization. This bargaining power stems from the possession of unique resources (such as brands, reputation, or access to customers) or investments in knowledge advantages. For example, Intel invests in R&D in many components of the PC ecosystem that it does not itself produce (Ethiraj and Puranam, 2004).

Two additional features besides the absence of formal authority, though not strictly unique to meta-organizations, also bear mentioning. First is the importance of forms of compensation other than (immediate) pecuniary incentives. The networks that supply Toyota or Li & Fung doubtless feature cash compensation, but the non-contractible shadows of the future and of the past—the expectation of future gains from exchange, and the ability to trust and coordinate with a partner based on past experiences—may be at least equally important in these relationships (Gulati, 1995; Dyer and Nobeoka, 2000; Gulati and Nickerson, 2008; Gulati and Sytch, 2008; Baker, Gibbons, and Murphy, 2002; Puranam and Vanneste, 2009; Vanneste and Puranam, 2010). Meta-organizations like Wikipedia or the Linux development community eschew monetary compensation altogether. Some individuals are paid by their employers to participate but those firms are essentially donating those resources to the community (Lakhani and Wolf, 2005). Instead, in the majority of cases, they may use needs, reputations, intrinsic motivation, and kudos

are the (non-contractible) benefits that motivate contribution and exchange in such communities (e.g., von Hippel and von Krogh, 2003; O'Mahony, 2003; Lee and Cole, 2003: Shah, 2006). These communities have had a dramatic impact on problem-solving outcomes (see Kogut and Metiu, 2001; Lakhani and von Hippel, 2003); they are self-motivated, self-selected, and self-governed (von Krogh, Spaeth, and Lakhani., 2003; Boudreau, Lacetera, and Lakhani, 2011; Dahlander and Gann, 2010). In such contexts, self-selection drives both participation and effort (von Krogh *et al.*, 2003; Boudreau and Lakhani, 2011).

Meta-organizations also often employ substitutes for collocated communication. While few large firms enjoy the luxury of collocation of all their employees, it is important to note that such organizations can bring at least some of their members together for high-bandwidth, rich-media face-to-face interactions. Decisions about who is collocated with whom are as important as decisions about who is grouped with whom in the organization's divisional structure (Nadler and Tushman, 1997). In meta-organizations, by contrast, any significant degree of collocation is impractical. Use of information and telecommunication technologies (ICTs) and partitioning of tasks in a manner that allows independence of action are alternatives to collocated production within meta-organizations (MacCormack, Rusnak and Baldwin, forthcoming; Hinds and Kiesler, 2002; Srikanth and Puranam, 2010).

THE RISE OF META-ORGANIZATIONS: ANTECEDENTS

11

Since Coase's original analysis (1937), we have known that even when production costs are lower outside a firm, the additional transaction costs associated with externalizing work tend to create an impetus towards integration within the firm. Subsequent work has refined our understanding of the nature of these transaction costs, and the extent to which they can be ascribed to opportunism or problems of coordination (Kogut and Zander, 1996; Gulati and Singh, 1998; Gulati, Lawrence, and Puranam, 2005). Research on the core competences of corporations (Prahalad and Hamel, 1990; Barney, 1991; Leiblien, 2003) has offered a complementary perspective, suggesting that firms locate the activities that drive their competitive advantage within own boundaries and outsource the rest. Finally, a significant body of research in organization theory studies how the firm's boundaries may protect the firm from dependencies in its task environment by erecting them around critical task, power, and competence contingencies (e.g., Thompson, 1967; Pfeffer and Salancik, 1978; Aldrich, 1979; Santos and Eisenhardt, 2005).

Despite these benefits of internalizing activities, a number of factors have collectively fueled recent trends toward the externalization of work and the emergence of meta-organizations. [1] The growing capacity for geographic dispersion of work facilitated by communication and information technologies is an important determinant of meta-organizations (Hinds and Kiesler, 2002). Labor market cost differential arbitrage and

---

[1] These are in addition to the traditional supply-side factors such as basic economies of scale and scope, and the "economies of focus" that enable the existence of a deep market of external suppliers who can operate faster, cheaper, and better than the internal units of a diversified organization (Gulati and Kletter, 2005; Jacobides and Winter, 2005).

differential access to skilled labor have also been critical in shaping this shift. Catalyzed by falling communication costs, many organizations have developed sophisticated practices that enable the division of labor and reintegration of efforts across geographies in ways that were inconceivable a few decades ago (Srikanth and Puranam, 2010). Task disaggregation in the context of low-cost communication has spurred the emergence of communities and competitive tournaments (in which many contributors compete to provide the best contribution) that are sometimes as effective as firms at innovation and knowledge production (O'Mahony & Lakhani, 2011). Thus, previously firm-based innovation activities may now be performed in external market, community, or tournament settings (Boudreau and Lakhani, 2009).

More generally, in a rapidly changing and increasingly competitive environment, customers in most sectors have more information and more choices; this increases pressure on firms to be agile and responsive to shifting customer needs (Gulati, 2007, 2010). Firms have also had to learn to operate and sell their products and services in disparate markets around the globe and at very different price points (Kumar, 2004). This set of circumstances has led firms to conclude that the costs of internal bureaucracy often exceed external transaction costs. Under these conditions, firms seek out external partners who are quicker and more responsive than their own internal business units.

Meta-organizations emerge when focal firms attempt to exercise control over external partners despite the absence of formal authority within an employment relationship. Meta-organizations prevail today in many sectors and take a wide variety of forms. In the

automotive industry, meta-organizations operate in the OEM-supplier networks orchestrated centrally by OEM firms. In the IT sector, platform providers like Microsoft, Apple, Google, SAP and Cisco cultivate thriving developer communities, which typically consist of thousands of globally dispersed small and large organizations, some tightly and some loosely tied to the platform providers and with varied in their levels of interaction with each other. In the nonprofit domain, large philanthropic funds like the Bill & Melinda Gates Foundation fund, monitor, and direct meta-organizations of nonprofit agencies, connecting them with each other and with crucial political, social, and economic actors.

DIMENSIONS OF META-ORGANIZATIONAL DESIGNS

Every meta-organization must, by our definition, employ some substitutes for formal authority, but the precise manner in which those alternatives are generated and exercised exhibit systematic variations. We argue that patterns within this variation may be understood by considering two important dimensions of meta-organizations: the degree to which a meta-organization's boundaries are open or closed and the degree of its internal stratification (see Table 1). Given the early stages of our understanding about meta-organizations, we restrict ourselves to describing variations along these dimensions; a full- fledged theory that may consider a whole array of other dimensions and also second order questions such as when we should observe which combination of variations must be deferred to future efforts.

Permeability of Boundaries

Meta-organizations encompass multiple organizations and/or communities of self-motivated individuals. Though the notion of "the boundaryless organization" (Ashkenas *et al.*, 1995) emphasizes the importance of inter-organizational relationships, the inter-organizational collective itself is, ironically, not without boundaries. Strategic deliberation about the extent and limits of purposive organizing is as relevant to meta-organizations as it is to integrated organizational entities: it shapes the attraction, selection, and retention of members of the collective. The meta-organization's boundaries provide a basis for members' identification with the collective and the collective's differentiation from others. The essential aspects of such boundary arrangements include (1) who chooses members (2) criteria for membership (i.e., the attributes members possess and the degree of redundancy between them); and (3) duration and exclusivity of membership (i.e., whether members can belong to more than one meta-organization).

A fundamental design consideration for a meta-organization is how membership decisions are made. A decision to grant membership may be made bilaterally, between the architect and the new member. An OEM managing a network of partners may consider the repercussions on its other relationships of establishing a relationship with a new supplier (Khanna, 1998), but ultimately the decision is its own to make. In other cases, introducing a new member into a collective requires the approval of existing members. In both contexts, contracts typically spell out expected contributions (e.g., minimum financial and temporal commitments), returns, and exit clauses. Membership is essentially closed—that is, new members require some form of approval to join.

Alternatively, designers of meta-organizations may choose more open membership arrangements in which the boundaries are kept more permeable. Membership in the collective is based on self-selection. Many IT-platform providers—such as the Open Handset Alliance, which develops the mobile-phone operating system Android—only, require developers to accept a terms-of-use agreement, leaving them broad latitude to decide what they want to contribute to the platform. Collectives that rely entirely on self-selected membership may find it more difficult to fill competence gaps and to ensure coordination or task completion, since exit from the collective is as easy as entry. Open membership can result in unsolicited and unwanted contributions as well as contestation of collective goals and agreements.

To retain the ability to create meta-alignment, platform operators and communities often reserve the right to approve contributions and thus preempt unwanted activity, or to reactively exclude unwanted contributions and contributors. Many open-source projects and "crowd-sourcing" communities, such as Wikipedia, Flickr, and YouTube, rely on reactive policing procedures to weed out unwanted content. Thus, though ex-ante membership criteria are open, and contributing to the collective is made easy, certain criteria and conditions are clarified and enforced ex-post. Approval and policing procedures in meta-organizations must necessarily be delicately managed, so as not to invalidate their openness and alienate contributors. Variations in how committed and involved members of the meta-organization are must be taken into account. Extended

waits for approval of contributions, and high rates of rejection or removal of contributions, will discourage members from future resource commitment.

Next, we consider the question of membership criteria. Even if no employment relationship exists between the constituent entities in a meta-organization, its architects are likely to exercise considerable care when choosing whom to admit: the permeability of the meta-organization may be kept deliberately low by means of careful specification of criteria. Possession of particular technologies or capabilities are frequent selection criteria (Rothaermel and Boeker, 2008; Das and Teng, 2000), but reputational and social capital are also prized (Arend, 2009; Ahuja, Polidoro, and Mitchell, 2009). For example, an IT firm launching a new software platform may seek to include established OEMs in its ecosystem of partners because they can lend legitimacy to the new software and provide access to a large potential customer base. Similarly, a nonprofit organization may seek the endorsement of a major philanthropic funder in hopes of benefiting from its ties to influential economic or political actors. In short, inclusion in a meta-organization may be based on the potential member's internal resources or on its network resources (Gulati, Mehrotra, and Sytch, 2008).

An important resource-related strategic consideration for boundary arrangements is the redundancy of members' resources and capabilities. Redundancy denotes the degree to which member organizations possess identical relevant resources or capabilities. One way to look at redundancy is as a measure of inter-organizational slack: high redundancy produces more flexibility to adapt to changes in the environment, provides more

opportunities for innovation, and allows for parallel processing of similar problems. High-redundancy meta-organizations maintain a lower level of interdependence and a lower risk of disrupting effective operation of the collective in case of fluctuations in membership. However, redundancy may also impact relational and power dynamics within the collective. High redundancy also conceivably gives the architects of the meta-organization greater bargaining power. High redundancy also carries certain costs, as it may reduce openness and cooperation, if members with redundant resources and capabilities struggle to differentiate their contributions to the collective, or consider themselves more easily replaceable; they may thus be hesitant to pursue activities they perceive as helping others but not improving their own position in the collective. Low-redundancy meta-organizations create a system of strong interdependencies between members, and support a high degree of co-specialization.

Finally, the architects of a meta-organization may also use boundary arrangements to shape the nature of the relationship between its constituent entities, in particular the exclusivity and duration of membership. Exclusivity of membership characterizes the degree to which member organizations make specific contributions exclusively to a focal meta-organization and not to others. In some meta-organizations, such as airline alliance networks for instance, membership is exclusive; membership in one meta-organization precludes membership in another. In contrast, membership in Li & Fung's meta-organization is not exclusive. Especially in highly competitive market environments, exclusive contributions from members may be vital to strategically differentiate the meta-organization's products and services. This restrictive approach to managing the

boundaries of the meta-organization can be particularly useful when the meta-organization is competing with other (meta-) organizations, or when the meta-organization generates resources vulnerable to free riding.

Duration of membership designates the length of time an organization remains a member of the collective (Van De Vrande, Lemmens, and Vanhaverbeke, 2006). Some partnering contracts specify a minimum period of engagement in the meta-organization. Others implement strong disincentives to discourage members from leaving the collective before certain collective goals are achieved or individual contributions are made in full. Explicit barriers to premature exit can aid in screening applicant organizations; they can also promote attainment of strategic objectives that require longer sustained effort from members to yield a return (Gulati *et al.*, 2008).

In sum, decisions about boundaries and the relative openness of membership fundamentally alter the behavioral dynamics within a meta-organization, as well as the range of feasible governance arrangements. Closed membership is reminiscent of traditional inter-organizational forms like strategic alliances. Partner search, screening, and selection are crucial tasks in these cases, and the timing of a new member's entry is controlled. Closed boundaries typically go hand in hand with an explicit and, more importantly, a tailored definition of tasks and of relationships to other members. Each member's specific role in the meta-organization is negotiated from the start, and the duration of membership and timing of exit is also negotiated. Closed membership is also

associated with fewer members and active management of members' diversity, in order to facilitate inter-organizational coordination.

Open membership, on the other hand, makes the timing of members' entry and exit difficult to control, and constrains designers to provide standardized role conceptions to new members. Opening up membership creates significantly higher collaboration-process losses, which may be offset by increasing input (such as number of members and number of contributions) and by encouraging collective attempts at improving the process.

Degree of Stratification

Many meta-organizations exhibit significant stratification; a hierarchical differentiation of roles or tiers of membership is marked in some cases and none in others. For instance, Boudreau and Lakhani (2009) describe higher stratification in meta-organizations associated with integrator platforms, where a single actor aggregates the innovative efforts of multiple actors, than in those associated with two-sided platforms in which the key actor merely brings together customers and suppliers. Where stratification is present, the upper tiers enjoy more extensive decision-making rights, bear more responsibility for coordinating the activities of the lower tiers, and participate in the meta-organization's design decisions. Tiering has two important functions for the collective: it reduces coordinative complexity and serves as a motivational mechanism. (For example, see Fjeldstad *et al.*, this issue, on how IBM uses tiering in its meta-organization.)

Stratification helps reduce the complexity of coordination by subdividing the collective into smaller subgroups (Simon, 1962; Zhou, forthcoming). Assigning higher-tier organizations to supervise and coordinate the activities of specific sets of lower-tier organizations in turn enables the highest-tier organizations to concentrate on oversight of the overall meta-organization. Like hierarchies in traditional organizations, tiering serves to specify spans of control within meta-organizations. In OEM-supplier networks, for example, the top-tier suppliers are responsible for planning, scheduling, and quality control of the activities of lower-tier suppliers, and in some cases for selection and strategic development of those suppliers. In this instance, tiering exploits the innate hierarchy of tasks associated with the value chain (Simon, 1962).

Alternatively, tiering may be based not on assigned tasks but on an administrative hierarchy, within which the tiers differ less in the sequential ordering of tasks than in terms of who exercises authority over whom. In retail supply chains, for instance, retailers designate certain vendors as "category captains". These vendors are responsible for improving shelf arrangements, launching product introductions, and planning promotional initiatives, in conjunction with other vendors and their own suppliers, to increase the retailer's sales and profitability in a particular category (Subramanian *et al.*, 2010). As many open-source communities demonstrate, however, tiers do not always go hand in hand with a concrete mandate or domain of oversight. Instead, higher-tier status may entail only an unspecific expectation of greater involvement in community-management tasks and resolution of community issues; (see O'Mahony and Ferraro, 2007).

Stratification and tiering can also serve as a motivational device. The material and symbolic benefits associated with higher tiers can create incentives for member organizations to contribute to the collective, and can even establish a "career trajectory" for them. The responsibilities awarded to higher-tier organizations also draw attention to which issues are important and which competencies are valued in the community, and thus help channel members' activities—without the direct intervention of higher tiers—toward desired ends. For example, assigning the upper tiers to stimulate innovation and improve efficiency within the collective signals to the lower tiers that successful self-initiated efforts in those directions may qualify them for higher-tier status in the future. Wikipedia, for instance, has a publicly declared egalitarian ethos, and many functions traditionally reserved to formal authority—such as resolution of disputes and exceptions are instead put to a vote. Yet it is widely known that all votes are not equal, as frequent contributors are seen as experts with greater credibility and legitimacy (Gorbatai, 2011).

A high degree of stratification gives rise to, and enables the exercise of, status- or role-based authority structures. Though such authority may be limited in scope, especially in open-membership contexts, it still creates a social structure that can guide task identification and assignment, decision making, and conflict resolution. In contrast, a low degree of stratification is likely to support the emergence of a "community of equals" in which members are simultaneously principals and agents of the collective. Such communities are also more likely to adopt peer-based approaches to coordination. Some designers may deliberately minimize stratification within meta-organizations to avoid, for

example, debates about the criteria and processes for determining status, and to encourage broad participation in vital design/supervisory tasks.

Flatter, more egalitarian designs are associated with heterarchical coordination arrangements, whereby all members have similar or overlapping rights and responsibilities to promote alignment of activities within the collective—which often involves extensive multilateral negotiation and consensus-building efforts. Alternatively, supervisory tasks may be temporarily assigned to particular members, depending on their capabilities and the specific tasks in question. Such low-stratification contexts enhance the member's sense of ownership of and commitment to the meta-organization. They may, however, also discourage co-specialization and make it more difficult and time-consuming to arrive at community-level decisions and resolve conflicts.

In sum, decisions about internal stratification have significant impacts on both motivation and coordination within meta-organizations. While a high degree of stratification may replicate many of the conventional benefits of stratification within traditional (business) organizations, it also potentially replicates its costs. Where widespread participation based on a sense of involvement and identification with the meta-organization (fueled by a sense of egalitarianism and freedom from the explicit exercise of authority) is critical, lower degrees of stratification may be preferable.

A TAXONOMY OF META-ORGANIZATIONS

Using stratification and membership boundaries as the two dimensions of a matrix, we have differentiated four types of meta-organizations (see Table 1).

<div align="center">**Insert Table 1 here**</div>

Those with significant stratification and closed membership most closely resemble traditional *extended-enterprise* models (Aron and Singh, 2005), in which a focal firm (or group of firms) contracts with upstream, downstream, or horizontal partners that possess complementary assets to enhance its own capacities, market reach, technology, capabilities, or reputation. McDonald's franchising system is an example, as are Toyota's and Li & Fung's tightly managed supplier networks. In such meta-organizations, informal authority based on bargaining power is carefully nurtured and exercised via choices about boundary permeability and stratification. Linkages between members of the meta-organization are directed rather than emergent.

There is evidence, however, that the Toyota supplier network is moving toward a *closed-community* model in which decision making and responsibilities are more evenly distributed (though there will continue to be lead actors, notably Toyota itself) and action is multilateral rather than unilateral (Evans and Wolf, 2005). Toyota (and other car manufacturers) expect suppliers to be more than order-takers—that is, to participate proactively in strategically directing the meta-organization and to invest in its future. Other examples of the closed-community type of meta-organization are industry consortia and standards committees that seek to build member consensus around technical or governance standards and/or regulatory initiatives (e.g., Rosenkopf, Metiu, and George 2001).

Open-membership meta-organizations with low stratification resemble *open communities* or public forums more than they do traditional organizations. Given their flexible boundaries, their structural features—such as processes, groups, and factions or clusters of members—are constantly in flux. Authority is less well defined, and linkages are emergent rather than directed (O'Mahony and Ferraro, 2007). Order is typically created by means of simple agreed-upon ground rules and/or mutual ad-hoc policing of member activity. Open communities are self-organizing contexts in which actors share knowledge freely (Baldwin and von Hippel, 2011; Franke and Shah, 2003; Faraj and Johnson, 2011).

The open-source software (OSS) movement, for example, has generated an alternative ecosystem in which external-to-the-firm user communities design, develop, distribute, and support complex products, whether on their own or in alliance with other firms (Lakhani and von Hippel, 2003; von Hippel, 2005; Boudreau & Lakhani, 2009; O'Mahony and Lakhani, 2011; Lerner and Schankerman, 2010). OSS communities are open in the sense that their outputs can be used by anyone (within the limits of the license), and that anyone can join merely by subscribing to an e-mail list. Openness in terms of membership leads in turn to transparency in the development process, since communication about projects and their direction largely occurs in public. Project leadership is thus accountable to the wider community for its growth and future direction, and everyone is aware of shortfalls and issues. Transparency also affords individuals self-

determination with respect to the level of effort they choose to expend and awareness of others' efforts that they might be able to fold into their own.

The online open-source encyclopedia Wikipedia was initially constructed on such an open and low-stratification model: much of the encyclopedia was written, edited, formatted, and organized by any member of the community. Over time, however, Wikipedia has differentiated roles and editing rights in the community, and has slowly moved toward a ***managed-ecosystem*** model; the large majority of members contributes to the system's input—the variation, phrased in ecological terms—and a smaller group of editors is responsible for most of the pruning and policing—or, again in ecological terms, the selection and retention processes (Gorbatai, 2011). A number of for-profit firms have sought to adopt a similar managed-ecosystem approach. The Open Handset Alliance, led by Google, has released its Android mobile operating-system platform under an open-source license (Linux). Google provides developer tools (and some support) free of charge, enabling numerous developers to create complementary software for the platform. These tools also assist hardware developers in offering a wide variety of Android-based devices to consumers. However, new platform releases and updates are controlled by Google, and technological trajectories for new features are primarily agreed upon by a core group of major carriers, manufacturers, and Google. Thus the community is characterized by a clear differentiation of roles and power (also see Fjeldstad *et al*. this issue on IBM's meta-organization).

The business model of InnoCentive is another example of a managed-ecosystem. Partnering with its clients' R&D laboratories, InnoCentive broadcasts their clients' most difficult-to-solve, in-house science problems (such information is traditionally highly proprietary). InnoCentive works with firms to generalize their problems such that no company-specific information is revealed. Solutions received are then evaluated by InnoCentive's client. A firm that is offered a suitable solution to its broadcast problem acquires the IP from the solver in exchange for the agreed-upon prize. Most IP transfer clauses grant the seeker rights to internal use and the solver rights to use in applications not required by the seeker (Lakhani and Panetta, 2007).

It is important to note that any given focal firm may simultaneously employ several types of meta-organization design across the different meta-organizations they create. At NASA, for example, space operations embody an extended-enterprise meta-organizational design, but space-medicine operations are organized as a managed ecosystem. Similarly, Lego organizes its traditional building-blocks business as an extended-enterprise design, but its robotics product lines represent both open and closed communities (see Lakhani, Lifshitz, and Tushman, in press).

DISCUSSION AND CONCLUSION

In an analysis of novelty in forms of organizing, Puranam, Alexy, and Reitzig (2011) argue that a new form is one that embodies new solutions to the basic problems of organizing—the division of labor and the integration of effort—in contrast to the

solutions used by existing organizations with similar goals. Meta-organizations thus represent a class of novel forms of organization: they solve the basic problems of organizing without explicitly relying on formal authority as enshrined in an employment contract. We have outlined some ways in which meta-organizations achieve this, but much remains to be learned. For instance, a very fundamental set of questions pertains to when (i.e. under what conditions) we should expect to observe meta-organizations of a particular kind of permeability and stratification to emerge. While we have outlined some of the benefits and costs of both permeability and stratification in meta-organization, a careful mapping of these to particular contexts remains an important research endeavor. Or stepping back further, we could ask when and where we are would expect to see meta-organizations in the first place and further if the founding conditions imprint certain logics that stay with those organizations long after.

Another set of questions worthy of further exploration is how the designers of meta-organizations specify a division of labor— that is, how they divide up and allocate tasks. The key decisions are the locus of task definition and assignment, the level of specificity and standardization of tasks, and the degree of task redundancy, as well as the process whereby tasks are allocated to actors within the meta-organization. For instance, designers may assign specific task packages to particular members, or let members self-select or self-design tasks aligned with overarching objectives, or reactively distribute/assign "leftover" tasks. For example, administrators in open-source software development monitor which code modules show signs of redundant efforts and which exhibit inadequate efforts.

A meta-organization's designer must recognize and accommodate members' organization-level strategies (and affiliations with different meta-organizations), and provide them a guiding economic logic for collective action while allowing appropriate flexibility for this logic to be realized. Tasks and objectives in some meta-organizations may be relatively broad and highly abstract, resembling ideological foundations rather than concrete milestones and action steps. As a result, we expect task definition and assignment often to resemble an ecology with some induced and some emergent processes and dynamically changing rules for selection and retention of key initiatives (Burgelman, 1991).

Another key question worthy of investigation is: does authority derived from bargaining power lead to fundamentally different patterns of division of labor within meta-organizations than authority arising from expertise or charisma? In supplier networks like Toyota's or Li & Fung's, for instance, the division of tasks basically reflects the value chain of the industry, whereas allocations of tasks are carefully orchestrated by the architect of the meta-organization. In Open Source Software development projects, by contrast, tasks may be divided up with a high degree of granularity and diversity, but contributors self-select into tasks (MacCormack, Rusnak and Baldwin, forthcoming). Thus an important question is whether particular forms of non-contractual authority are associated with particular forms of division of labor.

A third set of issues that bear investigation are how the nature of authority in meta-organizations may also influence the choice of mechanisms for integrating efforts. Once membership in the collective is established, designers must consider the linkages that are to be created among members, notably communication and decision-making channels (Gulati and Singh, 1998). Such channels determine information flow across boundaries and lend a certain degree of transparency to particular members' activities and decisions, thus creating a basis for coordination (Gulati and Sytch, 2007). By determining who collaborates with whom, and thus promoting interaction among particular clusters of members, linkages also shape knowledge sharing and inter-organizational learning. Important design considerations for linkages include: (1) which linkages are to be encouraged, (2) how deep/strong relations between organizations should be, and (3) how specific ties can be incentivized.

Consider the two ends of the continuum of choices about linkages. At one end, the system could be configured to allow the topology (who is connected to whom) and content (the type of relationship) of linkages between members to emerge without substantial authoritative interference. A host of relational mechanisms—such as homophily, proximity, clustering, and isomorphism—may operate in these contexts. However, given that the configuration of linkages (and thus of access to information and participation in decision making) significantly impacts the distribution of power in the collective, at the other extreme designers may want to control the linkages. For example, they may want to increase the density of ties in the network of member organizations to avoid bottlenecks and to reduce the influence of relatively more centrally positioned

organizations (Iansiti and Levien, 2004). Sometimes designers also try to change the nature of linkages. Toyota, for example, is well-known for encouraging its suppliers to exchange not only subassemblies and production plans but also knowledge about process improvements and systems optimization (Dyer and Nobeoka, 2000). Such openness and mutual support requires a high level of cooperation among members.

Another important question about the internal organization of meta-organizations pertains is how particular linkages can be incentivized. Privileged access to information or involvement in important decisions may serve as an intrinsic motivator for high-priority relations in the collective. Standard-setting committees are an example: the prospect of influencing crucial decisions can drive participation. In many cases, however, the extra effort required to engage in particular kinds of relations with other organizations calls for material or symbolic compensation. In some cases the (implied) threat of sanctions is used to mandate the sharing of information even as the rewards of doing so are emphasized. In Li & Fung's network, for instance, constituent organizations understand that they must share their best practices; if they do not give, they do not receive, and the benefits of receiving are clear.

Finally, it will be valuable to learn about other sources of authority in meta-organizations besides bargaining power, expertise, and reputation. For instance, Puranam *et al.* (2011) point out that certain exclusive founders' rights are embedded in the project-management software in use on open-source collaborative platforms like Source Forge. Specifically, founders have the authority to assign certain types of project work, or to delegate this

power to other members of the meta-organization. By pinpointing other forms of non-contractually-specified authority, we may be able to extend our understanding of the nuances of Weber's tripartite conceptualization of authority as rational-legal, competence-based, or charismatic, and of how these types of authority manifest themselves in meta-organizations.

We conclude by noting that it is not our claim that what we call meta-organizations have so far escaped the attention of academics; closely related, if not identical arrangements have been variously characterized as "virtual-organizations," "ego-networks," "constellations," "ecologies," "industrial clusters," "ecosystems," and "hybrid organizations" (e.g. Williamson, 1991; Moore, 1996; Mowshowitz, 2002; Murmann, 2003; Marquis and Lounsbury, 2007; O'Mahony and Bechky, 2008). But scholarly work on the various forms of multi-actor assemblages is largely disconnected from each other and shows few signs of convergence. Above and beyond our integrative objective of conceptualizing all of these types of collectives as meta-organizations, what is unique about our approach is that it explicitly treats a cluster of legally autonomous entities (firms or individuals) as an organization, and acknowledges that such a meta-organization, like any organization, embodies key structural elements that can be designed.

Rather than assuming that meta-organizations are entirely self-organized (because formal authority is invisible), we examine how architects of meta-organizations come to shape these systems in which their own activities are embedded. We also develop a taxonomy

of meta-organizations that articulates important differences between these emerging forms based on their degree of stratification and the permeability of their boundaries.

Our analysis provides an analytic framework for conceptually bringing together a wide variety of inter-organizational and community forms under one category (meta-organization), but at the same time establishing dimensions along which systematic variations within this category may be studied (stratification and boundary permeability). It also highlights differences between perspectives on traditional organizational design and meta-organizational design. We thus offer conceptual foundations which other scholars can refine, extend and use. We believe our approach promises to address the often-voiced concern that inter-organizational scholarship, and in particular studies of strategic alliances and networks, has not fully grasped the diversity of the clusters that have emerged, nor developed an understanding of the design parameters that help to partition the rich and diverse space of such forms of organizing (e.g., Benkler, 2006; Faraj and Johnson, 2011).

We have presented an initial effort to understand the vast range of meta-organizations that we observe today. Many areas of inquiry about meta-organizations remain fertile ground for further investigation. We hope that this paper, as well as the other papers in this special issue, serve as an impetus for future research on the topics of strategy and the design of organizational architectures.

	Low-stratification/ heterarchical decision making	High-stratification/ hierarchical decision making
Closed boundaries/ membership	Closed community: consortia, technical-standards committees	Extended enterprise: OEM-supplier networks, franchising networks
Open boundaries/ membership	Open community: Wikipedia, Open Source	Managed ecosystem: Android Operating System

Table 1. Variations in meta-organizational designs

BIBLIOGRAPHY

Ahuja G, Polidoro Jr. F, Mitchell W. 2009. Structural homophily or social asymmetry? The Formation of alliances by poorly embedded firms. *Strategic Management Journal* **30**(9): 941-958.

Aldrich HE. 1979. *Organizations and Environments*. Prentice-Hall: Englewood Cliffs, NJ.

Arend RJ. 2009. Reputation for cooperation: contingent benefits in alliance activity. *Strategic Management Journal* **30**(4): 371-385.

Aron R, Singh JV. 2005. Getting offshoring right. *Harvard Business Review* **83**(12): 135-145.

Ashkenas R, Ulrich D, Jick T, Kerr S. 1995. *The Boundaryless Organization: Breaking the Chains of Organizational Structure*. Jossey-Bass: San Francisco, CA.

Azoulay P. 2004. Capturing knowledge within and across firm boundaries: evidence from clinical development. *The American Economic Review* **94**(5). 1591-1612.

Baker G, Gibbons R, Murphy KJ. 2002. Relational contracts and the theory of the firm. *The Quarterly Journal of Economics* **117**(1): 39-84.

Baldwin C, von Hippel E. 2011. Modeling a paradigm shift: from producer innovation to user and open collaborative innovation. *Organization Science* **22**(6): 1399-1417.

Barnard CI. 1938. *Functions of the Executive*. Harvard University Press: Cambridge, MA.

Barney J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**(1): 99-120.

Bartlett CA, Ghoshal S. 1989. *Managing Across Borders: The Transnational Solution*. Harvard Business School Press: Boston, MA.

Benkler Y. 2006. *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. Yale University Press: New Haven, CT.

Blau PM. 1964. *Exchange and Power in Social Life*. J. Wiley: New York, NY.

Boudreau KJ, Lacetera N, Lakhani KR. 2011. Incentives and problem uncertainty in innovation contests: an empirical analysis. *Management Science* **57**(5): 843-863.

Boudreau KJ, Lakhani KR. 2009. How to manage outside innovation: competitive markets or collaborative communities. *MIT Sloan Management Review* **50**(4): 69-75.

Boudreau KJ, Lakhani K. 2011. "Fit": field experimental evidence on sorting, incentives and creative worker performance. Working Paper, Harvard Business School, Boston, MA.

Brown SL, Eisenhardt KM. 1997. The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly* **42**(1): 1-34.

Burgelman RA. 1991. Intraorganizational ecology of strategy making and organizational adaptation: theory and field research. *Organization Science* **2**(3): 239-262.

Chesbrough HW. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press: Boston, MA.

Coase RH. 1937. The Nature of the Firm. *Economica* **4**(16): 386-405.

Dahlander L, Gann DM. 2010. How open is innovation? *Research Policy* **39**(6): 699-709.

Dahlander L, O'Mahoney S. 2011. Progressing to the center: coordinating project work. *Organization Science* **22**(4): 961-979.

Das TK, Teng BS. 2000. A resource-based theory of strategic alliances. *Journal of Management* **26**(1): 31-61.

Doz YL, Kosonen M. 2008. *Fast Strategy: How Strategic Agility Will Help You Stay Ahead of the Game*. Pearson/ Longman: New York, NY.

Dyer JH. 1996. Specialized supplier networks as a source of competitive advantage: evidence from the auto industry. *Strategic Management Journal* **17**(4): 271-291.

Dyer JH, Nobeoka K. 2000. Creating and managing a high-performance knowledge-sharing network: the Toyota case. *Strategic Management Journal* **21**(3): 345-367.

Dyer JH, Singh H. 1998. The relational view: cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review* **23**(4): 660-679.

Ethiraj S, Puranam P. 2004. The distribution of R&D effort in systemic industries: implications for competitive advantage. *Advances in Strategic Management* **21**: 225-253.

Evans P, Wolf B. 2005. Collaboration rules. *Harvard Business Review* **83**(7/8): 96-104.

Faraj S, Johnson SL. 2011. Network exchange patterns in online communities. *Organization Science* **22**(5): 1464-1480.

Franke N, Shah SK. 2003. How communities support innovative activities: an exploration of assistance and sharing among end-users. *Research Policy* **32**(1): 157-178.

Galbraith J. 2001. Building organizations around the global customer. *Ivey Business Journal* **66**(1): 17-24.

Gorbatai AD. 2011. Exploring underproduction in Wikipedia. In *Proceedings of the 7th International Symposium on Wikis and Open Collaboration*. ACM: New York, NY; 205-206.

Gulati R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal* **28**(1): 85-112.

Gulati R. 1995. Social structure and alliance formation patterns: a longitudinal analysis. *Administrative Science Quarterly* **40**(4): 619-652.

Gulati R. 1998. Alliances and networks. *Strategic Management Journal* **19**(4): 293-317.

Gulati R. 2007. *Managing Network Resources: Alliances, Affiliations and Other Relational Assets*. Oxford University Press: New York, NY.

Gulati R. 2010. *Reorganize for Resilience: Putting Customers At the Center of Your Business*. Harvard Business School Press: Boston, MA.

Gulati R, Kletter D. 2004. Shrinking core-expanding periphery: the relational architecture of high performing organizations. *California Management Review* **47**(1): 77-104.

Gulati R, Lawrence P, Puranam P. 2005. Adaptation in vertical relationships: beyond incentive conflict. *Strategic Management Journal* **26**(12): 415-440.

Gulati R, Mehrotra P, Sytch M. 2008. Breaking up is never easy: planning for exit in a strategic alliance. *California Management Journal* **50**(4): 147-163.

Gulati R, Nickerson J. 2008. Interorganizational trust, governance choice, and exchange performance. *Organization Science*: 1-21.

Gulati R, Puranam P. 2009. Renewal through reorganization: the value of inconsistencies between formal and informal organization. *Organization Science* **20**(2): 422-440.

Gulati R, Singh H. 1998. The architecture of cooperation: managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly* **43**(4): 781-814.

Gulati R, Sytch M. 2007. Dependence asymmetry and joint dependence in interorganizational relationships: effects of embeddedness on a manufacturer's performance in procurement relationships. *Administrative Science Quarterly* **52**(3): 32-69.

Gulati R, Sytch M. 2008. Does familiarity breed trust? Revisiting the antecedents of trust. *Managerial Decision Economics* **29**: 165-190.

Grandori A. 2001. Neither hierarchy nor identity: knowledge-governance mechanisms and the theory of the firm. *Journal of Management and Governance* **5**: 381-399.

Henderson R, Newell RG. 2011. *Accelerating innovation in energy: insights from multiple sectors*. Harvard Business School Press: Boston, MA.

Hinds P, Kiesler S. 2002. *Distributed Work*. MIT Press: Cambridge, MA.

Huston L, Sakkab N. 2006. Connect and develop: inside Procter & Gamble's new model for innovation. *Harvard Business Review* **84**(3): 58-66.

Iansiti M, Levien R. 2004. *The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability*. Harvard Business School Press: Boston, MA.

Jacobides MG, Winter SG. 2005. The co-evolution of capabilities and transaction costs: explaining the institutional structure of production. *Strategic Management Journal* **26**(5): 395-415.

Jeppesen LB, Lakhani KR. 2010. Marginality and problem-solving effectiveness in broadcast search. *Organization Science* **21**(5): 1016-1033.

Kanter RM. 2009. *Supercorp: How Vanguard Companies Create Innovation, Profits, Growth, and Social Good*. Crown Business: New York, NY.

Khanna T. 1998. The scope of alliances. *Organization Science* **9**(3): 340-355.

Khanna T, Palepu K. 2000. Is group affiliation profitable in emerging markets? An analysis of diversified Indian business groups. *Journal of Finance* **55**(2): 867-891.

Kogut B, Metiu A. 2001. Open-source software development and distributed innovation. *Oxford Review of Economic Policy* **17**(2): 248-264.

Kogut B, Zander U. 1996. What firms do? Coordination, identity, and learning. *Organization Science* **7**(5): 502-518.

Kumar N. 2004. *Marketing as Strategy: Understanding the CEO's Agenda for Driving Growth and Innovation*. Harvard Business School Press: Boston, MA.

Lakhani KR, Panetta JA. 2007. The principles of distributed innovation. *Innovations: Technology, Governance, Globalization* **2**(3): 97-112.

Lakhani KR, Lifshitz H, Tushman M. In press. Open innovation and organizational boundaries: the impact of task decomposition and knowledge distribution on the locus of innovation. In *Handbook of Economic Organization: Integrating Economics and Organization Theory,* Grandori A (ed). Elgar: Cheltenham, UK.

Lakhani KR, von Hippel E. 2003. How open source software works: "free" user-to-user assistance. *Research Policy* **32**(6): 923-943.

Lakhani KR, Wolf R. 2005. Why hackers do what they do: understanding motivation and effort in free/open source software projects. In *Perspectives on Free and Open Source Software*, Feller J, Fitzgerald B, Hissam S, Lakhani K (eds). MIT Press: Cambridge, MA.

Lawrence PR, Lorsch JW. 1967. *Organization and Environment: Managing Differentiation and Integration*. R.D. Irwin: Homewood, IL.

Lee GK, Cole RE. 2003. From a firm-based to a community-based model of knowledge creation: the case of the Linux kernel development. *Organization Science* **14**(6): 633-649.

Leiblein MJ. 2003. The choice of organizational governance form and performance: predictions from transaction cost, resource-based, and real options theories. *Journal of Management* **29**(6): 937-961.

Lerner J, Schankerman M. 2010. *The Comingled Code: Open Source and Economic Development*. MIT Press: Cambridge, MA.

MacCormack A, Rusnak J, Baldwin C. 2006. Exploring the structure of complex software designs: an empirical study of open source and proprietary code. *Management Science* **52**(7): 1015-1030.

MacCormack A, Rusnak J, Baldwin C. Forthcoming. Exploring the duality between product and organizational architectures: a test of the "mirroring" hypothesis. *Research Policy*.

March JG, Simon HA. 1958. *Organizations*. Wiley: New York, NY.

Marquis C, Lounsbury M. 2007. Vive la résistance: competing logics and the consolidation of U.S. community banking. *Academy of Management Journal* **50**(4): 799-820.

Milgrom P, Roberts J. 1995. Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics* **19**(2-3): 179-208.

Moore JF. 1996. *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems.* Harper Business: New York, NY.

Mowshowitz A. 2002. *Virtual Organization: Toward a Theory of Societal Transformation Stimulated by Information Technology*. Quorum Books: Westport, CT.

Murmann JP. 2003. *Knowledge and Competitive Advantage: The Coevolution of Firms, Technology, and National Institutions.* Cambridge University Press: New York, NY.

Nadler D, Tushman M. 1988. *Strategic Organization Design: Concepts, Tools & Processes*. Foresman Scott: Glenview, IL.

Nadler MB, Tushman ML. 1997. *Competing by Design: The Power of Organizational Architecture*. Oxford University Press: New York, NY.

Nickerson JA, Zenger TR. 2004. A knowledge-based theory of the firm: The Problem-Solving Perspective. *Organization Science* **15**(6): 617-632.

O'Mahony S. 2003. Guarding the commons: how community managed software projects protect their work. *Research Policy* **32**(7): 1179-1198.

O'Mahoney S, Bechky BA. 2008. Boundary organizations: enabling collaboration among unexpected allies. *Administrative Science Quarterly* **53**(3): 422-459.

O'Mahoney S, Ferraro F. 2007. The emergence of governance in an open source community. *The Academy of Management Journal* **50**(5): 1079-1106.

O'Mahony S, Lakhani K. 2011. Organizations in the shadow of communities. Working paper, Harvard Business School, Boston, MA.

Pfeffer J, Salancik GR. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. Harper & Row: New York, NY.

Prahalad CK, Hamel G. 1990. The core competence of the corporation. *Harvard Business Review* **68**(3): 79-91.

Puranam P, Alexy O, Reitzig MG. 2011. What's new about "new" forms of organizing? Working paper, London Business School, London, UK.

Puranam P, Gulati R, Bhattacharya S. Forthcoming. How much to make and how much to buy: an analysis of optimal plural sourcing strategies. *Strategic Management Journal*.

Puranam P, Vanneste BS. 2009. Trust and governance: untangling a tangled web. *The Academy of Management Review* **34**(1):11-31.

Raymond ES. 1999. *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*. O'Reilly: Cambridge, MA.

Reuer JJ. 2004. *Strategic Alliances: Theory and Evidence*. Oxford University Press: Oxford, UK.

Rosenkopf L, Metiu A, George VP. 2001. From the bottom up? Technical committee activity and alliance formation. *Administrative Science Quarterly* **46**(4): 748-772.

Rothaermel FT, Boeker W. 2008. Old technology meets new technology: complementarities, similarities, and alliance formation. *Strategic Management Journal* **29**(1): 47-77.

Santos FM, Eisenhardt KM. 2005. Organizational boundaries and theories of organization. *Organization Science* **16**(5): 491-508.

Shah SK. 2006. Motivation, governance, and the viability of hybrid forms in open source software development. *Management Science* **52**(7): 1000-1014.

Simon HA. 1947. *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organizations*. Macmillan Co.: New York, NY.

Simon HA. 1951. A formal theory of the employment relationship. *Econometrica* **19**(3): 293-305.

Simon HA. 1962. The architecture of complexity. *Proceedings of the American Philosophical Society* **106**(6): 467-482.

Simon HA, Thompson VA, Smithburg DW. 1950. *Public Administration*. Knopf: New York, NY.

Srikanth K, Puranam P. 2010. Integrating distributed work: comparing task design, communication, and tacit coordination mechanisms. *Strategic Management Journal* **32**(8): 849-875.

Subramanian U, Raju JS, Dhar SK, Wang Y. 2010. Competitive consequences of using a category captain. *Management Science* **56**(10): 1739-1765.

Tautz J, Heilmann HR. 2008. *The Buzz About the Bees: Biology of a Superorganism*. Springer: Berlin, Germany.

Thompson JD. 1967. *Organizations in Action: Social Science Bases of Administrative Theory*. McGraw-Hill: New York, NY.

Tushman ML, O'Reilly CA. 1997. *Winning Through Innovation: A Practical Guide to Leading Organizational Change and Renewal*. Harvard Business School Press: Boston, MA.

Van de Vrande VJA, Lemmens C, Vanhaverbeke W. 2006. Choosing governance modes for external technology sourcing. *R and D Management* **36**(3): 347-363.

Vanhaverbeke W. 2006. The inter-organizational context of open innovation. In *Open Innovation: Researching a New Paradigm*, Chesbrough H, Vanhaverbeke W, West J (eds). Oxford University Press: New York, NY; 205-219.

Vanneste BS, Puranam P. 2010. Repeated interactions and contractual detail: identifying the learning effect. *Organization Science* **21**(1): 186-201.

von Hippel E. 1988. *The Sources of Innovation*. Oxford University Press: New York, NY.

von Hippel E. 2005. Open source software projects as user innovation networks – no manufacturer required. In *Perspectives on Free and Open Source Software*, Feller J, Fitzgerald B, Hissam S, Lakhani K (eds). MIT Press: Cambridge, MA; 267-278.

von Hippel E, von Krogh G. 2003. Open source software and the "private-collective" innovation model: issues for organization science. *Organization Science* **14**(2): 209-223.

von Krogh G, Spaeth S, Lakhani KR. Community, joining and specialization in open source software innovation: a case study. *Research Policy* **32**(7): 1217-1241.

Weber, M. 1922. *Wirtschaft und Gesellschaft*. Mohr: Tübingen, Germany.

West JW, Lakhani KR. 2008. Getting clear about communities in open innovation. *Industry & Innovation* **15**(2): 223-231.

Williamson OE. 1991. Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly* **36**(2): 269-296.

Zhou YM. Forthcoming. Designing for complexity: using divisions and hierarchy to manage complex tasks. *Organization Science.*