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DESIGN GUIDELINES TO ADDRESS GLOBAL CHALLENGES

LESSONS FROM GLOBAL ACTION NETWORKS

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Abstract: Traditional organizations appear to be incapable of adequately addressing critical global issues such as war, climate change, and economic inequality. Addressing these issues suggests the need for organizational innovation to develop global social contracts. Successful innovation must address four integration imperatives: (1) integrate effort and resources across organizational sectors (business, government, civil society) and sense-making, (2) create successful individual to global aggregations, (3) integrate the short and long term, and (4) integrate major issue areas. A new type of organization, Global Action Networks, aims for this integration. Based upon analysis of this new type of organization, five design principles for global social contract organizations are proposed.

Keywords: Organization design guidelines; global problem solving; global action networks

Why are some global issues pernicious and seemingly beyond the reach of substantial effort to address? Think of such things as the persistence of war, famine, economic inequality, biodiversity collapse, and climate change. These will be referred to as "global challenges." There are many ways to frame the reasons for their persistence, from lack of political will or consensus about action measures, to poor incentives, to blocking by powerful actors. These sorts of explanations can be reframed as under-developed institutional capacity to integrate diversity and stimulate necessary action.

A decade of work with a new type of network that is addressing global challenges forms the basis for this article. These networks are placed in the context of organizational evolution to present them as global social contract agents. Four critical integrating problems are identified that must be addressed for the networks' social contract response to be effective. The networks are described in terms of seven strategic characteristics. From this, five design principles are identified for the development of such agents. Hence, this article expands on knowledge about how, from an organizational design perspective, critical global issues can be addressed successfully.

This knowledge must be developed rapidly. Given the environmental sustainability imperative, weapons of mass destruction, pandemics, and threats of famines, organizing effective responses to global challenges must be found quickly, and those responses must themselves enable rapid action. Recent fundamental and subtle shifts suggest a new social contract organizing paradigm that does not place "government," as traditionally conceived, in such a central role. Ostrom (1990, 2000) has taken up the logic of collective action of large groups raised by Olson (1965) to address why people take action in situations when their absence would not seem to make a great difference. Ostrom emphasizes collective action's connection to the production of public goods and won the Nobel Prize in economics for her work in 2009. She notes: "The *problem* of collective action is finding a way to avoid deficient

outcomes and to move closer to optimal outcomes" (Ostrom & Walker, 1997: 427).

In effect, these perspectives challenge the traditional social contract theorists about the role of the state as *the* coordinator and arbitrator of societal interests. As an alternative, Reincke (1997, 1998, 1999) writes about "governing without government". While some think in terms of a supra-national state operating globally as the "solution" to the global governance deficit, others have noted a different sort of response arising in the vacuum, characterized by networks of diverse actors (Khanna, 2011). This includes global public policy networks (Reinicke, 1999–2000), issue networks (Rischard, 2001, 2002), and global governance organizations (Koppell, 2008, 2010).

Pursuing questions about complex large system change, this author has spent a decade working with, analyzing, and writing about these types of networks of diverse actors that he calls Global Action Networks (GANs) (Waddell, 2003a, 2003b, 2004, 2005a, 2007, 2011a, 2011b; Waddell & Khagram, 2007). GANs are global, multi-stakeholder, systemic change agents tackling wicked problems (Buchanan, 1992; Churchman, 1967). They include the UN Global Compact; Transparency International, which focuses on corruption; the Forest and Marine Stewardship Councils; the Microcredit Summit Campaign; the World Commission on Dams; the Global Fund to Fight AIDS, Tuberculosis and Malaria; the International Land Coalition; IUCN (with the environment); and the Global Alliance for Vaccines and Immunization. Almost all of these networks have arisen since the end of the Cold War, the resolution of which enabled the formation of diverse organizations, which are critical components of GANs, in many parts of the world.

This article crosses traditional disciplinary divides, mingling theories in sociology, political science, complexity/chaos theory, structural holes, organizational behavior, and strategy. Implicit in this approach is the assumption that mingling of disciplines and theories is important to advancing the research and knowledge development agenda regarding global challenges. This assumption arises from a belief in the value of a holistic perspective in developing both the agenda and solutions.

GLOBAL CHALLENGES FROM A SOCIAL EVOLUTION PERSPECTIVE

Despite this multi-disciplinary and cross-theoretical approach, an overarching social evolution theoretical perspective is useful to understand the emerging strategy to address global challenges. Just as the existence of elements of the periodic chart was predicted based on a theory about atomic structures, a social evolution theoretical perspective suggests that the core components of critically important organizational innovation already exist. However, being burdened with traditional ways of seeing the world blinds us to the ability to see what is new. In this case, the networks that are claimed here to be a new organizational form are commonly seen as odd civil society organizations or strange inter-governmental ones. An understanding of social evolution, in turn, frames the design principles.

Evolutionary sociology explains how and why new organizational types emerge. Over thousands of years, civilization has been marked by an inexorable drive toward increasing differentiation (Durkheim, 1966 [1893]; Parsons, 1977). Today this is seen with a growing complexity of identities that are increasingly common and would have been considered unthinkable in the past: consider a black French-extraction Senegalese lesbian Buddhist living in Manhattan and working for an information technology company.

This pace of differentiation can also be seen on the organizational level. At one time the organizing tasks were relatively few: farming, statecraft, trading, religious practice, and cultural production. Production chains were few and characterized by exchanges between producers and consumers with occasional artisans and merchants mixed in. Issues were very local, and life was by-and-large subject to the whims of nature. Today the array of governmental, business, and civil society organizations both in terms of goals and structures is astounding, and the dominant intellectual, if not yet operational, assumption is that man is having a huge impact on the environment.

In the face of this increasing complexity and differentiation arises the pernicious Hobbesian question about social order and what holds society together in the face of "three principal

causes of quarrel" (Hobbes, 1996 [1651]). This question has given rise to a long history of thinking about "social contracts" (Locke, 2011 [1690]; Rawls, 1971 [2005]; Rousseau, 2010 [1762]) as key tools for integration in the face of differentiation. These traditions typically start with three foundational points: (1) there is a hypothetical "natural state" where everyone is equal, (2) the key unit is an individual, and (3) the main organizing entity to respond to order and justice questions is the state.

These three points supported the organizational innovation in the West of "constitutional states" with a core operating principle of one person, one vote and the concept of social contract as a key vehicle of coherence (Locke, 2011 [1690]; Rousseau, 2010 [1762]). The state was distinguished by being the sole agent of legitimate coercive power, which it normatively employed to better the lives of its citizens. After the economic horror of the Great Depression and the physical terror of the Second World War, the state became arbitrator in a model of "big government – big business – big labor," in which the core imperatives were economic and physical security.

Tremendous new organizing power accompanied this process: think of the emergence of corporations with the founding of the railroads that produced commercial organizations coordinating across time zones and functional specialization to produce previously unimaginable large-scale material wealth; governments that developed into welfare states with huge bureaucracies to ensure human dignity, peace, and order; and the rise of civil society organizations that burst out of their religious and labor roots to blossom into an amazing array of environmental, human rights, developmental, and other organizations.

This increased organizing power, and an accompanying growth of new technologies, have diminished the role of geographic distance into the phenomenon of globalization. Globalization has led to a huge increase in population and material wealth, and a previously unimaginable negative impact on the environment. The old organizing model that focused on the state as the core agent of social contract production – premised on organizing principles that include the primacy of the individual and "one person, one vote" – seems oddly out of step and even eclipsed in this new world. How do we develop institutions to effectively address issues in a world of seven billion people with a global diversity of culture and contexts? The environmental and financial crises and the scale of income inequality suggest that something significantly new is needed to organize society globally and develop social contracts – to enhance our integration and coordination power (WBGU, 2011). As one innovation that is responding to this challenge, this paper looks at Global Action Networks (GANs) and the principles behind them.

THE INTEGRATION CHALLENGE

The social evolutionary perspective emphasizes the need for integration in the face of continually increasing differentiation. But what exactly needs to be integrated? There is an enormous literature about organizing strategies to address the needs for global integration. The political science literature focuses on the role of government, particularly intergovernmental arrangements such as the Bretton Woods institutions, trade agreements, and international conventions. Similar attention has been paid to the trans-national and multi-national corporation and to global civil society. Most of these approaches favor intra-sectoral (within one of business, government, or civil society) organizational hierarchies with the key organizing challenge being how to connect from local to global. The concept of "transnational relations" expands the equation to regular interactions across national boundaries when at least one actor is a non-state agent (Keohane & Nye, 1971). Reinicke and Deng (2000) characterize the global integration challenge by two dimensions. One is referred to as vertical, by which they mean local-to-global – for example, connecting local government to global governmental organizations. The second dimension is horizontal, which refers to inter-sectoral and inter-organizational links within sectors, such as city-to-city links. These analyses seem rather limited, however, and under-define the integrating challenge. Four particular integration challenges are proposed to describe the challenge more comprehensively and beyond the traditional intra-organizational focus.

One challenge is to *integrate effort and resources across organizational sectors* (business,

government, civil society) *and sense-making* (mental, physical, emotional). All three sectors influence the global challenges, and those global challenges are of a scale that requires the resources and competencies of all. The challenge of integrating them is particularly significant because of their differences. Distinguishing between these three organizing traditions has deep roots. In the 1920s, theosophist Rudolph Steiner (1999 [1923]) wrote about society in terms of "threefolding" among three distinct "spheres": the political sphere of law-making, governance, and rules regarding how people interact; the economic sphere promoting production; and the cultural sphere, which refers to the free human spirit expression involving thinking, morality, and creativity. Four decades later, sociologist Amitai Etzioni (1961) looked at organizations from the perspective of three distinct forms of power: governmental, in which power is coercive (police, laws, courts); business, which depends upon calculative and instrumental (financial payments) power to achieve its goals; and non-profit, where power is normative and people act based upon shared values. Similar typologies have been advanced by others: those writing to understand the "third sector" have distinguished between prince-merchant-citizen (Najam, 1996; Nerfin, 1986); management theory tradition thinks in terms of hierarchies-markets-networks (Powell, 1990); and economist Oliver Williamson (1991) writes of hierarchy-markets-hybrids. The sectors are distinguished by archetypal roles, with government's role being to maintain order, business' to create wealth, and civil society's to hold traditions and values. The sectors are also characterized by different sense-making modes, with government being dominantly mental, business physical, and civil society emotional (Waddell, 2005b). The analysts' conclusion that the divides are significant is further buttressed by an expanding literature on multi-stakeholder and cross-sectoral partnerships and collaboration (Clarke & Fuller, 2010; Gray, 1989; Huzzard, Ahlberg, & Ekman, 2010; Selsky & Parker, 2005; Wood & Gray, 1991).

A second integration challenge is to *create successful individual to global aggregations*. Sometimes this is characterized as a geographic challenge, but this is a rather simplistic framing that suggests the issues are only the rather mechanical ones of coordinating across time zones and distances. There are two distinct and more important dimensions of this challenge. One involves linguistic and cultural diversity, with culture understood as "the collective programming of the mind that distinguishes one group or category of people from another" (Hofstede, 1993: 89) and produces the Tower of Babel effect of confusion, distrust, and difficulty in collaboration. The more local the level, the more likely people are to share language, values, and culture and the more likely they are to have the repetitive interactions necessary to generate trust to take action (Bourdieu, 1977; Habermas, 1984; Luhmann, 1979). The challenges of collective action associated with greater geographic expanse arising from cultural distinctions are well documented with regard to a range of issues such as ethics, decision-making, leadership, motivation, and individualism versus collectivism. (For a summary, see Tsui, Nifadkar, and Ou, 2007.) The basic impact of cultural differences can be experienced positively, as with the capacity to generate innovation, or negatively, such as the generation of conflict. Different disciplines have specialized in describing the challenge in different ways: political science specializing in inter-state perspective, management science in organizational dimensions, psychology with individual behaviors, and sociology from a societal viewpoint.

This same range of perspective is also associated with the second individual-to-global dimension: organizational and structural. It might be summarized as: How can individuals be connected to global action, and vice-versa, to create mutually robust and meaningful exchanges? Traditional social contract theorists see the state as the critical institution to aggregate individuals. However, our intergovernmental institutions clearly aggregate the interests of states rather than the individuals behind them. We have no meaningful global governance entity that reflects the individual in a way that honors the social contract tradition. Business tends to think of this issue first in terms of strategy, and there is an enormous outpouring of "global strategy" analysis. New ways are emerging to address the need to aggregate diverse voices and interests, notably with new media and novel network strategies (Castells, 2000; Reinicke, 1998; Slaughter, 2004). However, there is a natural difficulty in developing these new entities conceptually and operationally; moreover, traditional power structures resist giving space for new, transcendent organizations.

A third integration challenge is with *time horizons and the need to integrate the short and long term* and develop "…a culture of obligation towards future generations" (WBGU, 2011: 2). Different organizational sectors of our societies are dominated by different temporal logics. These are related to theories of accountability and effectiveness. Our business structures are based on temporal cycles of quarters, reflecting their farming roots associated with seasons. This has been well documented to produce numerous problems associated with "short-termism" since "…the course of action that is most desirable over the long run is not the best course of action in the short term" (Laverty, 1996: 825), such as with investment decisions (Laverty, 1996; Porter & Wayland, 1992). Government institutions are organized around electoral cycles ranging usually from two to five years. This has been noted to influence policy decisions oriented to re-election, which often conflicts with long-term interests (Jacobs, 2011; Leonardo, 2009). The long-term public policy strategies required for issues associated with sustainable development have produced experiments with new approaches to address the election cycle constraints, such as with transition management in The Netherlands (Rotmans, Kemp, & Asselt, 2001). Civil society organizations, being concerned with more enduring values and sustainability itself, tend toward longer cycles, but they are strongly influenced by economic and political cycles. Of course, none of these temporal orientations is "right" or "wrong". However, the sustainability challenge emphasizes the importance of a longer-term horizon than has been historically necessary, and how we can appropriately assert it while not ignoring the value of shorter-term foci is still problematic.

A fourth integration challenge is *across issue areas themselves*. Traditional science and problem-solving have depended on strategies to divide problems into ever-smaller parts – parts that are comparatively easy to address. However, a whole is usually more than the sum of its parts, and such strategies tend to overlook the dynamics of the whole. Today the divisions are seen in the way people talk about issues of health, education, water, agriculture, business, or politics. The global challenges are noted for their *systemic* nature and demand better strategies to integrate effort across them. This has given rise to the increasing popularity of systems theory, which emphasizes the importance of understanding the relationships among the parts (Bertalanffy, 1968; Forrester, 1968, 1971).

These four integration challenges collectively suggest "messy" (Ackoff, 1974) or "wicked" problems. "Wicked problems are a 'class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing'" (Buchanan, 1992: 15), referring to a citation of Horst Rittel in Churchman (1967).

GLOBAL ACTION NETWORKS

This section summarizes the author's years of looking at networks, forms of collaboration, and large system change processes. GANs are global, multi-stakeholder, systemic change agents tackling wicked issues. Seven major characteristics are proposed for GANs, after much discussion with colleagues and collective analysis aiming for parsimony and comprehensiveness. These characteristics are seen as suggesting an ideal type (Weber, 1904/1949). Many organizations combine a few of these characteristics, but the argument here is that collectively these characteristics define a new organizational form that is as different as business is from civil society and as both of those are from government. As can be expected with a newly emerging organizational form, there are a lot of experimental variations that produce this ideal type. Today there are a few dozen of these types of networks that reflect, more or less, these seven characteristics. For example, some are more regional (it takes time to become global), some focus more on incremental than systemic change, and some treat the "learning" of "entrepreneurial learning" component rather cavalierly. The oldest example that reflects these characteristics is the Red Cross Movement; a few others were created before the end of the Cold War. However, it took the ending of the Cold War and the invention of enabling information technologies for the composite GAN elements to flourish and the GAN form to spread (Waddell, 2011a).

Glocal (global and multi-level)

This characteristic is often associated with the nation state-based model of the United Nations system that is *inter-national* and designed specifically to cross national political boundaries. There are significantly different assumptions behind the concepts of "international" and "global". The distinct assumptions increase with the concept of *glocal*, where the multiple action levels (local, national, regional, global) and sectoral geographic action frames (nations, markets, interest communities) come together. This characteristic was described earlier as one of the four key integration challenges, encompassing cultural, linguistic, and geographic divisions. Global issues are particularly apparent with GANs working on environmental issues, such as the Global Water Partnership, the Forest Stewardship Council, and IUCN. Environmental issues imply an environmental organizing imperative, such as a watershed or bio-diversity hot spot, that frequently crosses political-cultural-linguistic boundaries and requires global approaches.

Systemic change agent

GANs are not status quo organizations, nor are they about simply documenting and disseminating what exists. They are about the most difficult of change objectives: systemic change. For Transparency International, this means shifting individuals' behaviors and understanding what's possible in a world free of corruption, that is, changing social, economic, and political relationships, structures, and processes.

Table 1 presents change as being of three broad types. Many organizations are involved with *incremental* change, often referred to as "scaling up." That refers to the goal of doing more of what is already being done. The *reform* mode of change is also not unusual, although it is less frequent. Often it is associated with legislation, since it involves changing the rules of the game. The most difficult type of change is *transformation*. This involves fundamental questioning about how we think about issues and uncovering assumptions that are not articulated. In contrast to the mediating and negotiating processes of the other types of change, transformation is a revisioning process of how people in society can live together, given the scale of challenge or opportunity that we are facing.

Table 1: Types of Change

Type of Change	Incremental	Reform	Transformation
Core Question	How can we do more of the same? Are we doing things right?	What rules shall we create? What are our mental models and assumptions?	How do we make sense of this? What is the purpose? How do we know what is best?
Purpose	To improve performance	To understand and change the system and its parts	To innovate and create previously unimagined possibilities
Power and Relation-ships	Confirms existing rules. Preserves the established power structure and relationships among actors in the system	Opens rules to revision. Suspends established power relationships; promotes authentic interactions; creates a space for genuine reform of the system	Opens issue to creation of new ways of thinking and action. Promotes transformation of relationships with whole-system awareness and identity; promotes examining deep structures that sustain the system
Temporal Horizon	Short-term	Medium-term	Long-term

Source: Adapted from Waddell (2011a: 97).

One reason transformation is so difficult is because it involves shifts in power, usually accomplished by some parties "losing" power to others in terms of traditional zero-sum thinking about power, and reconceptualizing power in a new vision and set of goals. This is certainly true with the integration of transparency into business practices: it inherently suggests that different stakeholders' concerns have to be integrated into the way business functions. It requires fundamentally reconceptualizing the role of business to create a new business model. This is the *transcendent* aspect of GANs' work: encompassing concerns with an innovative higher-level way of interacting.

Systemic change involves all three of these forms of change, and GANs' role is to steward the development of the change. A key role for GANs is to "hold" the diverse temporal horizons to mature transformational solutions. In the case of Transparency International (TI), the change is quite obviously a transformational one. When TI began in the early 1990s, the World Bank still equated corruption with cultural idiosyncrasies. In other cases, such as with the Global Compact and business, the challenge strategically is presented as an incremental one since transformation appears so big and complicated that most would not participate in such an initiative. Rather, the trick is to be able to have participants experience the transformation as incremental change over the decades that are required to realize the peaceful type of transformation that GANs advocate. In such change processes, the very concept of "ownership" is redefined. However, participants must feel that they are "co-owners" of the process if it is to be successful. They must feel the goals are *their* goals, or they will not devote the energy necessary to realize them.

Diversity-embracing

This characteristic reflects the cultural component of the global-to-local challenge, and the challenge to integrate resources across organizational sectors. GANs are formed because traditional organizations' attempts to address wicked issues are inadequate or outright unsuccessful. For example, in development the U.S. had government-led strategies in the 1960s through the 1980s, at which point business-led strategies became the favored approach with the Washington Consensus, which succumbed to other critiques (Williamson, 2002). Today we have the World Water Council and the Global Fund to Fight AIDS as GANs that reflect learning about limitations of government-led strategies. Traditional ethnic, linguistic, geographic, political, and business-government-civil society divisions require integration to be able to address the issues effectively – GANs are a *collaborative* enterprise.

The requirement of integration is obvious with environmental issues. The Climate Group, for example, focuses on bridging business and local government; the Marine Stewardship Council brings together business, technical experts, and NGOs. GANs must demonstrate the ability to integrate into their governance and decision-making structure at least two of the three organizational sectors. Of course, the emerging archetype is that all three be engaged in a "whole systems" strategy.

Inter-organizational network

Networks come in many forms. Organizations are a particular kind of network: they have a hierarchical (vertical) control structure that is legitimized through legal incorporation. GANs are a very particular kind of network: inter-organizational. In their mature stage, they connect a very large number of organizations, with multiple hubs. Table 2 presents definitions for network types that are particularly important for GANs.

A major aspect of GANs is that they are inter-organizational networks composed of many inter-organizational partnerships. These partnerships comprise modest numbers of the network's participants working together around a specific task often bounded by geography and sub-issues. The Renewable Energy and Energy Efficiency Partnership, for example, has a Brazilion project on solar water heating.

One role of the whole inter-organizational network is to ensure coherence of the diverse tasks that the partnerships are undertaking. This is particularly obvious with the Global Reporting Initiative (GRI) as it develops a globally adopted framework for triple-bottom line accounting. Ensuring coherence means creating "interventions" and stimulating certain activities within the network. For example, the GRI undertakes revisions of its framework to continually advance standards. GANs operate with a tipping-point (Gladwell, 2002, 2010) theory of change: when sufficient numbers of organizations begin adopting a business model that integrates the GRI principles, it will become the "normal" business model, and others in the broader system will adopt it without even realizing how it was developed.

Table 2: Types of Networks					
	Inter-Personal	**Organizational**	**Inter-Organizational Partnership**	**Inter-Organizational Network**	**System**
Legally Distinct Entities	Many	One	Few	Very many	All stakeholders
Organization Structure	Informal	Hierarchical	Spoke and wheel	Multi-hub	Diffuse
Organizing Logic	Personal	Administering/ Managing	Coordination	Coherence	Diverse self-direction
Operating Focus	Relation-ships	Organization	Task	System	System boundaries
Participation	Open	Closed	Highly controlled	Loosely controlled	External

Source: Adapted from Waddell (2011a: 25).

Global public goods producer

In economists' jargon, public goods are those that share the quality of non-excludability and non-rivalry (Cowen, 1988; Kaul, 2003). That means that when the good is available to one party, it is available to all, and that the consumption of the good by one party does not reduce its availability to others. "Air" is a classic example. GANs are in the business of developing these types of goods. For GANs, public goods are associated with the development of social and production systems. From this perspective, the Global Compact is in the business of developing a new business model to the point where it is the "normal" business model. This will require new structures and values necessary for it to flourish. This new model will be something available for everyone to use – in fact, they will not even think about whether to use it, since it will be considered so obvious.

Entrepreneurial action learner

GANs cultivate and support action in all parts of the system that they are working to change. They do not depend on a hierarchy of approval, which stifles voluntary leadership. However, successful GANs also emphasize discipline and harvesting of lessons to share more broadly and build collective capacity. Practitioners' actions can be understood in terms of the action research/learning/inquiry (Fisher, Rooke, & Torbert, 2003; Reason & Bradbury, 2001; Revans, 1982; Torbert, 2010) and even engaged scholarship (Van de Ven, 2007) traditions.

The action learning characteristic is particularly important because GAN's challenges, such as eradicating diseases, are *complex* challenges. The adjective "complex" means something quite specific, as Snowden (2005) has described with great clarity. It is distinguished from a *simple* issue, where cause and effect are linear, quite closely related, and well defined. For example, filling holes in a street is something that requires very limited and easily defined actions that can be handled within a municipal government department. *Complex* is also distinguished from *complicated*, which refers to an issue that is relatively definable but requires a much larger number of interactions over a longer time period. A classic example is sending a person to the moon: this requires engaging a large number of organizations and people, but the science and implementation involve quite definable physical challenges.

Complex refers to situations where the answer is not known and is typically difficult to define because it involves many changing contextual variables and a large number of organizations and people. Paths to disease eradication do not follow the types of roll-out processes associated with business scaling-up; success depends on learning in highly contextualized environments. The successes of the Global Fund to Fight AIDs and the Global Alliance for Vaccines and Immunization are associated with this GAN characteristic (Paina & Peters, 2011; Stoever et al., 2011).

GAN issues require an approach of planting many seeds and nurturing their development, rather than promoting one or two big solutions as "the answer." The latter will produce results that might be inappropriate in other contexts or quickly be bypassed by new developments. This action learning characteristic builds GANs' ability to integrate all of the four challenges.

How to address the four challenges is not obvious. Answering this question requires action and learning to build capacity throughout the network through explicit learning, codifying, process innovation, and skills development.

Voluntary leader

To realize their ambitious missions around global change, GANs must be collections of those who are truly engaged in realizing their visions of a better future. GANs must be spaces where organizations and people with resources and talent can productively work together for a shared vision that involves systemic change. GANs must be careful not to become trade associations, which are agents of the status quo and particular stakeholder interests. Also, they must not be seen as regulators who are outsiders enforcing rules on others. Both of those types of organizations play important and valuable roles, but they are not GANs. A core tension for GANs is between their need to be led by those who truly are systemic change drivers and the need to engage a large number of participants in a system to realize the tipping point.

Leadership is part of the challenge facing the UN Global Compact (UNGC), which aims to give life to ten universal labor, human rights, environmental and anti-corruption principles with a focus on business. Currently the UNGC aims for 20,000 participants by 2020. It already has over 6,000, so the 2020 goal might not seem like a lot. Quality is also critical, but is 20,000 enough to realize a tipping point? The UNGC and other GANs, being a new organizational form, have only their own individual and community experiences to reflect on. This again emphasizes the importance of having a disciplined action learning strategy. This important characteristic provides GANs with individuals who have the vision to address the four integrating challenges.

Table 3: The Seven GAN Strategic Characteristics and Illustrative Questions

1. Global and multi-level: Are local and global appropriately connected and exchanging? Do the geographic foci within "global" make sense?
2. Systemic change agent: Is the focus on incremental change? Reform? Transformation? Short-term, long-term? How explicit? Are people increasingly empowered?
3. Diversity-embracing: Are the issue stakeholders sufficiently engaged? Is there a culture of respect and mutual understanding?
4. Inter-organizational network: Are organizations realizing value? Are the necessary sub-global and smaller issue organizations involved to realize the goals?
5. Global public goods producer: Are the benefits of the network distributed? Is there a "greater good" ideal driving the process?
6. Entrepreneurial action learner: Is there robust activity throughout the network? Are people "inventing" new approaches and taking advantage of new opportunities?
7. Voluntary leader: Is network leadership shared? Is there a forward-tipping dimension to continually push frontiers? Is there renewal?

Source: Waddell (2011b).

Table 3 summarizes the seven characteristics of a GAN. Taken as a whole, the characteristics describe an entity that aims to do two things in particular that are related to addressing wicked global issues. One is to be a "big tent," in the American vernacular, that embraces a wide variety of perspectives, resources, goals, and values. The other is to act: these are not theoretical organizations but rather ones that value grounded learning.

DESIGN PRINCIPLES

GANs are associated with new approaches to governance of the commons. GANs are in the early stages of development as a new organizational form, with actual examples reflecting a wide variety of structures and processes. Extrapolating from what is emerging and building on GANs' strategic characteristics, what are the key design principles to guide structure and process definition? Valuing both parsimony and comprehensiveness, what design principles must be honored to have an effective GAN? Five such principles are proposed.

(1) Design around experience by taking action on an issue versus importing models and solutions. All of the GANs derive their support and legitimacy from effectively addressing substantive issues. Sometimes this is categorically physical, such as with the physical environment or health. Sometimes it is more ethereal but with a clear physical impact, such as defining and giving life to new standards as with certification and standard-setting processes. Organizing around a substantive issue is a way to address the integrating challenges because it brings together diverse parties around objective realities that can be accurately described and analyzed.

When people think "global" with public issues, they almost inevitably jump into a geographic structure mindset with something like local-national-regional-continental-global. This often leads them to get lost in "scale," and to long theoretical discussions about structures and processes. This results in two problems. First, it denies the "entrepreneurial learning" strategy and development of processes and structures that arise out of experience in addressing a substantive issue. The second problem is that it leads to importing inappropriate mental models from other sectors about how to organize – very often with a traditional geographic one mimicking inter-governmental organizations (IGOs). But different strategies and issues have different and multiple "centers of gravity." The Global Reporting Initiatives' key center is an individual corporation – which leads to corporate-industry-global structure with industry the primary organizing imperative, and geography secondary. Transparency International is organized around national chapters as its key unit, in large part because addressing corruption is seen as a national government enforcement issue. However, it has developed organizing strategies around "projects" with corruption pacts such as one associated with the billions of euros to develop the Berlin airport. It works at the local level, such as in Bangladesh, with a large network of local centers to deepen action with people's daily lives.

This principle also emphasizes the importance of thinking of design as a living, ongoing activity rather than a static, set-in-stone model. There needs to be commitment to evolving structure rather than to any particular organizational structure. This implies jettisoning cherished ideas about the value of permanence, as when a GAN founding leader described that he aimed to establish a "permanent organizational structure." This approach denies the need to be responsive to successes and deepening understanding of challenges. As effective learning organizations, GANs need to continually evolve in response to success and deepened learning. For example, the International Land Coalition had significant success with its global-focused activities to realize integration of its goals into international agreements. The development of these enabling frameworks required shifting to implementation and shifting its processes and structures to focus on the national level; regional (continental) levels had less importance since they were not "implementers". Continental regional activities made little sense outside of Latin America, where language and history provided a rationale (iScale, 2011).

This experienced-based approach provides opportunity for participants to come to know each other beyond stereotypes that often separate organizational sectors. As GANs develop with their expansive and systemic view, they come up against other issues and start to learn how to integrate them into their own concerns. Participants experience interconnectedness and learn to think of relationships in new ways.

(2) Integrate complexity and emergence versus linear, simple and defined. Substantive physical issues are contrasted with more process-oriented issues that are often cross-cutting and critical. How GANs go about their work must skillfully draw from the understanding that they are working on complex adaptive systems (Beinhocker, 1997; Lissack, 1999) that require strategies of emergence (Lissack & Letiche, 2002) reflected in the entrepreneurial learning characteristic. This includes structures and processes to realize transformation, create consensual action amongst diverse interests, and create coherence globally. These are critical to GANs' success, but they are not issues that people organize around as with substantive issues.

This approach challenges the mechanical industrial age that remains largely with us, in terms of how the vast majority of people think of organizational design. But the work of GANs is not a linear production process of simple cause-effect, root causes and replication.

Complexity theorists are not just saying human systems are like biological ones – they are saying they *are* biological ones (Beinhocker, 1997). The implications are significant:

> *Complexity thus investigates emergent, dynamic and self-organizing systems that interact in ways that heavily influence the probabilities of later events (Prigogine, 1997: 35). Such intersecting systems are like a 'dynamical zoo' involving changes in patterns that are 'wildly unlike the smoothly additive changes of their simpler cousins' (Axelrod & Cohen, 1999: 14). This complex systems world is a world of avalanches, of founder effects, self-restoring patterns, apparently stable regimes that suddenly collapse, punctuated equilibria, 'butterfly effects' and thresholds as systems tip from one state to another (Urry, 2005).*

This principle shifts the challenge from one of integration of effort to creating coherence of action around the substantive issue. Integration implies an unachievable amount of coordination globally in response to a granularity in consensus that is very unlikely with GANs' wicked problems; given the importance of GANs' responsiveness to a widely diverse range of contexts, integration can actually generate problems.

Coherence is a much higher level of agreement. Lissack and Letiche (2002: 84–85) describe it as:

> *...a field of meaning(s) wherein people share complex structures of cognition and relate to one another from their shared rhetorical circumstance. Coherence entails an evolving, constantly changing, social cognitive situation. Experience of shared situation is crucial to coherence. In any situation, there are multiple possibilities; coherence is not one truth or an inevitable course of action. It is an acknowledged commonality of awareness, of circumstance.*

GANs' design must support living with ambiguity and paradox while creating a common sense of the importance of the substantive issue. This is usually accomplished by creating one or a few common interventions/activities (such as development of Transparency International's "Transparency Index") and by stimulating additional action that is appropriately informed by others' experiences and priorities. This leads to "emergence" of solutions (Scharmer, 2001, 2009).

This design principle creates issues for GANs' development. They have a natural tendency to be very action oriented and to be underdeveloped in thinking about how to take effective action. For example, although they spend enormous resources on collective learning, almost none have learning strategies or senior staff allocated to them. A recent survey revealed that despite the importance of collaborative effort, almost none use collaborative document development, project management, or contact management tools. In effect, they still have to understand and develop core competencies to realize success (Waddell, 2011a).

This principle responds to all four integration challenges. In fact, it could be said that the principle actively embraces the challenges as sources of energy and innovation necessary to respond to critical global issues. The principle stresses that the answers are not "out there" to be purchased but are to be co-developed by learning about others' perspectives and roles in possible futures. People are engaged in forward-thinking and acting to define how the future can be different and better rather than focusing on historic wrongs and conflicts.

(3) Create transcendence rather than a community of disparate interests. To hold together the diverse perspectives over time, a core strategy involves creating transcendence. This refers to the way GANs actually frame their work, to integrate the various objectives of their stakeholders into a coherent mission and vision. For example, business must see its profit-making objectives as part of the outcomes; government its goals of order and security; and civil society its values of justice and long-term community health. There is a longer-term GAN developmental trajectory to continually evolve transcendence that includes actually crossing the diverse issues that may be core to organizing, such as economic development, water, agriculture, health, and human rights. For example, the Global Water Partnerships' success over time is expanding to include much broader environmental and economic concerns, and work with non–water–focused actors.

This work is helped by the complexity principle. "What complexity science metaphors do for an organization, is give its members access to both new words and new possibilities

for action. With the access to new actions comes the potential for new identity" (Lissack, 1999: 122). This "newness" is key to successful transcendence. Transcending emphasizes the importance of GANs' process skills and their ability to create meaningful connections across diverse cultures, objectives, values, and world views. It is core to all four of the integrating challenges. To respond to the temporal challenge, for example, GANs must produce valued outcomes in the time frames of all their stakeholders, but in general they are dealing with long-term systemic change and transformation challenges. Transcending encourages participants to move from their own centricities to understand those of others, which awakens new ways of seeing the whole.

(4) Develop holistic systems rather than islands of success. This principle reflects a true systems and network perspective of the whole that transcends a focus on individuals and organizations by focusing on issues, roles, and exchanges (Allee, 2003, 2008). This is a world well beyond the hierarchical and hub-and-spoke mental models that commonly are implicit or explicit parts of design principles. This is a world of decentralized initiative and "leaderfulness" (Raelin, 2003). Local and global are complementary, not hierarchical and competitive. GANs are about generating robust exchanges between participants who have a particular role in addressing an issue. They are also about bridging and filling in the structural holes (Burt, 1992, 2004) that can be barriers to addressing issues. For example, the Renewable Energy and Energy Efficiency Partnership is about addressing capital and knowledge gaps. Verna Allee (2011), the founder of value network analysis, explains roles as:

> ...the many different 'hats' we wear. Those hats are actually different roles that we play. In Value Network Analysis (VNA) these different roles are represented as nodes in the network. In traditional organizations most work is organized around either a process or a job function. The concept of role is quite different, and evokes a different mindset about how work gets done.

Although organizations and individuals are important, more important is that the roles in the system are fulfilled, and this may be done by one or more individuals or organizations. Organizational health is dependent on the exchanges that occur between those playing their roles.

GANs are always in development as networks, realizing that a core issue they are addressing is underorganization (Brown, 1980). This principle is relevant to all four integrating challenges and leads to the imperative of creating GANs as multi-stakeholder and multi-level initiatives that are sensitive to the relationship between their focal issues and other issues.

(5) Emphasize trust and participation rather than representation and membership. GANs possess one core asset: trust. They are organizations with few, if any, "sticks" to ensure participation; they really depend on carrots. The core carrot is what the GAN can produce of value for participants' collective mission, as well as for an individual participant. Participants must feel their views and interests are part and parcel of the GANs' functioning.

Given the diversity of GANs and their global focus, which means they must engage thousands of organizations for success, ensuring trust is no simple matter. One way is to design governance rules to mandate representation of diverse stakeholders. However, this is a formidable challenge, considering the dynamic nature of how GANs address their issues, and the diversity of stakeholders in a glocal network. As this article has suggested, identity is increasingly a multi-dimensional thing. The answer is to break out of traditional thinking of "representation" and "membership," and to emphasize the importance of maintaining and building trust when developing decision-making processes and structures. Do decision-makers inspire trust from Luhman's (1979) three dimensions – trust in shared understanding, objectives, and abilities? Do they have the respect of system stakeholders? Individuals may reflect a stakeholder group's interests or those of a particular organization, but the expectation that they "represent" them in a traditional sense is usually an unreasonable, confusing, unproductive route. Participants are "voluntary leaders" and personal passion is important; as action entrepreneurs their role is to find ways to develop meaningful action for stakeholders and organizations with whom they associate.

There does need to be some formal legal structure which requires "owners/members." But any legal structure is going to be a great compromise: other than for intergovernmental organizations (which come with their own structural limitations), there is no way to incorporate globally, and a national jurisdiction must be chosen. There is no "intersectoral" structure – in the end a business, governmental, or NGO legal structure will be necessary. We still have to invent the legal structures appropriate for GANs.

Of course, trust also requires openness and clarity in accessing and becoming part of decision-making. But given the dynamic nature of the issues GANs are addressing, these should be experienced as enabling rather than as confining; as open rather than closed; as focused on supporting effective rather than simply functionary action. This principle might be referred to (either negatively or positively) as the "faith" principle: the need to develop and maintain an experienced reality of respect and mutual commitment. The complexity of issues, the long-term horizons in addressing them, and the wide variety of interests and perspectives are more than any one person can "hold." In the end, the sense of a shared understanding and intention is key to addressing the integration problems. We still have to develop the etiquettes, logics, processes, structures, and ceremonies to adequately give life to this principle.

DISCUSSION

These principles are presented as the basis for designing solutions to the four integrating challenges presented by differences in sense-making represented by organizational sectors, glocal focus, temporal span, and substantive issue silos. They are presented as a new way to think about social contract development globally. One part of the shift is represented by Figure 1.
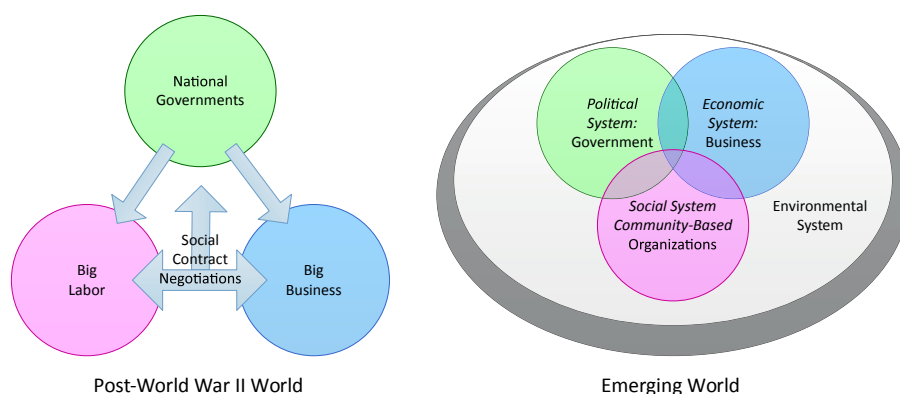

Fig. 1. Shifting Relationships Between Organizational Sectors

This figure illustrates a shift from the "big government – big labor – big business" social contract generator when economic and physical security were the imperatives following the Great Depression and World War II. It suggests that we are now in a world where the state is not in charge, nor is it the representative of individuals' interests (as promoted by traditional social contract theory). Rather, the organizational sectors become key agents in social contract development. Where does this leave the individual, who for 500 years in the West has been seen as the building block for social contract? This is an important challenge to the West, particularly the United States, where individualism is such an outstanding feature (Hofstede, 1993). But does this emerging social contract formulation actually diminish the role of the individual, or considering the diversity of identities such as the one illustrated in the opening of this article, have the options actually been enriched? The description contrasting individualism and collectivism suggests some basic shifts in our concept of "individual":

> *Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onwards are integrated into strong, cohesive ingroups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty (Hofstede, 1993: 5).*

In this emerging social contract world, where identity is fragmenting and "family" is being significantly redefined (Economist, 2011a, b; Newport, 2011) "individualism" takes on new meaning. Perhaps the GAN strategy to embrace diversity is actually a good reformulated approach for a globalized world. GANs do not challenge the value of individuals. Rather, they challenge the operationalization of value as one person, one vote in favor of an organizational or higher level as the key unit. GANs aim to transcend this operational interpretation while embracing its continued legitimacy for the state and other organizations.

Box 1: Principles for Governing the Commons (Ostrom, 2005)

1. Clearly defined boundaries. The boundaries of the resource system (e.g., irrigation system or fishery) and the individuals or households with rights to harvest resource units are clearly defined.
2. Proportional equivalence between benefits and costs. Rules specifying the amount of resource products that a user is allocated are related to local conditions and to rules requiring labor, materials, and/or money inputs.
3. Collective-choice arrangements. Many of the individuals affected by harvesting and protection rules are included in the group who can modify these rules.
4. Monitoring. Monitors, who actively audit biophysical conditions and user behavior, are at least partially accountable to the users and/or are the users themselves.
5. Graduated sanctions. Users who violate rules-in-use are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other users, from officials accountable to these users, or from both.
6. Conflict-resolution mechanisms. Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials.
7. Minimal recognition of rights to organize. The rights of users to devise their own institutions are not challenged by external governmental authorities, and users have long-term tenure rights to the resource.

When the entity is part of a larger system:

8. Nested enterprises. Activities are organized in multiple layers of nested enterprises.

GANs are essentially about developing global public goods (Kaul, 2003) and managing the global commons (Hardin, 1968) with a logic of collaborative governance (Zadek, 2005). Principles for governance of the commons have been developed by, most notably, Ostrom (Ostrom, 1990; Ostrom, Burger, Field, Norgaard, & Policansky, 1999). Her design principles, shown in Box 1, arise from studies of long-enduring institutions for governing sustainable resources rather than Global Action Networks. The questions GANs address are often more ethereal, and certainly not so obvious or as easy to "touch" as the irrigation systems, forest management schemes, and fisheries that Ostrom focuses on.

Ostrom's design principles provide an interesting comparison to the five discussed here. A quick comparison is useful to deepen understanding of the ones proposed for GANs. Ostrom's principles are broadly complementary to the ones presented here. Ostrom's are naturally flavored by her focus on governance of resources, which may or may not be an issue for GANs. Her principles in general are much more like operational guidelines than organizational design. This means the principles proposed here are somewhat more conceptual, at a higher level of abstraction, and more parsimonious. Both might usefully be read together; the one exception is that Ostrom emphasizes "clearly defined boundaries," whereas the proposed principles suggest boundaries actually shift as an issue develops and evolves. In fact, the local resource pools that are the source of Ostrom's principles might be subsets of a GAN: the GAN principles would embrace them as one particular response to the GAN issue.

CONCLUSIONS

GANs' "big-tent" action approach holds great promise for addressing the four integration challenges. It does not start with the goal of broad-based agreement as a precursor, as do traditional international problem-setting strategies such as ones for climate change and other conventions. GANs provide for action by those who perceive common interest, demonstrating innovative ways to address global challenges until they become a new dominant norm. Unlike many NGO activists, GAN leaders do not spend energy berating the laggards, but focus on creation. Unlike many businesses, they do not simply focus on narrow interests but emphasize the connection between interests.

The organizing principles animating GANs suggest a big shift away from the traditional inter-governmental strategies to address big global issues such as climate change reflected in the Kyoto Accord and UN Framework Convention on Climate Change, a multi-decade process. More fundamentally, they raise big issues about how we approach the development of social contracts globally as well as sacrosanct assumptions such as the role of one person, one vote. These design principles suggest the need for shifting mental models from several perspectives, as has been articulated in their titles. People coming from traditional organizational structures to GANs often import conflicting mental models. This can have significant negative impacts. The Global Alliance for Improved Nutrition, for example, was initiated on the path of becoming a GAN by its founding leaders. New leaders imported a mental model that eventually produced what today is essentially an international NGO, with hierarchy and geographical offices. That type of organization can still be useful, but whether it will be as impactful as a GAN is doubtful.

Writing about "wicked problems" from a perspective of multiple types of design, Buchanan (1992: 10) comments: "Properly understood and used, [these areas of design thinking] are also places of invention shared by all designers, places where one discovers the dimensions of design thinking by a reconsideration of problems and solutions." This type of design thinking invention is badly needed to address global challenges, respond to societal integration-differentiation needs, and define improved paths to the increasingly important question of how to develop global social contracts. GANs represent one possible path.

This article began with reference to challenges to the emergence of a prosperous, peaceful, and healthy global civilization and planet. With the specters of environmental degradation, weapons of mass destruction, widespread famine, and devastating pandemics, the role of GANs should be broadened into a top priority. The reality is that aside from a few organizations in the health arena (notably the Global Fund to Fight AIDS), GANs are struggling. They are severely resource-constrained (who pays for such global public goods production not controlled by government?) and, quite frankly, not terribly sophisticated in terms of competencies needed for success (Waddell, 2011a). This must change, through new financing mechanisms and increased research and knowledge to support developing the networks' competencies in the context of their complex issue arenas. We must become much more skillful in developing large system transformational change in complex, global arenas.

REFERENCES

Ackoff R. 1974. *Redesigning the Future: A Systems Approach to Societal Problems*. Wiley, New York, NY.

Allee V. 2003. *The Future of Knowledge: Increasing Prosperity through Value Networks*. Butterworth-Heinemann, New York, NY.

Allee V. 2008. Value network analysis and value conversion of tangible and intangible assets. *Journal of Intellectual Capital* 9(1): 5–24.

Allee V. 2011. *Value Networks and the True Nature of Collaboration*. ValueNet Works and Verna Allee Associates. http://www.valuenetworksandcollaboration.com/home.html

Axelrod R, Cohen M. 1999. *Harnessing Complexity*. Free Press, New York, NY.

Beinhocker ED. 1997. Strategy at the edge of chaos. *The McKinsey Quarterly* (1): http://www.mckinseyquarterly.com/Strategy_at_the_edge_of_chaos_1063.

Bertalanffy LV. 1968. *General System Theory*. George Braziller, New York, NY.

Bourdieu P. 1977. *Outline of a Theory of Practice*. The Press Syndicate of the University of Cambridge, Cambridge, UK.

Brown LD. 1980. Planned change in underorganized systems. In T.G. Cummings (Ed.), *Systems Theory for Organization Development*: 181–208. Wiley, Chichester, UK.

Buchanan R. 1992. Wicked problems in design thinking. *Design Issues* 8(2): 5–21.

Burt R. 1992. *Structural Holes: The Social Structure of Competition*. Harvard University Press, Cambridge, MA.

Burt R. 2004. Structural holes and good ideas. *American Journal of Sociology* 110(2): 349–399.

Castells M. 2000. *The Rise of the Network Society*. Blackwell Publishers, Malden, MA.

Churchman CW. 1967. Guest editorial: wicked problems. *Management Science* 14(4): B141–B142.

Clarke A, Fuller M. 2010. Collaborative strategic management: Strategy formulation and implementation by multi-organizational cross-sector social partnerships. *Journal of Business Ethics* 94: 85–101.

Cowen T. 1988. Public goods and externalities: Old and new perspectives. In T. Cowen (Ed.), *The Theory of Market Failure: A Critical Examination*. George Mason University Press, Fairfax, VA.

Durkheim E. 1966 [1893]. *On the Division of Labor in Society*. Free Press, New York, NY.

Economist. 2011a. Asia's lonely hearts. *Economist*: 9-9. Economist Newspaper Limited.

Economist. 2011b. Herr and Madame, Senor and Mrs. *Economist* 400(8759): 67–69.

Etzioni A. 1961. *A Comparative Analysis of Complex Organizations*. Free Press, New York, NY.

Fisher D, Rooke D, Torbert W. 2003. *Personal and Organizational Transformations Through Action Inquiry*. Edge\Work Press, Boston, MA.

Forrester JW. 1968. *Principles of Systems*. The MIT Press, Cambridge, MA.

Forrester JW. 1971. Counterintuitive behavior of social systems. *Theory and Decision* 2(2): 109–140.

Gladwell M. 2002. *The Tipping Point: How Little Things Can Make a Big Difference*. Little, Brown and Company, Boston, MA.

Gladwell M. 2010. What is the Tipping Point? http://www.gladwell.com/tippingpoint/index.html.

Gray BG. 1989. *Collaborating: Finding Common Ground for Multiparty Problems*. Jossey-Bass, San Francisco, CA.

Habermas J. 1984. *The Theory of Communicative Action. Vol. 1, Reason and Rationalization of Society*. Beacon Press, Boston, MA.

Hardin G. 1968. The tragedy of the commons. *Science* 162: 1243–1248.

Hobbes T. 1996 [1651]. *Leviathan*. Oxford University Press, Oxford, UK.

Hofstede G. 1993. Cultural constraints in management theories. *The Executive* 7(1): 81–94.

Huzzard T, Ahlberg BM, Ekman M. 2010. Constructing interorganizational collaboration. *Action Research* 8(3): 293–314.

iScale (Steve Waddell, H. T. 2011. An Independent Review of the Implementation and Impact of the International Land Coalition 2007–2011 Strategic Framework: Summary Report. International Land Coalition, Rome, Italy.

Jacobs AM. 2011. *Governing for the Long Term: Democracy and the Politics of Investment*. Cambridge University Press, Cambridge, UK.

Kaul I. 2003. *Providing Global Public Goods: Managing Globalization*. United Nations, New York, NY.

Keohane RO, Nye JS. 1971. *Transnational Relations and World Politics*. Harvard University Press, Cambridge, MA.

Khanna P. 2011. *How to Run the World: Charting a Course to the Next Renaissance*. Random House, New York, NY.

Koppell JG. 2008. Global governance organizations: Legitimacy and authority in conflict. *Journal of Public Administration Research and Theory* 18: 177–203.

Koppell JG. 2010. *World Rule: Accountability, Legitimacy, and the Design of Global Governance*. University of Chicago Press, Chicago, IL.

Laverty KJ. 1996. Economic "short-termism": The debate, the unresolved issues, and the implications for management practice and research. *Academy of Management Review* 21(3): 825–860.

Leonardo M. 2009. A theory of political cycles. *Journal of Economic Theory* 144(3): 1166–1186.

Lissack MR. 1999. Complexity: The science, its vocabulary and its relation to organizations. *Emergence* 1(1): 110.

Lissack MR, Letiche H. 2002. Complexity, emergence, resilience, and coherence: Gaining perspective on organizations and their study. *Emergence* 4(3): 72-94.

Locke J. 2011 [1690]. *Second Treatise on Government*. CreateSpace, Seattle, WA.

Luhmann N. 1979. *Trust and Power*. Wiley, Chichester, UK.

Najam A. 1996. Understanding the third sector: Revisiting the prince, the merchant and the citizen. *Nonprofit Management & Leadership* 7(2): 203–219.

Nerfin M. 1986. Neither prince nor merchant: Citizen – an introduction to the third system. In K. Ahooja-Patel, A.G. Drabek, & M. Nerfin (Eds.), *World Economy in Transition*. Pergamon Press, Oxford, UK.

Newport F. 2011. *For First Time, Majority of Americans Favor Legal Gay Marriage*. Gallup.

Olson M. 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Harvard University Press, Cambridge, MA.

Ostrom E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press, Cambridge, UK.

Ostrom E. 2000. Collective action and the evolution of social norms. *Journal of Economic Perspectives* 14(3): 137–158.

Ostrom E. 2005. *Understanding Institutional Diversity*. Princeton University Press, Princeton, NJ.

Ostrom E, Burger J, Field CB, Norgaard RB, Policansky D. 1999. Revisiting the commons: Local lessons, global challenges. *Science* 284(278): 278–282.

Ostrom E, Walker J. 1997. Neither markets nor states: Linking transformation processes in collective action arenas. In M. McGinnis (Ed.), *Polycentricity and Local Public Economies. Readings from the Workshop in Political Theory and Policy Analysis*: 427-472. Cambridge University Press, Cambridge, UK.

Paina L, Peters DH. 2011. Understanding pathways for scaling up health services through the lens of complex adaptive systems. *Health Policy and Planning* 1–9.

Parsons T. 1977. *The Evolution of Societies*. Prentice-Hall, Englewood Cliffs, NJ.

Porter ME, Wayland R. 1992. Capital disadvantage: America's failing capital investment system. *Harvard Business Review* 70(5): 65–82.

Powell WW. 1990. Neither market nor hierarchy: network forms of organization. In B. Staw & L. L. Cummings (Eds.), *Research in Organizational Behavior*: 295–336. JAI Press, Greenwich, CT.

Prigogine I. 1997. *The End of Certainty*. Free Press, New York, NY.

Raelin J. 2003. *Creating Leaderful Organizations: How to Bring Out Leadership in Everyone*. Berrett-Koehler, San Francisco, CA.

Rawls J. 1971 [2005]. *A Theory of Justice*. Belknap Press of Harvard University Press, Cambridge, MA.

Reason P, Bradbury H. 2001. *The Handbook of Action Research*. Sage Publications, Newbury Park, CA.

Reinicke WH. 1997. Global public policy. *Foreign Affairs* 76(6): 127–138.

Reinicke WH. 1998. *Global Public Policy. Governing without Government?* Brookings Institute, Washington, DC.

Reinicke WH. 1999–2000. The other World Wide Web: Global public policy networks. *Foreign Policy* (Winter): 44–57.

Reinicke WH, Deng FM. 2000. Critical choices: The United Nations, networks, and the future of global governance. International Development Research Council, Toronto, Canada.

Revans R. 1982. *Action Learning*. Charwell-Bratt, Bromley, UK.

Rischard J-F. 2001. High noon: The urgent need for new approaches to global problem-solving. *Journal of International Economic Law* 4(3): 507–525.

Rischard J-F. 2002. *High Noon: 20 Global Problems, 20 Years to Solve Them*. Basic Books, New York, NY.

Rotmans J, Kemp R, Asselt M. 2001. More evolution than revolution: Transition management in public policy. *Foresight* 3(1): 15–31.

Rousseau J-J. 2010 [1762]. *On the Social Contract*. CreateSpace. Seattle, WA.

Scharmer CO. 2001. Self-transcending knowledge: Sensing and organizing around emerging opportunities. *Journal of Knowledge Management* 5(2): 137–150.

Scharmer CO. 2009. *Theory U: Leading from the Future as it Emerges*. Berrett-Koehler, San Francisco, CA.

Selsky JW, Parker B. 2005. Cross-sector partnerships to address social issues: Challenges to theory and practice. *Journal of Management* 31(6): 849–873.

Slaughter A-M. 2004. *A New World Order*. Princeton University Press, Princeton, NJ.

Snowden D. 2005. Strategy in the context of uncertainty. *Handbook of Business Strategy* 6(1): 47–54.

Steiner R. 1999 [1923]. *Towards Social Renewal, Rethinking the Basis of Society [The Threefold Commonwealth]*. Rudolf Steiner Press, London, UK.

Stoever K, Maher C, Aylward RB, Jacobson J, Mohamed AJ, John TJ, Scott RS, Wright A. 2011. Group report: Elements of good governance in disease eradication initiatives. In S. L. Cochi & W. R. Dowdle (Eds.), *Disease Eradication in the 21st Century: Implications for Global Health*: 191–199. The MIT Press, Cambridge, MA.

Torbert WR. 2010. The power of balance: Transforming self, society, and scientific inquiry. *Integral Review* 6(1): 208–235.

Tsui AS, Nifadkar SS, Ou AY. 2007. Cross-national, cross-cultural organizational behavior research: Advances, gaps, and recommendations. *Journal of Management* 33(3): 426–478.

Urry J. 2005. The complexities of the global. *Theory Culture Society* 22: 235–254.

Van de Ven A. 2007. *Engaged Scholarship: A Guide for Organizational and Social Research*. Oxford University Press, New York, NY.

Waddell S. 2003a. Global Action Networks: A global invention for business to make globalization work for all. *Journal of Corporate Citizenship* 12(Winter): 27–42.

Waddell S. 2003b. Global Action Networks: Building global public policy systems of accountability. *AccountAbility Quarterly* 20: 19–26.

Waddell S. 2004. The global compact as a new organizational form. In S. Waddock, M. MacIntosh, & G. Kell (Eds.), *Learning to Talk: Corporate Citizenship and the Development of the UN Global Compact*: 289–301. Greenleaf Publishing, Sheffield, UK.

Waddell S. 2005a. Social integration: A global societal learning and change perspective. Paper presented at Social Integration: UN Global Experts Meeting. Nov. 21–23, New York, NY.

Waddell S. 2005b. *Societal Learning and Change: How Governments, Business and Civil Society are Creating Solutions to Complex Multi-Stakeholder Problems*. Greenleaf Publishing, Sheffield, UK.

Waddell S. 2007. Realizing global change: Developing the tools, building the infrastructure. *Journal of Corporate Citizenship* Special Issue(26): 69–84.

Waddell S. 2011a. *Global Action Networks: Creating our Future Together*. Palgrave-Macmillan, Bocconi University on Management, Hampshire, UK.

Waddell S. 2011b. The Global Compact: An organizational innovation to realize UN Principles. UN Global Compact, New York, NY.

Waddell S, Khagram S. 2007. Multi-stakeholder global networks: Emerging systems for the global common good. In P. Glasbergen, F. Biermann, & A. P. J. Mol (Eds.), *Partnerships, Governance and Sustainable Development: Reflections on Theory and Practice*: 261–287. Edward Elgar Publishing, Cheltenham Glos, UK.

WBGU. 2011. World in transition: A social contract for sustainability. German Advisory Council on Global Change, Berlin, Germany.

Weber M. 1904/1949. Objectivity in social science and social policy. In E. A. Shils & H. A. Finch (Eds.), *The Methodology of the Social Sciences*. Free Press, New York, NY.

Williamson J. 2002. What should the World Bank think about the Washington Consensus? *World Bank Research Observer* 15(2): 251–264.

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

Wood DJ, Gray B. 1991. Toward a comprehensive theory of collaboration. *Journal of Applied Behavioral Science* 27(2): 139–162.

Zadek S. 2005. The logic of collaborative governance: Corporate responsibility, accountability and the social contract. Working Paper. Center for Business and Government, Harvard University, and AccountAbility, Cambridge, MA.

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DESIGNING THE ORGANIZATION FOR USER INNOVATION

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Abstract: There is increasing consensus among practitioners and academics alike that we are in the midst of a paradigm shift from producer-centered and internal innovation processes toward user-centered and open innovation processes. This paradigm shift induces significant changes to the design of organizations. Even though the research field of user innovation has been developing over a period of more than four decades, there have been only occasional intersections with the research field of organizational design. In this article, we aim to provide an integrated perspective of the two fields. We first identify major user innovation strategies. We then derive the implications for each user innovation strategy on key dimensions of organizational design.

Keywords: User innovation; organization design

The point of departure for this article is the growing literature around the phenomenon that companies are in the midst of a paradigm shift from closed, producer-centered ways of innovating to open, user-centered innovation processes (Chesbrough, 2003; von Hippel, 2005). To improve innovation performance and increase competitiveness, more and more firms are employing user innovation strategies (von Hippel, 2005). Such strategies have proven to be of high value to almost every type of company; both start-ups and well-established companies, irrespective of the industry they are operating in, can benefit from incorporating the creative potential of "external" individuals and organizations into the innovation process (Bogers, Afuah, & Bastian, 2010; Hienerth, Keinz, & Lettl, 2011).

Research has devoted a great deal of attention to describing particular approaches, such as the lead-user method (Lüthje & Herstatt, 2004; von Hippel, 1986), toolkits for user innovation and design (von Hippel, 2001; von Hippel & Katz, 2002), and the development and management of user communities (Füller, Matzler, & Hoppe, 2008; Schau, Muñiz, & Arnould, 2009). Despite the voluminous description and documentation, the implementation of user innovation strategies remains a challenging undertaking. Often, companies fail to benefit from these strategies because of a lack of organizational preparedness. For example, the "not-invented-here" syndrome of employees (Katz & Allen, 1982), as well as general organizational inertia (Kelly & Amburgey, 1991; Witteloostuijn, 1998), limit the absorptive capacity of companies (Cohen & Levinthal, 1990) and prevent them from effectively leveraging the input from external sources (Hienerth et al., 2011). Therefore, opening up a company's core business processes, such as R&D, and product development and commercialization, calls for a substantial organizational re-design.

In this article, we present a framework that encompasses different types of user innovation strategies and derive specific recommendations for the organizational design of companies employing these strategies. In line with Burton and Obel (2004), we apply a multi-contingency information-processing view to address the specific challenges in designing an organization for user innovation. We theorize on both the structural and human components of organizational design (Burton & Obel, 2004; Burton, Obel, & DeSanctis, 2011) and carve out their specific importance with regard to the implementation of different types of user

innovation strategies. We use the framework for organization design of Burton and Obel (2004) and Burton et al. (2011) as it is widely used by scholars and practitioners alike.

In the first section of our article, we provide a comprehensive overview of the most important approaches to integrate users into a company's core business processes. We then present our framework of user innovation strategies and explore the need for organizational re-design dependent on these strategies. Based on these insights, we provide concrete recommendations on how to design the organization for each of the identified user innovation strategies. Finally, we discuss the generalizability of our framework and outline future research directions.

EXISTING USER INNOVATION APPROACHES

Rationale of user innovation strategies

User innovation strategies are based on the insight that users are an important source of creative ideas for new products or services in many industries, ranging from IT solutions to sporting and medical equipment (Baldwin, Hienerth, & von Hippel, 2006; Franke & von Hippel, 2003; Herstatt & von Hippel, 1992; Jeppesen & Frederiksen, 2006; Lettl, Herstatt, & Gemuenden, 2006; Morrison, Roberts, & von Hippel, 2000; Urban & von Hippel, 1988; von Hippel, 2005). What makes users such valuable sources of inspiration is their use experience. Users know best the strengths and weaknesses of a given product in daily use. Thus, if a product does not fit their current needs, users know which product attributes need to be changed or which novel functions should be integrated in order to improve the product. In addition, some users have very urgent needs for a product that perfectly fits their requirements and start developing customized solutions on their own (von Hippel, 2005). Furthermore, users have been shown to be of high value in the diffusion of innovations (Hienerth & Lettl, 2011). User innovation strategies aim at exploiting these external sources of competitive advantage by systematically integrating users into the company's core business processes. There is a considerable body of literature on methods and instruments for the integration of users into corporate innovation and marketing activities. These methods are diverse and come with different value propositions.

Lead-user method

The lead-user method is a systematic approach to identify and, in a second step, involve a special group of highly advanced and progressive users into corporate innovation processes for the purpose of generating radically new innovations. Such progressive users – usually referred to as lead-users – have been found to be capable of developing truly novel solutions with high commercial attractiveness (Franke, von Hippel, & Schreier, 2006; Lilien, Morrison, Searls, Sonnack, & von Hippel, 2002). They possess two specific characteristics making them valuable contributors to corporate innovation processes: they have a leading-edge position with regard to an important market trend, and they have a high individual expected benefit from an innovation (Morrison et al., 2000; Urban & von Hippel, 1988; von Hippel, 1986, 2005). First, lead-users are ahead of the mass market: they face certain needs much earlier than average users ("trend leadership"). Second, because of their specific need and a lack of available solutions, lead-users are highly motivated to engage in innovative activities on their own (the literature refers to this aspect as "high expected benefit"). As lead-users anticipate needs of the mass market because of their trend leadership, their solutions are very likely to become attractive to large market segments (Lilien et al., 2002; Lüthje & Herstatt, 2004; von Hippel, 1986). However, lead user–generated solutions tend to be radical in terms of technical sophistication and viability; thus, demand for lead-user innovations in the mass market usually emerges after a time lag along the diffusion curve (Hienerth & Lettl, 2011; Lilien et al., 2002).

Due to the high value proposition of lead-user generated concepts and solutions, an increasing number of companies try to tackle the creative potential of this source of innovation. Most of the existing initiatives for integrating lead-users follow the logic of the lead-user

method as described by von Hippel (1986) and are designed as projects with limited time frame and scope. In a first step, the company defines a search field – a certain market calling for an innovative new product or a specific technological problem that is to be solved. In the next step, the field is searched for the most important trends (yet unsatisfied user needs), and consequently for lead-users that are ahead of those trends. Ultimately, the identified lead-users are invited to participate in a workshop together with a cross-functional project team consisting of employees of the company. The goal of these workshops is to generate a small number of concrete and radical new product concepts (Herstatt & von Hippel, 1992; Lüthje & Herstatt, 2004; von Hippel, 1986).

Crowdsourcing and user communities

Crowdsourcing denotes a user innovation approach that is very different from the lead-user method. Instead of looking for a very specific group of highly innovative users who generate radical innovations, crowdsourcing – also referred to as "broadcast search" (Jeppesen & Lakhani, 2010) or "innovation tournaments" (Terwiesch & Xu, 2008) – focuses on outsourcing innovation-related tasks such as idea generation for new-product design to the broad crowd of external users. The basic premise of crowdsourcing is that large groups of external problem solvers with heterogeneous backgrounds, skills, and abilities are more likely to provide a wide range of adequate solutions to innovation-related problems than the internal R&D department (Terwiesch & Xu, 2008). Often, crowdsourcing initiatives take the form of a competition. The focal producer firm invites external individuals to participate and to compete for prizes sponsored by the company.

A special form of crowdsourcing is the collaboration of focal producer firms with so-called user communities. User communities are informal, self-organized (online) networks of users that exchange information and knowledge as well as innovative ideas and artifacts related to a topic or field of common interest (e.g., the product of the focal producer firm) (Franke & Shah, 2003; Harhoff, Henkel, & von Hippel, 2003; von Hippel, 2007). Instead of competing, users organized within a user community frequently interact and collaborate around a product of shared interest. In contrast to hierarchies or other forms of networks, exchange processes between members in user communities are not based on formal contracts but on "relational contracts" in the sense of trust, shared norms and values, and general reciprocity (Murray & O'Mahony, 2007). Support to individual user innovators from their peer community has been shown to be an important success factor (Baldwin et al., 2006; Franke & von Hippel, 2003; Hienerth & Lettl, 2011; Jeppesen & Frederiksen, 2006) as it allows for cumulative innovation, that is, building on the solutions of others (Brown & Duguid, 1991; Murray & O'Mahony, 2007; von Hippel, 2007). Furthermore, user communities provide a setting for the identification of attractive ideas and for the effective identification of flaws. As Raymond (1999) puts it in his well-known quote, "Given enough eyeballs, all bugs are shallow." In addition, user communities provide support to the innovative activities not only in the ideation phase but also in later stages of the innovation process. Prior research has also revealed that user communities help in the diffusion of an innovation and are vibrant arenas for new-firm creation by user innovators themselves, making them valuable from a marketing perspective (Baldwin et al., 2006; Franke & Shah, 2003; Shah & Tripsas, 2007).

Toolkits and mass customization

Toolkits for user innovation and design are user-friendly and integrated sets of product-design, prototyping, and design-testing tools intended for use by end-users (von Hippel, 2005; von Hippel & Katz, 2002). The underlying idea of the toolkit approach is to shift innovation-related product-design tasks from the focal producer firm to the users by equipping them with online tools and enabling them to customize a product to their individual needs and preferences completely on their own (Thomke & von Hippel, 2002; von Hippel, 2005; von Hippel & Katz, 2002). The toolkit provides a selection of different characteristics for each product dimension (e.g., blue, red, or green). Users can then choose the preferred characteristic for each product dimension and thus configure their own products. The toolkit approach was first applied in the semiconductor industry (Thomke & von Hippel, 2002) and

the computer games industry (Jeppesen & Molin, 2003; Prügl & Schreier, 2006). Today, it is used in many different fields, including toys, foods, and financial services because of its high value proposition. For example, research has shown that the users' willingness to pay increases substantially if they are allowed to design their own solutions and/or products (Franke, Keinz, & Steger, 2009; Franke & Piller, 2004). Second, toolkits for user innovation and design can be used as valid marketing tools: Observing the interaction of users with the toolkit and tracking those design specifications chosen most often gives hints on how to design standard products for the vast majority of customers not using the toolkit (Franke & Piller, 2004). In contrast to the lead-user method or collaboration with user communities in the course of crowdsourcing activities, the toolkit approach – as implemented by most manufacturers employing this method – aims at mass customization and does not focus on the generation of radical new solutions.

NEED FOR ORGANIZATIONAL (RE-)DESIGN WHEN EMPLOYING USER INNOVATION STRATEGIES

A typology of user innovation strategies

In the previous section, we presented the most important user innovation methods. Obviously, these methods differ greatly from each other with respect to their value proposition as well as their sustainability and the number of external individuals and groups integrated into the company's business processes. For example, the lead-user method is often organized as a project of limited time with only a few external contributors. Such initiatives are independent of the company's organizational routines and standard core business processes. In contrast, toolkits for user innovation and design are intended to involve a large number of people in corporate innovation processes. They are usually implemented for an indefinite period of time since their construction is a costly and timely task and regarded as an investment. Thus, companies providing such online design platforms for customized products often decide to set up a mass customization strategy.

These various differences between the user innovation methods affect the need for organizational re-design in companies employing these approaches. For the lead-user method, the need for organizational re-design will be comparatively low and for the most part limited to the human components of our organizational (re-)design framework (including work processes, people, coordination and control, and incentive mechanisms). In the case of crowdsourcing and toolkits/mass customization, it will be significantly greater and also include the structural dimensions of organizational design (goals, strategy, and structure). Figure 1 illustrates these considerations.

Searching: One-time involvement of individual lead users
Harvesting: Innovation competitions
Cooperation: Repetitive/regular involvement of lead users
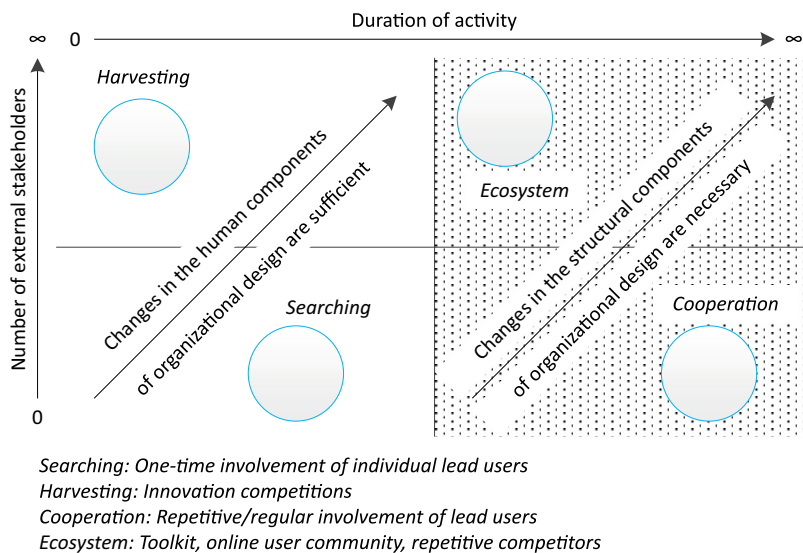*Ecosystem: Toolkit, online user community, repetitive competitors*

Fig. 1. Types of user innovation approaches

Searching strategy

Companies in the lower left corner apply what we call "searching" user innovation strategies. These strategies build on user innovation initiatives that are of limited duration and involve only a small number of external individuals. The typical user innovation methods applied in such a setting are collaboration with elite circles (Pisano & Verganti, 2008) and the lead-user method. The challenges of the lead-user method with regard to organizational design are manifold but limited to the human components of our multi-contingency information processing view of organizational design: First, the company has to find employees (from different functional areas within the company) who are willing to participate in a project with unknown external individuals and an unpredictable output in addition to their day-to-day tasks. These internal project team members need to be open to inputs of external users that sometimes might be perceived as lacking an expert status. If the company-internal project members do not believe in the value of lead-user projects and fail to act as internal ambassadors of this initiative, lead-users' concepts are very likely to suffer from a lack of acceptance within the focal producer firm and can become victim of the "not-invented-here" syndrome. Thus, the "people" component of our organizational design framework plays a major role for companies employing the lead-user method.

Another aspect regarding the human component deals with the recruiting of the lead-users. The lead-users themselves are the most crucial success factor in lead-user projects. If the company fails to identify real lead-users (trend leaders with the ability and willingness to contribute to corporate innovation processes) or invites the "wrong" individuals, the whole project may be compromised. Thus, the company has to implement a new type of business process, the systematic search for lead-users such as by means of pyramiding or broadcast search (von Hippel, Franke, & Prügl, 2009). If identified, lead-users have to be willing to participate in the project. Usually, lead-users do not claim any monetary rewards for their contribution from the outset. Because they have an urgent need themselves for an innovative solution, they are willing to collaborate with the focal producer firm and freely reveal their needs-based knowledge (von Hippel, 2007; von Hippel & von Krogh, 2006). However, if the cooperation continues after the actual lead-user workshop (e.g., when certain lead-users are invited to participate in the development of a prototype), monetary incentives as well as IP rights become an issue. In this case, the company has to think about control and incentive systems as well. However, isolated lead-user projects and other short-term user innovation initiatives involving only a small number of external individuals (e.g., elite circles) do not affect the company's goals, strategies, and structures.

Harvesting strategy

The same is true of companies pursuing activities that can be referred to as "harvesting" user innovation strategies. Companies following a harvesting strategy also only occasionally engage in user innovation activities; they can be differentiated from companies following searching strategies by the number of external users involved in corporate innovation processes. Usually, harvesting strategies take the form of crowdsourcing activities with a limited time scope (e.g., innovation contests), to which a large number of people are invited. The higher number of external contributors in innovation contests (as compared to isolated lead-user projects) increases complexity of the user innovation initiative and calls for a more comprehensive organizational re-design. However, as in the case of searching strategies, the most important challenges in preparing the organization for harvesting user innovation strategies primarily address the human components of organizational design. For example, conducting an innovation contest might bear the risk of loss of control of the producer firm with respect to the new product development. When inviting a large number of unknown people to contribute ideas and concepts, it is difficult to align the creative activities of the crowd with the focal producer firm's strategy (Hienerth et al., 2011). A good example was the innovation contest sponsored by Pril (a brand of the Henkel Group) in which the company offered an award for a new bottle design for dish liquid. Participants submitted thousands of designs, among them a high proportion of designs that were perceived as being inappropriate by Pril because of a misfit with the corporate strategy and values. Pril refused to award those

designs, although the customers had rated them very high. As a result, Pril ran into a PR disaster and was accused of ignoring their customers' wishes (Breithut, 2011).

A final issue is that users might perceive a company's crowdsourcing activities as "unfair" exploitation of their work force. Thus, organizational design activities also have to comprise the set-up of the crowdsourcing initiative. The focal producer firm has to develop routines and processes with regard to dealing with IP rights issues, and develop incentive systems based on monetary and non-monetary rewards (like gains in reputation of the contributors) if the company actually builds on user-generated content (Franke, Klausberger, & Keinz, 2012b). On the other hand, employees (especially members of the R&D and the marketing departments) of the focal producer firm might perceive the outsourcing of ideation processes as a threat to their competences and responsibilities. Organizational design has to address this aspect in order to foster the acceptance of the content and ideas generated and prevent the crowdsourcing initiative from becoming a cosmetic marketing event.

The proportion of companies pursuing searching and harvesting user innovation strategies is rather high in practice. Research shows that many companies engage in lead-user projects or crowdsourcing activities only on the occasion of a special problem which could not be solved internally (Jeppesen & Lakhani, 2010; Lilien et al., 2002). In such cases, the company does not intend to employ the user innovation approach on a continuous basis. Due to the short-term perspective and the project character of the initiative, the company's goals, strategies, and organizational structures do not need to be adapted. However, as soon as the integration of users becomes an ongoing and more systematic business activity within the company, structural components of our organizational design framework become more important. Companies following "cooperation" and "ecosystem" user innovation strategies have chosen to employ user innovation methods and instruments with a long-term perspective.

Cooperation strategy

This strategy builds on a relatively low number of external contributors (e.g., in the course of lead-user projects) on a continuous basis. Companies employing cooperation strategies face the same challenges for organizational re-designs as those following searching strategies. In addition, the decision to integrate lead-users on a continuous basis is often accompanied by a shift in the global corporate strategy towards innovation leadership within the respective industry. The company has to be open to and prepared for the development and marketing of truly novel and disruptive solutions with a high commercial potential but also a limited technological feasibility (Lilien et al., 2002; Lüthje & Herstatt, 2004). Furthermore, the company's organizational structure has to adapt to the new business processes (as described in the section on the lead-user method) associated with conducting lead-user projects.

Ecosystem strategy

This strategy focuses on the collaboration with a large number of company-external individuals (e.g., by employing toolkits for user innovation and design or collaborating with user communities). The ecosystem user innovation strategies (in the upper right corner of Figure 1) usually cause the highest need for a fundamental organizational re-design, as user innovation methods typically used in such settings (e.g., toolkits for user innovation and design or the long-term collaboration with user communities) almost inevitably tackle the organization's structural dimensions. As indicated earlier, providing a toolkit for user innovation and design, for example, almost always goes along with the implementation of a mass customization strategy on the corporate level. But offering customized products instead of or in addition to standard products means to target new customer segments, as the value proposition to the customer changes (Pine, Bart, & Boynton, 1993). Mass customization strategies also affect the organizational structure and the core business processes. For example, the production system, as well as the distribution system, has to be re-organized in order to deal with "markets of one" (Bardakci & Whitelock, 2003). If companies fail to adapt structurally to this new strategy, they are likely to run into trouble, as the cases of some industry leaders – including Toyota, Levi Strauss, Dow Jones, Mattel, and Motorola – that have tried to employ mass customization strategies have shown (Franke & Piller, 2004; Pine

et al., 1993). Thus, companies have to reorganize themselves with respect to strategy and structure. The same is true for companies constantly cooperating with user communities. The scope of their organizational activities increases as they have to manage external, informally organized social entities. On the other hand, the responsibilities as well as the scope of the activities of the R&D and the marketing departments within the company might change. These changes need to be considered in the organizational structure of the focal producer firms.

Table 1 provides an overview of the challenges of different user innovation strategies with regard to organizational re-design. In the next section, we will build upon these insights and develop generic design principles that help the company to internally prepare for user innovation.

Table 1. Design challenges of the different user innovation strategies

User innovation strategy	Typical methods	Challenges for organizational design	Component addressed
Searching	• Lead-user method	• Unwillingness of employees to participate in lead-user projects due to additional work and "not-invented-here" syndrome	• People • Incentive systems
		• Need for new processes (e.g., the search for lead-users and the evaluation of their lead-user status)	• Work processes
		• Development of cooperation templates (if lead-users are asked to help in the further development of their ideas) including incentive systems and an IP strategy	• Work processes • Incentive and control/ coordination systems
Harvesting	• Innovation contests	• Alignment of innovative activities by internals with corporate strategy	• Incentive and control/ coordination systems
		• Avoiding the perception of being "unfair" or exploiting external problem solvers (e.g., distributive and procedural fairness)	• People • Work Processes
		• Outsourcing of ideation might be perceived as a threat by members of R&D and marketing department	• People
Cooperation	• Lead-user method • Expert circles (repeatedly conducted)	• Capability building on the individual level • Need for learning processes from prior lead user projects • Development of cooperation templates and a learning base	• People • Work processes • Incentive and control/ coordination systems
		• Global corporate strategy needs to change toward innovation leadership	• Goals • Strategy
		• New responsibilities for establishing long-term relationships with lead-users	• Structure • Work processes
Ecosystem	• Toolkits for user innovation and design • Co-creation with user communities	• Lack of capability to understand complex ecosystems • Recognizing and designing the interfaces • Aligned incentives/coordination systems among R&D, production, and marketing	• People • Work processes • Incentive and control/ coordination systems
		• Global corporate strategy needs to change because of new value proposition to customers (e.g., toward innovation leadership, mass customization, etc.)	• Goals • Strategy
		• Re-organization of manufacturing and distribution system associated with a re-design of the organizational structure	• Work processes • Structure
		• New responsibilities for managing the user community	• Structure • Work processes

DESIGN PRINCIPLES FOR COMPANIES EMPLOYING USER INNOVATION STRATEGIES

Based on the challenges of user innovation strategies for organizational design discussed in the previous section, we present design principles that help the firm to prepare for user innovation.

Design principles for searching strategies

As described earlier, user innovation strategies of short duration and the involvement of a low number of external individuals do not call for fundamental changes within the organization. However, to prevent lead-user projects from failure, the following design principles should be applied.

1. Convince employees by demonstrating the potential of user-generated content and by creating appropriate incentive systems.

One of the biggest obstacles against lead-user projects or other initiatives of integrating external individuals lacking an "expert" status into corporate innovation processes is the reluctance of employees to engage in such endeavors (see Table 1). Psychological barriers like the "not-invented-here" syndrome as well as the fear of having to fulfill new tasks in addition to the daily work cannot be overcome by command from the top management. Instead, producer firms need to convince the middle management (e.g., the head of the R&D department or the division managers) of the high creative potential and solution-related know-how lying outside the company. Research has shown that the middle management plays an important role in establishing innovative processes as people on this management level often play the role of innovation champions (Hauschildt & Schewe, 2000; Witte, 1977), making them capable of asserting user innovation initiatives. A good means of convincing the middle management of the integration of external individuals into the innovation activities is to collect evidence of the high quality of external inputs. Companies like Coloplast or Lego have confessed to open innovation strategies only after the management had been presented with concepts (including detailed and highly sophisticated construction plans of user-generated innovations) that were freely circulating in user communities without the company even knowing about them (Hienerth et al., 2011). Another important aspect is to establish incentive systems that reward truly novel ideas and concepts. As has been shown, lead-user generated innovations on average are radical innovations developed in-house (Lilien et al., 2002). Last, devoting a certain percentage of the employees' regular working time to the lead-user project might motivate them to engage in such projects and underline the strategic importance attributed to such initiatives. Industry leaders such as Google, 3M, and IBM have allow their employees to work part-time on creative activities and have perceived such activities to be successful (Vise & Malseed, 2005).

2. Development of competencies with regard to identifying lead-users and moderating lead-user workshops.

Conducting an R&D project together with external individuals is associated with tasks novel to the organization. Lead-users that are capable of contributing solutions to a specific internal problem have to be identified and, when found, put into a specific workshop setting in which they jointly develop solutions together with company representatives. Both activities, searching for lead-users (usually based on social search methods like pyramiding and/or broadcasting, see von Hippel et al. (2009)) as well as organizing and moderating the lead-user workshop (Hienerth, Poetz, & von Hippel, 2007) are challenging tasks that are quite different from those within traditional innovation projects and call for experienced facilitators. Thus, it is important to acquire these new competencies, either by building them internally or by hiring external project managers possessing specific experience with such projects.

3. Development of cooperation incentives.

As explained earlier, users innovate for the purpose of satisfying their own, very specific and urgent needs. As they usually do not start their innovative activities with the intention to commercialize their solutions and concepts, they freely reveal their ideas (von Hippel, 1986, 2005; von Hippel & von Krogh, 2006). If invited to a company's lead-user workshop, the interest in the topic, the prospect of meeting and exchanging with other people with similar

interests, the enjoyment of jointly developing ideas that could be useful for themselves, or just the honor of being regarded as an "expert" by the company motivates lead-users to participate in such projects without any monetary compensation. However, as soon as the company takes up a lead-user generated idea and decides to prolong cooperation after the lead-user workshop (e.g., for the purpose of getting support in the development of a prototype), it has to think about incentives for the lead-user to enter such a collaboration. Because of their intrinsic motivation, lead-users are very often not satisfied with traditional consulting contracts including fixed daily consultancy fees. In addition to such contracts, lead-users very often claim the right to use and commercialize the invention on their own if the company – for whatever reason – fails to market it. Furthermore, the reputational gain by being named as the original inventor in the case of successful commercialization also plays an important role for lead-users. Interestingly, the incentives for lead-users to collaborate with a focal producer firm are quite similar to those of contributors to open-source projects (von Hippel & von Krogh, 2006).

Design principles for harvesting strategies

Involving a large number of external individuals into corporate innovation processes, even if the project runs only a short period of time, as in the case of innovation contests, comes with a broad range of problems (see Table 1). The following design principles help to overcome these obstacles.

1. Clear descriptions of the problem and solution parameters as well as implementation of incentive and control systems.

Innovation contests are open calls (hosted by a company) to an unknown group of potential problem solvers to work on a specific problem and to submit adequate solutions. The company then chooses the best solution for the purpose of commercializing it and awards the submitter of the winning solution a prize. In contrast to employees, participants in crowdsourcing activities do not know the company's strategy and innovate independently without any guidance from the company. Thus, as the Pril example above illustrated, user-generated solutions might be inadequate from a corporate perspective. To reduce the proportion of unfeasible solutions, the company needs to align the users' problem-solving activities with the goals of the innovation contest. The most obvious way to do so is to provide potential contributors with detailed information on what an adequate solution makes. The requirements communicated to the users must be those dimensions applied when it comes to selecting the winner. As Jeppesen and Lakhani (2010) point out, choosing a harvesting strategy means that the company withdraws from the "driver's seat" of problem solving. Rather, the company has to develop competencies in the right way of formulating and broadcasting the challenge.

Besides incentive systems, control systems also play an important role in aligning the participants' innovative activities with the corporate strategy. For example, in its innovation jams, IBM tries to guide the contributors' activities in predetermined directions by providing them upfront with the jam's goals, rules, and materials to familiarize them with current solutions (including descriptions of their problems) as well as emerging technologies that could be of interest in solving the problem (Hienerth et al., 2011). A clear problem description has been shown to have another important advantage: The better the problem is described (on an abstract level), the more heterogeneous the crowd participating in problem-solving activities will be, which is an important success factor in innovation contests as it affects the quality of ideas submitted (Jeppesen & Lakhani, 2010). Another way of limiting the solution space is to provide participants with a toolkit that only allows for solutions in a predetermined design space. In addition to a better alignment of generated solutions with the company's requirements, the toolkit also acts as a problem-solving "assistant," enabling novice problem solvers to participate in innovation contests (Franke, Keinz, & Schreier, 2008).

2. Consideration of users' fairness perceptions in the design of innovation contests.

The design of the innovation contest heavily affects the number of participants, which in turn is positively correlated with the quantity and quality of the solutions submitted. To attract as many participants as possible, companies usually offer monetary prizes for the best solutions. These prizes must be valuable enough that they are likely to compensate the average

participant for the effort put into the generation of a solution. For example, in the case of Threadless, a U.S.-based producer of T-shirts designed by users via innovation contests, the originator of the winning design received a prize of up to USD 2,500. The fairness rationale is based on social exchange theory which says that users participate in innovation contests if they expect to derive greater benefits than costs (Blau, 1964). Although self-interest plays an important role for users participating in innovation contests, it is not enough to compensate them for their effort. Research shows that users – beyond self-interest – evaluate whether the crowdsourcing activity is a "fair deal" with regard to the distribution of benefits arising from the innovation contest as well as the organization of the crucial processes (Franke et al., 2012b). For example, the submitter of a T-shirt design is likely to perceive a prize of USD 2,500 as unfair (even if the generation of the design took only one hour), if the submitter learns that the company makes a few hundred thousand dollars by selling T-shirts with that design (Franke et al., 2012b). Thus, for example, a certain share of the sales (even if it is rather low) is perceived as being more fair than a fixed compensation (Füller, Jawecki, & Mühlbacher, 2007). Furthermore, non-monetary benefits (as a gain of reputation) by naming the user as the originator on the product or the company website increases fairness perceptions of users (Füller, Faullant, & Matzler, 2010; Jeppesen & Frederiksen, 2006). In addition, the company should take care for procedural fairness which also affects the willingness of users to participate in innovation contests. Many participants wish to take part in the process of evaluating the designs and choosing the winners. Companies should think of integrating user ratings into their decision-making processes (Franke et al., 2012b).

3. *Involvement of the focal producer firm's middle management and employees by the implementation of appropriate incentive systems.*

As in the case of lead-user projects, the outsourcing of innovation-related tasks always rouses the fear of losing competencies and responsibilities among employees. In order to ensure the employees' and the middle management's interest in the innovation contests and to avoid a "not-invented-here" attitude toward the externally generated solutions, the company should employ incentive systems depending on the outcome of the crowdsourcing activity. Again, the novelty of new product ideas might be an adequate measure as well as time-to-market of innovations, as crowdsourcing activities have been shown to propel the processes of developing marketable products. Procter & Gamble has employed such an incentive system successfully (Huston & Sakkab, 2006).

Design principles for cooperation strategies

Cooperation strategies call for organizational design activities similar to those of searching strategies. Because of the sustainability of cooperation strategies, some additional challenges regarding the structural components need to be resolved.

1. *Adaptation of the corporate strategy to deal with radical/disruptive innovation.*

Continuously integrating external lead-users into the new product development process will increase the proportion of radical and disruptive innovations that promise a high market potential but low technological feasibility (Lilien et al., 2002; Lüthje & Herstatt, 2004). Such radical innovations might also affect the business model of the producer as they change the way a customer need is satisfied (Hienerth et al., 2011; Lettl, Hienerth, & Keinz, 2012) and open up new markets and applications. However, many well-established companies are reluctant to change their existing business models or enter completely new and unknown markets. In order to overcome organizational inertia, the top management has to anchor innovation leadership in the corporate strategy. Good examples for such efforts are Lego and IBM. A few years ago Lego realized that some lead-users were inventing on standard Lego bricks in order to make them usable in their daily professional lives. For example, some architects invented Lego brick kits specifically designed for architectural models of complex buildings. Also, psychological therapists used new, self-designed Lego toys for visualizing family constellations. Lego soon realized the commercial potential of specific product lines for professionals. However, lacking the specific knowledge (e.g., architecture, psychological therapy) to enter these industries, Lego launched a user entrepreneurship program. As a part of its corporate strategy, Lego allows selected users to become entrepreneurs themselves and sell their self-generated products under the Lego brand, supporting them with favorable

purchase prices, advice on legal issues, and co-marketing. In 2008, the company even established an incubator at its Billund, Denmark headquarters. IBM has chosen a similar approach. The innovation jam has become an important business activity and central part of the company's strategy. IBM also devotes generous budgets to the winners of the innovation jams in order to bring their ideas to life (Hienerth et al., 2011).

   2. Appointment of persons responsible for the relationship management with lead-users and external experts.

Clearly, the lead-users are the most important success factor in lead-user projects. As identifying progressive lead-users is a costly and timely task (von Hippel et al., 2009) and many lead-users ahead of a trend might be valuable in more than just one innovation project, it is advisable to establish sustainable relationships to lead-users. For successfully managing the long-term relations with lead-users, persons officially assigned with this task are needed. Thus, the company should appoint one or more persons in charge of taking care of lead-users. For example, Coloplast and Lego have established new organizational sub-units responsible for managing the relationship with lead-users (Hienerth et al., 2011). These persons are comparable to what the organizational science literature calls "gatekeepers" (Allen, 1967). They are expected to foster the dialogue between internal and external individuals involved in innovation processes (Allen, 1967; Hauschildt & Schewe, 2000). Another important function of these actors is to facilitate project-to-project learning (Koners & Goffin, 2007). If involved in lead-user projects on a continuous basis, gatekeepers accumulate valuable procedural know-how and skills with regard to the search for lead-users and the management of lead-user workshops (see design principles for searching strategies).

Design principles for ecosystem strategies

Ecosystem strategies come with the most fundamental challenges for organizational design. In addition to all the design principles presented previously, the following recommendations are offered.

   1. Design the organization as part of a user innovation ecosystem and adapt the organizational structure.

Companies constantly integrating a large number of external individuals into their core business processes have to realize themselves as being only a part of a user innovation ecosystem consisting of the corporate partner, user communities, and lead-users. These three types of actors co-exist and are able to jointly contribute to the development of innovations by using synergies emerging from their interplay (Lettl et al., 2012). For example, a company might foster innovative activities within a user community by introducing a toolkit for user innovation and design. Such an online platform can become the nucleus of a vivid user community and trigger the interaction between users (Franke et al., 2008). In turn, members of the user community could help to further develop the toolkit (Hienerth & Lettl, 2011; Prügl & Schreier, 2006). In addition, a vivid user community attracts lead-users as they can get support in terms of feedback and work power from other users, reducing the risk of failing with their innovations (Dahlander & Wallin, 2006; Franke & Shah, 2003). In order to allow for such synergy effects, the company has to fully commit to user innovation as an integral part of its strategy. Furthermore, the company has to structurally adapt to this new strategy. Generally speaking, flat hierarchies allowing the middle management (e.g., product or division managers) to independently collaborate with external problem solvers positively affect the success of user innovation strategies. Consequently, responsibilities as well as required capabilities should also be shifted to the middle management. In the case of Coloplast, a Danish producer of stoma products, the division managers are free to start cooperations with lead-users on their own. They receive special training provided by a person experienced in collaborations with users and are then asked to manage the R&D project on their own.

   Besides flat hierarchies, incentive systems applied by the top management have to take into account the nature of user innovation strategies. Especially in the short term, user innovation strategies are characterized by large investments but low monetary return on investment. In order to underline the strategic importance of user innovation initiatives,

companies like Coloplast, Lego, and IBM have opted for some more intermediate and non-monetary measures (e.g., the number of new patents, "buzz" in their user communities, and positive spillovers into the company's reputation) instead of monetary ROI when evaluating the success of their user innovation efforts (Hienerth et al., 2011).

Last, when pursuing a user innovation strategy, internal processes such as manufacturing and distribution need to be reorganized. Mass customization strategies, for example, call for a modular product architecture.

2. *Appointment of persons responsible for proactively participating in and managing the community.*

As a part of a user innovation ecosystem, the company has to define ways of collaborating with the other parties (lead-users and user communities as such). As users are not contractually related to the organization, they are not dependent on directives. This means that a company cannot "manage" the user community in a traditional sense. In order to align innovative activities in such user communities with the strategy of the corporation, the company needs to build a sustainable relationship with the community in addition to employing incentive and control systems (as described above). There are different ways of doing this. Some companies, like EA, a German producer of PC games, have employed a VIP program. They proactively target the most active and best-networked users in their user communities and try to tie them to the company by inviting them to test new games as BETA users prior to all others or by granting them a special VIP status at trade fairs and other corporate events. The purpose of such activities is to frequently interact with those individuals as they have key positions in the user communities and are likely to influence the general attitude towards the company within the community. If the community was started by, or is more centered around the company, a good strategy is to have corporate representatives participate in the community. Those representatives often have the status of administrators, guiding discussions and influencing general trends and innovative activities within the community. For example, IBM appoints facilitators responsible for organizing its jam activities. One of the facilitators' tasks is to monitor ongoing discussions during a jam and to gently remind participants of the jam's purpose if they stray off topic or into dead-end discussions (Hienerth et al., 2011). A third option would be to "have an agent on the inside" (Dahlander & Wallin, 2006). Research has shown firm-controlled individuals disguising their affiliation with the company (e.g., employees pretending to be independent community members) to be highly effective in influencing the user community's activities and the attitude towards the company among the community members (Dahlander & Wallin, 2006; Franke, Funke, Keinz, & Taudes, 2012a; Miller, Fabian, & Lin, 2009). Irrespective of which of the alternatives presented here is chosen, the company has to appoint a person officially in charge of coordinating the activities described. The position that is to be created somehow equals the role of a gatekeeper; thus, it aims at systematically taking-up, processing, and exchanging innovation-related information from internal and external sources (Allen, 1967; Katz & Tushman, 1979).

DISCUSSION

There is rich empirical evidence that the locus of innovation is increasingly shifting from producer firms towards users of products and technologies, that innovation is becoming increasingly democratized (von Hippel, 2005). This shift is accelerated by new information and communication technologies that allow users to share information and knowledge at low cost. At the same time, scholars and practitioners alike have developed a comprehensive set of methods that allow producer firms to leverage the creativity of users for their new product development efforts. Such methods include the lead-user method, innovation contests, collaboration with user communities, and toolkits for user innovation and design.

Our analysis reveals that user innovation strategies that are executed as "one-shot games" (such as searching and harvesting) primarily affect the human components of organizational design. For the searching strategy, processes, incentives, and competencies need to be developed that allow the focal producer firm to identify and collaborate with an elite circle (Pisano & Verganti, 2008) of progressive users. With respect to the harvesting user innovation strategy, processes, incentives and competencies need to be developed

that allow the focal producer firm to leverage the creative potential from a large number of geographically dispersed users and to align the creative contributions with the corporate strategy. For example, R&D employees need to accept and master the fundamental role shift from problem solvers to problem formulators and from idea generators to idea collectors. In this respect, R&D employees also need to develop the ability to frame problems in a way so that they attract a large number of experts from many different fields. Both searching and harvesting strategies require R&D employees to overcome a "not-invented-here" syndrome, and they require the design of exchange processes that are perceived as fair by the users.

Another key insight from our analysis is that the more a focal producer firm aims to involve users in its new product development efforts on a sustainable basis, the more it needs to complement changes in the human components with changes in the structural components of organizational design. For the user innovation strategy of cooperation to be sustained, firms need to adapt their strategy and structure to deal with radical and disruptive innovation on a continuous basis, and they need to appoint employees who are responsible for relationship management with lead-users and external experts. Here, producer firms also need to develop a double-loop learning capability to reflect on prior projects and processes and to set up an organizational memory so that the insights (both procedural and fact-based) from prior projects are disseminated to relevant stakeholders inside the firm. The ecosystem strategy implies the most fundamental changes to organizational design. It implies that the boundaries between the producer firm and users become increasingly blurred. For this strategy, focal producer firms need to view and design themselves as part of a collaborative user innovation ecosystem, and they need to create organizational units responsible for community management. According to Miles et al. (2009), this implies that the focal producer firm increasingly develops and applies community-based organizational designs and facilitative management approaches. The authors refer to such organizational designs as the I-form (Innovation-Form) as it responds to the economic era of innovation that most firms face today. Such community-based models require fundamentally different coordination and control mechanisms than their traditional counterparts such as (a) shared interest, (b) collaborative values such as the willingness to share knowledge and the seeking of fairness in community contributions and the distribution of rewards, (c) community-oriented leadership with a focus on facilitating community growth and sustainability, (d) protocols and infrastructure that support collaboration, and (e) expandable commons based on knowledge-sharing processes by general reciprocity that allow cumulative innovation (Fjeldstad, Snow, Miles, & Lettl, 2012; Miles, Snow, Fjeldstad, Miles, & Lettl, 2010).

We observe that pioneering firms such as Procter & Gamble, Lego, and IBM experiment with harvesting, cooperation, and ecosystem strategies simultaneously and increasingly aim to leverage synergies across the three strategies. This requires an integrated approach over all divisions, functions, and management levels of the focal producer firm, which calls for top management commitment and a company-wide strategy for user innovation. For example, Procter & Gamble has over a period of five years fundamentally changed its company-wide innovation approach from R&D to "C&D" – Connect and Develop (Huston & Sakkab, 2006). The C&D strategy comprises a mix of approaches such as the lead-user method, innovation contests, entrepreneurship programs, and various communities. According to Procter & Gamble, this new strategy requires a senior executive who has day-to-day accountability for its vision, operations, and performance. At Procter & Gamble, it is the vice president for innovation and knowledge who is given this responsibility. Each business unit has C&D leaders who have dotted-line reporting relationships with the vice presidents. Managers responsible for specific communities and networks report directly (Huston & Sakkab, 2006). Also, there needs to be a process where all incoming ideas are collected and distributed across the entire organization. In the C&D approach, product ideas are stored on P&G's online "eurekacatalog" through a template that documents related facts (e.g., current sales of existing products or patent availability for a new technology). The document is then disseminated to relevant managers such as general managers, business line managers, brand managers, and R&D teams worldwide (Huston & Sakkab, 2006).

Lego is leveraging synergies by its lead-user entrepreneurship incubator. Lego selects lead-user entrepreneurs who fit both with their personalities and their ideas to the Lego

strategy and values. Those selected lead-user entrepreneurs can then use the complementary assets of Lego (brand, know-how, distribution systems) to exploit the identified business opportunities. The user community provides support in the early stages of the entrepreneurial process in the form of feedback to the business idea, technical expertise, and as a first-sales market. The emerging symbiotic ecosystem of the lead-user entrepreneurs, the Lego company, and the various user communities allows it to leverage synergies such as reduced risk for the Lego company and the lead-user entrepreneur, the continuous identification and exploitation of business opportunities, and growth and sustainability of the user communities (Lettl et al., 2012). Consequently, this emerging symbiotic ecosystem has similar features to the organizational design that Miles, Miles, and Snow (2005) envision as a collaborative entrepreneurship where a large number of loosely coupled actors with diverse knowledge bases engage in a process of continuous opportunity recognition and exploitation.

Besides the lead-user entrepreneurship incubator, Lego is able to leverage synergies from its user ecosystem by (a) identifying lead-users via specific innovation contests, (b) integrating those lead-users into concrete new product development projects, (c) leveraging lead-users to further develop toolkits for user design, and (d) identifying trends by observing communication and design activities in its various user communities. In order to create and leverage such symbiotic user innovation ecosystems, a focal producer firm needs to understand the critical interfaces between different user innovation strategies, and it needs to change its capability from acting as an orchestrator (using its hierarchical power in a network of actors to enforce intended processes and outcomes) to a facilitator of collaborative innovation processes (by providing collaborative infrastructures and by facilitating a collective process for developing shared vision, protocols, and expandable commons) (Miles, Miles, Snow, Blomqvist, & Rocha, 2009).

IBM has developed a dynamic capability to develop collaborative innovation communities, such as Blade.org (Snow, Fjeldstad, Lettl, & Miles, 2011) or the Eclipse Foundation, for continuously executing innovation contests within the firm referred to as the IBM Innovation Jam (Bjelland & Chapman Wood, 2008), and by involving elite experts from outside the firm referred to as the IBM Global Innovation Outlook.

CONCLUSION

As described in this article, the symbiotic settings between focal producer firms and users as illustrated above provide interesting new perspectives to the research strand on organizational ambidexterity (Tushman & O'Reilly, 2006). After all, they open up new opportunities for producer firms to become ambidextrous, to explore and exploit simultaneously, as multiple users can be a source of continuous and simultaneous exploration of business ideas (that the firm may not be able to recognize itself) and their exploitation. We expect companies in knowledge-intensive industries increasingly to be able to apply all of the user innovation strategies skillfully and simultaneously. To develop meaningful frameworks and guidance for managers who need to master this transformation, we believe researchers in the area of user innovation and organizational design need to form a collaborative community. We hope that our article helps to trigger this development.

REFERENCES

Allen TJ. 1967. Communications in the research and development laboratory. *Technology Review* 70(1): 31-37.

Baldwin C, Hienerth C, von Hippel E. 2006. How user innovations become commercial products: A theoretical investigation and case study. *Research Policy* 35(9): 1291-1313.

Bardakci A, Whitelock J. 2003. Mass-customisation in marketing: The consumer perspective. *Journal of Consumer Marketing* 20(5): 463-479.

Bjelland M, Chapman Wood R. 2008. An inside view on IBM's innovation jam. *Sloan Managment Review* 50(1): 32-40.

Blau P. 1964. *Exchange and Power in Social Life*. Wiley, New York, NY.

Bogers M, Afuah A, Bastian B. 2010. Users as innovators: A review, critique, and future research directions. *Journal of Management* 36(4): 857-875.

Breithut J (Producer). 2011. November 30th, 2011. Pril-Wettbewerb endet im PR-Debakel. Retrieved from http://www.spiegel.de/netzwelt/netzpolitik/0,1518,763808,00.html

Brown JS, Duguid P. 1991. Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science* 2(1): 40-57.

Burton RM, Obel B. 2004. *Strategic Organizational Diagnosis and Design: The Dynamics of Fit*. Kluwer Academic Publishers, Dordrecht, Netherlands.

Burton RM, Obel B, DeSanctis G. 2011. *Organizational Design: A Step-by-Step Approach*. Cambridge University Press, New York, NY.

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

Cohen WM, Levinthal DA. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35(1): 128-152.

Dahlander L, Wallin MW. 2006. A man on the inside: Unlocking communities as complementary assets. *Research Policy* 35(8): 1243-1259.

Fjeldstad ØD, Snow CC, Miles RE, Lettl C. 2012. The architecture of collaboration. *Strategic Management Journal* 33: 734-750.

Franke N, Funke T, Keinz P, Taudes A. 2012a. Does infiltration work? Managing conflicts between firms and user communities via firm advocates. Working Paper. Vienna University of Economics and Business. Vienna, Austria.

Franke N, Keinz P, Schreier M. 2008. Complementing mass customization toolkits with user communities: How peer input improves customer self-design. *Journal of Product Innovation Management* 25(6): 546-559.

Franke N, Keinz P, Steger CJ. 2009. Testing the value of customization: When do customers really prefer products tailored to their preferences? *Journal of Marketing* 73(5): 103-121.

Franke N, Klausberger K, Keinz P. 2012b. Does this sound like a fair deal? - The role of fairness perceptions in the individual's decision to participate in firm innovation. Working Paper. Vienna University of Economics and Business. Vienna, Austria.

Franke N, Piller F. 2004. Value creation by toolkits for user innovation and design: The case of the watch market. *Journal of Product Innovation Management* 21(6): 401-415.

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

Franke N, von Hippel E. 2003. Satisfying heterogeneous user needs via innovation toolkits: The case of Apache security software. *Research Policy* 32(7): 1199-1215.

Franke N, von Hippel E, Schreier M. 2006. Finding commercially attractive user innovations: A test of lead-user theory. *Journal of Product Innovation Management* 23(4): 301-315.

Füller J, Faullant R, Matzler K. 2010. Triggers for virtual customer integration in the development of medical equipment — From a manufacturer and a user's perspective. *Industrial Marketing Management* 39(8): 1376-1383.

Füller J, Jawecki G, Mühlbacher H. 2007. Innovation creation by online basketball communities. *Journal of Business Research* 60(1): 60-71.

Füller J, Matzler K, Hoppe M. 2008. Brand community members as a source of innovation. *Journal of Product Innovation Management* 25(6): 608-619.

Harhoff D, Henkel J, von Hippel E. 2003. Profiting from voluntary information spillovers: How users benefit by freely revealing their innovations. *Research Policy* 32(10): 1753-1769.

Hauschildt J, Schewe G. 2000. Gatekeeper and process promoter: Key persons in agile and innovative organizations. *International Journal of Agile Management Systems* 2(2): 96-104.

Herstatt C, von Hippel E. 1992. From experience: Developing new product concepts via the lead user method: A case study in a "low-tech" field. *Journal of Product Innovation Management* 9(3): 213-221.

Hienerth C, Keinz P, Lettl C. 2011. Exploring the nature and implementation process of user-centric business models. *Long Range Planning* 44(5-6): 344-374.

Hienerth C, Lettl C. 2011. Exploring how peer communities enable lead user innovations to become standard equipment in the industry: Community pull effects. *Journal of Product Innovation Management* 28(1): 175-195.

Hienerth C, Poetz M, von Hippel E. 2007. Exploring key characteristics of lead user workshop participants: Who contributes best to the generation of truly novel solutions? Paper presented at the DRUID Summer Conference, Copenhagen, Denmark.

Huston L, Sakkab N. 2006. Connect and develop. *Harvard Business Review* 84(3): 58-66.

Jeppesen LB, Frederiksen L. 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science* 17(1): 45-63.

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

Jeppesen LO, Molin M. 2003. Consumers as co-developers: Learning and innovation outside the firm. *Technology Analysis & Strategic Management* 15(3): 363.

Katz R, Allen TJ. 1982. Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D project groups. *R&D Management* 12(1): 7-20.

Katz R, Tushman M. 1979. Communication patterns, project performance, and task characteristics: An empirical evaluation and integration in an R&D setting. *Organizational Behavior and Human Performance* 23(2): 139-162.

Kelly D, Amburgey TL. 1991. Organizational inertia and momentum: A dynamic model of strategic change. *Academy of Management Journal* 34(3): 591-612.

Koners U, Goffin K. 2007. Learning from postproject reviews: A cross-case analysis. *Journal of Product Innovation Management* 24(3): 242-258.

Lettl C, Herstatt C, Gemuenden HG. 2006. Users' contributions to radical innovation: Evidence from four cases in the field of medical equipment technology. *R&D Management* 36(3): 251-272.

Lettl C, Hienerth C, Keinz P. 2012. Exploring synergies amongst producer firms, lead users, and communities: The case of Lego. Working Paper. Vienna University of Economics and Business. Vienna, Austria.

Lilien GL, Morrison PD, Searls K, Sonnack M, von Hippel E. 2002. Performance assessment of the lead user idea-generation process for new product development. *Management Science* 48(8): 1042-1059.

Lüthje C, Herstatt C. 2004. The lead user method: An outline of empirical findings and issues for future research. *R&D Management* 34(5): 553-568.

Miles RE, Miles G, Snow CC. 2005. *Collaborative Entrepreneurship*. Stanford University Press, Stanford, CA.

Miles RE, Miles G, Snow CC, Blomqvist K, Rocha H. 2009. The I-form organization. *California Management Review* 51(4): 61-76.

Miles RE, Snow CC, Fjeldstad ØD, Miles G, Lettl C. 2010. Designing organizations to meet 21st-century opportunities and challenges. *Organizational Dynamics* 39(2): 93-103.

Miller KD, Fabian F, Lin S-J. 2009. Strategies for online communities. *Strategic Management Journal* 30(3): 305-322.

Morrison PD, Roberts JH, von Hippel E. 2000. Determinants of user innovation and innovation sharing in a local market. *Management Science* 46(12): 1513-1527.

Murray F, O'Mahony S. 2007. Exploring the foundations of cumulative innovation: Implications for organization science. *Organization Science* 18(6): 1006-1021.

Pine BJ, Bart V, Boynton AC. 1993. Making mass customization work. *Harvard Business Review* 71(5): 108-119.

Pisano GP, Verganti R. 2008. Which kind of collaboration is right for you? *Harvard Business Review* 86(12): 78-86.

Prügl R, Schreier M. 2006. Learning from leading-edge customers at The Sims: Opening up the innovation process using toolkits. *R&D Management* 36(3): 237-250.

Raymond E. 1999. The cathedral and the bazaar. *Knowledge, Technology & Policy* 12(3): 23-49.

Schau HJ, Muñiz AM, Arnould EJ. 2009. How brand community practices create value. *Journal of Marketing* 73(5): 30-51.

Shah SK, Tripsas M. 2007. The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal* 1(1-2): 123-140.

Snow CC, Fjeldstad ØD, Lettl C, Miles RE. 2011. Organizing continuous product development and commercialization: The collaborative community of firms model. *Journal of Product Innovation Management* 28(1): 3-16.

Terwiesch C, Xu Y. 2008. Innovation contests, open innovation, and multiagent problem solving. *Management Science* 54(9): 1529-1543.

Thomke S, von Hippel E. 2002. Customers as innovators: A new way to create value. *Harvard Business Review* 80(4): 74-81.

Tushman M, O'Reilly CA. 2006. Managing evolutionary and revolutionary change. In D. Mayle (Ed.), *Managing Innovation and Change*. 3rd Edition. SAGE Publications, London, UK.

Urban GL, von Hippel, E. 1988. Lead user analyses for the development of new industrial products. *Management Science* 34(5): 569-582.

Vise DA, Malseed M. 2005. *The Google Story*. Delacorte Press, New York, NY.

von Hippel E. 1986. Lead users: A source of novel product concepts. *Management Science* 32(7): 791-805.

von Hippel E. 2001. Perspective: User toolkits for innovation. *Journal of Product Innovation Management* 18(4): 247-257.

von Hippel E. 2005. *Democratizing Innovation*. MIT Press, Cambridge, MA.

von Hippel E. 2007. Horizontal innovation networks—by and for users. *Industrial and Corporate Change* 16(2): 293-315.

von Hippel E, Franke N, Prügl R. 2009. Pyramiding: Efficient search for rare subjects. *Research Policy* 38(9): 1397-1406.

von Hippel E, Katz R. 2002. Shifting innovation to users via toolkits. *Management Science* 48(7): 821-833.

von Hippel E, von Krogh G. 2006. Free revealing and the private-collective model for innovation incentives. *R&D Management* 36(3): 295-306.

Witte E. 1977. Power and innovation: A two-center theory. *International Studies of Management & Organization* 7(1): 47-70.

Witteloostuijn AV. 1998. Bridging behavioral and economic theories of decline: Organizational inertia, strategic competition, and chronic failure. *Management Science* 44(4): 501-519.
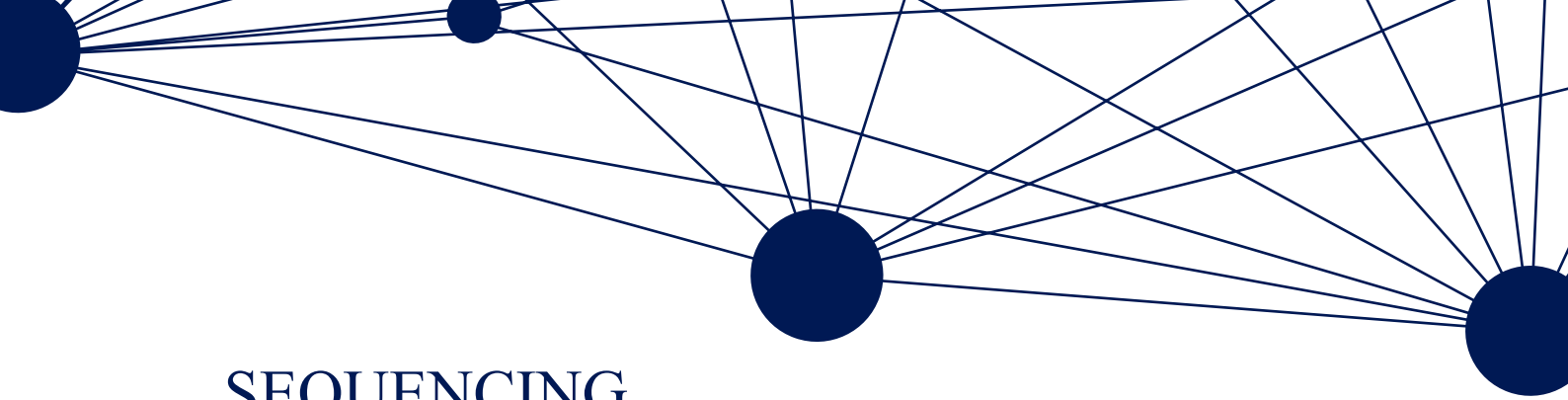
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SEQUENCING ORGANIZATIONAL CHANGE FOR POST-SHOCK ADAPTATION

A SIMULATION MODEL

PETER JACK GALLO • RICHARD M. BURTON

Abstract: What should an organization do after an environmental shock? What is the best sequence for changing organizational features or activities in response to a shock? In this study, a simulation methodology is used to examine how different sequences in changes to strategy, structure, and resource allocation affect the success of the adaptation process. Results show that the choice of change sequence leads to varying outcomes in organizational maneuverability, competence, and effectiveness. However, no one sequence is optimal for all scenarios; the best sequence choice depends on the goals of the change process as well as the content and direction of change. After an environmental shock, an organization should analyze and determine which sequence of change to follow. However, if there is little time for analysis, a reasonable heuristic is to implement a change in strategy first.

Keywords: Simulation; organizational change; change sequencing; implementation; organizational adaptation

> *"Would you tell me, please, which way I ought to go from here?" asked Alice.*
>
> *"That depends a good deal on where you want to get to," said the Cat.*
>
> *"I don't much care where," said Alice.*
>
> *"Then it doesn't matter which way you go," said the Cat.*
>
> Lewis Carroll, *Alice's Adventures in Wonderland*

Do organizations have Alice's problem of deciding which way to go after experiencing an environmental shock? The trauma of deteriorating corporate performance could lead a firm to be equally ambivalent when deciding how to proceed. The Cheshire Cat's wisdom is logical but not particularly helpful unless a firm does know where it wants to go. This simple goal-oriented wisdom may prove useful to firms hit by an environmental shock. Ford Motor Company, for example, faced recurring shocks of extreme growth and contraction before undergoing a comprehensive adaptation process starting in 2006. Standard & Poor's Stock Report on Ford Motor Company, Inc. shows that annual net income grew rapidly from USD 284 million in 2002 to USD 3.6 billion in 2004. In 2005 and 2006, annual net income dropped, first, to USD 2.2 billion and then to a net loss of USD 12.6 billion. Ford sources attribute the performance declines to a rapid shift in consumer demand from profitable sport utility vehicles to economy cars in the wake of gasoline price spikes following Hurricane Katrina in 2005 (Krisher, 2006). These performance shocks motivated the company to transform itself simply to survive. Alan Mulally was brought in as the new CEO in September 2006, and many organizational changes were made, including changes in organization structure, strategy, and resource allocation (Hoffman, 2012). For Ford, was the order of these changes important to its future success?

This study examines how the sequence of an organizational change process (Barnett & Carroll, 1995) affects the outcomes of post-shock organizational adaptation. Shocks can provoke firms to undertake dramatic and rapid changes as described by the change model called "punctuated equilibrium" (Gersick, 1991; Romanelli & Tushman, 1994). Firms may make changes to several key organizational elements that will effectively transform the firm from one organizational archetype to another (Burton, Obel, & DeSanctis, 2011; Greenwood & Hinings, 1993). Because organizational changes cannot be made instantaneously, they are often made sequentially, temporarily creating "incoherent" organizational configurations along the path of adaptation (Greenwood & Hinings, 1993). The order or sequence in which organizational elements are changed is not predetermined or inevitable (Pettigrew, 1990), and different sequences of change can impact the adaptation process (Abbott, 1988; Van de Ven & Poole, 1990). Pursuing one sequence may lead a firm through a pattern of configurations with greater performance than an alternative sequence. Ford chose to start by changing its CEO, followed by selling its ownership in foreign luxury brands and then lowering the firm's manufacturing capacity, but Ford management could have chosen a different sequence of adaptation.

In our study, we compare sequences that lead to the same final organizational configuration; however, the question is whether different sequences yield different performances along the way. We analyze three performance criteria: (1) maneuverability (Nissen & Burton, 2011), the quickness with which an organization changes from an initial organizational configuration to a planned final configuration; (2) competence, a firm's skills built from learning and the experience gained from repeated activities (Levitt & March, 1988); and (3) effectiveness, the ratio of competence to maneuverability. All three outcomes are desirable, but there are tradeoffs between them. Moving quickly to a new configuration can destroy competence while moving slowly maintains competence but at the price of getting there slowly. For Ford, would a different sequence have led to a faster turnaround or allowed for greater productivity during the period of adaptation? Competence is studied because it is an important determinant of firm performance (Tushman & Romanelli, 1985) and because transformations may destroy competence (Nelson & Winter, 1982; Sastry, 1997). Maneuverability is examined to highlight speed and the importance of getting to where you want to be quickly and efficiently. The final performance criterion, effectiveness, is intended to provide a measure that accounts for the inherent tradeoffs between maneuverability and competence.

The process of organizational change and the role of maneuverability, competence, and effectiveness can be examined using a simulation methodology. The agent-based platform SimVision™ (Levitt, 2012) allows us to experiment with a variety of change sequences and measure maneuverability and competence outcomes. Determining the best sequence depends on the particular organizational goals of the adaptation process. Sequences that begin with a change in structure result in faster adaptation and would be the best choice when maximizing maneuverability. Adaptation sequences that start with a change in strategy result in firms emerging from the period of change with greater experience, suggesting this is the better sequence if the goal is to maximize competence.

We begin with a theoretical discussion of the organizational change literature. Here we discuss the different motivations that encourage firms to focus on maneuverability or competence as well as the evidence that sequence plays a role in determining organizational change outcomes. Next, we discuss the simulation model and present our results. In the discussion and future research sections, we relate our results to previous studies of organizational adaptation, and we discuss the implications of our findings for researchers and managers. We conclude by highlighting the importance of the change sequence in steering successful post-shock adaptation.

THEORETICAL BACKGROUND

Although post-shock adaptation is required for organizational survival, change also increases the failure rate of organizations (Armenakis & Bedeian, 1999) by disrupting existing organizational routines that promote competence (Amburgey, Kelly, & Barnett, 1993; Nelson & Winter, 1982). Firms must balance the need for adaptation with the benefits of stability

(Leana & Barry, 2000), and the sequence of change and its effect on the maneuverability, competence, and effectiveness of the adaptation process could provide a means for striking this balance.

Sequencing has been addressed in the strategic management literature, where contingency theory research found that changes in organization structure follow changes in growth strategy (Chandler, 1962). Later empirical work on a sample of 262 firms found that strategy was a more important driver of structure than vice versa (Amburgey & Dacin, 1994). The sequence of changes to organizational structure and strategy has been a fundamental area of investigation, and we include them in our study. However, we choose to investigate more than the binary choice between these two organizational elements. Researchers have called for the examination of the sequence of change caused by environmental jolts (Meyer, 1982) and their effects on organizational performance (Pettigrew, Woodman, & Cameron, 2001). A study of radical organizational transformation at Canadian Olympic Non-Profits found that organizations completing radical transitions tend to make changes to high-impact organizational elements, such as the authority system, early in the transformation process (Amis, Slack, & Hinings, 2004). Our study includes changes in structure, strategy, and resource allocation to best approximate the radical adaptation processes often required after a significant environmental shock.

In addition to studies of the propensity for one change sequence over another, some research has explored the effect of sequence on performance. Siggelkow and Levinthal (2003) used a simulation methodology to study the effectiveness of three different organization structures in searching for high-performing configurations post-environmental shock. They found that a structure of temporary decentralization, where a firm starts with a decentralized structure for the period of exploration and learning and follows with a change to a centralized structure for the purpose of exploitation, leads to higher long-term performance. Their results show that sequencing changes in structure can lead to higher performance. We build on Siggelkow and Levinthal (2003) by modeling sequencing changes in strategy and resource allocation as well as structure.

Reorientations and transformations include changes to strategy, structure, and resource allocation (Tushman & Romanelli, 1985). The sequence of changes to these elements can introduce different "incoherent" organizational configurations (Greenwood and Hinings, 1993) with varying degrees of organization-environment fit (Donaldson, 1995; Lawrence & Lorsch, 1967; Miles & Snow, 1994). Conditions of misfit suggest that there is an opportunity for certain change sequences to outperform others.

The literature on configurations supports the idea that sequence should matter, but the question of firm performance during the adaptation process has received limited attention in the literature. The premise of the theory of punctuated equilibrium is that adaptations are large and brief, followed by periods of equilibrium. The total time of transformation, called "maneuverability" by Nissen and Burton (2011), is an important measure of adaptation success. However, maneuverability is not the only means to determine the success of a post-shock adaptation. In a system dynamics model of punctuated equilibrium, Sastry (1997) found that post-shock adaptations could lead to failure – if firms respond too quickly to pressures for change or if they respond too slowly. When firms are slow to respond to the signals for change, they suffer large declines in performance before acting to implement change. Such firms may focus their change goals on maneuverability hoping to achieve a state of fit as quickly as possible. The formalized model also demonstrated that transformations were accompanied by significant drops in competence (Sastry, 1997). If different sequences result in different levels of competence at the conclusion of adaptation, might it be possible to choose a sequence that maximizes firm competence? For example, firms that respond quickly to signals for change have not experienced severe performance loss; they can focus on recovering competence during the transformation rather than maneuverability. Maneuverability and competence represent two different goals for adaptation, and different change sequences may better accomplish one over the other. We extend Siggelkow and Levinthal's (2003) study of organization structure and Sastry's (1997) study of competence by examining the effects on performance of both maneuverability and competence during different sequences of adaptation.

SIMULATION MODEL

We used a simulation experiment to study the maneuverability and competence outcomes of all six possible sequence patterns for changes in organizational strategy, structure, and resource allocation. Simulation is a valuable tool for experimentation and examination of possibilities (Burton, 2003; Davis, Eisenhardt, & Bingham, 2007); we use it to gain insight into how sequence affects a firm's performance while undergoing adaptation. In our experiments, we utilize SimVision™, an agent-based simulation developed for the design of work processes and the organization of project teams (Levitt, 2012). SimVision™ utilizes an information-processing model of the information routines and micro behaviors of boundedly rational agents (March & Simon, 1958). Agents send information to each other and make decisions on what to do (Jin, Levitt, Kunz, & Christiansen, 1995; Levitt et al., 1999). The firm is represented entirely by these agents, their tasks, and communication links. SimVision™ has been validated in field settings ranging from chip fabrication to product launches (Jin & Levitt, 1996; Levitt et al., 1999). In addition, SimVision™ (and its precursor, VDT) has been used to study topics in organization theory, including studies of alternative control strategies (Long, Burton, & Cardinal, 2002) and communication strategies (Carroll & Burton, 2000). (See the appendix for a detailed description of the SimVision™ simulation and how it is used to model the sequence of adaptation.)

Modeling the Organization and Alternative Change Sequences

The organization is modeled as a set of both well-defined project tasks and agents assigned to complete the tasks. The relations among the agents and the assignment of tasks are experimentally manipulated to correspond with different settings for strategy, structure, and resource allocation. All experiments begin with the organizational model in its original configuration and run to complete one project cycle. At the conclusion of the first project cycle, a change in strategy, structure, or resource allocation is implemented, and a second project cycle is initiated. At the conclusion of the second project, the next change is made, and the final change is made after completing the third project cycle. After the third project, all simulations will have achieved the final configuration, and a fourth project is run in the final configuration mode.

Experimental Manipulations

Our study simulates the reorientation of a project organization from one configuration of strategy, structure, and resource allocation to a final configuration. The simulation starts with an M-form (multidivisional) structure, two product lines, and equal distribution of resources, then reorients to an organization with a U-form (functional) structure and four product lines which use twice as many resources in the later tasks of each product line. The organization changes one of the three elements at a time to transform from the starting configuration to the final configuration, creating six possible sequences of post-shock adaptation (see Table 1). Each change sequence is simulated in SimVision™ by changing the elements as described in the appendix; all other elements of the simulation remain constant throughout.

Changes in Organization Structure

The change of structure modeled is a shift from the multidivisional form to a functional structure – that is, from M-form to U-form. Chandler (1962) chronicled the benefits for modern firms in changing from the U-form to the M-form. However, the U form persists and has cost advantages over the M-form when coordinating components across divisions (Qian, Roland, & Xu, 2006). Therefore, a move from M-form to U-form is a viable option for firms in resource-constrained environments.

Changes in Strategy

Changes in strategy capture the level of product diversification in which a company is engaged. Our simulated organization starts with only two product lines and eventually diversifies to four distinct product lines. In the simulation, the original configuration consists of eight tasks

(four per product line). Then the change in strategy is introduced, doubling the product lines and leading to an organization with sixteen tasks. Romanelli and Tushman (1994) captured changes in strategy by the introduction or abandonment of product lines.

Changes in Resource Allocation

Our model allows for the direct manipulation of how resources – in this case, human resources – are allocated. The starting configuration consists of an equal number of full-time employees (FTEs) assigned to all the tasks in the model organization. The change shifts human resources until twice as many FTEs are assigned to later tasks than to earlier tasks in the project; this could, for example, simulate a shift in focus from R&D to sales and marketing.

Table 1. Simulation Results

Sequence	Maneuverability (weeks)	Competence (work hours)	Effectiveness (work hours/week)
Strategy→Resource Allocation→Structure	37.5	2800	74.7
Strategy→Structure→Resource Allocation	36.4	2800	76.9
Resource Allocation→Strategy→Structure	34.7	2400	69.2
Resource Allocation→Structure→Strategy	28.8	2000	69.4
Structure→Strategy→Resource Allocation	31.8	2400	75.5
Structure→Resource Allocation→Strategy	26.9	2000	74.3

RESULTS

Table 1 presents the simulation results for the six different sequences of post-shock adaptation and the performance outcomes of maneuverability, competence, and effectiveness. Maneuverability is the time required to complete the adaptation process. Competence is the amount of production accomplished during the adaptation process. Effectiveness is the ratio of competence to maneuverability. These results reflect the mean value for a sample of 25 simulations and are significantly different at the $p < .01$ level.

Maneuverability

If the firm's goal is maneuverability, or to align the firm with the external environment as quickly as possible, then the sequence Structure→Resource Allocation→Strategy is the best choice as shown in Table 1. Maneuverability, however, does not necessarily represent all desirable outcomes.

Competence

Competence is measured as the production accomplished during the period of adaptation. We chose to represent a change in strategy with a doubling of product lines. Therefore, the amount of production accomplished is different depending on when the change in strategy is introduced. Competence (work volume) varies between 2000, 2400, and 2800 hours of production as shown in Table 1. The two sequences in which strategy is the first organizational element that is changed accomplish the greatest amount of production (2800 hours) during the period of adaptation.

Effectiveness

A third metric could be useful for firms whose goals are not maneuverability or competence alone. We introduce the ratio of competence to maneuverability as an effectiveness measure. This ratio identifies which change sequence accomplishes the greatest amount of work per unit of adaptation time. In our experiments, the sequence Strategy→Structure→Resource Allocation has the greatest value on effectiveness. The ratio of competence/maneuverability, while providing a useful effectiveness measure, does not supplant the importance of the individual measures. Firms set their own adaptation goals and decide which performance measure – maneuverability, competence, or effectiveness – is most relevant.

In summary, the sequence Strategy→Structure→Resource Allocation has the highest value for the effectiveness measure. However, this does not coincide with the quickest sequence to reorientation (maneuverability), which is the sequence Structure→Resource Allocation→Strategy. Both Strategy→Structure→Resource Allocation and Strategy→Resource Allocation→Structure have the highest work volume and are optimal when considering the goal of competence.

Post Hoc Interpretation of Results

In our model and analysis, we changed the firm from an M-form configuration to a U-form. However, the experimental design can be easily reversed – from U-form to M-form. The results in Table 1 would be identical were we to run our model in the opposite direction, starting with a firm in the final configuration and adapting towards the initial configuration. What then, are the best sequences for an organization changing from U-form to M-form, while downsizing from four product lines to two, and moving to an equal distribution of human resources across the firm? The results also appear in Table 1, with the exception that the sequences are reversed. The greatest maneuverability or quickest time is Strategy→Resource Allocation→Structure. The greatest competence is either Structure→Resource Allocation→Strategy or Resource Allocation→Structure→Strategy. And the sequence with the greatest effectiveness is Resource Allocation→Structure→Strategy. The change in strategy consists of downsizing from four product lines to two, so it seems reasonable that maneuverability is greatest if the change process starts by changing strategy. Competence is measured as the total work accomplished during the change process; this seems to explain why competence is greatest for the sequences that end with a change in strategy. Reversing the direction of our experiment in this manner highlights another interesting finding regarding sequence. The direction in which organizational elements are changed will also influence the choice of optimum change sequence. The best sequence depends not only on where you want to go but where you start from as well.

DISCUSSION

Our study utilized a computational experiment to investigate the impact of change sequence on post-shock organizational adaptation. Results demonstrated significant differences in the maneuverability, competence, and effectiveness of the adaptation process for all six experimental sequences. By demonstrating that sequence can have significant and varying impacts on these three performance metrics, our simulation study provides initial insight into adaptation sequence and its role in organizational performance in dynamic environments with shocks. Sastry's (1997) results in prior simulation research demonstrated significant drops in competence after a reorientation, as had been stated in the original theory of organizational evolution (Tushman & Romanelli, 1985). Because different sequences of change result in different volumes of work accomplished by the time the full reorientation is complete, and organizations learn from experience (Levitt & March, 1988), sequence has a direct impact on the recovery of competence during post-shock adaptation. The earlier a change in strategy is introduced, the greater is the production accomplished during the adaptation process. An organization may struggle while waiting for the structure and resource allocation to align with the new strategy, but this period of struggle provides useful experience in which organizational competence begins to recover. We do not test the effect of increased experience on organizational competence directly; however, our experiment suggests that sequence impacts competence through the total amount of work accomplished. Our results show that the optimal sequence for firms with a goal of competence recovery would be either sequence that begins with a change in strategy.

Beyond our findings on maneuverability, competence, and effectiveness, reversing the simulated experiments highlights the importance of the direction of change in determining optimal sequence. If the firm is an M-form with balanced resources across two product lines, then the best sequence can be read directly from the rows in Table 1. If the firm is U-form with unbalanced resources across four product lines, then the sequences presented in Table 1 need to be interpreted in reverse. Therefore, the optimal sequences for firms changing in

opposite directions are in fact mirrored. This demonstrates that the best sequence depends upon two contingencies: the direction in which organizational elements are being changed and which goal is the most important.

The implications of our study for management are straightforward: assess where you are and where you want to be. This is a truism for every organizational change and not surprising to managers. However, it is not obvious that the order or sequence of change is crucial as well. Here, we demonstrate that the choice of the sequence of change and the intermediate stages of change have significant effects. The challenge of environmental shock will generate managerial attention on the question of exactly which organizational elements to change. Our study indicates that managements' work is not done when they have determined the appropriate changes. Management should devote effort to determining the best sequence for the various changes that comprise the adaptation.

Periods of post-shock adaptation can be quite challenging and present significant time constraints. So our implication that the sequence of change needs to be analyzed and determined carefully may not be welcome. However, our study does suggest some opportunities for simplifying the determination of good change sequences. Sequences that start with a change in strategy perform well against all three goals. For firms in the initial configuration (balanced undiversified M-form), changing strategy first works best on competence and effectiveness but less well on maneuverability. If the experiment is reversed, changing strategy first works best on maneuverability and reasonably well on effectiveness. For change in both directions, a good heuristic is to implement a change in strategy first. When time to make a management decision is short, this heuristic is quick and robust as the chances of making a large mistake are small. However, if time permits it might be beneficial for a firm to use a simulation to model the change process and determine exactly which sequence benefits the firm the most.

Let us return to Ford Motor Company in 2006. Studying the timeline of changes implemented by Mr. Mulally, it is evident that strategy changes were tackled first during the adaptation process. Luxury brands were divested, truck factories were closed, and a compact fuel-efficient Ford sold in Europe was fast-tracked for release in the U.S. market (Hoffman, 2012). All of these changes were implemented before the change to a matrix organization structure and even before the full team of executives was in place. Certainly, many of the problems at Ford were endogenous. However, the steep rise in gasoline prices after Hurricane Katrina and a subsequent shift in demand away from sport utility vehicles was the exogenous shock that overcame the firm's inertia (Krisher, 2006). The content of the adaptation required at Ford was far-reaching and complex. But what can we say of the sequence of adaptation that was needed? In interviews with Ford executives, Hoffman (2012) found evidence of the organizational inertia that prevented the company from implementing necessary changes sooner. Therefore, by the time the firm chose to align with its external environment, it had suffered extensive drops in performance. Maneuverability, aligning with the external environment as quickly as possible, should have been the primary goal of its adaptation process. Ford had missed the shift in consumer sentiment towards greater fuel efficiency. The company's fuel-efficient product offerings paled in comparison to Japanese and European competitors, suggesting low coherence between the firm's routines for gas-guzzler production and growing demand for fuel efficiency. Was "strategy first" the right choice for a firm focused on maneuverability? Our simulation focused on a more limited set of changes than what Ford experienced; however, our results do show that, for downsizing firms, starting with a change in strategy leads to the quickest adaptation.

As of close of fiscal year 2011, the turnaround at Ford had been an unqualified success, with the firm posting net income of approximately USD 20 billion – despite the additional environmental shock of the global financial crisis in 2008. How much of that can be attributed to the sequence of implementation versus the content of change itself is not entirely clear. But the focus on strategy first did have quantifiable benefits in terms of product quality ratings and customer satisfaction surveys (Hoffman, 2012). Ford also benefited from increased goodwill for rejecting federal bailout money in 2009, but while this goodwill drove customers to dealerships, the company had to have cars that people actually wanted to buy to make a sale. The Ford example provides an understanding of the complex interplay between context and adaptation goals, content, and process.

Our study results confirm that sequence is an important factor in the appropriate implementation of adaptation. We cannot provide a one-size-fits-all sequence for organizational change (Pettigrew, 1990), but strategy first is a good heuristic. Firms may choose one sequence over another depending on the context of the shock and the goals of adaptation. Our results hold for firms whose context requires the specific archetypal shift we modeled. The appropriate sequence may be quite different if the firm's context requires different shifts in organizational configuration. So, unlike Alice, who doesn't care where she goes, organizations need to understand exactly where they are and where they want to go before they know which sequence of changes to undertake.

FUTURE RESEARCH

The canvas for future research for the proper sequence of organizational changes is broad. Here, environmental shock was the stimulus for change. Less dramatic reasons for organizational change include market shifts, new product or technology initiatives, and new regulatory regimes. Environments and organizations are changing continually. We examined the combination of strategy, structure, and resource allocation as the adaptive response. But organizational changes can also involve leadership, routines or capabilities, IT systems, coordination and control mechanisms, and incentives. With possible changes being both separate and in combination, the number of organizational configurations becomes quite large. Burton et al. (2011) discuss the complexity of change and argue that the competency loss due to misfits is substantial. Many other important research questions regarding the goals, sequencing, and outcomes of change need to be explored.

One next step is to begin with field studies of organizational change that go into greater depth than the illustrative Ford case used here. We did not investigate either alternative sequences of change at Ford or the full scope of the changes themselves. Field studies of organizational change with an emphasis on the choice of sequence and its efficacy are called for. Further, such studies could be analyzed at the micro level using agent-based simulation models such as SimVision™. A SimVision™ model could be constructed by using real-world data to investigate alternative change sequences in much the same way as we did in the present study.

Another approach is a multi-firm field study of organizational change using the methodology pioneered by Eisenhardt (1989). The independent variable could be the sequence of organizational change, moderators could be contextual variables or other controls, and the dependent variables could be the maneuverability, competence, and effectiveness performance measures that we have used here. Such studies would provide detailed micro data on the change process and its outcomes.

CONCLUSION

Our study results indicate that the sequence of organizational changes is an important determinant of the success of the post-shock adaptation process. There is not one optimal sequence of change; the choice of sequence is context dependent. An organization's goals for the adaptation process, as well as the content and direction of the desired change, determine what the best sequence option will be. Some goals may emphasize maneuverability or accomplishing a change as quickly as possible, others may focus on maintaining the greatest competence during the change process, and others may emphasize effectiveness. Our simulation experiments show that different implementation sequences create significant differences in the maneuverability, competence, and effectiveness of a firm's adaptive response to a shock in the external environment. The varying impact of implementation sequence on these three metrics highlights the importance of understanding the goals of the adaptation process before initiating the sequence of changes that comprise the transformation.

Our experiments modeled the reorientation from one organizational archetype to another. Our methodology, however, also allowed us to reverse our experiments yielding different results for the optimal sequence on our three measures. These results demonstrated the importance of the content and direction of change. For example, the best sequence is different for firms in the M-form from those in the U-form – an asymmetry. While our results do not

allow us to prescribe a one-size-fits-all best sequence for the process of post-shock adaptation, the significant differences across sequences establish that this should be an important concern to management. Determining strategy first has long been an important principle in organization design (Chandler, 1962), and we find some evidence that this principle may be extended to implementation. If the time for analysis after an environmental shock is very short and management needs to make a quick decision, then initiating a change in strategy first appears to be a safe heuristic.

REFERENCES

Abbott A. 1988. Transcending general linear reality. *Sociological Theory* 6(2): 169-186.

Amburgey TL, Dacin T. 1994. As the left foot follows the right? The dynamics of strategic and structural change. *Academy of Management Journal* 37(6): 1427–1452.

Amburgey TL, Kelly D, Barnett WP. 1993. Resetting the clock: The dynamics of organizational change and failure. *Administrative Science Quarterly* 38: 51–73.

Amis J, Slack T, Hinings CR. 2004. The pace, sequence, and linearity of radical change. *Academy of Management Journal* 47(1): 15–39.

Armenakis AA, Bedeian AG. 1999. Organizational change: A review of theory and research in the 1990s. *Journal of Management* 25(3): 293–315.

Barnett WP, Carroll GR. 1995. Modeling internal organizational change. *Annual Review of Sociology* 21: 217–236.

Burton RM. 2003. Computational laboratories for organization science: Questions, validity and docking. *Computational and Mathematical Organization Theory* 9(1): 91-108.

Burton RM, Obel B, DeSanctis G. 2011. *Organizational Design: A Step-by-Step Approach*. Cambridge University Press, Cambridge, UK.

Carroll T, Burton R. 2000. Organizations and complexity: Searching for the edge of chaos. *Computational & Mathematical Organization Theory* 6(4): 319–337.

Chandler AD. 1962. *Strategy and Structure: Chapters in the History of the Industrial Enterprise*. Doubleday, New York, New York.

Davis JP, Eisenhardt KM, Bingham CB. 2007. Developing theory through simulation methods. *Academy of Management Review* 32(2): 480–499.

Donaldson L. 1995. *American Anti-Management Theories of Organization*. Cambridge University Press, Cambridge, UK.

Eisenhardt KM. 1989. Building theories from case study research. *Academy of Management Review* 14(4): 532–550.

Gersick CJ. 1991. Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *Academy of Management Review* 16(1): 10–36.

Greenwood R, Hinings CR. 1993. Understanding strategic change: The contribution of archetypes. *Academy of Management Journal* 36(5): 1052-1081.

Hoffman BG. 2012. *American Icon: Alan Mulally and the Fight to Save Ford Motor Company*. Crown Business, New York, New York.

Jin Y, Levitt RE, Kunz JC, Christiansen TR. 1995. The virtual design team: A computer simulation framework for studying organizational aspects of concurrent design. *Simulation* 64(3): 42–57.

Jin Y, Levitt RE. 1996. The virtual design team: A computational model of project organizations. *Computational & Mathematical Organization Theory* 2(3): 171–195.

Krisher T. 2006. Official says Ford caught off guard by rapid shift from trucks. *Pittsburgh Post-Gazette* 80(10): C-2.

Lawrence PR, Lorsch JW. 1967. *Organization and Environment*. Graduate School of Business Administration, Harvard University, Cambridge, MA.

Leana CR, Barry B. 2000. Stability and change as simultaneous experiences in organizational life. *Academy of Management Review* 25(4): 753–759.

Levitt B, March JG. 1988. Organizational learning. *Annual Review of Sociology* 14: 319–340.

Levitt RE. 2012. The Virtual Design Team: Designing project organizations as engineers design bridges. *Journal of Organization Design* 1(2): 14-41.

Levitt RE, Thomsen J, Christiansen TR, Kunz JC, Jin Y, Nass C. 1999. Simulating project work processes and organizations: Toward a micro-contingency theory of organizational design. *Management Science* 45(11): 1479–1495.

Long CP, Burton RM, Cardinal LB. 2002. Three controls are better than one: A computational model of complex control systems. *Computational & Mathematical Organization Theory* 8(3): 197–220.

March JG, Simon HA. 1958. Organizations. John Wiley & Sons, New York, New York.

Meyer AD. 1982. Adapting to environmental jolts. *Administrative Science Quarterly* 27(4): 515-537.

Miles RE, Snow CC. 1994. *Fit, Failure and the Hall of Fame*. Free Press, New York, New York.

Nelson RR, Winter SG. 1982. *An Evolutionary Theory of Economic Change*. Belknap, Cambridge, MA.

Nissen ME, Burton RM. 2011. Designing organizations for dynamic fit: System stability, maneuverability, and opportunity loss. *IEEE Transactions on Systems, Man, and Cybernetics–Part A: Systems and Humans* 41(3): 418–433.

Pettigrew AM. 1990. Longitudinal field research on change: Theory and practice. *Organization Science* 1(3): 267-292.

Pettigrew AM, Woodman RW, Cameron KS. 2001. Studying organizational change and development: Challenges for future research. *Academy of Management Journal* 44(4): 697–713.

Qian Y, Roland G, Xu C. 2006. Coordination and experimentation in M-Form and U-Form organizations. *Journal of Political Economy* 114(2): 366–402.

Romanelli E, Tushman ML. 1994. Organizational transformation as punctuated equilibrium: An empirical test. *Academy of Management Journal* 37(5): 1141–1166.

Sastry MA. 1997. Problems and paradoxes in a model of punctuated organizational change. *Administrative Science Quarterly* 42(2): 237–275.

Siggelkow N, Levinthal DA. 2003. Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Organization Science* 14(6): 650–669.

Tushman ML, Romanelli E. 1985. Organizational evolution: A metamorphosis model of convergence and reallocation. *Research in Organizational Behavior* 7: 171–222.

Van de Ven AH, Poole MS. 1990. Methods for studying innovation development in the Minnesota Innovation Research Program. *Organization Science* 1(3): 313-335.

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APPENDIX

We use the SimVision™ project organization model to investigate the impact of different sequences of change. The order of post-shock adaptation is modeled by sequentially changing each of three key organizational elements. SimVision™ defines an organization by its various tasks and the aggregate characteristics of the workers assigned to those tasks. SimVision™ is a laboratory to simulate the information-processing demands on time-constrained individuals and is well suited to test the impact of changes in organizational activity on the adaptation process. By manipulating the workflow design, task variables, and worker parameter values, it is possible to create alternatives in strategy, structure, and resource allocation within the project organization. In our research design, two archetypal organizational configurations are modeled, and the variety of sequences an organization can follow when transforming from one archetype to another are simulated.

The model in this study consists of an organization of agents (employees or managers), project tasks, and successor links. Project tasks define the work done by the organization, while the successor links dictate the order in which the tasks are accomplished. In the graphical interpretations of the simulation model, tasks are designated as rectangular boxes, while successor links are designated with solid arrows. Agents are assigned to individual or multiple tasks; an agent assigned to other agents represents a manager. Agents are represented graphically with a human icon, and assignments are designated using solid arrows. By manipulating the design of these three elements, we create a simple virtual organization and model how it transforms from one archetypal configuration of organizational activities to another. In our study, the focus is the actual dynamics of implementing the change. SimVision™ is chosen as the modeling software because it allows for the direct manipulation of structure, strategy, and resource allocation.

All of the simulation experiments start with the initial organizational configuration depicted in Figure A1. This initial configuration is described as the balanced undiversified M-form archetype. The simulation proceeds to model changes in strategy, structure, and resource allocation that result in the final organizational configuration seen in Figure A2. This configuration is described as the unbalanced diversified U-form archetype. The changes in the organization are accomplished by changing the elements of the SimVision™ model; a detailed description of those changes follows.
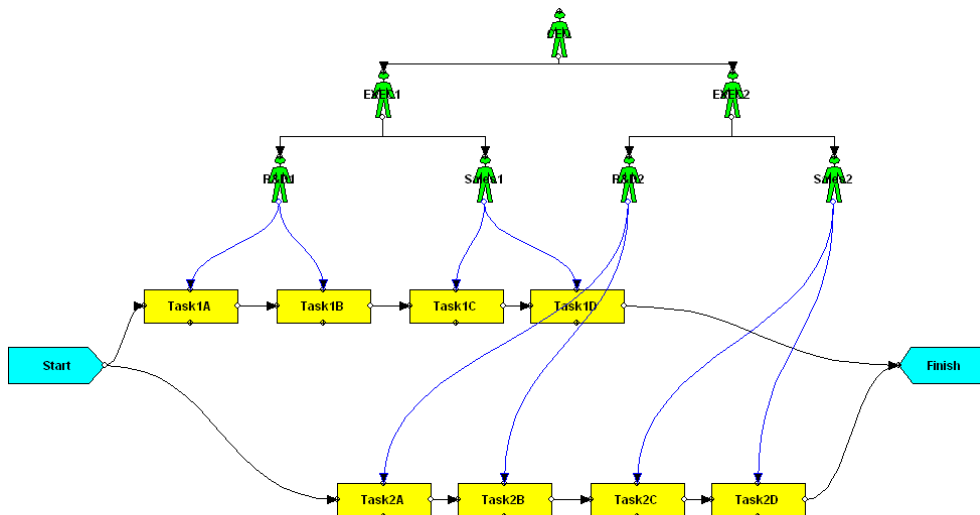

Fig. A1. Initial Organizational Configuration

Strategy: The initial configuration is described as undiversified even though Figure A1 shows two product lines. It might be better to describe the initial configuration as "under-diversified" in relation to the final configuration. The change in strategy being modeled in

the experiments is a doubling of product lines from two to four. Each product line is made up of four tasks labeled A, B, C, and D. The property settings for each task are set to identical values and remain unchanged throughout the simulation experiments. For example, work volume sets the "work type" property for all tasks, and the value of work volume is set to 50 hours. Work volume represents the total quantity of work required to complete the task, but the duration of the task will vary depending on how many employees are assigned to a given task. The value of 50 hours remains unchanged throughout the experimental manipulations. The changes in strategy are introduced simply by the addition of tasks 3A-D and 4A-D shown in Figure A2. These tasks have the same property settings as tasks 1A-D and 2A-D.
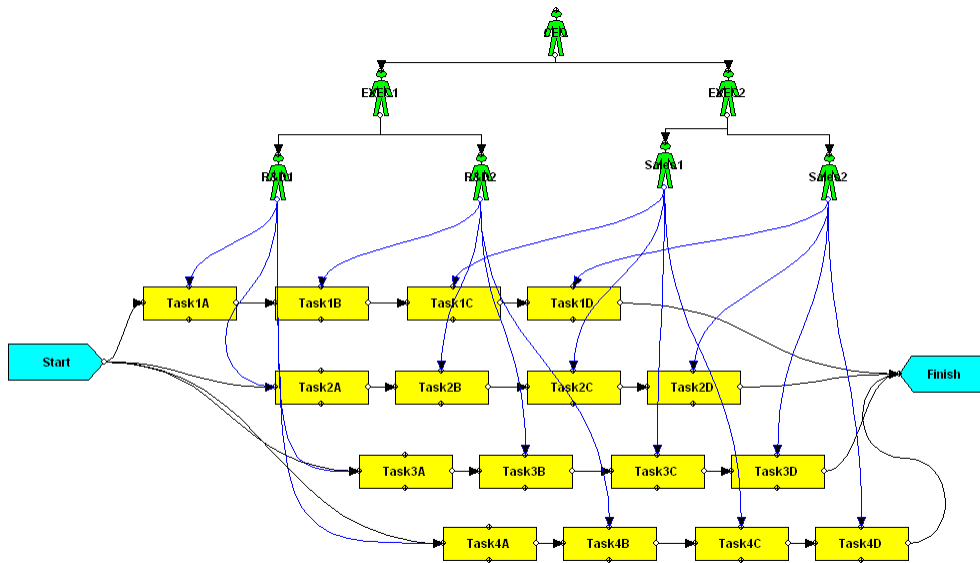

Fig. A2. Final Organizational Configuration

Structure: The change in structure modeled in our simulations is a change from the M-form to the U-form. Figure A1, depicting the initial organizational configuration, clearly represents a M-form structure. The structure of the firm is determined by the placement and positioning of the assignment links that assign positions to individual tasks, as well as by the supervision links that demonstrate the hierarchy of the organization. Figure A1 shows that only positions supervised by EXEC1 are assigned to tasks 1A-D; likewise, only positions supervised by EXEC2 are assigned to tasks 2A-D. Therefore, the product outputs of tasks 1A-D are the responsibility of one singular division, and a separate division is responsible for the products of tasks 2A-D. The change in structure is accomplished by reorganizing the assignment and supervision links to create a U-form organization structure. This U-form structure is present in Figure A2, but for the sake of visual clarity it is helpful to look at the change in structure before the change in strategy is introduced. Figure A3 is the resulting organizational configuration when the change sequence starts with a change in structure.

In Figure A3, note the change in supervisory links. EXEC1 now supervises both R&D 1 and R&D 2 positions, while EXEC2 supervises both sales positions. The assignment links have also changed to create the U-form structure. Each position is now responsible for a given task across all product lines. R&D 1 works on both task 1A and 2A, and R&D 2 works on tasks 1B and 2B. These changes create a functional orientation, where units work on identical functions across the various product lines. These changes in assignment and supervision links are the only manipulations used to change the organization from M-form to U-form. All task properties and person properties remain unchanged.

Resource Allocation: In Figure A1, seven person icons represent all of the human resources in the simulated firm. In SimVision™, the FTE (full-time employee) property setting allows for values both less than and greater than one. This helps in modeling part-time employees as well as modeling several similar employees with a single graphical icon. In the initial organizational configuration of Figure A1, the FTE property is set to six FTEs each for both
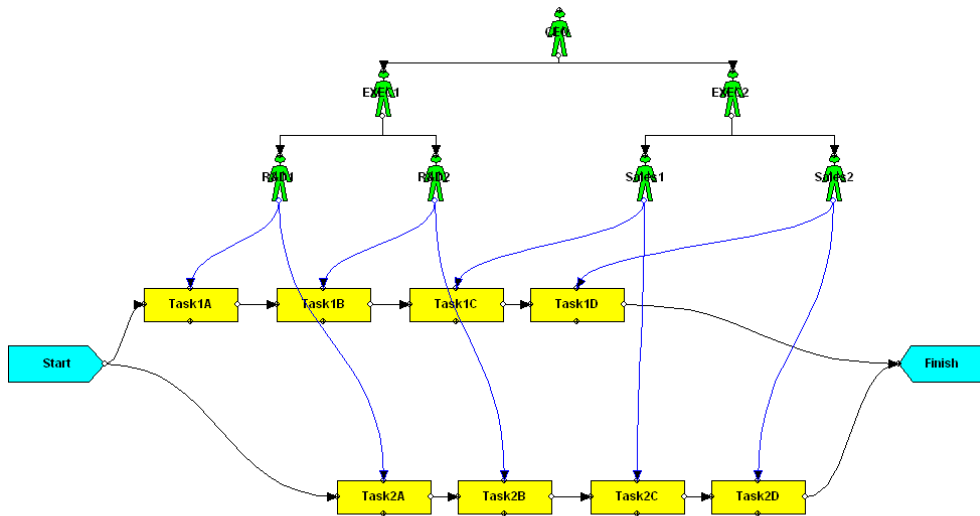
Fig. A3. U-Form Structure (Change Structure First)

R&D icons and both sales icons. Similarly, both EXEC1 and EXEC2's FTE property is set to a value of three. The CEO's FTE setting is set to a value of one. With these settings, the total human resources of the firm are allocated equally across the two business units. Each unit has three executives overseeing the work of twelve employees equally distributed between R&D and sales. All of the other properties assigned to persons remain unchanged throughout the simulation experiments.

Shifting the FTE settings of the person icons simulates the change in resource allocation; the CEO person property settings remain unchanged throughout. In Figure A2, the positions of the person icons have changed but so have the values of the FTE property. Unfortunately, the change in FTE settings is not represented graphically. The final organizational configuration is described as unbalanced and, in fact, the later stages of the process now have twice as many human resources assigned as the earlier stages. EXEC2's FTE is now set to a value of four, while EXEC1's FTE has been reduced to two. Likewise, both sales icons' FTE property is set to eight while the FTE setting for both R&D persons is reduced to a value of four. Therefore, the final organizational configuration has two executives overseeing the work of eight employees on the eight A and B tasks of the four product lines. Four executives and sixteen employees oversee the C and D tasks of these same product lines. Twice as many human resources are dedicated to the later stages of the product line than to the earlier stages.

Sequencing

The changes to strategy, structure, and resource allocation can now be applied to the initial organizational configuration in different sequences to measure the effect of sequence on the adaptation process. As mentioned in the results section, there are a total of six possible sequences when only three organizational elements are being changed. Each sequence follows the organization as it transforms through four organizational configurations. To illustrate this point, let us use the Structure→Resource Allocation→Strategy sequence as an example. The simulation starts with the initial configuration depicted in Figure A1. The first element changed is the structure, and the organization is now in the configuration represented in Figure A3. The third configuration is created by the next change, in this case the introduction of an unbalanced resource allocation. Recall that this change is created by a change in FTE settings and cannot be seen graphically. Finally, the strategy is changed and the organization now enters its fourth and final configuration as seen in Figure A2.

Each sequence is modeled by simulating the organization as it runs through the four configurations that represent the sequence. The SimVision™ software allows for the creation of projects, and these projects can be linked together with successor links. Therefore, by

creating all the organizational configurations represented by a sequence and then linking these configurations together in the appropriate order we can simulate the adaptation process. The simulation output gives us details on the total duration of the simulation – that is, how long it took the organization to cycle through all four of the organizational configurations that represent a given change sequence as well as the total work volume accomplished. These two outputs are the performance metrics presented in Table 1.

MOVING DESIGN FROM METAPHOR TO MANAGEMENT PRACTICE

JEANNE M. LIEDTKA • BIDHAN L. PARMAR

Abstract: Despite the centrality of "design" to the field of organizational science, we argue that its use has remained at the level of metaphor rather than practice. Donald Schon's concept of "reflection in action" addresses this gap by describing how managers can practice *designing* by generating problem frames as hypotheses, and then testing and refining those hypotheses in the situation. Much of management theory has focused on stable and predictable situations where problem framing is less important. As practitioners and scholars alike increasingly embrace the complexity and ambiguity of the global business environment, Schon's ideas are starting to take hold. In this article, we explore Schon's concept of the "reflective practitioner" and show how it can move beyond theory to implementation.

Keywords: Design; design process; problem framing; hypothesis generation

For those who study organization design, one of the most influential works has been Donald Schon's (1982) book, *The Reflective Practitioner: How Professionals Think in Action*. In it, Schon put flesh on the bones of Simon's (1969) assertion about the centrality of design to the practice of management by providing detailed descriptions of the design process for professional work across an array of fields. While business managers are the focus of an entire chapter, Schon's analysis of managerial practice has received less attention than his chapter on architecture, featuring the arresting character of Quist, a master architect. It is Schon's rich description of Quist's "reflection in action" that contributed to establishing design as one of the powerful metaphors in the field of organizational science:

> *Quist spins out a web of moves, subjecting each cluster of moves to multiple evaluations drawn from his repertoire of design domains. As he does so, he shifts from embracing freedom of choice to acceptance of implications, from involvement in local units to a distanced consideration of the resulting whole, and from a stance of tentative exploration to one of commitment. He discovers in the situation's back-talk a whole new idea which generates a system of implications for further moves. His global experiment is also a reflective conversation with the situation. (Schon, 1982: 102-103)*

But "design" in use, both in research and in practice, has remained largely at the level of metaphor, meaning "a word or phrase literally denoting one kind of object or idea used in place of another to suggest a likeness or analogy between them" (Merriam-Webster Dictionary, 2012). In other words, we have not taken to heart the actual *practice* of designing and what that looks like as practiced by Quist, a true designer. Instead, we have spoken figuratively of the need for design as a kind of grand plan, not taking the notion of *designing* literally. To do so would be to treat design as a verb instead of a noun, and to teach design methods to our students and advocate their use by practitioners. Schon's contribution is to share with us the specifics of design as a practice, by highlighting Quist's process of decision making as a "reflective conversation with a situation" in which the complexity of the situation necessitates an experimental approach. Each choice Quist makes results in both intended and unintended consequences that he attends to carefully. In this view of professional practice, design becomes a "shaping process" in which the situation "talks back" continually and

"each move is a local experiment which contributes to the global experiment of reframing the problem."

This view of the decision-making process is of special significance in today's increasingly complex and ambiguous business environment, and it offers managers a powerful means of enhancing their individual effectiveness. It also suggests organizational designs better suited to the challenges of solving the "wicked problems" (Churchman, 1967) that characterize strategy making today.

ELEMENTS OF THE REFLECTIVE PRACTITIONER IN ACTION

Schon's designer begins by imposing a frame on a situation and then uses that frame to explore a variety of hypothetical "what if" statements before settling on a particularly promising one for further inquiry. The hypothesis-generation process is followed by an evaluative conversation in which the designer *acts* (in the virtual environment provided by the design process) and then attends to the feedback from the situation to iterate towards an improved solution. Throughout the process, the designer calls up his or her past experiences ("repertoire") and uses these to inform but not to constrain choices, moving between intense immersion with the nuances of the situation and a more distanced appraisal of the whole.

At an abstract level, it is easy to extend the metaphor of architectural design Schon describes to the design of organizations. Organizations, after all, are just particular kinds of spaces. Rather than working with bricks and mortar, organizational leaders create spaces out of different kinds of material: structures, cultures, systems, and processes. Nonetheless, these organizational spaces are designed with a purpose in mind, and they succeed (or fail) to the extent that they evoke the desired behaviors from their members necessary to achieve the organization's purpose. Schon teaches us that the process behind the creation of space is fundamentally *hypothesis-driven* when practiced by the masters.

This core lesson, however, has largely failed to take hold in management practice. For most business managers and students, the concept of hypothesis-driven decision making remains a foreign one, scarcely attended to in most business curricula or given attention in management practice. The traditional decision-making processes that are taught involve a linear method of thinking in which the problem is defined (and that definition is accepted as "true"), a comprehensive range of alternative solutions is generated and evaluated, and the optimal one is selected. While this decision process can be efficient, it is less useful in complex and ambiguous situations, where problem definition is an open and critical question.

In contrast, a hypothesis-driven approach is iterative in nature, skeptical as to the definition of the problem itself, opportunistic in its generation of solutions, and almost obsessed with optionality and experimentation, rather than a single-solution approach borne of analysis. The stark contrast between the linear and hypothesis-driven approaches, while keeping Schon's work on the reading list of doctoral students, has not accorded it much attention on the reading lists of managers, who tend to be more comfortable with efficiency than experimentation.

This situation may be changing: Schon's *ideas*, if not his words, are very much at the center of management conversation today. His ideas are especially evident in current popular management tomes that call attention to "little bets" (Sims, 2011), "lean start-ups" (Ries, 2011) and "learning launches" (Liedtka, Rosen, & Wiltbank, 2009), to note just a few of the terms that have emerged to encourage experimentation in organizations. Schon's concept of repertoire has also recently received enthusiastic attention in the popular press, as in Malcolm Gladwell's *Blink* (2005), and in the business press in books such as *Strategic Intuition* (Duggan, 2009).

It does not require great foresight to see why design-oriented, hypothesis-driven behaviors are likely to lead to more effective and efficient organizational functioning in environments of continuous ambiguity and uncertainty, or why answering the wrong question, or answering the right question poorly, is increasingly costly in such environments. Hypothesis-driven thinking allows the accommodation of both the left brain processes traditionally associated with business with the right brain processes suddenly popular in the wake of the success of innovative firms like Apple and IDEO. In such firms, hypothesis generation asks the

creative question, "What if?" and hypothesis testing follows, bringing relevant data to bear on the situation. Taken together, and repeated over time, this sequence allows managers to achieve ever-improving outcomes without forfeiting the ability to explore new ideas. Such an approach allows movement beyond simplistic notions of cause and effect to continuous learning and is central to creating ambidextrous organizations (Tushman & O'Reilly, 1996). Translating Schon's theories and observations from abstract ideas into concrete behaviors represents a significant opportunity for management practitioners. In the next sections, we discuss what that translation would look like.

BRIDGING THE GAP BETWEEN THEORY AND PRACTICE

Creating effective hypothesis-driven organizational decision making involves paying attention to three distinct elements highlighted by Schon: framing, assumption testing, and repertoire.

Framing

Problem framing is a well-recognized aspect of decision making – in theory. Before managers can solve problems or take advantage of opportunities that may arise in their businesses, it is evident that they must frame those problems or opportunities. Schon's work contributes by directing our attention to the importance of the *conscious* imposition of a frame on a problematic situation. That is, he insists that the frame itself be treated as a hypothesis. We know that leaders often identify and frame problems intuitively without much conscious deliberation. Thus, they do not notice or pay as much attention to framing as they do to other phases of decision making. By engaging this process more carefully, managers can explore improved frames for problem definition and avoid the costs associated with selecting and persisting with a flawed frame.

The "facts" of a situation are always interpreted from a particular point of view. Schon points out that people frame problems based on their *repertoire* of past experiences and knowledge. Some problems are particularly difficult because they can be associated with a variety of factors, and therefore, it can be unclear how one should frame the problem and how one can best act in relation to it. To engage in more deliberate problem framing requires meta cognition – or thinking about thinking. Decision makers must question their own approach to the problem and consider ways to approach it differently that may increase the chances of obtaining a successful solution.

Schon says that decision makers must then attend to how the situation is *reshaped* by imposing that particular frame, by assessing what actions become possible as a result, what disconfirming data arise, and what explanations might account for them. Seeing a situation in a particular way is not enough; the effectiveness of the frame must be discovered in action, preferably in low-cost tests of the assumptions that underlie the solution derived from that frame.

Assumption Testing

To treat a problem definition as a hypothesis entails surfacing and testing the assumptions upon which it is based. Any hypothesis is only as good as its underlying assumptions are valid. Raising and testing deeply embedded assumptions about what must be true for any given choice to be a good one is essential to good decision making. It is in the testing of assumptions that, in Schon's words, "the situation talks back, the practitioner listens, and as he appreciates what he hears, he reframes the situation once again, in an iterative not a linear fashion" (1982:132). In the assumption-testing process, discrepant cues and disconfirming data can reveal the inadequacy of a particular frame and its attendant solution.

But managers find this approach challenging in practice. Almost 50 years after Simon's (1969) assertion that design is central to management practice, hypothesis generation and testing is rarely at the core of *any* training in management. Accordingly, most managers are not trained to be hypothesis-driven in their decision-making approach. Though they may be data-driven, it is generally historical data that managers already have on hand that they use

in their decision making. Starting with a hypothesis and then figuring out what data you need to test it – and where to find that data – reverses this process. Many times the assumptions themselves are not clearly visible nor are the data needed to address them readily known. Therefore, it has to be solicited from key stakeholders. In order to conduct such tests, Schon points out that managers must have "virtual worlds" to work in:

> *Virtual worlds are contexts for experiment within which practitioners can suspend or control some of the everyday impediments to rigorous reflection-in-action. They are representative worlds of practice in the double sense of "practice." (Schon, 1982: 162)*

Providing the safety of virtual worlds in which organizational members can conduct their experiments and test their framing of a situation, as well as the solutions a particular framing suggests, is an essential task in organizational design according to Schon.

Repertoire

Central to both framing and assumption testing is Schon's notion of repertoire. Repertoire is a set of interpretive lenses that practitioners acquire through experience and learning. The quality (and hence efficacy) of the initial framing and its attendant hypothesis generation is repertoire-dependent: the hypothesis that Quist generates is strongly influenced by his past. To be a master architect is to possess an array of frames that relate to the shape of different problematic situations. As the situation "talks back," Quist interprets what it says through his own stories and experiences to make sense of unfolding reactions as they occur. Quist's extensive repertoire allows him to quickly hypothesize about the "shape of the problem." This recognition allows him to zero in on a hypothetical solution with seemingly uncanny accuracy. What looks like a flash of brilliant insight – or creativity – is in fact his repertoire at work. It is not that Quist is smarter than the young apprentice he supervises. He merely has what she lacks – an extensive set of experiences that he has transformed into learning that is accessible in the face of a new situation.

When decision makers try to make sense of a new situation, they search first for its familiarity to something already present in their repertoire. Indeed, "it is our capacity to see unfamiliar situations as familiar ones and to do in the former as we have done in the latter that enables us to bring our past experience to bear on the unique case," Schon (1982:140) asserts. Thus, helping organizational members develop a broad repertoire is key to grooming them for success in hypothesis generation. Furthermore, Schon argues that it is only in the *doing* that repertoire really develops. Learners must be allowed to make choices and then be encouraged to understand the consequences of such choices in the situation's "back talk." This reaffirms the importance of "virtual worlds", and the challenge of organizational design is to create environments that make the consequences of those choices, and the inevitable mistakes that they embody, as low risk and inexpensive as possible.

IMPLICATIONS FOR PRACTICE

We see five ways that Schon's ideas can be implemented in order to enhance an organization's ability to deal with complex, dynamic environments.

1. **Focus on building repertoire.** Opportunities lie latent, waiting to be discovered, but only some of us see them depending upon our repertoire. Chances are that those who spot opportunities can do so because they have *already* seen them in some form or another, perhaps in a different industry or other environment. The broader an organizational member's repertoire, the more experiences that person has had, the more likely he or she is to see something that others with a narrower repertoire will miss. This is important to keep in mind as organizations design employee development processes and paths. Developing managers in silos makes for narrow repertoires. High-performing organizations have long believed in developing leadership talent through exposure to multiple functions and businesses. This model has a direct impact on employees' ability to be better decision makers in the face of uncertainty as well.

    While obtaining multiple experiences, organization members must be explicitly guided by the concept of repertoire building. Dweck's (2006) research on school

children's development, whether they pursue or avoid new experiences, offers sobering evidence of the extent to which our educational systems discourage learning when they emphasize avoiding mistakes. Higgins (2007) offers a similar perspective about our individual predisposition. Like Dweck, Higgins sees two types of focus in new situations: promotion and prevention. People with a promotion focus ("promoters") are motivated by an idealized end state which leads to a concern with advancement, growth, and accomplishment. Those with a prevention focus ("preventers") are motivated more by avoiding negative outcomes and so are concerned with protection and safety. Promoters, Higgins argues, prefer errors of commission because their inclination is to act, to pursue multiple avenues to reach their goals. Preventers prefer errors of omission, choosing instead not to act in order to minimize the possibility of a negative outcome. These two streams of research suggest that many organizational members arrive at work with a fear of failure that causes them to avoid opportunities that build repertoire, preferring instead errors of omission. When organizations punish mistakes, they add fuel to the fire and encourage unwillingness to experiment and the avoidance of new experiences that broaden repertoire.

A focus on repertoire also necessitates that we give special attention to managers who have "grown up" without the benefits of attention to broadening their experience base. Here, two prescriptions come to mind. First, much research attests to the importance of diverse teams that provide a broader perspective when the repertoires of individual members are limited – the diversity of the cumulative members' experience may compensate for the narrowness of individual repertoires. Second, explicit attention to the influence of industry and organizational mental models on problem framing becomes especially important in decision-making processes.

2. **Focus on doing while analyzing.** In an uncertain environment, the bias clearly should be towards experimentation and action, granting organizational members the autonomy and resources to act without seeking layers of permission. And if risk cannot be avoided, organizations must turn their attention to managing it. Organizational designs must encourage members to start small with contained experiments that minimize the costs of learning. Examples include using partners instead of building new manufacturing facilities and relying on the extension of already developed capabilities versus developing new ones. Part of risk reduction is also about keeping it simple and local – where feedback is quick and unambiguous, and where corporate politics and layers of interpretation do not get in the way of assessing the relationship between cause and effect. This is how learning from experiments is made easier.

3. **Obtain quick and inexpensive feedback from the environment.** "Fail early to succeed sooner" is a phrase heard today in innovative organizations. In fact, an emphasis on speed may be the ultimate Trojan horse of adaptability and innovation – so seemingly innocent on the outside, but subversive to bureaucracy at its core. Decision-making processes in many large organizations are set up almost surely to veto managers' ability to quickly and easily conduct small experiments in the marketplace. Instead, managers find themselves trapped in conference rooms, revising Power Point presentations aimed at "proving" that an idea that does not yet exist will succeed in order to obtain permission to act. This is a fool's errand. Advice to end run the systems and processes set up to control access to funding and other organizational resources sounds subversive indeed. Committing to making speed a top priority accomplishes much the same thing but from beneath a cloak of respectability – for in today's world, who can be against speed?

On the other hand, while organizations *should* be impatient to act, they must not be so impatient that they proceed to scaling a new idea without first listening to the situation talk back. Often, an organization's idea of an experiment is to pilot a new product and see whether or not it sells. This, however, does not constitute a test that allows for learning about how to improve the hypothesis for further testing. In a world of complexity and ambiguity, we are unlikely to get it right the first time, and so data that allow us to fail quickly and cheaply may be the most useful kind of all.

4. **Create virtual worlds where it is safe to fail.** Organizations need to be designed to conduct experiments aimed at learning rather than testing theoretically finished products

and strategies. To borrow Schrage's (2000) concept of "serious play", treat prototypes "as playgrounds not dress rehearsals." Managers need to test assumptions rather than final solutions. The idea that organizations must take risks to succeed in uncertain environments is an old cliché. With risk comes the possibility of failure, of committing errors. Therefore, organizational culture and process must be accepting of intelligent "mistakes" in service to learning. Levitt (2012) discusses how virtual methods can be used to study, design, and even invent organizations.

5. **Establish infrastructure to support experimentation.** Many of the behaviors Schon advocates are facilitated by appropriate organizational systems and processes. Organizational members develop broad repertoires more easily when rich human resource processes for recruiting, training, and education are in place. Individuals are encouraged to have a growth or "promotion" mindset when the organization's own cultural mindset is not fixed. Feedback arrives quickly when information and accounting systems measure the right outcomes and get this information to the right people promptly and accurately. Minds are prepared to recognize opportunity through thoughtful planning and budgeting practices and exposure to customers. Ideas get to market for rapid testing only when trusting relationships with supply chain partners make that possible.

CONCLUSION

Schon recognized the inherent tension between the design orientation of professionals and the rules of the bureaucracies they are often asked to operate in. That tension – that "organizational predicament" as he called it – demands extraordinary organizational designs:

> *In contrast to the normal bureaucratic emphasis on uniform procedures, objective measures of performance and center/periphery systems of control, a reflective institution must place a high priority on flexible procedures, differentiated responses, qualitative appreciation of complex processes, and decentralized responsibility for judgment and action. (Schon, 1982: 338)*

More than thirty years later, Schon's words still ring true, and we aspire to see increasing use of his "reflection in action" approach by business professionals, to transform design from a metaphorical talking point to a reality in practice.

REFERENCES

Churchman CW. 1967. Guest editorial: Wicked problems. *Management Science* 14(4): B141-B142.

Duggan W. 2008. *Strategic Intuition*. Columbia University Press, New York, NY.

Dweck C. 2006. *Mindset: The New Psychology of Success*. Random House, New York, NY.

Gladwell M. 2005. *Blink*. Little, Brown & Co., New York, NY.

Higgins E. 1997. Beyond pleasure and pain. *American Psychologist* 52 (12): 1280-1300.

Levitt RE. 2012. Using simulation to study, design, and invent organizations. Journal of Organization Design 1(3): 68-73.

Liedtka J, Rosen R, Wiltbank R. 2009. *The Catalyst: How You Can Lead Extraordinary Growth*. Crown Business, New York, NY.

"Metaphor". In Merriam-Webster's Dictionary. Retrieved November 15, 2012 from http:// www. merriam-webster.com/dictionary/metaphor

Ries E. 2011. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business, New York, NY.

Schon D. 1982. *The Reflective Practitioner: How Professionals Think in Action*. Basic Books, New York, NY.

Schrage M. 2000. *Serious Play*. Harvard Business School Press, Boston, MA.

Simon H. 1969. *The Sciences of the Artificial*. MIT Press, Cambridge, MA.

Sims P. 2011. *Little Bets: How Breakthrough Ideas Emerge from Small Discoveries*. Free Press, New York, NY.

Tushman M, O'Reilly C. 1996. Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review* 38: 8-30.

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USING SIMULATION TO STUDY, DESIGN, AND INVENT ORGANIZATIONS

RAYMOND E. LEVITT

Abstract: Over the past 50 years, computational modeling and simulation have had enormous impact on the advancement of knowledge in fields such as physics, chemistry, and subsequently, biology. After simulation models had been validated in these fields, they were rapidly adopted as powerful new tools to enhance and extend engineering practice. Might social science and management practice be following a similar trajectory? This article argues that progressively validated, calibrated, and refined computational simulation models of organizations are rapidly evolving into: (a) powerful new kinds of organizational analysis tools to support organization design by predicting the performance of specific organizational configurations for a given task and environment; (b) flexible new kinds of organizational theorem provers for validating extant organization theory and developing new theory; and (c) organizational test benches that can be used to explore the efficacy of hypothetical organizational configurations that can address the unprecedented demands of new and emerging work processes in the presence of high levels of uncertainty and ambiguity.

Keywords: Simulation; agent-based; organization design; research methods

Agent-based simulation has advanced the predictive power of the physical sciences and engineering immensely since the late 1960s. Computational simulation models of bridges, buildings, and airplanes can often predict their stress-strain-deflection behavior to finer tolerances than they can be built. Similarly, chemical reactions, groundwater flow, and many other engineering phenomena are being ever more accurately simulated. Could social science and management practice—specifically, the science and practice of organization theory, which began to explore the use of computational modeling in earnest starting around the 1980s—be following a similar trajectory? This article argues that the spectacular success of simulation in advancing engineering science and practice over the past 50 years provides a template for the potential impact of agent-based simulation on organizational science and organizational design.

AGENT-BASED SIMULATION IN ORGANIZATION SCIENCE AND DESIGN

Similar to their colleagues in the physical sciences and engineering, organizational scientists have generally used a "three-legged stool" research approach. They have:

1. Gathered empirical data from real-world observations to motivate, test, and refine organization theories;
2. Designed and executed experiments, typically using paid student subjects, in much the same way as engineering researchers used physical scale models; and
3. Developed theories based on these observations and experiments, sometimes formalized in mathematics (especially in economics) but more commonly expressed in words and diagrams.

Arguably, the most serious shortcoming of traditional social science research has been the paucity of unified, multi-level theories. Micro behavioral theories and empirical findings from cognitive and social psychology have been developed in relative isolation from macro theories and empirical findings in sociology, political science, and economics. The result—until some recent work in behavioral economics and political science—has been a series of unconnected, single-level, discipline-based "islands of theorizing" in the social sciences.

Agent-based computational simulation addresses this deficiency in traditional social science research. Mature, validated, micro social science findings can be embedded in computational agents as sets of "canonical" micro behaviors. The designer of a simulation experiment can then model the way in which these canonical agents interact with other computational agents and aspects of the task and/or environment to generate emergent meso- and macro-level organizational predictions, which can then be validated against meso- and macro-empirical data. This is the approach that was used so successfully by physical scientists and engineers in developing their "finite element" models of structural and other engineered systems: Embed well-validated micro physical behaviors in thousands of small "finite elements" and then simulate the elements' collective behaviors and their interactions with connected elements to generate emergent meso- and macro-level predictions that can be tested against real-world macro data.

Starting with the pioneering work of Cyert and March (1963) and Cohen and Cyert (1965), and encouraged by the widely cited "garbage can model" of organizational choice (Cohen, March, & Olsen, 1972), computational modeling and simulation have now provided a fourth modality for social science research. Social science research based on computational modeling and simulation has not yet come close to replacing synthetic experiments in the same way that computational modeling in the physical sciences has almost totally replaced physical scale models, but it is beginning to augment traditional synthetic and natural empirical experiments in psychology, sociology, economics, and political science for developing and testing theories, and some mature computational modeling tools have begun to be used by management consultants for organizational diagnosis and design.

THE POWER OF "SERIOUS PLAY"

Michael Schrage (2000) describes how validated simulation tools with intuitive visual inputs and outputs allow multidisciplinary groups of people to engage in new kinds of collaborative work. He termed the process in which group members can propose alternatives and rapidly simulate and visualize their predicted outcomes "serious play." Working as an organizational design consultant in some highly charged corporate situations, the author has experienced the serious play phenomenon firsthand with organizational simulations. Competing ideas about how a work process and organization should be configured are imbued with the ego of each alternative's proponent and are impossible to test without simulation except by trial and error *in vivo*. They are thus not easily resolved. However, when provided with intuitive and credible real-time simulation outputs that reveal and display the implications of alternative proposed solutions, participants immediately shift their focus from debating the ego-bound, proposed alternatives to a much more objective discussion about the implications of the competing alternatives. A far more rational and constructive dialogue develops that becomes focused on which set of outcomes is more or less desirable, rather than on the beauty—or lack thereof—of each proponent's ideas. The following section presents two software tools with strong grounding in organization science research that enable this kind of serious play in the process of organization design.

CAPABILITIES AND LIMITATIONS OF TWO ORGANIZATIONAL SIMULATION TOOLS

A small number of computational modeling and simulation tools for organizational diagnosis and design have undergone extensive validation and can be used confidently both for organization design and organizational research. We describe two examples here. Various others are currently being developed.

Burton and Obel's (2004) Organizational Consultant® uses sets of rules based on

meticulously integrated findings from decades of empirical organizational research to analyze the degree of fit among an organization's environment, technology, management style, and multiple dimensions of its structural configuration. Organizational Consultant has been validated against more than one hundred enterprises in multiple countries and can thus be used confidently at the level of a business unit or an enterprise to diagnose structural misfits as well as to explore the fit of alternative organizational configurations and to make predictions about the fitness of innovative organizational designs proposed to address hypothetical future technological, environmental, and managerial contexts.

SimVision®, based on Stanford's 20-year "Virtual Design Team"[1] research program, is an agent-based model that simulates the information processing demand vs. information processing capacity of project organizations engaged in complex and fast-paced, semi-routine, project-based work. SimVision makes specific quantitative predictions about schedule, cost, and quality outcomes of alternative organizational configurations, including task assignments; reporting relationships; managers' spans of control; workers' and managers' skill levels; levels of centralization, formalization, and matrix strength; and team experience (Jin & Levitt, 1996; Levitt, Thomsen, Christiansen, Kunz, Jin, & Nass, 1999). It has been validated over more than a decade on hundreds of projects in construction, aerospace, consumer products, software development, semiconductors, and pharmaceuticals and is now in routine commercial use to design organizations for complex, fast-track engineering projects worldwide. It has been extended to model the contention for scarce human resources in an organization posed by a portfolio of ongoing projects or programs, so that it can provide business unit or enterprise-level simulation of project-based organizations like engineering firms, management consulting firms, or large IT departments. Moreover, SimVision® has increasingly been used by researchers since 2000 as an organizational test bench to answer organizational questions and explore innovative organizational configurations (e.g., Cardinal, Turner, Fern, & Burton, 2011; Carroll & Burton, 2000; Carroll, Gormley, Bilardo, Burton, & Woodman, 2006; Jensen, Håkonsson, Burton, & Obel, 2010; Kim & Burton, 2002; Nissen & Burton, 2011; Wong & Burton, 2000).

CAUTIONS ABOUT ORGANIZATIONAL SIMULATION

With rapid advances in object-oriented computer languages, it is now relatively easy to embed multiple complex behaviors into computational agents, assemble the agents into different organizational configurations in different contexts, assign tasks to the agents, and generate emergent organizational outcomes. Predictably, the ease of building new simulation models has led to simulation research of varied quality. Good science builds on previous science, but many of the simulation models developed during the last decade have not built on previous research. This section offers some cautions in developing organizational simulations to avoid the pitfalls of poor science and ineffective management consulting.

Build organizational simulation models on firm ground. For a model's predictions to be credible and repeatable, its agent micro behaviors must be grounded in the findings of the best available research. Before they could be used for the design of buildings or airplanes, finite element engineering models had to undergo extensive evaluation of their micro behavior, their interaction algorithms, and their outputs at multiple levels. Similarly, before simulation models can be used with confidence to design real-world organizations, their micro behavior, interaction algorithms, and outputs need extensive validation.[2] When no prior empirical micro social science research exists to specify the agent behaviors of interest, organizational researchers—or their cognitive and social psychology collaborators—must study and understand the micro behaviors of interest through meticulous new ethnographic research rather than simply assuming them.

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1 The name Virtual Design Team was intended to denote a computer simulation of a real design team not the current colloquial meaning of a "virtual" team as a geographically distributed or temporary, multi-organizational team.

2 This kind of validation is very time-consuming, extending way beyond the duration of a typical Ph.D. dissertation, and so has often not been done as well as it should be. Thomsen, Levitt, Kunz, Nass, and Fridsma (1999) propose the stages of validation through which a computational model of organizations should be developed.

Use just enough detail. It is now easy to build agent-based models with sets of behaviors that are far more complex, and that interact in many more ways, than can be done intelligibly using verbal models or, more formally, in tractable mathematical models. This has led many early computational modelers to build models with agent behaviors and interactions that are so complex that the causality of their emergent behavior is as opaque as that of the real-world organizations they aspire to inform. As Burton and Obel (2011) state, overly complex models do not serve to advance organizational science. And, because they cannot be scientifically validated, their predictions are unlikely to hold up in real-world settings. So the second caution for aspiring computational modelers is to keep models as simple as possible for their intended purpose.

Use natural workplace idioms not organizational jargon. Model terminology must be focused on its intended audience. Early versions of VDT that we developed for academic audiences use terms like "actors" and "activities" to describe what managers call "workers" and "tasks". We learned very quickly, however, that tools being used to support organization design in managerial settings must use natural idioms from the workplace to be effective.

Find the future at the edges of the present. When the author was looking to simulate examples of radically decentralized organizations that could be models for new kinds of "power to the edge" construction projects, the most relevant examples were found in open-source software development, Internet video production, and other emerging workplaces, not on the construction sites of even the most progressive construction firms. The future of organizational forms is being invented by Web 2.0 millennials in their highly interactive and creative work and play, not in the R&D departments of Fortune 100 companies or the laboratories of on-campus social scientists.

CONCLUSIONS

This article began by asking whether computational simulation of organizations might follow the same trajectory that proved so successful in advancing the physical sciences and engineering. We conclude that this is indeed the case, albeit lagging the physical sciences by about two decades. Computational experiments and computer-aided organization design consulting are already becoming routine. Organizational Consultant currently provides valuable, albeit qualitative, suggestions for improving structural and contextual fit at the level of an enterprise or business unit, and SimVision provides quantitative predictions for project organizations engaged in semi-routine work processes. The limitations of these simulations, although significant, still allow both of these models to be used to design a wide range of real-world enterprise and project-level organizations. Moreover, these kinds of computational models are also now being used to teach organization design at dozens of universities around the world. And they are being used to explore designs for new, more agile, and decentralized forms of organizations that can cope with the rapid change and the democratic and interactive work styles of the "Web 2.0" world and the new millennial workers (Alberts & Hayes, 2003; Cardinal et al., 2011; Levitt, 2011).

The increasing availability of "Big Data" (Galbraith, 2012; McKinsey Global Institute, 2011) about social behavior contained in the myriad online traces that users of enterprise computing systems, supply chain management tools, and social networking sites leave behind them offers a treasure trove of data to refine and extend micro theories of human behavior. These data are already being used extensively by marketing researchers and being applied to design ever more finely targeted advertising and political campaigns. Organizational researchers can use the same kinds of big data, under appropriate privacy protocols, to extend and refine our theories of micro behavior in a working world that is increasingly communicating online and becoming more socially networked.

There is exciting and important work to be done, and powerful and accessible tools and data sources to do it with. Go forth and simulate!

REFERENCES

Alberts D, Hayes R. 2003. *Power to the Edge: Command… Control… in the Information Age*. Center for Advanced Concepts and Technology, Command and Control Research Program, US Department of Defense. http://www.dodccrp.org/files/Alberts_Power.pdf

Burton RM, Obel B. 2004. *Strategic Organizational Diagnosis and Design: The Dynamics of Fit,* 3rd edition (with OrgConSoftware). Kluwer Academic Publishers, Boston, MA.

Burton R, Obel B. 2011. What-is, what-might-be, what-should-be studies—and triangulation? *Organization Science* 22(5): 1195–1202.

Cardinal LB, Turner SF, Fern MJ, Burton RM. 2011. Organizing for product development across technological environments. *Organization Science* 22(4): 1000–1025.

Carroll T, Burton RM. 2000. Exploring "complex" organizational designs. *Computational and Mathematical Organization Theory* 6(4): 319–337.

Carroll TN, Gormley TJ, Bilardo VJ, Burton RM, Woodman KL. 2006. Designing a new organization at NASA: An organization design process using simulation. *Organization Science—Special Issue on Organizational Design* 17(2): 202–214.

Cohen KJ, Cyert RM. 1965. Simulation of organizational behavior. In J.G. March (Ed.), *Handbook of Organizations*, 305–334. Rand McNally, Chicago, IL.

Cohen MD, March JG, Olsen JP. 1972. A garbage can model of organizational choice. *Administrative Science Quarterly* 17(1): 1–25.

Cyert RM, March JG. 1963. *A Behavioral Theory of the Firm*. Prentice-Hall, Englewood Cliffs, NJ.

Galbraith JR. 2012. The evolution of enterprise organization designs. *Journal of Organization Design* 1(2): 1-13.

Jensen KW, Håkonsson DD, Burton RM, Obel B. 2010. The effect of virtuality on the functioning of centralized versus decentralized structures—an information processing perspective. *Computational and Mathematical Organization Theory* 16(2): 144–170.

Jin Y, Levitt RE. 1996. The virtual design team: A computational model of project organizations. *Journal of Computational and Mathematical Organization Theory* 2(3): 171–195.

Kim J, Burton RM. 2002. The effect of task uncertainty and decentralization on project team performance. *Computational and Mathematical Organization Theory* 8(4): 365–384.

Levitt RE, Thomsen J, Christiansen TR, Kunz JC, Jin Y, Nass C. 1999. Simulating project work processes and organizations: Toward a micro-contingency theory of organizational design. *Management Science* 45(11): 1479–1495.

Levitt RE. 2011. Toward project management 2.0. *Engineering Project Organization Journal* 1(3): 197–210.

McKinsey Global Institute. 2011. Big data: The next frontier for innovation, competition, and productivity.

Nissen M, Burton RM. 2011. Designing organizations for dynamic fit: System stability, maneuverability, and opportunity loss. *IEEE Transactions on Systems, Man, and Cybernetics—Part A: Systems and Humans* 41(3): 418–433.

Schrage M. 2000. S*erious Play: How the World's Best Companies Simulate to Innovate*. Harvard Business Press, Boston, MA.

Thomsen J, Levitt RE, Kunz JC, Nass CI, Fridsma DB. 1999. A trajectory for validating computational emulation models of organizations. *Journal of Computational and Mathematical Organization Theory* 5(4): 385–401.

Wong S, Burton RM. 2000. Virtual teams: What are their characteristics and impact on team performance? *Computational and Mathematical Organization Theory* 6(4): 339–360.

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IMPROVING SUPPLY CHAIN PERFORMANCE THROUGH ORGANIZATIONAL DESIGN

INSIGHTS FROM KEY SUPPLIERS TO THE UNITED STATES AIR FORCE

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Abstract: Creating organizational designs that maximize performance is a key goal for many executives. We sought to uncover ways that a giant organization – the United States Department of Defense (DoD) – could improve its performance via organazational design changes. Based on input from 80 executives who collectively represent over 60 defense contractors, we found that the DoD could become more efficient and effective by (1) relying on relational contracting within its supply chains, (2) designing better reward systems, (3) focusing on results rather than processes when managing its suppliers, (4) moving its supply chains toward a best value approach, and (5) investing strategically in its workforce. In drawing implications from our findings for organizations in general, we highlight companies that have reaped rewards from making these five moves in the past.

Keywords: Organization design; supply chain management; strategic management; performance

> *"We must…abandon inefficient practices."*
>
> Ashton Carter, United States Under Secretary of Defense
> for Acquisition, Technology, and Logistics
> June 28, 2010 Memorandum for Acquisition Professionals

Like most large organizations, the United States Department of Defense (DoD) acquires many of the materials it needs from outside the organization. It spends approximately $400 billion per year – roughly 57% of its overall budget – acquiring products and services via defense contractors. Each acquisition involves two main types of costs – the actual cost of the goods and services and the transaction costs involved in the acquisition process. Most organizations incur far more transaction costs than necessary, making them much less efficient than they could be.

Also like most organizations, the DoD seeks to enhance its performance by reducing costs and increasing efficiency. Under Secretary Carter's memo of June 28, 2010 notes the need to "identify and then act on steps [DoD] can take to obtain two to three percent net annual growth in warfighting capabilities without incurring a commensurate budget increase by identifying and eliminating unproductive or low-value added overhead; in effect, doing more without more." The reduction of transaction costs offers an excellent opportunity to help meet this goal.

In our view, decisions about organizational design and related aspects of organizing have the potential to improve the DoD. Further, many of the insights that can arise from analyzing DoD practices can inform organizations in general. In seeking to gain these insights, we

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tapped into the knowledge and experience of leading defense contractors that supply the United States Air Force (USAF). Because contractors have a vast experience base to draw from when assessing the USAF's supply function, they are uniquely positioned to provide valuable external points of view about opportunities for the USAF to improve supply chain performance. We collected data from 80 executives who collectively represent more than 60 of the USAF's largest suppliers. Their ideas provide the basis for five insights for the USAF and for organizations in general about how to improve supply chain performance via organizational design.

BACKGROUND AND STUDY

Words such as "overhead" and "bureaucracy" are often used to refer to administrative processes that cost money but add little value. When searching for ways to improve organizational design and increase efficiency, the leaders of an organization usually target these processes. Overhead and bureaucracy are convenient villains, but some degree of oversight is necessary within any organization in order for its goals to be met. Thus, sorting through what administrative costs are necessary and what costs are candidates for elimination should be central to efforts to become more efficient. Understanding how costs arise and evolve within administrative processes is an important first step.

Research on transaction costs offers clues about how costs arise and evolve as well as how to increase the efficiency of organizational designs. Professor Oliver Williamson of the University of California – Berkeley began developing transaction cost theory in the mid-1970s. This theory has had a profound effect on knowledge about organizational design and efficiency (Williamson, 1975, 1985). The impact of Williamson's work has been so large that he was awarded a share of the 2009 Nobel Prize in Economics. One of Williamson's key insights is that organizations can improve their performance by making organizational design decisions that minimize transaction costs.

With this insight in mind, we began our study by interviewing experts on government contracting about transactions costs within the USAF. We interviewed two sets of people. The first set was three professional consultants who collectively have worked on similar research projects to this one, have had careers in the U.S. armed forces, and have worked for defense contractors. The second set was five executives at contractors that play key roles as suppliers within USAF programs. We told both sets of people that their input was confidential in order to encourage them to offer candid thoughts and opinions.

Following the interviews, we developed a questionnaire to identify contractors' beliefs about the percentage of acquisition program costs that is typically absorbed by transaction costs, the factors that raise unnecessary transaction costs, and what could be done to reduce these costs. Alongside the questionnaire development, we identified prime- and sub-contractors[1] to target for responses. Several resources were used to identify contractors. The first was *Government Executive*, a publication that lists the 100 largest defense contractors and indicates whether these contractors work with the USAF. The second was the Federal Procurement Data System, which also contains a contractor list. The third was the DoD's website. We also searched the Internet for other USAF contractors.

Next, we telephoned each firm and identified relevant executives who work in contracts, purchasing, and business development. We then contacted these executives to determine whether they are knowledgeable about USAF acquisition programs and whether they were willing to participate in the questionnaire over the phone or via a website. We also guaranteed their anonymity. The 144 prime- and sub-contractors who were contacted are listed in the appendix.

Overall, we received input from 80 executives representing at least 60 defense contractors. We do not know the exact number of firms that are included because some firms offered more than one potential respondent and because we ensured respondents' anonymity.

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1 A prime contractor is a supplier that has been awarded a contract to supply goods or services to the USAF. Sub-contractors are hired by prime contractors to perform work related to fulfilling the contract.

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FINDINGS AND RECOMMENDATIONS

To gain a sense of the scope of opportunity presented by improving organizational design, we asked contractors to estimate *what percentage of USAF acquisition expenditures are transaction costs*. The average response was that transaction costs account for 25% of USAF acquisition expenditures. If we assume that this estimate is accurate and that this figure reflects the DoD as a whole, a decrease of these costs by just 5% would free up $5 billion. Such a reduction would be quite modest, given that the potential for improved performance within most supply chains is estimated to be approximately 20% (Ketchen, Rebarick, Hult, & Meyer, 2008). Realizing this full potential could result in $20 billion in savings per year across the DoD.

Respondents were also asked, *What are the main factors that create unnecessary transaction costs?* and *What steps can be taken to reduce unnecessary transaction costs?* We followed a four-step process to distill insights from the contractors' answers. First, three subject matter experts with doctorates in management independently identified themes among the responses. They then exchanged opinions and arrived at consensus about those themes. Next, a domain analysis that is popular among qualitative researchers was performed (Spradley, 1979). Third, a computer-guided qualitative analysis was performed using a program called QDA Miner. Finally, the three subject-matter experts reconvened to synthesize the insights offered by the three preceding steps. The four-step process gave rise to five main insights. These insights are explained below and are summarized in Table 1.

Table 1. Potential Benefits of USAF Contractors' Insights

Insight	Potential Benefits	Exemplar Company
Improve organizational design by relying on relational contracting.	Long-term relationships reduce uncertainty and allow partners to collaborate with greater confidence, reducing the need for costly monitoring.	Procter & Gamble is seeking to derive 50% of its innovations from external ideas, up from 10% in 2001.
Design reward systems to reward what you want done.	Sharing a portion of the savings that suppliers create encourages them to find creative ways to save money while maintaining quality standards.	To encourage its suppliers to share cost-saving ideas, communications giant R.R. Donnelly splits any savings it enjoys with the supplier.
Ask "what" not "how".	Specifying outcomes is cheaper than monitoring processes. Allowing suppliers to figure out how best to reach their goals unleashes their motivation and creativity.	A potential bonus offered to C.C. Myers led the firm to complete a 140-day construction contract in only 66 days.
Move toward a best value approach.	Some firms have enjoyed significant improvements in both efficiency and effectiveness by moving away from a focus on cost and toward a focus on total value added for the customer.	Toyota is redesigning its supply chains to ensure recovery from a major earthquake in only two weeks.
Invest strategically in the workforce.	Organizations whose personnel have the highest levels of knowledge, skills, and abilities have been found to be the most efficient and effective.	In an industry that endures more than 20% annual turnover, over 95% of employees at SAS Institute, Inc. remain with the firm each year.

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1. Improve organizational design by relying on relational contracting.

From our respondents' points of view, the acquisition process could be much more efficient and effective if the USAF treated contractors differently. This perspective was captured very well by a respondent who asserted that the "government needs to view working with a contractor as a partner, not an adversary. We are trying to help improve the way they do business, yet they sometimes subtly stonewall our efforts." A similar response was that government employees "need to get to know their supply chain better. They are very standoffish so that it doesn't look like they are favoring some suppliers." Another noted that transaction costs can be reduced via "more open teaming/negotiation between contractor and government… Partnership is the key word, working toward a common goal."

Improving communication was seen by several contractors as crucial to building a spirit of partnership. One stressed the need for "strong communication paths and understanding along each step of the development, delivery, support, and intended use of the products." A similar but more colorful recommendation from a contractor was to "increase communications that create learning and understanding… During the proposal phase don't shut out industry, during the development phase be resident with the development team, during the testing phase be part of the solution and not the hammer, during the support phase communicate expectations for the end user and the equipment often and explicitly."

Relational contracting is an organizational design concept that could help the USAF as well as other organizations facing similar problems. When using relational contracting, buyers and suppliers work together to build trust. The current DoD approach is to call for competitive bids for each contract and closely monitor the winner's progress. The emphasis in relational contracting is not on individual contracts but instead on developing a long-term relationship across a series of contracts (Dyer & Singh, 1998). Rather than hoarding information and data to protect against exploitation by the other side, information and data are exchanged so that both sides can perform their roles better. As long as a contractor is working in a cooperative and trustworthy manner to steadily reduce costs, it will be well-positioned to receive future business – a promise that furnishes a strong incentive to perform. Relational contracting can reduce transaction costs in several ways (Dyer & Singh, 1998). Buyers become less fearful of being cheated by suppliers, thereby decreasing their reliance on costly reports and monitoring systems. Suppliers become less fearful of the uncertainty surrounding technological goals and demand levels. Money can also be saved to the extent that trust leads both sides to feel less compelled to negotiate and write detailed contracts. Stated simply, relational contracting can help organizations obtain products and services at the best prices.

Organizational design research has also tied relational contracting to a valuable change in the mindsets surrounding contracting (Weber & Mayer, 2011). Traditional contracting emphasizes the creation of structures and procedures for preventing losses due to misbehavior. One example is complex monitoring systems, such as those that the USAF's contractors view as wasteful. In contrast, the two sides of a relational contract are able to focus on the potential gains that can be achieved through collaboration and efforts to build trust. This not only improves efficiency, but it also can enhance effectiveness (and thus overall value). In 2001, 10% of the innovations pursued by Procter & Gamble were initiated by its suppliers. In recognition of the gains that can be achieved via relational contracting, the company's executives have set a goal of deriving 50% of its innovations from the ideas and recommendations of suppliers and other external parties (Slone, Dittman, & Mentzer, 2010).

2. Design reward systems to reward what you want done.

Decades of research have established that organizations must be careful about what they reward because inevitably people do what is rewarded (cf. Kerr, 1975). One popular book has even proclaimed "what gets rewarded gets done" to be the greatest management principle in the world (LeBoeuf, 1985). Thus, creating effective reward systems is a key element of organizational design. Communications giant R.R. Donnelly, for example, rewards suppliers financially for helping the firm cut costs. If a supplier's idea reduces R.R. Donnelly's costs, the firm splits the savings with the supplier (Ketchen et al., 2008).

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In line with this idea, Under Secretary Carter's memo stresses the need to "incentivize efficiency" and the need to align the "incentives of the Department and industry." One way to incentivize contractors – which is a current focus in USAF contracting – is by splitting the savings with contractors if they perform work under budget while meeting quality standards and schedules. We encourage the continued – and expanded, where feasible – use of such incentives both inside DoD programs and among organizations in general. The alternative creates perverse incentives: If no program is in place to share savings, a contractor will be tempted to maximize its profits by spending to the limits of a contract. In an effort to avoid such problems, the DoD is pursuing a variety of 'better-buying initiatives' that attempt to tie incentives to good performance. Distilling lessons from in-depth analysis of successful and unsuccessful better-buying initiatives has a strong potential to identify best practices that can be applied broadly to reduce costs and enhance effectiveness.

3. Ask "what" not "how."

Mandated reports that are used to monitor contractors' behavior during the course of a USAF contract repeatedly came up among our respondents as a thorny issue. One respondent highlighted the wasteful nature of "development, collection, and generation of reports that are not used nor referenced during [the] contract," while another pointed to excess costs created by "documenting and maintaining processes, compliance, etc., and educating/training staff on compliance processes." Another stressed the costs created by "too many reports, too many people to have to report to…. No central focus for reporting requirements…. All asking the same questions that are constantly being asked without any value being added to product." Others mentioned "unnecessary reports," "excessive procurement red tape," "customer requirements for meetings, data, reviews, etc.," and the customer "asking for a hard copy of contracts and close outs instead of electronic."

Several contractors stressed that merely keeping up with changes to bureaucratic processes adds costs. One observed that "changing reporting requirements makes dealing with the government difficult." Another noted that creating reports is "ever changing and very onerous with always new requirements, never taking away any requirements." A third lamented that "the way the information is collected changes every two years: paper, then electronic, then back to paper." Overall, contractors called for less "paperwork," "micromanagement," and "administrative oversight." They recognize that there is a trade-off with the reporting demands of key stakeholders, but they believe costs could be reduced through "streamlining unnecessary requirements and policies" and eliminating steps in the process in order to allow for "more efficient use of our time."

A change in organizational design that could improve this situation is shifting from managing suppliers by monitoring how they do their work toward concentrating on whether or not their performance is sufficient. Specifically, performance-based contracting is a contracting approach that involves giving performance specifications to suppliers and letting them figure out the best way to meet the specifications. Rather than the buyer dictating both what needs to be accomplished and how to do it, the buyer focuses on what and allows the supplier to decide how. Because outcomes are easier and cheaper to monitor than behaviors, transaction costs are reduced (Eisenhardt, 1989). Focusing on outcomes would also give contractors the flexibility to work with their supply base in a way that suits each program's nature and, in many cases, lower the government's costs for goods and services (Crook & Combs, 2007). Indeed, the more tiers that are involved in an organization's supply network, the higher the potential for performance-based contracting to provide benefits.

A 1994 contract between the State of California and road construction company C.C. Myers, Inc. provides a striking example of how performance-based contracting can inspire exceptional performance. Following an earthquake, four bridges on the Santa Monica Freeway in Los Angeles needed to be replaced. The contract terms stated that the goal was to replace the bridges in 140 days. For each day early the work was completed, C.C. Myers would receive a $200,000 bonus. Offering this bonus was viewed as a good investment because economists estimated that the local economy was losing $1 million each day the bridges were closed. If the contractor completed the work behind schedule, it would suffer a

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$200,000 per day penalty. Given these powerful incentives, C.C. Myers fulfilled the contract in only 66 days and the firm pocketed a nearly $15 million bonus (Zamichow & Ellis, 1994).

4. Move toward a "best value" approach.

Contractors contend that a narrow emphasis on cost within the USAF acquisition process actually ends up costing more in the long run. One emphasized that "They [USAF] often do themselves no favors when the primary evaluation criterion is Lowest Price, Technically Acceptable (LPTA). The LPTA is fine for the purchase of items that are commodities. However, when you are talking about specialized goods and services, LPTA is not in the best interest of the government because LPTA does not allow for a complex analysis and therefore limits the government's ability to make smart, value-based decisions. For these types of specialized services, LPTA actually presents a higher-risk approach, and in the end the government pays more than it would have if the evaluation criteria had been risk-based rather than price-based."Another respondent lamented that decision makers"…focus too much on price. The government does not get the best or the most technically sound products – just the cheapest."

Some forward-thinking organizations have been transitioning away from designing their supply chains around one main metric – usually cost or speed – and toward a best value approach. Best value supply chains focus on delivering the maximum total value added to the customer across four metrics: cost, quality, speed, and flexibility (Ketchen, et al., 2008). In particular, best value supply chains maximize total value added by developing "the three As" – *agility* (the ability to react quickly to surprises), *adaptability* (a willingness to change when needed, without concern for history and legacy issues), and the *alignment* of interests across the members of a supply chain (Ketchen & Hult, 2007).

To the extent that our respondents' concerns are accurate, shifting the focus of various programs away from cost alone and toward total value added via "the three As" has the potential to benefit the USAF and other defense organizations. More broadly, organizations in general can benefit from making organizational design choices based on finding the right balance among cost, quality, speed, and flexibility rather than fixating on cost or speed alone.

Toyota offers a good example. After the March 2011 earthquake and tsunami in Japan, Toyota struggled to maintain automobile production. Because the firm's executives had emphasized cost minimization within its supply chains, Toyota lacked the flexibility to rely on geographic areas that were not affected by the disaster. Toyota is now working on a plan aimed at creating enough flexibility in its supply chains to fully recover from a similar disaster in only two weeks (Kim, 2011). The plan centers on collaborating on common auto parts with other Japanese car makers, asking the suppliers of specialized parts to store significant amounts of inventory, and ensuring that Toyota's production facilities in other parts of the world are not solely reliant on its Japanese facilities.

5. Invest strategically in the workforce.

Contractors lamented that too many skilled and experienced people are leaving the USAF's acquisition programs and that this turnover creates major costs. One contractor expressed concern that "there has been a loss in technical capabilities within the government which impacts interpretation of deliverables meeting requirements." Others pointed to the need for a "more knowledgeable procurement workforce," "stability in the contracting offices," and "more skilled folks in the contract specialist field." When skilled and experienced people leave, one result is that people with less skill and experience are then left in charge of writing and managing contracts. This can result in requirements that are too vague, overly complex compliance processes, and long cycle times for awarding contracts.

Creating and maintaining a high-quality workforce is vital to organizational efficiency. Human capital refers to the knowledge, skills, and abilities possessed by employees within an organization. A recent meta-analysis of data from over 12,000 organizations found that human capital has a strong association with organizational performance (Crook, Todd, Combs, Woehr, & Ketchen, 2011). Organizations that are able to identify and retain their best people are much more likely to be efficient and effective than those that do not.

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The organizational design implications for the USAF, and for large complex organizations in general, are simple in concept yet very challenging to leverage. When turnover is a problem, executives must identify why people with strong knowledge, skills, and abilities are leaving their positions and then take action to resolve these concerns and reduce future turnover. Such actions might include creating new pathways for recognizing, rewarding, and promoting excellent performers. Efforts to re-acquire valuable former employees also could be worthwhile. More specifically, developing metrics to assess the quality of the re-acquired work force and the effectiveness of work force improvement initiatives could improve the ability of organizations to fulfill their missions. Similarly, thorough analysis of how the various elements of oversight of the acquisition process is helping and harming the ability of program managers to meet their objectives could yield substantial benefits.

SAS Institute, Inc. is a firm that appears to have mastered the art of building and keeping human capital. According to the firm's CEO Jim Goodnight, "I guess 95 percent of my assets drive out the front gate every evening. It's my job to bring them back" (Leung, 2009). SAS executives keep employees coming back by encouraging them to get their work done in a 35-hour week, not imposing a dress code, and offering a wide variety of perks such as onsite car detailing, a golf putting green, and a masseur. While annual employee turnover at most software companies exceeds 20%, only about 2% of SAS employees leave each year. This saves SAS tens of millions of dollars on employee recruiting and training. Not surprisingly, SAS ranked as #1 on *Fortune* magazine's 2010 and 2011 lists of best places to work.

CONCLUSION

An organization's supply chain relationships are typically constructed over an extended period of time. This evolution of organizational structure can create significant advantages as well as disadvantages. On the positive side, mutually beneficial relationships between an organization and its suppliers can be developed and nurtured. On the negative side, problem areas can become more entrenched with the passage of time. Indeed, in reference to the DoD's organizational design, Under Secretary Carter's memo cautions that "it has taken years for excessive costs and unproductive overhead to creep into our business processes, and it will take years to work them out." Based on research on organizational design and insights from leading defense contractors, we offer five recommendations that may reduce unnecessary costs in the years ahead. Given that most organizations have inefficiencies within their supply chains, these recommendations also may prove useful for organizations in general.

REFERENCES

Carter, AB. 2010. *Memorandum for acquisition professionals*. Accessed June 25, 2012 at http://www.acq.osd.mil/docs/USD%28AT&L%29_Memo_to_Acquisition_Professionals_June_28_2010.pdf

Crook TR, Combs JG. 2007. Sources and consequences of bargaining power in supply chains. *Journal of Operations Management* 25(2): 546–555.

Crook TR, Todd SY, Combs JG, Woehr DJ, Ketchen DJ. 2011. Does human capital matter? A meta-analysis of the relationship between human capital and firm performance. *Journal of Applied Psychology* 96(3): 443–456.

Dyer JH, Singh H. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review* 23: 660–679.

Eisenhardt K. 1989. Agency theory: An assessment and review. *Academy of Management Review* 14: 57–74.

Kerr S. 1975. On the folly of rewarding A, while hoping for B. *Academy of Management Review* 18(4): 769–783.

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Organizational Design: Insights from Key
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Ketchen DJ, Hult GT. 2007. Bridging organization theory and supply chain management: The case of best value supply chains. *Journal of Operations Management* 25: 573–580.

Ketchen DJ, Rebarick W, Hult GT, Meyer D. 2008. Best value supply chains: A key competitive weapon for the 21st century. *Business Horizons* 51: 235–243.

Kim C-R. 2011. Toyota aims for quake-proof supply chain. http://www.reuters.com/article/2011/09/06/us-toyota-idUSTRE7852RF20110906. Accessed January 9, 2012.

LeBoeuf M. 1985. *The greatest management principle in the world*. Putnam, New York.

Leung R. 2009. Working the good life. http://www.cbsnews.com/stories/2003/04/18/60minutes/main550102.shtml. Accessed January 9, 2012.

Slone R, Dittman JP, Mentzer JT. 2010. *New supply chain agenda: The five steps that drive real value*. Harvard Business School Press, Boston.

Spradley JP. 1979. *The ethnographic interview*. Wadsworth Group/Thomas Learning, New York.

Weber L, Mayer K. 2011. Designing effective contracts: Exploring the influence of framing and expectations. *Academy of Management Review* 36(1): 53–75.

Williamson OE. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. Free Press, New York.

Williamson OE. 1985. *The Economic Institutions of Capitalism*. Free Press, New York.

Zamichow N, Ellis V. 1994. Santa Monica Freeway to reopen on Tuesday. http://articles.latimes.com/1994-04-06/news/mn-42778_1_santa-monica-freeway. Accessed January 9, 2012.

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APPENDIX

Defense Firms Contacted for Input (n=144)

AAI Corporation	Cypress	John Hopkins
Accenture	Decibel	Kaman Aircraft
ACES	Defense Tech	Kearfott
Action Target	DEL	Kellogg Brown and Root
Advanced Integrated Systems	Digital Systems	Knights Armament
AdvatechPacific	Dillon Aero	Kongsberg Defense
Aerojet	DRS	Kratos Training Solutions
Aerospace	DYn	Lockheed Martin
Aerovironment	Dynetics	MITRE
Aegis Defense Services	EADS	M7
Airscan	East West	NexGen
Aivea	EnvironmentalTectonics	Northrop Grumman
Alliant Techsystems	Elbit Systems	ORNL
Allied Container	ENCO	OT Training
AM General	Evergreen Intl	Osterhout Design
Antonov Airlines	Exxon	OT Training
Applied Research Associates	Fabrique National De Herstal	Parsons
Aptima	FGM	Precision Cast
Argon ST	FLIR systems	Quantum
ARINC	FLUOR	QinetiQ
ASSETT	FMC	Raytheon
AV	FN Herstal	Remington Arms
BAE Systems	Force Protection	Rock Island Arsenal
Ball Corp	Foster Wheeler	Rockwell Collins
Barrett Fire Arms	Foundation Health	Rolls Royce
BDM	GA Tech	RONCO WSI
Bechtel	GE	SAAB
Beocore	Gemini	SBG Technology
Black Knight	General Atomics	SAIC
Blazeware	General Dynamics	Sensi
Boeing	GEO Centers	Senspex
BoozAllenHamilton	GB Industrial Battery	Shell Oil
Brashear	G4 plc	Simplex Grinnell
British Fuels	Glock	SGIS
Brogden	Goodrich	Smartronix
CACI Intl	Halliburton	Smith and Wesson
Carlyle Group	Harris	Sparta
Carnegie Mellon	Healthnet	Springfield Armory
Charles Stark Draper	Heckler and Koch	SRC
Chenega	Hewlett Packard	SRI
CAN	Humana	ST Engineering
Cole Engineering	IBM	Stanley
Colt Defense	Ideal Building Services	StrategyONE Services
Concurrent Tech	Industrial Machining Design	Tatitlek
Crye	Infotech	Textron
CSC	Insight Technology	VDC Displays
Cubic	International Research Group	Wackenhut
Cybernet Systems	Jacobs Engineering	Y12