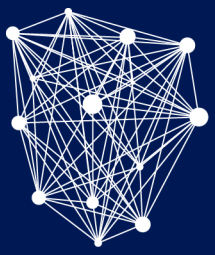

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EDITORIAL

Periodically, leading scholars in the organization sciences have paused to reflect on the status of organization and management theory (e.g., Perrow, 1973; Hambrick, 1993; Huber, 2010). Their overall conclusions have been strikingly similar: organization and management theories may matter a great deal to the scholars who produce them, but they matter very little to managers. As an applied discipline, the field of organization design offers a true opportunity to bridge the worlds of scholarly research and management practice. Problems of organization design exist at the nexus of theory and practice, demanding rich understanding, robust theorizing, strong empirical analysis, and futuristic thinking. Further, with rapid technological evolution, new forms of organizing, and dynamic economic and social environments within and across countries, problems of organization design in the private, public, and nonprofit sectors are ever more complex and challenging, for both researchers and managers.

Those of us who formed the Organizational Design Community (www.orgdesigncomm.com) and established the ***Journal of Organization Design*** (www.jorgdesign.net) believe that scholars and managers can and should work together to design (or redesign) organizations to be much more effective than the organizations that exist today. However, effective collaboration requires that we shift our attention from explaining the past to developing insights about the future and then deriving the implications for organization design and management action. Such a shift has implications for both theory development and research methodology. ***Journal of Organization Design*** provides a forum for authors who wish to rigorously explore what organizations might become, as well as for those who wish to translate their ideas into practice. We invite theorists, methodologists, practitioners, and futurists in organization design to submit their work to the journal.

Our vision for the ***Journal of Organization Design*** is future-oriented in both publication strategy and content. The journal will offer the following features to its authors and readers, making it the leader in open access publishing in the organization sciences:

Open access
- Freely accessible to all audiences online
- Covered by the major indexing and archiving services
- Authors retain rights to their work

High-quality, rapid editorial process
- Double-blind peer reviews by international experts in the field
- Fast turnaround of submitted papers

Instant publication
- Accepted papers uploaded immediately after copy editing and formatting
- No constraints on journal issue size (JOD has unlimited space to publish accepted papers)

Wide distribution to increase scholarly citations and managerial impact
- While most traditional subscription journals target a narrow audience, JOD will reach academics and practitioners across fields, including (but not limited to) organizational design and change, organizational behavior, organization theory, strategic management, international management, public and nonprofit administration, management consulting

Opportunity to upload a short self-recorded video to introduce and personalize your research

Multiple article formats, each reviewed through a different process, offering you an appropriate format to tailor the nature and length of your paper
- *Research Articles*: These articles present compelling research ideas and/or findings that are useful to scholars and practitioners in a format approximately

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half the length of a typical academic journal article (up to 4,000 words excluding appendices). The emphasis is on scholarly contributions to theoretical or empirical understanding of the phenomenon, although not necessarily both simultaneously. All research methodologies are welcome, including qualitative fieldwork, quantitative analyses, survey-based studies, action research, laboratory experiments, field trials, computational modeling, meta-analyses, and replication studies. The review process will be led by an Associate Editor for Research Articles. The online submission process requires a brief statement (up to 150 words) of the paper's contribution and why the organization design community would find it useful.

- *Translational Articles*: These articles (up to 4,000 words) take an existing concept, theory, or study and derive practical implications for organization design. The review process for a submitted translational paper will be led by an Associate Editor for Translational Articles.
- *Point of View Articles*: These articles (up to 2,000 words) present an opinion, speculation, or new idea or perspective, and are not necessarily supported with extensive data or proof. Point of View Articles will be processed by the Co-Editors and may be accompanied by an invited commentary.
- *Urgent Issue Articles*: These articles (up to 2,000 words) describe a problem or issue whose importance and urgency merit immediate attention in the organization design community. Urgent Issue Articles will be processed by the Co-Editors.

We are pleased to present the first issue of the ***Journal of Organization Design***. This issue is devoted entirely to the topic of the future of organization design, and it contains seven statements which we hope will inspire both managers and scholars. These statements emphasize the importance of organization design, and they describe how the field can expand and improve. We hope to see many papers submitted to JOD in the future that address the opportunities and challenges discussed in these seven statements. The authors of the statements will be present at the Organizational Design Community's inaugural conference, *The Future of Organization Design*, which will be held at the Harvard Business School on August 3, 2012. There they will expand on their statements and lead discussions which we hope will usher in a new era of organization design theory and practice.

We look forward to presenting future issues of JOD, and we hope you will join us in this endeavor by reading the journal and by submitting your papers.

Børge Obel
Charles C. Snow
Co-Editors

THE FUTURE OF ORGANIZATION DESIGN

JAY R. GALBRAITH

The type of organization design that I practice is strategic organization design. It has roots in Chandler's (1962) work which states, "Structure follows strategy." It applies to organizing at the enterprise, business unit, region, or functional levels. It is a top-down design methodology. The alternative is a bottom-up design approach such as the socio-technical systems approach. Bottom-up design methodologies build and design an organization around the technology being utilized and are most applicable at lower levels of the organization.

SHAPERS OF ORGANIZATION DESIGN

In my opinion, the future of strategic organization design will be shaped by three main phenomena. The first phenomenon, which Chandler (1962) described as a process of "concatenation," involves ever-increasing complexity and interdependence as firms add new strategic emphases and then incorporate them into their structure. About every 30 years or so, leading companies have added a new dimension to their strategies and structure. I think there will be another dimension – a dimension based on "Big Data" – that will be added to enterprise structures of the future.

A second shaper of organization designs of the future is the law of requisite variety (Ashby, 1956). This law, taken from cybernetics, states that as the number and variety of relevant entities in the stakeholder environment increases, the number and variety of units inside the enterprise must increase in order to manage these entities. The number and variety of stakeholders have been increasing as we have evolved from a mass production, mass market economy to one of mass customization and segmented markets. IBM, for example, used to have a single direct sales force calling on its various customers. Today there are eight go-to-market channels to reach customers and various departments to manage the relationships with channel partners and customers. Both concatenation and requisite variety have required the creation of more, and more sophisticated, integrating mechanisms.

The third shaper of future organization designs are the enabling technologies resulting from the Third Industrial Revolution (Markillie, 2012; Rifkin, 2011). This revolution is based on new technologies like three-dimensional printers that can fabricate a product anywhere in the world. Product designs can be stored in software in the cloud and downloaded to a printer at the point of demand. The products can be extruded, layer-by-layer, from 3D printers loaded with plastics, carbon fiber materials, or metals. These new digital devices can eliminate expensive supply chains, maximize customization, and minimize economies of scale. These devices cost only one to 20 million dollars, so a global firm's country and customer organizations can have their own manufacturing departments. This revolution will shift power and authority from global supply chain functions to the customer segments and countries.

ADDING STRATEGIC DIMENSIONS

At the beginning of the 20th century, most large business firms were vertically integrated and organized into functional structures. Chandler (1962) described how many of these firms diversified and organized into the multi-divisional structure. That structure was two-dimensional with business unit profit centers and functions reporting to the CEO. Around 1960, many U.S. corporations began to expand internationally, starting with European

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markets. This expansion was executed through a three-dimensional organization. Countries and regions were added to the structure, and they also reported to the CEO. Then, in the 1990s, companies such as IBM and Procter & Gamble started to focus heavily on customers, adding a fourth strategic dimension that needed to be incorporated into the organization. Reporting to the Office of the Chief Executive at P&G were global functions, global business units, regions, and global customer units. P&G called its organization the "Four Pillar" structure.

Procter & Gamble embedded these new dimensions throughout its existing structure, thus creating massive new complexity and interdependencies. The new dimensions are not just added onto, or bolted on, the existing structure but are woven into it via various matrix relationships. When P&G creates a global Wal-Mart team, that unit has roughly 250 people, and it reports to the regions as well as the CEO. In each region, the structure consists of business unit teams that also report to the global business units. Each regional business team is organized around functions, which also report to their functional units at the top of the global Wal-Mart team structure. The Four Pillar organization is actually a four-dimensional matrix. Clearly, coordinating these four dimensions is a major challenge for organization design.

The question naturally arises as to whether there will be a fifth dimension. My guess is yes, there will be a fifth dimension and it will be Big Data (McKinsey Global Institute, 2011). Companies are beginning to aggregate their currently independent databases. Today each customer team, business unit, country, and function has its own database. The trend is to collect and combine these databases centrally. Using analytical search engines and algorithms, companies can generate new and valuable insights from the various data. Customers, both new and old, are usually willing to pay for these insights. Given their importance, these databases and analytical units are being combined and now report to the CEO. Big Data could very well be the next strategic emphasis of the future enterprise organization.

REQUISITE VARIETY

The complexity that is created by moving from a mass market to a fragmented and segmented market can be seen in consumer goods companies. Most of these companies were organized in the U.S. by product categories and functions in a two-dimensional matrix structure. The product lines or categories owned the brands. But then companies began brand extensions across categories. At P&G, Olay was a hand lotion. It still is, but the brand has been extended into anti-aging products, bar soap, body wash, facial cleansers, facial moisturizers, facial hair removers, and ultra-violet protection products. Now P&G needs to coordinate brands across products and functions. Another complexity arises when the products and brands are modified to appeal to different segments. P&G has standard versions of products and brands, and additional versions for African Americans and Hispanics. So, consumer goods companies in the U.S. are organized by products and functions, as before, but also by brands and consumer segments. These are four-dimensional structures.

Coordination and complexity issues are present in all types of companies. The different types of media, customer segments, regulators, non-governmental organizations, technologies, and channels all require some kind of attention by the firm. This attention becomes the responsibility of units – often new units – inside the organization. Together, these units increase the number of entities and the interdependencies among them. The challenge is, how do we coordinate all of these units so as to achieve the firm's multiple strategies? Let's consider the coordination mechanisms that are being created to do so.

COORDINATION MECHANISMS

In my earlier work (Galbraith, 1974), I used the concept of information-processing capacity of an organization. As the number of different kinds of units in a company increases, and the interdependencies among them increase, the organization must process more information. Additional information-processing capacity can be achieved in two ways. One way is for a company to increase the capacity of its hierarchy to process more information, usually through some centralized mechanism. Alternatively, it can decentralize interdependence by employing lateral forms of coordination. Future organizations will use both types of

coordination mechanisms.

The hierarchy has been enhanced by "two-in-a-box" structures and by multi-dimensional planning and resource allocation schemes. Companies such as Monsanto, Intel, and some investment banks use two-in-a-box management structures. At Monsanto, business units are run by a general manager combination of a bio scientist and a sales/marketing person. The capacity at the top of the hierarchy has also been expanded. For example, when Jack Welch was the CEO of General Electric, he had two or three vice chairmen who joined in an Office of the CEO. The businesses reported to Welch, and the vice chairmen had expertise that Welch did not. This structure allowed three or four executives to focus on the whole enterprise rather than just one.

The resource allocation and priority setting system has also been enhanced. The best publicly available example is ABB under CEO Percy Barnevik (Barnevik, 1991; Strebel & Govinder, 2003). Barnevik put together a financial reporting system that could yield profit and loss reports for 5,000 business unit/country entities. Here the four-dimensional organization creates four ways to measure profits and losses. In such organizations, there is a continual debate about which measure is best.

The second way to process the coordination information necessary to manage interdependence is through an extensive lateral organization. Lateral mechanisms vary from simple informal relationships to formal teams and, finally, to complex matrix processes. All are being augmented with collaborative software and video conferencing. As much as possible, business processes are being automated. Customers of Cisco, for example, can design their own products and then hit a "buy" button. The order goes through Cisco's system to outside contractors, which assemble and ship the product. The product is delivered, the customer pays, and the electronic cash goes to Cisco's bank. All of the interdependence has been automated.

The human side of the organization is being redesigned as well. In many firms, emphasis is placed on developing shared values that guide decisions without communication between interdependent units and managers. Selection, development, and promotion processes are focused on creating collaborative managers. A culture of collaboration drives many of the processes to manage interdependence, and rotational assignments are used to develop managers who understand and identify with the total company. Rotations create the personal networks to get things done in these multi-dimensional organizations.

CONCLUSION

Strategic organization design's future will look a lot like its past. Companies add a new strategic dimension to their strategy and structure about every 30 years, thereby requiring the creation of new integrating mechanisms. Moreover, companies face a proliferation of internal organizational units as business evolves away from mass marketing and mass media toward more targeted (fragmented and segmented) responses to market, media, and stakeholder demands. The constant interplay of rising complexity and interdependence creates an ongoing demand for organization designs that can respond with new and more powerful coordination mechanisms.

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A PRACTITIONER'S VIEW OF THE FUTURE OF ORGANIZATION DESIGN

FUTURE TRENDS AND IMPLICATIONS FOR ROYAL DUTCH SHELL

JAN STEINMETZ[1] • CHUCK BENNETT • DORTHE DØJBAK HÅKONSSON

Humanity is facing an increasingly challenging outlook for energy needs and the planet. Royal Dutch Shell is a global group of energy and petrochemicals companies with approximately 100,000 employees in more than 80 countries that is committed to help meet the challenges of the new energy environment in a sustainable and responsible manner. My statement will present some of the future trends and possible implications which can be seen for organization design within Royal Dutch Shell (Shell) and which are applicable to other large, complex enterprises. It largely represents the personal views and reflections of a practitioner both inside and outside of Shell's human resources (HR) function in the United States. Using the lens of organization design, we will review the themes that emerged from the Shell Energy 2025 and Shell Energy 2050 global scenarios. Next, we will discuss Shell's previous experience, challenges, and issues related to organization design, and how the recent redesign of the HR function has provided wider space and crisper focus to meet the challenges of the future. Finally, we will review the design challenges that the future trends impose upon the organization design practice. Although these challenges and implications are derived from experience working in Shell and its joint ventures, they are not confined solely to Shell. Because many of the challenges discussed below would benefit from scholarly research, the statement represents a practitioner's view on how the future of organization design may play out.

A VIEW OF THE FUTURE BASED ON SHELL'S ENERGY 2025 AND 2050 GLOBAL SCENARIOS

Shell uses global scenarios to cast light on the context in which it operates, to identify emerging challenges, and to foster adaptability to change. These scenarios are made in cooperation with external experts and Shell colleagues to share best understanding of what the future holds. The scenarios are used to help review and assess strategy against a range of possible developments over the long term and to think broadly about the future. The most recent scenario, Shell Energy 2050, offers alternative ways the future may develop. Overall, the company's view is that the world can no longer avoid three hard truths about energy supply and demand: there will be a step-change increase in energy use; supply will struggle to keep pace with demand; and environmental stresses are increasing.

It's easy to expect that the world's energy system a century from now will be very different from that of today. But how will the inevitable transitions emerge over the next decades? Shell uses scenario development to identify themes that will impact the business, including the discipline of organization design, Shell Energy 2050 relied on three key questions: What

1 This paper represents the thoughts and ideas of Jan Steinmetz. Chuck Bennett contributed with bringing the past Shell experience into the paper and in shaping the content, and Dorthe Døjbak Håkonsson contributed in writing the paper so that it is fit for purpose for the JOD.

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are the most significant factors that will influence the business environment, and how might they differ from today? What might those factors suggest with regard to the need for changed organization design elements to effectively respond to them? What could we be doing to help prepare for, or shape, the times ahead?

A review of Shell's scenarios with these three questions in mind led to eight major themes relevant to organization design which need to be addressed:

1. *Globalization continues*: The Company's global footprint must be carefully designed and managed.
2. *Sustainable development is valued*: Helping meet the world's growing energy needs in economically, environmentally, and socially responsible ways.
3. *The energy system will operate with increasing tension*: Demand for more energy and less carbon dioxide.
4. *Corporate reputation is re-emerging as a significant economic value*: Out of the ashes of the Enron debacle, the great financial crisis, and the British Petroleum incident, corporate reputation will be a competitive advantage.
5. *Demand for transparency and accountability will intensify*: With social media and changing norms, transparency and honoring business principles are a must.
6. *The role of the State will increase*: Governments will place more emphasis than ever on balancing efficiency to achieve low-cost energy supply, security to meet that supply, and supporting social cohesion.
7. *A global regulatory context will develop*: Global companies will argue for clear, harmonized international policies as a way to avoid inefficiencies and uncertainties that result from a patchwork of local and national regulations.
8. *There will be fierce competition for talent*: With the rapid growth of emerging markets, especially in East Asia and Africa, and crew changes in more developed countries, companies will be competing for top talent in global markets.

HOW SHELL IN THE UNITED STATES TRADITIONALLY HAS DEALT WITH ORGANIZATION DESIGN

Initially, Shell's organization design approach was heavily influenced by the experiences of Proctor & Gamble. Shell brought in expertise from Proctor & Gamble and other companies with mature, established practice areas; adapted proven methodologies; and transplanted these for the fit-for-purpose design of green field operations in mining, chemicals, and exploration and production industries. Unlike the green field design projects, however, most of the brown field design projects tended to be driven by structure, system, or process agendas. In these instances, strategy and the external environment were not driving forces. During this period, Shell's governance was country- and business-based, and business units were largely self-sufficient and had local accountability and autonomy.

For many years, issues related to organization design primarily were dealt with by the Organization Effectiveness (OE) practice area. The OE practice area was operated as a separate structure outside of HR and was strongly influenced by socio-technical systems thinking and by the individual practitioner's approach to design and change. Each business unit tended to have its own dedicated OE and change specialists. During major transformations, those resources were sometimes expanded to as many as fifty people sitting in a transition structure to support a design and change life cycle. The desired "future culture" was typically not built into the design, as it was seen as soft and esoteric; nor was the engagement process sufficiently robust to support the organizational changes. Due to all of these factors, "designs" were often driven by the personal energy of a leader. These leaders tended to have the "answers in their minds" rather than basing solutions on a thorough diagnosis or the open systems step of externalization. This resulted in current designs often being tweaked rather than aiming for a more fundamental redesign. This also meant that designs were driven "inside out" rather than "outside in" and therefore often missed the customer input and a strategic intent at the beginning of brown field projects. Leader and resource energy ebbed after conceptual design, as a "hurry up" mentality often would short-circuit detailed design discussions, thereby sub-optimizing the overall outcome.

STRATEGIC ORGANIZATION DESIGN IS NOW A PRIMARY HR CAPABILITY

Clearly, Shell needed a more strategic and externally oriented organization design capability to meet its future challenges, including ensuring that people strategies, systems, and programs are aligned with business objectives. A recent major redesign of the HR function separated HR into Business HR and HR Operations. This model extended Business HR into the space of organization design, talent management, and business consultation, while allowing HR Operations to focus primarily on achieving operational excellence in delivery and expertise in HR acumen. With this increased capacity and expanded focus, Shell's Business HR is now much better positioned to contribute to improved business decisions, business leader development, and overall company performance through diagnosis, solutions, and advice. In the future, senior Business HR leaders will have primary responsibility for conducting organization design and/or serve as the interface for outside consultants (organizational development, organizational design, etc.). In addition, senior Business HR leaders will be able to integrate organization design with talent management.

FUTURE TRENDS AND IMPLICATIONS FOR ORGANIZATION DESIGN

With organization design capability now residing within Shell's HR function, eight major implications, all of which will have to be dealt with, can be derived from the future themes identified above:

1. *Given that the HR function is seen as strategic and extends its scope and governance to include organization design:*
    - Business HR's role will expand to include organization design as a core competency area, particularly at senior management levels.
    - The Senior HR VP will be the access point for external consultants, not the Senior Business Leader or CEO.
    - The organization design discipline will sit within HR, with a few consulting experts in a Center of Excellence that is the owner of the intellectual property.
2. *Given the increased level of competition for talent, talent management and organization design processes will be intertwined to ensure the necessary leadership and resources for the Company:*
    - The process is iterative, taking into account the strength of existing and "bench" leadership. Leadership readiness will factor into design decisions.
    - Talent management implications will be incorporated up-front into the company's organization and managed as an integrated project program.
    - Organization design will need to focus on increasing capacity of existing resources as an additional strategy to meet resource demands of the business.
    - Implementation planning will need to allow for external resourcing and/or talent movement.
3. *Given the competition for talent, including the need for attraction and retention, a focus on generational differences, as well as reward systems and cultural attributes, will require more attention in design and change efforts:*
    - With HR having more direct ownership of the design process, there will be more openness to addressing reward and people systems.
    - The design process must fully accommodate multiple diverse cultures, particularly where it impacts the degree of open participation.
    - The impact of external regulations and expectations on reward systems at all levels, especially at senior levels, will be assessed.
4. *Given the need for sustainability, design processes themselves must be more sustainable, organic, and ongoing, and less mechanistic and short term, with assurances built into the processes:*
    - Overall, the design process will be sequenced and extended, no longer seen as fast-cycle and dedicated to individual projects.

- Action learning and engagement will be incorporated to ensure alignment and ownership.
- Continuity and tenure of designers and key leaders will be assured so that design outcomes are achieved.
- Diagnostic skills will be a critical development area for HR leaders and internal practitioners.
- Capacity to focus on detailed design and considerations at the individual level will be increased.
- At the outset of projects, the design process will consider the desired culture as a conscious outcome.

5. *Given the need to externalize, including increased use of stakeholder management, there will be more up-front external involvement and ongoing participation in the design process:*
    - There will be more focus on setting and clarifying business strategies and objectives, and understanding their implications for organization design.
    - There will be more focus on identifying and planning for external impacts on the system of interest.
    - Large conference design approaches will be favored to ensure that engagement occurs both within and outside of the organization. This will extend the design cycle time but will also create better solutions with more ownership and enhanced implementation.
6. *Given increasing globalization, including new governance demands and the need for more standardization, some organization design projects will be owned at the global rather than local level:*
    - Global standard operating models will apply in certain areas, and design will allow for less variation and choice locally.
    - The contract for design will be managed at the global level and will shift the access point from local to global leaders.
    - Change management approaches will be standardized, with some "fit-for-purpose" tailoring to accommodate local context and culture.
    - Implementation timing will be geared to global requirements (e.g., European Staff Councils).
7. *Given the more complex regulatory context and the value placed on corporate reputation, there will be a clear emphasis placed on creating the requisite levels of assurance and compliance:*
    - Decision authority and segregation, as well as assurance, will take on a more important role in the design process. Indeed, defining the critical level of assurance will be a pivot point for design.
    - The value of assurance will be an important stage-gate step of the design and will be built into the design process.
    - Design experts will need to be able to find the right balance of speed and individual accountability with appropriate levels of assurance and risk management.
    - In the design of structure, governance will be strengthened and seen as an important risk management tool.
8. *Given the demand for transparency, and the speed and sophistication of social media, expectations for early and honest engagement with all stakeholders will intensify and must be built into the design and change process:*
    - The role of communications, including choice of appropriate channels, will take front seat in the design process.
    - The role of leaders will be heavily impacted and require very different engagement, advocacy, and personal mastery skills.
    - Leaders will need to commit more time to build shared vision and alignment.
    - The process needs to ensure a rhythm of communication and engagement.
    - Change management processes will require more sophisticated sensing mechanisms and monitoring.

CONCLUSION

To meet the future, Shell is currently planning for a world of increased transparency, sustainability, and regulatory requirements, along with the need for complex stakeholder relationship management and fierce competition for talent. The company has already taken important initiatives, such as the reorganization of its HR function, to be better positioned in the future. A number of important design problems remain unsolved, however, including issues that extend well beyond Shell's control and that require more collaborative research and effort. We hope that this statement will help the design community prepare for, and shape, responsible participation in organization design of the future.

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THE CENTRALITY OF ORGANIZATION DESIGN

RAYMOND E. MILES

I am excited about this new journal focused on the subject of organization design. In my view, organization design is a central issue in the field of management. Designing an organization requires an understanding of strategy, as we pointed out some time ago (Miles & Snow, 1978). For example, if you want to be a prospector (a first-mover strategy), you have to design your firm to move quickly in new directions, which is likely to require that it be arranged so that various kinds of teams can interact across organizational units and levels. Designing an organization to follow a first-mover strategy also requires both an understanding of leadership and a commitment to the free flow of information throughout the organization. Leaders must understand how cross-functional teams pursue ideas and opportunities, and they must facilitate collaborative knowledge sharing to drive innovations that help the firm operate entrepreneurially. Because an organization is a complex, dynamic system, perhaps no other single topic is so deeply implanted at the core of management, organization theory, and organizational behavior as organization design. Moreover, organization design once was, and could be again, the topic of an ongoing dialogue between managers and academics focused on business organizations.

Throughout my research and writing from the 1950s to the present, the topic of designing organizations has nearly always been the starting point of meaningful conversations with managers. In the 1960s, when academics and managers interacted freely around efforts at team building, job design, and leadership and motivation, designing new organization structures and management mechanisms was a shared interest (Likert, 1967; McGregor, 1960). In the 1970s, as business strategy formulation and implementation emerged as an organizational challenge, designing the firm to fit chosen strategies was of interest to both scholars and practitioners (Miles & Snow, 1978; Peters & Waterman, 1982). In the 1980s and 1990s, as organization theory turned its attention towards networked organizations, which require coordinated and even collaborative relationships among multiple firms in a global supply chain, design became a continuous process, emphasizing the creation of conditions that support a changing and demanding level of trustworthiness and knowledge sharing not only within but across firms (Miles & Snow, 1994). Lastly, both economic and organizational research in the last decade increasingly has focused on the level and pace of innovation as the primary wealth-creation mechanism of the 21st century. To facilitate rapid and efficient innovation, firms are seeking to both broaden and deepen their external linkages, through processes such as open innovation (Chesbrough, 2003), user-driven innovation (von Hippel, 2005), and collaborative entrepreneurship (Miles, Miles, & Snow, 2005). Throughout this evolutionary process, organizations have become more complex and difficult to manage, demanding a new awareness of organizational design alternatives and how they can be generated and implemented. Such awareness can only come from a close and continuing dialogue between researchers and practitioners.

Despite calls for "useful research" (Mohrman, Lawler, & Associates, 2011) and "engaged scholarship" (Van de Ven, 2007), academics and managers seldom collaborate closely on developing solutions to organizational and managerial problems as they once did. Organization design, from the simplest challenges to the most complex, requires a holistic view – a clear vision of the firm's purpose, its chosen market strategies, an understanding of the resources needed to pursue objectives, and the optimal approach for arranging and utilizing those resources. Deciding on an optimal design requires the cost-benefit analysis of design alternatives and the alignment of the chosen structure with management mechanisms and

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leadership values and skills. Each new era demands a new level of managerial understanding and capability and, correspondingly, a new level of scholarly research and new approaches for sharing knowledge across these communities. Even as the academy and the leaders of organizations have moved further into their respective spheres, one common topic of interest usually has been organization design. Certainly, this new journal will not by itself recreate the valuable patterns of interaction between managers and scholars that existed 40-50 years ago, but focusing attention on organization design may well rekindle shared interests and could even lead academics back into the field and managers into classrooms.

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RETHINKING ORGANIZATIONAL DESIGN FOR COMPLEX ENDEAVORS

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The future of Organizational Design (OD) will be shaped by the extent to which the field can address the fundamental organizational design challenges we face in this Age of Interactions (Alberts, 2011). Will we prefer to take the well-paved path directly ahead, perfecting the design processes currently employed to increase the probability that a particular organization is successful in a particular environment? Or will we blaze a new trail, re-conceptualizing the fundamental elements of organizational design in response to a world that is changing the nature of organizations and the capabilities they need to survive?

Reinventing OD partly involves going back to basics to reconsider what we mean by an "organization" and the defining characteristics of its operating environment, the measures of merit or fitness by which the quality of a given design is determined, and the meaning of design itself. While this may be a formidable challenge for the field of OD, only by venturing down this alternate path will we be able to create the agile complex enterprises needed to tackle the pressing security, societal, economic, and environmental challenges we face.

RETHINKING THE FITNESS MEASURE FOR ORGANIZATIONS

Organizations in almost all competitive spaces have recognized that their worlds are becoming more complex and are seeking better ways to deal with this complexity. Kates and Galbraith (2007), for example, note that the increasing rate of change as well as the interconnectedness of the environment contribute to the greater complexity faced by their client organizations. Increased environmental complexity and dynamism translate into more ambiguity, less predictability, and greater risks for organizations. Surprises occur with greater frequency, and unfamiliar situations become more common. These trends suggest that we may benefit from changing the way we determine the quality of a particular organization's design, employing different metrics in the OD process. The traditional metrics used to assess the fitness of an organizational design have been alignment or congruence, coupled with measures of organizational performance calculated under a specific set of circumstances, usually either current circumstances or a predicted set of circumstances. Different measures related to performance, effectiveness, and/or efficiency have been used as a function of the most urgent or persistent problems faced by an organization at its particular stage of development or maturity.

As the level of complexity and the rate of change experienced by the organization increases, the future, both immediate and longer term, becomes less clear. The question faced by the designer ultimately becomes, "What circumstances do we use to evaluate and determine if the design of a particular organization is working or not?" The response to this assessment challenge is usually to add more "scenarios." That is, instead of assuming that the current situation (scenario) is appropriate and sufficient, the assessment process is enriched by creating some number, usually a limited set, of possible futures. While definitely a step in the right direction, the scenario-based approach provides no real assurance that the planning scenarios used are representative of future challenges. In fact, history has shown that we, as individuals and organizations, find ourselves in situations that we did not anticipate and for

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which we are ill-prepared.

One question that needs to be addressed by the OD community is whether or not an organization's design can itself contribute to it being ill-prepared for the unexpected. That is, to what extent does a particular design make an organization more susceptible to surprise and less able to deal with unfamiliar circumstances? In its more general form, this question is whether or not an OD process is suggesting designs that are, to some degree, less well-suited, or even unsuited, for a complex and dynamic world. A related question is whether or not OD, as currently conceived and practiced, adequately addresses situations where the expected life of a design is relatively short and where a series of design changes is needed to maintain a minimum level of fitness.

It has long been recognized that no single organizational approach works well under all circumstances. Thus, there are circumstances for which any given organizational approach will be ill-suited. Furthermore, as a particular design is fine-tuned (optimized) over time, for a well understood and stable situation, the likelihood that it will not perform acceptably increases if the situation changes. At some point, then, efforts to improve efficiency may actually increase the probability of failure, if and when circumstances change significantly.

Given an uncertain and dynamic future, the ability to successfully cope with changes in circumstances – that is, to demonstrate agility (Alberts & Hayes, 2003) – would seem to be a desirable, even existential, property of an organization. Thus, an organization's agility is a necessary consideration when assessing the fitness of a particular organizational design. The concept of agility, as used here, incorporates notions of responsiveness, versatility, flexibility, resilience, adaptability, and innovativeness. Individuals, processes, systems, and particular organizational designs that have these characteristics can be called "agile." Designs that are not agile detract from the organization's ability to dynamically adapt to its environment.

Organizations are not limited to adopting and keeping a particular organizational design for a given mission, task, or set of circumstances. If an organization recognizes salient features of the situation and selects, from among a set of design options, the one that, if not perhaps the best-suited, would be well-suited, then the organizational design process itself exhibits a measure of agility. Overall, the agility of the organizational design process would greatly increase if the process could (a) sense relevant changes in circumstances and, based upon the nature of the changed situation, determine if the current design options are still appropriate; (b) determine that the current organizational design is no longer appropriate and suggest a more appropriate design option; and (c) effect a timely transition from the current design to a more appropriate one.

This discussion suggests that, as the environment becomes more dynamic and complex, organizational agility becomes more important. Further, an agile organizational design process may need to provide appropriate designs at any given point in time. Hence, the ability of an organization to prosper, if not to simply survive, may depend, at least partially, on the existence of an agile OD process.

FROM ORGANIZATIONS TO COMPLEX ENTERPRISES

When we turn our attention from the micro challenges associated with the fitness of individual organizations operating in a competitive space to 21st-century macro challenges (nuclear proliferation, climate change, failed states, global financial crises, national health policies, disaster relief, cyber-security, etc.) that involve a large number of entities working together, complexity increases in two main ways. The first involves an increase in the complexity of the problem while the second involves an increase in the complexity of the actors.

In the first instance, macro problems involve interdependent, multidimensional spaces that can give rise to unintended consequences, sometimes cascading consequences. To begin to understand the possible consequences of potential actions in such situations, actors will, in many cases, require expertise that they traditionally have not had. In the second instance, overcoming these global challenges is almost always beyond the abilities and the resources of any single entity, no matter how large, capable, or rich. Thus, to both develop the understanding required to craft solution strategies and to implement them, a heterogeneous collection of actors needs to work together in ways that heretofore have rarely been seen.

Collectives of independent organizations, termed complex enterprises, cannot be "organized" in traditional ways. In such collectives, there is no one who is "in charge." Instead of a single chain of command, there are multiple hierarchies, no one of which is authorized to command the others.

The tasks associated with management or governance are far more difficult in a complex enterprise. In a traditional organization with a chain of command, allocating decision rights – that is, roles, responsibilities, and authority – is rather straightforward once the organization's routines have been determined. The allocation of decision rights for a complex enterprise (and with these rights, access to "community" resources) needs to be determined collaboratively. Fostering an appropriate pattern of inter-organizational interactions and associated information-sharing behaviors to achieve a desired distribution of information, while certainly not trivial in any organization, becomes quite challenging for a complex enterprise. To date, experiments with organizational designs for complex enterprises have occurred primarily within military organizations and civil-military coalitions (Alberts, Huber, & Moffat, 2010).

Although individual organizations can be quite large and diverse, particularly international organizations, they differ from collectives or complex enterprises in important ways. One major difference is the question of persistence or permanence. The complex enterprises formed in response to a variety of challenges (e.g., international conflict, natural disaster, economic or social crisis) are temporary in nature. Organizations, as we have come to think about them, are designed to persist. As a consequence, our notion of an effective organization is one that grows and becomes sustainable. We need a better understanding of how organizations can be designed to be of the right scale and scope to be immediately effective and then dissolve (or redirect) when the mission is accomplished.

FROM DELIBERATE TO EMERGENT DESIGN

The verb "design" implies authority, understanding, process, and control. If any of these four design prerequisites are missing or lacking in some way, then the organizational designs that result may be less effective or less effectively implemented than they otherwise might be. Collectives or complex enterprises differ from organizations in ways that impact all of these design prerequisites. With no one in charge in a complex enterprise, there is no accepted design authority and no control over efforts to adopt (or change) a particular design. These impediments might be overcome if there is sufficient shared understanding among the actors about the nature of the complex endeavor, the environment in which the endeavor is to take place, the appropriateness of different design options, and the consequences associated with the choice of an inappropriate collective approach. One could envision a case where, given shared understanding, participating actors might see that adopting a particular approach would be in their self-interest. At this point, however, we lack the theoretical foundations and empirical evidence upon which such an understanding would be built. Theory-driven emergent designs, once developed, will be powerful mechanisms for solving 21st-century problems.

FUTURE OF ORGANIZATIONAL DESIGN

The future of the field of organizational design will be tied to its ability to expand (a) its view of organizations to include complex enterprises, (b) the set of criteria it uses to assess the fitness of design options to include agility, and (c) the set of possible design options to include those that are better suited for complex challenges in a dynamic and uncertain operating environment. In addition, the OD community will need to focus on developing a better understanding of the inter-relationships between the designs of individual organizations and the design of the complex enterprises to which these organizations will, at times, be a part. To the extent that the OD community is able to make progress in these areas, it will fill a need in our understanding of better ways to bring the energy, creativity, expertise, information, and resources available to bear on the most important and challenging problems we face.

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A FUTURE FOR THE SCIENCE OF ORGANIZATION DESIGN

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Rather than *the* future of organization design (academics make justifiably reluctant futurists), I want to discuss *a* possible future for the science of organization design – one that I hope will come to pass.

I understand organization design to refer to a particular form of human problem solving in which the problem is one of getting multiple individuals with diverse knowledge and interests to collectively achieve something that they could not by acting individually. Because bounded rationality affects not only the members but also the designers of organizations, solutions may be imperfect and unsuccessful, and many may have arisen almost unintentionally. But clearly there are better and worse solutions, and given the predominantly organizational nature of our economy, many good solutions exist in the form of the organizations that surround us.

Is organization design an important field of study? If we judge importance in terms of potential impact on human affairs, then the answer is a resounding "yes". Further, the importance of improving our knowledge of organization design is likely to remain high in the foreseeable future because of several trends. These trends include advances in information technology that encourage experimentation with new organizational designs, large economies like India and China attempting to rapidly transform the organizational infrastructure of their public administration, the professionalization of the NGO and charity sector, and multinational corporations' increasing attempts to exploit globally distributed intellectual resources.

Can a normatively oriented field such as organization design be amenable to scientific study? Simon's (1996) statement remains the authoritative one on the epistemology of a science of design, and indeed the field made considerable scientific progress through the contributions of academic stalwarts such as Lawrence, Lorsch, Thompson, Tushman, Nadler, Mintzberg, Ghoshal, Doz, and others. Yet as my co-authors and I discuss elsewhere (Gulati, Puranam, & Tushman, 2012), for a variety of reasons there has been a hiatus in the study of organization design, which is only now showing signs of lifting.

So what would organization design as a rejuvenated and useful branch of organization science look like? I believe the field would have three main characteristics. First, the field would be characterized by a high degree of *consilience*. As described by the biologist E.O. Wilson (1998), consilience advocates the importance of scientific explanation at one level of aggregation based on scientific knowledge about lower-order phenomena (e.g., organizations as aggregations of individuals or individual actions occurring as a result of cognitive structures). Consilience requires not only scientifically derived knowledge of lower-level phenomena but also a theory of aggregation.

It is well known that it is sometimes possible to construct theories of higher-level aggregates with only scant knowledge of lower-level elements (Simon, 1996) – in other words, without consilience. However, if the purpose is to develop theories that improve how organizations work (and not only describe how they behave), then it seems unlikely we can progress far in this way. Put simply, useful theories of organization design are likely to emerge from knowledge (rather than assumptions) about how individuals interact in organizational contexts. Thus, there are likely to be many useful things we can learn from cognitive and social psychologists to help construct better theories of organization design.

Second, the field would see *a revolution in empirical methods*. Greenwald's (2012) recent analysis of Nobel prize awards highlights the importance of methodology in opening up new areas for theory development, and this seems particularly relevant to organization design.

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Obtaining large-scale data on the design of organizations has always been difficult, but if the field is to progress, then rich and reliable data on the workings of organizations are essential. Creative ways to get at organizational data will have to be found. One approach involves returning to methods that used to be mainstream: laboratory experiments have contributed significantly to the field in the past (e.g., Cyert & March, 1963) and could do so again. A second approach is to adopt appropriate methodologies from adjacent disciplines, such as methodologies that allow the analysis of social network data or the conduct of field experiments. A third approach involves looking for data in unusual places (e.g., methods to reliably code and analyze textual and linguistic data on governance arrangements in alliance contracts, post-merger integration plans, email records, annual statements, accounting results, and CEO reporting relationships).

Third, a sophisticated applied branch of the field would develop which goes well beyond providing general advice to *prototyping new organizational designs*. This could happen either *in silico* through computational agent-based models or in the behavioral lab – with new proposed organizational arrangements being tested for unanticipated consequences before being implemented.

A dash of humility is appropriate when discussing the future of the science of organization design. It may be that organizations prove to be such formidably complex systems that we make little progress on any of these dimensions. A science of organization design requires at least some degree of consilience by synthesis (Wilson, 1998), and this may prove to be just too difficult. However, I do not think the evidence and progress to date warrant such pessimism; in any case, the enterprise is too important to not even try.

In conclusion, the technology of organizing is the mother of all "general purpose technologies" (Bresnahan & Trajtenberg, 1995). It provides the framework within which we make progress on other technologies (and is sometimes in turn shaped by them). Organization design is too important a field of social science to suffer another long hiatus given its potential to be in Pasteur's quadrant (Stokes, 1997), an arena where the synergies between practice and theory are likely to be very high.

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ORGANIZATION DESIGN FOR BUSINESS ECOSYSTEMS

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The modern corporation has long been the central focus of the field of organization design. Such firms can be likened to nation-states: they have boundaries that circumscribe citizen-employees, and they engage in production and trade. 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; Iansiti & Levien, 2004; von Hippel, 1988). Ecosystems generally encompass numerous corporations, individuals, and communities that might be individually autonomous but 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. Specifically, how should diverse entities be integrated into a coherent network that generates goods in the present and new designs for the future? To answer that question, organization designers must think about how to distribute property rights, people, and activities across numerous self-governing enterprises in ways that are advantageous for the group (ecosystem) as well as for the designer's own firm or community.

DISTRIBUTED INNOVATION AS THE UNINTENDED CONSEQUENCE OF MODULARITY

Organization design always reflects the material culture of a given time and place and is thus fundamentally constrained by technology (Heilbroner, 1967; MacKenzie, 2009). Of particular importance are the technologies of communication and information processing. Communication technologies matter for obvious reasons: they change the degree of real-time adaptive coordination within an organization. Information-processing technologies play a subtler role: they change the degree to which an organization can experiment to discover new and better practices.

When communication and information processing are slow and costly, organizations tend to be small and locally specialized. Standardization across geographically dispersed units is feasible but expensive. When communication is faster but information is still precious and expensive, large organizations become more feasible yet they will tend to be risk-averse and not innovative once their basic configuration has been established (Bohn & Jaikumar, 2005). In the Information Age, the cost of information processing has plummeted, and this supports innovation in two distinct ways. First, it speeds up the evaluation of new designs by making it possible to compute the impact of design changes without having to build physical prototypes. Second, and less obviously, cheap information processing makes it feasible (and even desirable) to modularize designs, that is, to subdivide them into nearly independent components that can be modified separately without compromising the whole (Baldwin & Clark, 2000; Clark, 1985; Simon, 1962). In other words, when information is cheap, designers and engineers can codify the architecture of a technical system – specifying the way the parts will fit together – and begin to experiment with both the component modules and the architecture. In contrast, when information is expensive, such experimentation is not practical.

Not surprisingly, the rise of modular systems occurred hand-in-hand with the upsurge of ever-cheaper information technology in the second half of the 20th century. Such systems

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made highly distributed innovation not only possible but, in a value-seeking economy, inevitable (Heilbroner, 1994). Interestingly, distributed innovation was an unintended consequence of modularity. In fact, it was not even envisioned as a possibility by the first designers of modular systems. Consider, for example, the IBM System/360 computer. In using a modular design for that product, IBM was seeking enhanced customer satisfaction, economies of scale, and reduced complexity in manufacturing. But distributed innovation unexpectedly emerged in the form of competition from the manufacturers of plug-compatible peripheral devices like disk drives. At the time, IBM executives were surprised – and greatly dismayed – by the rise of that business ecosystem.

Even when the possibility of an ecosystem is apparent, managers cannot necessarily anticipate the pathways to profitability. For IBM, the saga of unintended consequences continued with the personal computer. After their experience with the System/360, IBM executives tried to create a PC ecosystem to reduce costs and to enhance the new product's appeal. They assumed that IBM would profit from every PC system sold and control the growth of the market to protect IBM's minicomputer franchise. This worked fine in the short run, but then the ecosystem became flooded with PC clones, which destroyed IBM's profits and cannibalized its minicomputer business. Unable to compete, IBM was forced to retreat from the ecosystem it had nurtured. But the model of distributed innovation based on modular architectures was here to stay.

ADVANTAGES OF BUSINESS ECOSYSTEMS: JOY'S LAW AND CREATIVE PROBLEM SOLVING

Innovation is fundamentally the result of creative problem solving. But creativity is a delicate creature, and nurturing it in organizations is a topic much discussed in both the academic literature and the popular press. A basic challenge is that creative problem solvers are very diverse in their habits of thought and action. As such, an organization that supports one person's excellence will frustrate others. And the best individuals to solve a particular problem could literally be scattered around the world. As Bill Joy, a co-founder of Sun Microsystems, once famously said, "Most of the bright people don't work for you – no matter who you are. [So] you need a strategy that allows for innovation occurring elsewhere" (quoted in Surowiecki, 1997).

Consequently, organization design must take into account that creative problem solvers can choose from among many different work environments. Some individuals may form startups to tackle a particular problem; others might choose to work by themselves and dedicate their efforts to answering a research question; and still others may seek a community of like-minded individuals. A key issue here is how to induce such diverse individuals to apply their skills to a given set of problems in ways that allow their efforts to be linked and aggregated into a coherent whole. Some problem solvers might prefer working on their own problems while others may choose to solve problems for others, all motivated by intellectual curiosity, financial compensation, fame, or any combination of those and other factors (Lakhani & Wolf, 2005). Whatever the case, there are two common threads that distinguish these diverse individuals from agents who work under standard employment or supply contracts: autonomy in problem selection and control over their own creations. The latter issue can be addressed by allocating property rights to problem solvers, giving them control over their creations. Such control could be used to generate profits or to ensure that a creation remains "forever free."

In summary, many creative problem solvers will not (or simply cannot) work effectively under standard employment or supply contracts. Moreover, no single setting can attract all types of creative people. And that's what makes distributed innovation in a business ecosystem such a desirable organizational form. The ecosystem provides a large tent that can encompass creators who value autonomy and want to exercise control over their ideas. Indeed, the delicacy of creativity – the fact that it withers quickly in the wrong environment – makes diverse business ecosystems not only desirable but increasingly necessary to remain competitive in many industries.

COMPETITION AND TECHNOLOGICAL EVOLUTION IN BUSINESS ECOSYSTEMS

When organization design focuses on individual firms, the discussion naturally tends toward head-to-head competition among companies making similar products. Such competition has not disappeared from business ecosystems: firms still rise and fall on the value and appeal of their products and the efficiency of their operations. But while members of an ecosystem compete, the larger system itself will inevitably evolve, opening countless opportunities for recombination: the selection of one mixture of organizational elements from myriad possibilities. Consider Facebook. The key asset of the firm is a social network website with content supplied almost entirely by users and with revenue generated from advertising. In some respects, Facebook is a classic, ad-supported business, but the company's operations have grown far beyond the boundaries of a traditional firm. To support the website and manage traffic, Facebook depends on the Internet and World Wide Web protocols (free rules); the Internet's physical infrastructure, both wired and wireless (regulated modules); personal computers and smartphones (low-cost modules); and four major open-source codebases (free modules). By recombining those and other components from the distributed innovation of a business ecosystem, Facebook was able to capitalize on lucrative opportunities in the rapidly growing field of social networking.

CONCLUSION

Business ecosystems of distributed innovation first became prominent in the high-tech and information-intensive industries, and they have since spread to other areas. But the extent to which business ecosystems will play an important role throughout different industries remains to be seen. To be sure, certain markets present inherent challenges. In heavily regulated industries, for instance, an integrated corporation that is responsible and accountable for a given product might be a more effective organizational form than a multi-agent, recombinant ecosystem. That said, the potential benefits of distributed innovation must be recognized, and the field of organization design must broaden its traditional focus on the individual firm to encompass this compelling new approach for creating value.

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OPEN INNOVATION AND ORGANIZATION DESIGN

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Abernathy's (1978) empirical work on the automotive industry investigated relationships among an organization's boundary (all manufacturing plants), its organizational design (fluid vs. specific), and its ability to execute product and/or process innovations. Abernathy's ideas of dominant designs and the locus of innovation have been central to scholars of innovation, R&D, and strategic management. Similarly, building on March and Simon's (1958) concept of organizations as decision making systems, Woodward (1965), Burns and Stalker (1966), and Lawrence and Lorsch (1967) examined relationships among organizational boundaries, organization structure, and innovation in a set of industries that varied by technology and environmental uncertainty. These and other early empirical works have led a diverse group of scholars to develop theories about firm boundaries, organization design, and the ability to innovate.

In organizational economics, the notion of organizational boundaries has been rooted in transaction cost logic (Coase, 1937). Economists favor explanations based on minimizing transaction costs. Many activities related to innovation and the design and production of goods and services are difficult to contract on the open market. Transaction costs make it efficient for the emergence of firms that reduce such costs by integrating market activities inside the firm (Williamson, 1975, 1981). The transaction cost research tradition has helped to clarify relationships among innovation, the firm, and its environment (or market). This literature has focused on understanding which sets of activities should be inside or outside the firm's boundaries.

Organization theorists and strategic management scholars have noted that value creation involves the production of complex goods and services requiring ongoing knowledge development and transfer across diverse settings (Chandler, 1977; Nickerson & Zenger, 2004). The burden of continuous knowledge creation imposes high coordination costs that are best minimized through a managerial hierarchy. For anything but the simplest problems, the visible hand of a firm's management is required to define and select problems to solve for value creation. Lastly, a significant body of research in organization theory is rooted in how firms set boundaries in a way that protects them from dependencies in their task environment and reduces uncertainty around critical task, power, and competence contingencies (e.g., Santos & Eisenhardt, 2005; Thompson, 1967).

However, customers and other users outside the firm are also an important source of valuable innovations (von Hippel, 1988, 2005). Users include self-organizing communities that freely share knowledge. The open source software movement crystallized an alternative innovation ecosystem where external-to-the-firm user communities design, develop, distribute, and support complex products on their own or in alliance with (and in some cases opposition to) incumbent firms. The rise – and sometimes prevalence – of community innovation, with its contrasting loci of innovation and nonhierarchical bases of organizing, poses a challenge to the received theory of innovation, the firm, and organizational boundaries.

The organization design community must reconcile these divergent scholarly perspectives on the relationship between firm boundaries and the locus of innovation (Gulati, Puranam, & Tushman, 2012). The innovation and organization design literatures must move beyond debates between open vs. closed boundaries and instead embrace the notion of complex organizational boundaries where firms simultaneously pursue a range of boundary options that include "closed" vertical integration, strategic alliances with key partners, and "open" boundaries characteristic of various open innovation approaches. The simultaneous pursuit

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of multiple types of organizational boundaries results in organizations that can attend to complex, often internally inconsistent, innovation logics and their structural and process requirements.

With the democratization of both the tools of knowledge production and dissemination, many more actors outside traditional firm boundaries have access to unique solution knowledge that may be applicable to innovation tasks within firms (Jeppesen & Lakhani, 2010). Such task decomposition and the fact that widely distributed actors have access to differentiated knowledge push the locus of innovation outside traditional firm boundaries. We suggest that task decomposition and knowledge distribution provide a framework for the choice of firm boundaries. These strategic contingencies lead to a different set of design and boundary choices than the traditional topics of asset specificity, information processing, or strategic core. Lastly, we suggest that firm-centered innovation logic is fundamentally different from open innovation logic, and that open innovation logic is increasingly gaining momentum as new multi-actor organizational forms emerge. If so, our theories of innovation, organization design, and organizational change must capture and resolve the tensions between these contrasting innovation modes.

Open innovation, enabled by low-cost communication and the decreased costs of memory and computation, has transformed markets and social relations (Benkler, 2006). In contrast to firm-centered innovation, open innovation is decentralized, peer based, and includes intrinsic and pro-social motives. While the community nature of peer innovation is developing its own literature, and we are rapidly gaining an understanding of the nature and social structure of these communities, the impact of this innovation mode on the firm is not well understood. We do not yet have a theory of the firm, either for incumbents or new entrants, which takes into account community innovation. Thus far, the impact of open innovation on the organization theory and strategic management literatures has been minimal (Argote, 2011).

As open and firm-based innovation are based on contrasting assumptions of agency, control, motivation, and locus of innovation, emerging theories of organizing for innovation must reflect these paradoxical and internally inconsistent innovation modes. Innovation and organization design research must move to macro levels of analysis as we explore how communities inform and shape the firm, and how the firm shapes and leverages its communities in service of its innovation processes and objectives (e.g., Jacobides & Winter, in press; O'Mahony & Lakhani, 2011). Similarly, if open and market-based innovation processes are complements, and the firm's boundaries are contingent on the product's degree of modularity and knowledge distribution, multiple types of boundaries will be employed to manage innovation. Those boundaries will range from traditional intra-firm interfaces to complex inter-firm relations (e.g., ambidextrous designs), to webs of interdependence with partners, to interdependence with potentially anonymous communities. Just how are the mechanisms associated with complex intra-firm boundaries and relations with partners different from shaping relations in open communities? The theory of innovation and complex organizational boundaries can build on extant literature on paradox (e.g., Andriopoulos & Lewis, 2009) and extend this work to contradictory innovation modes. As so much of this research on dynamic boundaries involves senior leaders making choices involving contrasting innovation modes in the context of the firm's history, it is also important to understand how managers think about innovation and organization designs in a way that admits these contradictions (e.g., Smith & Lewis, 2011; Smith & Tushman, 2005).

We have focused here on the challenges faced by incumbent firms having to respond to increasingly open innovation requirements. Much work needs to be done on the characteristics of new entrants that are born in a context already rooted in open innovation. It may be that the founding of firms anchored in open innovation is fundamentally different from that of traditional entrepreneurial start-ups. It may also be that firms such as LuLuLemon or Threadless build their initial business models and supporting organizational forms based on open innovation logic and only deal with more traditional innovation and organizational dynamics when they increase their scale (Lakhani & Kanji, 2009).

As the theoretical and research implications of contrasting innovation modes and complex boundaries are substantial, so too are the implications for managerial choice and agency. If open and firm-based innovation processes are complements, then management must choose

which tasks will be executed in each innovation mode. We suggest that these choices are contingent on the extent to which critical tasks can be decomposed and the extent to which the tasks' knowledge requirements are concentrated. Strategic choices need to be executed with systems, structures, incentives, cultures, and boundaries tailored to open and firm-based innovation modes. Further, if the firm is ever more dependent on open communities, how do leaders act to influence these external communities? Finally, management teams must build their own personal capabilities to deal with contradictions as well as their firm's ability to deal with contradictions. Building architectures to attend to contrasting innovation modes will be particularly challenging, requiring an updated and expanded theory of organization design.

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