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Complexity leadership: Enabling people and organizations for adaptability

Mary Uhl-Bien, Michael Arena

“We’ve got 21st century technology and speed colliding head-on with 20th and 19th century institutions, rules and cultures.”

-Amory Lovins

In 2010, IBM’s CEO Study reported that the rising rate of complexity associated with increasing volatility, uncertainty and interconnectedness was the biggest challenge facing organizational leaders around the globe. In this environment, the world is operating in fundamentally different ways. As Sam Palmisano, head of IBM at the time described, incremental changes are no longer sufficient because “events, threats and opportunities aren’t just coming at us faster or with less predictability; they are converging and influencing each other to create entirely unique situations.” These contexts require adaptability and new ways of leading. Despite this, executives indicated that their organizations were not equipped to deal with complexity, and over half the CEOs doubted their ability to manage it.

Since that time complexity has only increased. If in 2010 we saw economies topple from complexity due to the Global Financial Crisis, in recent years it is as if the very foundations of what we know about management are being pulled out beneath us. Organizations and entire industries are being affected, with increased connectivity allowing everyday people to network and drive large-scale political, social and market disruption. For some, these are exciting times and the opportunities to lead change have never been greater. For others, the lack of clarity and speed at which complexity is increasing feels overwhelming and chaotic. For the latter, there is a growing sense of dismay about what the future holds and the inability to control it.

The key to addressing this dismay lies in arming organizations and individuals with a new way of understanding what it takes to lead in a complex world. We must leverage what we know about managing organizations for efficiency and results while incorporating new knowledge about how to lead for

adaptability. To do this, we look to the theory of complex adaptive systems in complexity science. Findings in complexity theory allow us to consider how principles of organizing emanating from the physical and biological sciences can inform our understanding of adaptability in organizational contexts.

In this article, we synthesize learning from a decade-long research/practice partnership into a model of *Complexity Leadership*. We begin by explaining what complexity is and why it is changing the way we need to lead in today’s contexts. We then present what our research has revealed about effectively leading organizations and people for adaptability. We conclude by offering the complexity leadership model as an overarching framework for understanding and practicing leadership in a complex world.

WHAT IS COMPLEXITY?

Although many are feeling and experiencing complexity in the workplace and in their lives, it is harder for them to describe exactly what it is. Despite the name, the concept of complexity itself is really quite simple: Complexity is about *rich interconnectivity*. Adding the word “rich” to interconnectivity means that when things interact, they change one another in unexpected and irreversible ways. Complexity scholars like to describe this as the distinction between “complexity” and “complicated.” Complicated systems may have many parts but when the parts interact they do not change each other. For example, a jumbo jet is complicated but mayonnaise is complex. When you add parts to a jumbo jet they make a bigger entity but the original components do not change—a wheel is still a wheel, a window is a window, and steel always remains steel. When you mix the ingredients in mayonnaise (eggs, oil, lemon), however, the ingredients are fundamentally changed, and you can never get the original elements

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back. In complexity terms, the system is not decomposable back to its original parts.

Once we understand this, we can see complexity all around us. It occurs when networked interactions allow events to link up and create unexpected outcomes, or *emergence*. As mentioned earlier, the Global Financial Crisis (GFC) is a complexity emergence event in that a variety of factors linked up in an interconnected system and produced an outcome that was largely unpredictable, other than in the short term, and had far-reaching effects. After it happened there was no going back—organizations and economies around the world had to operate in the new reality. Moreover, the impact can be long lasting. We are still feeling the effects of the GFC, and it influences decision-making and activities in our current contexts.

In today's environment, complexity is occurring on multiple levels and across many sectors and contexts. Although many forces are driving it, the underlying factors are greater interconnectivity and redistribution of power resulting from information flows that are allowing people to link up and drive change in unprecedented ways. Complexity is transforming entire industries, with many organizations ill prepared to respond to these threats. Leaders, caught in the demands of the moment, drive efficiency and results in the core business, while at the same time new competitors are emerging that can threaten traditional core businesses. The result is that virtually every major industrial sector is facing some form of potential disruption, be it telecom with free calling from WhatsApp, automotive with ride-sharing from Uber, or financial services with free trading from RobinHood.

Perhaps no one is feeling complexity more strongly than healthcare, where volatile regulatory environments, evolving pay structures, changing patient relationships, and wearable technologies are combining to create tremendous uncertainty with respect to where healthcare will go. As one healthcare CEO describes it:

Although we are performing well right now, the decisions I make today are going to affect what happens with our organization in the next few years. If I send us down one path and it doesn't go that direction I could be positioning my organization for a situation it can't get out of. It's like being Christopher Columbus having to pack his ships for the new world. You don't know what you are going to face: Will the world be round or will it be flat? Will there be food...disease? Will we run into friends or enemies? About the only thing I can do in this situation is pack the 'must-haves,' those things that help prepare you for any eventuality. So that is what I spend my time thinking about is how I can arm my organization with the 'must-haves.'

The "Order" Response

In this new reality, it is more essential than ever for organizations to adapt—to pivot in real time with the changing needs of the environment. They must fit the mantra of complexity theorists that *it takes complexity to beat complexity*. Despite this, what we see in our data over and over again is that when faced with complexity, the natural proclivity of people and organizations is to respond with order—to turn to hierarchical approaches of leading and managing change top-down.

Snapping back to previously successful, ordered solutions provides a sense of control that satisfies not only the needs of managers who have been trained in traditional leadership models, but also organizational members who look to leaders to take care of them and make things "right" again.

What we see in our research is that when confronted with complexity, organizations most often seek greater accountability. They demand "more from less" and instill better risk mitigation strategies. When these fail, they turn to greater regulatory control. These "order" responses can actually do more harm than good. An example is the recording industry's response to the emergence of Napster in the 1990s. From June 1999 to February 2001, the peer-to-peer music sharing entity grew from zero to over 26 million users. For the first time ever, individuals were able to gain access to their favorite songs without having to purchase entire CDs. But the Recording Industry Association of America (RIAA) responded by filing a suit for vicarious copyright infringement under the U.S. Digital Millennium Copyright Act. The result was that in July 2001, Napster was forced to shut down.

However, the battle was far from over. In the five years following the Napster defense, a massive litigation campaign was launched by the RIAA, with more than 30,000 lawsuits aimed at targeting alleged copyright scofflaws on peer-to-peer networks. The industry not only focused on the Napster clones, but also attacked on the consumer front—striking fear into the hearts of potential downloaders. Despite this large-scale crackdown, billions of copyrighted songs nevertheless continued to be shared. What the recording industry seemed to ignore was the impetus behind the Napster explosion. They had created an easy user interface to download music, and enabled users to select one song at a time—disrupting the industry forever.

In this situation, the leaders turned to order. They pulled back to "equilibrium," focusing on the world as they wished it to be, and not as it was. Because many organizations and industries are managed based on bureaucratic organizing principles emanating from the challenges of the Industrial Age, this is a common response. When faced with challenges and the need to make decisions, leaders are trained to jump into management mode and drive control. They are biased toward order. The problem with this is that order is the enemy of adaptability, and ordered responses can stifle out the interactive dynamics needed by organizations to respond effectively to complexity.

The Adaptive Response

In complex environments, instead of order we need an adaptive response. Adaptive responses resist the pull to order and capitalize on the collective intelligence of groups and networks. Organizations that enable an adaptive response do not turn to a top-down approach. Instead they engage networks and emergence.

Emergence is the creation of new order that happens when agents (e.g., people, technology, information, resources) in a networked system combine together in an environment poised for change to generate the emergence of something that did not exist previously. In the emergence process, interacting parts of a system (i.e., agents) network around some kind of need and begin to link up. Adaptive

responses are generated when these networked agents are able to resonate around a new approach, alternative way of thinking, or adaptive solution that meets the needs of a complex challenge. These innovations are generated in the “space between,” meaning that no one person can claim or take credit for them. Rather, they are the result of richly connected interactions that allow diverse people, ideas and pressures to collide and combine in ways that generate emergence of novelty.

The dynamic nature of emergence means that adaptive responses cannot be managed in the traditional sense; instead, they need to be enabled. Leaders enable adaptive responses by engaging in and creating conditions that feed and fuel emergence. One such condition is information flows. Information flows allow agents to find each other and link up common need, purpose or perspectives around which they can cohere to identify an adaptive response. When information flows are obstructed, e.g., by silos or hierarchical decision-making processes, they inhibit the ability of the organization to be adaptive. This is why so many organizations today are turning to flexible and open office spaces that are designed to enable collaboration and learning by removing assigned desks, increasing traffic flows to promote interaction, and providing spaces and resources for people to come together and create.

A second condition is pressures. Pressures act to loosen up a system for change. When a system is loosened up it seeks novelty, creating windows of opportunity not present at other times. Those who understand the role of pressures and timing can interact with emergence events in ways that shape their form and impact. They can use tags and attractors to channel energy in desired ways. In complexity, a *tag* is a symbol, event, person or piece of information that enables or speeds up (i.e., “catalyzes”) an aggregation process. An *attractor* pulls a dynamic toward it.

Tags and attractors help us to understand the complexity dynamics behind the rise of Donald Trump in the 2015–16 U.S. presidential election. Using an emergence lens, we can see how Trump did not create the sentiment that drove his campaign and align people around his vision, as would be suggested by traditional leadership interpretations. Rather, he acted as an attractor for a sentiment that was already there. For Trump, “Make America Great Again” was a tag that catalyzed disillusionment with the status quo and the establishment, and enabled people who held these views to link up and drive emergence.

Tags and attractors also help us to understand the failure of establishment leaders to stop Trump. Not recognizing the complexity dynamics that were at play, those who tried to suppress his candidacy failed because their actions did not acknowledge and validate the sentiment that was driving it. In fact, they did the opposite—they showed how out of touch they were with the party base. The effect was that rather than stop the movement, they fed and fueled it. This illustrates one of the great ironies of complexity: In complex environments, traditional approaches to leadership often make things worse. Rather than thinking of leaders as establishing the vision and invoking authority to align the vision top down, complexity and emergence allow us to see how leadership emerges within a complex network of people, place and conditions—i.e., how leadership operates in the context of a complex adaptive system.

ORGANIZING FOR ADAPTABILITY

A complex adaptive system is a dynamic system that is able to adapt in and evolve with a changing environment. At a macro level, it is a collection of dynamic networks of interactions, with each network comprised of a collection of many agents acting in parallel, creating rich interconnectivity. Colonies of social insects such as ants and bees that use simple rules and networked interactions to generate highly adaptive behavior are complex adaptive systems. So are neural networks that comprise the functioning of the human brain. In business, complex adaptive systems are seen in the emergence and dynamics of economies and markets.

In the physical and biological sciences, complex adaptive systems are described as having no centralized control and no fixed order. They are self-organizing, continually adapting and changing in relation to environmental conditions. But we know that is not true of organizational systems. Our structures, no matter how flat or circular, do have hierarchy and hierarchical leaders. Their formal organization charts and management systems inhibit the ability of the system to self-organize. Moreover, because they are grounded in bureaucracy, they value rationality, efficiency and stability over adaptability. There is no getting around this. As long as organizations have hierarchy, and nearly all human organizing systems do, they have elements of bureaucracy, and the natural tendency of bureaucracy is to pull the system to order.

The question for our research, then, was: How can we lead our organizations to be adaptive in the face of order imposed by hierarchical (bureaucratic) organizing structures? Given that by definition complex adaptive systems are self-organizing, i.e., they do not have hierarchy and are not managed and planned, is it possible to enable organizations to act as complex adaptive systems even though they have hierarchical structures?

The Constraints of Bureaucracy

What our findings show is that organizations that are able to operate as complex adaptive systems do so by enabling adaptive space. Adaptive space is a network structure not previously recognized in the leadership literature. It plays in the pressures created by complexity challenges and allows agents to interact in ways that generate emergence and new adaptive order for a system. When enabled in organizations, adaptive space represents hierarchical organizations’ way of coping with the limits of bureaucratic organizing on adaptability. It helps leaders and organizations resist the pull to equilibrium by enabling self-organizing in the context of bureaucratic structures.

To see this, we need to think of organizations as comprised of two primary systems: an operational system and an entrepreneurial system. Operational systems are found in the formal, bureaucratic organizational structures that push for order, e.g., standardization, alignment, and control. They are responsible for productivity, efficiency, and results. Entrepreneurial systems occur in the informal structures and systems that push for change, e.g., new opportunities, different operating procedures, new products and services, or extension into different business areas. They are responsible for innovation, learning and growth.

Nearly all organizations start out entrepreneurial. They use opportunity and innovation to create economic or social value, often by challenging conventional wisdom and practicing disruptive innovation. Consistent with complex adaptive systems, ones that survive have fluid, self-organizing structures that allow them to adapt and change in the face of pressures from their environments. As entrepreneurial startups grow, however, they take on an operational system to convert innovation into repeatable results. The operational system invokes rules and procedures that help them align the desire for innovation with the need for scalable business outcomes.

For many organizations, this is the start of the pull to order. As many operational systems get put in place and grow, the ability to self-organize becomes more constrained. In fact, that is the role of bureaucratic structures—their purpose is to maintain order and maximize efficiency. Therefore, once operational systems come into play, the two systems go into battle: Operational pushes for rules, regulations, standardization and control, and entrepreneurial pushes for innovation, discovery, experimentation, play and flexibility.

When we ask people which predominates, the overwhelming response is operational. This is because the deck is stacked in its favor. Formal power (i.e., authority) and control are vested in the operational system. Managers are trained to use rules and standard operating procedures to make decisions in the face of conflicting or challenging perspectives, eliminating or reducing adaptive tension in the system. Employees are trained to push decision-making responsibility up, letting managers take care of problems and return the system to status quo. Entrepreneurs typically have a dislike or even disdain for the operational system; as a result, they are often ineffective at advocating successfully for advancing entrepreneurial interests.

Thus when faced with complexity, even when there are significant attempts to drive change, many organizations pull back to equilibrium. They operate as complex systems, but not complex *adaptive* systems. In these complex systems, such as government bureaucracies and deeply entrenched old-line companies, the entrepreneurial system is stifled and the organization is biased to order.

The Need for Adaptive Space

In organizations that are adaptive, however, we see different dynamics at play. In adaptive organizations the operational system is not privileged, and conflict (i.e., adaptive tension) and the entrepreneurial system are not wiped out. Rather, leaders in these organizations recognize that adaptability lies in the rich interconnectivity (i.e., the complexity) of networked systems and their agents. Consistent with complex adaptive systems, they accept that everything cannot be structured, planned and controlled—there is also a need for self-organizing and emergence. Therefore, leaders in adaptive organizations capitalize on the tension created between the entrepreneurial system and the operational system to generate innovative new thinking and productive adaptability for the system. They do this by enabling adaptive space.

Adaptive space is contexts and conditions that enable networked interactions to foster the generation and linking up of novel ideas, innovation and learning in a system. Because bureaucratic organizing is designed to shut down

the informal system and its challenges to authority and status quo, adaptive space is needed to open these channels back up and allow ideas from the informal (entrepreneurial) and formal (operational) systems to interact and connect in productive ways. The opening of channels and removal of barriers is not permanent. This is why adaptive space is called “space” (e.g., temporary, fluid) and not system (e.g., permanent, fixed structures). Adaptive space works to open up information flows and engage dynamics of complexity and network structures to enable emergence of novelty and innovation needed for adaptability.

Network Structures

Leaders help enable adaptive space by facilitating the generation and movement of ideas and information across a system, creating conditions for emergence. They do this by capitalizing on two network structures associated with idea generation and flow: brokerage and group cohesion (see Fig. 1). *Brokerage* connects or bridges from one group to another. Brokerage creates conditions to facilitate discovery and introduction of novel ideas and help amplify them for scale across a system. *Group cohesion* is how connected an agent is with others in a group. Group cohesion provides a safe environment for pressure testing and iterating ideas to make them more impactful and amenable for scaling.

Research shows that because brokerage provides agents with early access to new and diverse information regarding things that are happening in other areas, it helps spark creative solutions and allows opportunities to influence how this information is distributed. Brokerage enables agents to think more boldly about what is possible by creating a richer set of possibilities. For example, in one large pharmaceutical company the drug-development process could be traced back to a few key scientists who had brokerage relationships with outside academics. When two of the most richly connected brokers departed, these relationships were also lost and the innovation rate for the company dropped

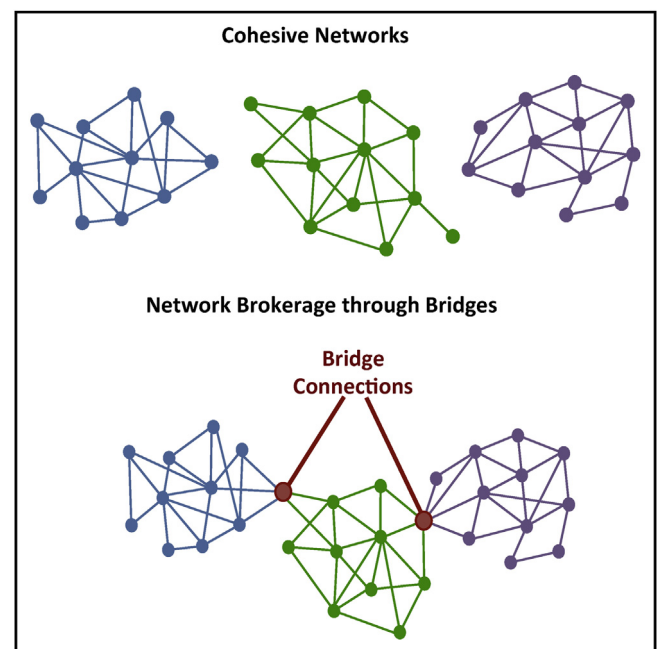


Figure 1 Network Structures.

significantly, making the company less adaptive. This is consistent with research showing that brokerage creates greater access to novel insights and enhances diffusion of these insights.

Group cohesion on the other hand, enables agents to quickly share information under conditions of high levels of trust. Research shows that when ideas are introduced in cohesive groups, they are more likely to be adopted and enhanced locally. This is why trust and culture are so important to adaptability. The level of trust within cohesive groups facilitates positive affect, learning and risk taking—all considered to be crucial components of creativity. Pixar’s dailies are an example of adaptive space that engages the power of group cohesion to foster innovation and emergence. Each day a handful of creators present in-progress work to a local group for a critical review. Agents within this system know that the feedback from these reviews is intended to enhance their work. Here adaptive space acts as a pressure test of ideas generated and iterated in a local context. The level of tension experienced within dailies actually enables a more feasible adaptive response. Without cohesion established in advance, this tension might not be quite as positive to the outcome.

Complexity Dynamics

Complexity dynamics explain how the network structures of brokerage and cohesion create the conditions for adaptive space. Leaders who enable adaptive space understand two key dynamics that make complex systems adaptive: conflicting and linking up. Conflicting is the tension created when agents bring diverse needs, worldviews, preferences or values to interactions. It motivates and pressures a system or agent to elaborate and change. Linking up occurs when agents find commonality that allows them to bond in relationships and networks. Linkages are the connections that hold bonded agents and aggregates together.

Conflicting. Conflicting provides the thought diversity and exposure to ideological differences needed for creativity. It occurs when agents co-create in cohesive groups or when entrepreneurial leaders try to extend ideas across different networks. Conflicting can also be a benefit of mergers when enabled appropriately—mergers disrupt existing structures and bring new ideas and perspectives that can loosen up a system for change. We saw this in our data when a merger between a large financial service firm with a clear operational bias and a smaller, more agile bank with a clear entrepreneurial bias created conflicting that opened up adaptive space, bringing rich new innovations to the parent company. Diversity, or heterogeneity, is essential to adaptive space. If all agents bring the same perspective then rich interconnectivity is not possible—there is no conflicting or competing view to generate tension to change or adapt.

Conflicting is why brokerage provides such rich contexts for idea generation. Brokerage connects diverse groups with one another and allows opportunities for agents to link up around a problem (e.g., challenge) and a solution. For conflicting to generate adaptive space, however, it has to engage the right kind of diversity: The conflict has to be at a rich interconnectivity (i.e., network) level, and not at a chaotic or order level (see Fig. 2). At the order level, conflicting is wiped out by the hierarchical structure, e.g., a manager may step in and eliminate the conflict or revert to standard

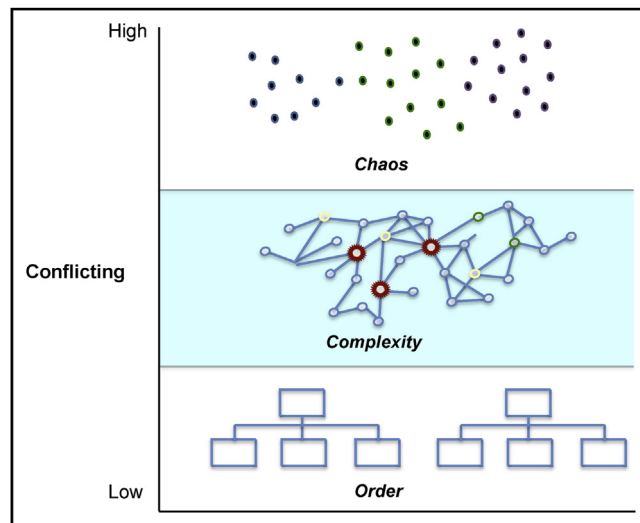


Figure 2 Levels of Conflicting.

operating procedures for decision-making. At the chaos level, agents are so divided they cannot find any points of commonality around which they can link up. We see this in conflicts in the Middle East, where tribal history and war have created deep rifts and animosity among those from different ethnic and religious identities. Conflicting that leads to only divisiveness and separation cannot generate emergence of new adaptive order. There must be some commonality or complementarity of need or perspective that allows agents to link up. Emergence relies on linking up.

Linking Up. Linking up occurs when interdependent agents have enough common perspective, such as a mutual desire for change, a common technological view, or shared identity and/or values, to link up (i.e., combine ideas and efforts) in ways that trigger novelty and amplify emergence. For example, linking up occurs when people in a social network come together around a common cause, such as social justice movements (e.g., Black Lives Matter, the Tea Party, Occupy Wall Street) or shared technology platforms (e.g., Airbnb, Snapchat, Twitter), to drive change in society, economies and markets.

Leaders can enable linking up by bringing together “poised” agents—those with ideas and desire to change—and providing them with resources and opportunity to generate novel solutions and approaches. General Motors (GM) does this with co-labs: 24 hour hackathon-type events that link up diverse agents around a core challenge. A co-lab brings “poised” participants together to work in small teams and tasks them with making a shark tank pitch to an executive sponsor at the end of the 24 hours. By placing participants in competitive environments under conditions of complexity pressures, co-labs allow leaders to leverage brokerage, conflicting, and linking up to initiate adaptive responses to complex challenges.

Leaders can also enable linking up to feed and fuel emergence by using tags and attractors. Tags create attractors for people to come together and link up to drive change. At GM, co-labs are part of a broader initiative that has the tag of “GM 2020.” The reputation of a tag like GM2020 taps into the natural capacities of brokerage to help spread an idea quickly and attract others—especially critical sponsors—to

an initiative, energizing them to take action. Therefore, participants can leverage the GM2020 tag when they need to demonstrate the legitimacy of their idea or build momentum across groups.

The Role of Pressures

While tags and attractors can help leaders energize emergence, they are often not enough. Hierarchical organizations can be resistant to change, and proficient at spitting out those who attempt to initiate it. Pressures may therefore be needed to loosen the system up for change. In organizations, complexity is often experienced as pressures. Complexity pressures disrupt current patterns of organizing, naturally opening up adaptive space. Complexity pressures typically involve: 1) a need for a novel solution (i.e., existing ways of operating will not work), 2) new partnerships (i.e., people have to work together who have not worked together before), 3) conflicting perspectives (i.e., individuals bring different needs and diverse experiences), and 4) interdependence (i.e., no choice but to work together—adapt or “die”).

This is exactly what we are seeing unfold in the automotive industry today. It is clear that the industry is poised for disruption with new services like Uber’s ride sharing and non-traditional players like Google investing in autonomous mobility. What is less clear is the path forward. As a result, companies like Toyota, Honda, Ford and General Motors are hedging their bets. They are engaging different relationships, investing in new technologies, and exploring alternative business models in attempts to “meet complexity with complexity.”

Responding effectively to complexity pressures requires leaders to enable adaptive space. Doing so is not easy, however, particularly in organizations with traditional bureaucratic organizing structures. The silos of hierarchical structures work against networking and linking up; moreover, adaptive space can run counter to the control systems that dominate many management practices. We can see this in one large engineering firm we studied that forged an alliance with an external partner in an attempt to bring new technological capability to the organization. While the partner brought new advancements, they also had their own way of doing things and managers in the engineering firm almost immediately started to demand that the partner be more disciplined to yield better outcomes. As a result, many of the practices from the new partner were ignored and, in the end, the acquired technology didn’t yield the hoped-for impact.

Leaders in adaptive organizations resist this temptation. They capitalize on the adaptive space and network structures opened up by complexity to enable adaptive responses. For organizations like Google, Mayo Clinic and W.L. Gore, the ability to open and protect adaptive space is designed into the system. At Google, leadership and innovation can be generated from anywhere, top-down or bottom-up. Google works to continually adapt by placing the user in the center of everything they do and challenging themselves to be ten times bolder. Mayo has developed habits of constantly scanning for broad trends both within healthcare and across industries, and taking on small experiments to collect evidence and applying prototypes to crystallize ideas and validate tangible outcomes. W.L. Gore is fanatical about its people. They believe that if you hire great people and

provide them with space to dabble in the things they are highly passionate about they will excel, and the company will benefit. They openly celebrate both successes and failure. People are often introduced through the stories of things they have worked on in the past, and associates are openly encouraged to grow their “lattice”—i.e., their own internal network.

For innovative and adaptive organizations adaptive space is at the very core of who they are and what they do. Leaders are central to the creation and sustainability of this space. Enabling adaptive space requires a new way of thinking about leadership, however. To describe this, we turn next to a discussion of how the concepts introduced above all come together in the complexity leadership model. *Complexity Leadership* is a new framework for leadership research and practice that describes how leaders can enable organizations to operate as complex adaptive systems—networked systems able to adapt in and evolve with a changing environment.

LEADING FOR ADAPTABILITY

Complexity leadership draws attention to three types of leadership needed for adaptability: operational leadership, entrepreneurial leadership and enabling leadership (see Fig. 3). Operational leadership is the formal design and alignment of systems and processes for efficiently executing on ideas and converting them into productive outcomes (e.g., exploitation). Entrepreneurial leadership is the source of new ideas, innovation, learning and growth for the organization (e.g., exploration). Enabling leadership is the enabling of conditions that effectively support and sustain adaptive space. Enabling leadership is a unique form of leadership introduced by complexity thinking. When appropriately engaged with operational and entrepreneurial leadership, enabling leadership helps organizations be agile in the face of complexity (i.e., operate as complex adaptive systems).

The three functions associated with complexity leadership are not isolated to any one individual or position: A single individual could potentially engage in any or none of them. In fact, the most agile leaders would have proficiency in all three. Highly agile complexity leaders would be able to transition between entrepreneurial, enabling and operational thinking to introduce, adapt and advance novel ideas into the system in the form of new, adaptive order. This is not typically the case, though, nor is it necessary. In most cases, adaptive organizations tap into a broad array of leaders: those with the capacity to flexibly administer operational systems and accommodate adaptability to transform it into results; those skilled in entrepreneurial leadership to generate new ways of thinking and operating; and those who can enable conditions that trigger new ideas for the entrepreneurial system and help them flow into the operational system to generate innovation and adaptive outcomes.

Operational Leadership

In complexity, leaders still need to embrace the power of the operational system to generate efficiency and produce ongoing results. But they engage the formal functions differently. They recognize that innovation and adaptability are

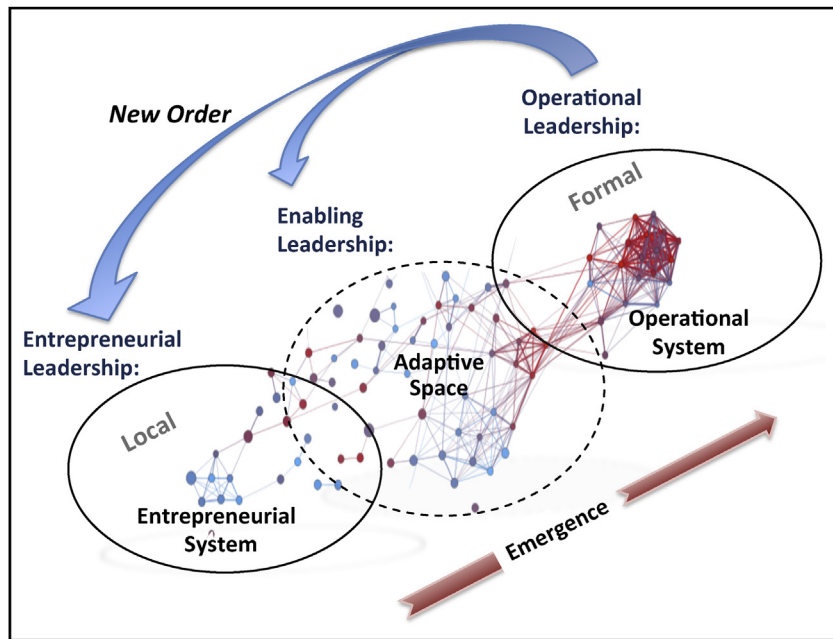


Figure 3 The Complexity Leadership Model.

as core to organizational survival as operating results; therefore, they work to protect against the destructive effects of the pull to order that privileges operational decision making at the expense of entrepreneurial thinking.

They also view the formal role as helping accommodate, rather than stifle, attempts by entrepreneurial and enabling leaders to drive change into the system. A clear finding from our research is that innovation is generated in the tension between entrepreneurial and operational pressures. Without operational constraints, entrepreneurial initiatives can be idealistic and lofty. Entrepreneurial leaders are focused on innovation and different ways of doing things, but quite often may not understand the realities of getting things implemented within the operational system. Operational leaders, therefore, need to introduce constraints for entrepreneurial

leaders in ways that help them see why the operational system cannot accommodate them or how the idea needs to be adapted to align with organizational needs, rather than leaving them feeling hopeless or discouraged about the ability of the system to accommodate change.

A key role of operational leaders in the complexity leadership framework is converting emergent ideas into organizational systems and structures that produce innovation and ongoing results. Operational leaders do this by sponsoring, aligning and executing (see Fig. 4). *Sponsoring* involves pulling ideas from adaptive space and positioning them for support from the formal system. Sponsoring helps overcome the problem of the “brick wall”—the seemingly automatic reflex of the operational system and its leaders to say no when approached with innovative ideas or suggestions for

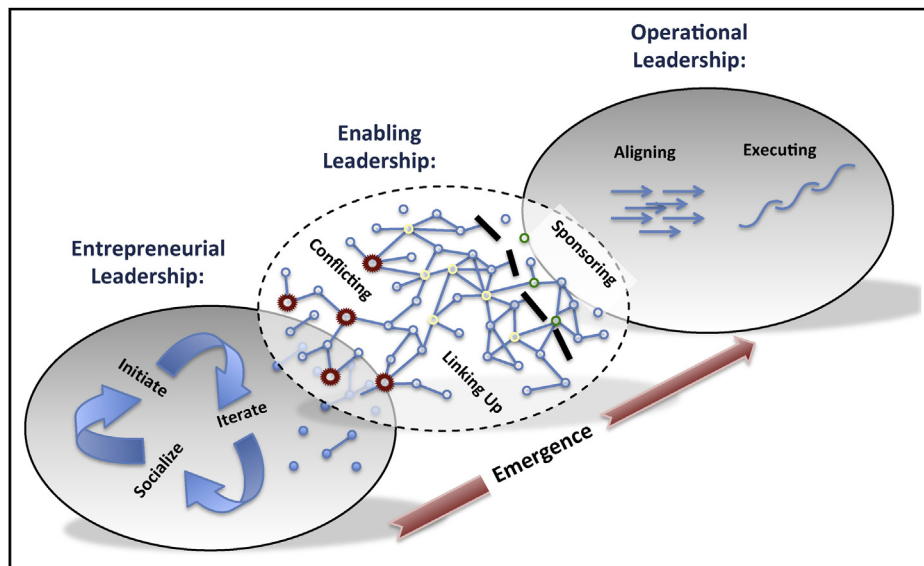


Figure 4 Complexity Leadership Behaviors View.

new ways of doing things. *Aligning* and *executing* involve finding ways to resource and implement the idea or new approach to enhance organizational performance and fitness.

Operational leaders help enable ideas into the formal system by creating energy, enthusiasm and support for emerging initiatives among those with the authority to formalize and act on them. They work to break down the brick wall that stops innovation from happening. The most familiar experience of the brick wall occurs when entrepreneurial leaders attempting to scale innovations from their local context into the broader system find quickly that they are blocked, i.e., stopped in their tracks with seemingly no way around. We can see this in the example of one large retail organization that experienced this when a team of field sales representatives identified a new way of selling in their market. The sales reps were excited by pilot tests showing that customers raved about the new service, allowing them to double the existing close rate on sales leads. Scaling the solution to other markets required a technology investment, however, and the team hit the brick wall: The technology requirements for the solution did not fit within the standard platform protocols. As a result, the idea was rejected as part of the formal decision process.

This is where sponsorship kicks in. To transform the brick wall into a wall of resistance that *filters*, rather than blocks new ideas, operational leaders need to serve as bridges from adaptive space into the operational system. In the example above, this happened when an executive team member stepped in and acted as a sponsor. This leader, who had visited the market and personally experienced the piloted solution, pushed back against the protocols. She energized support in the formal system by arguing that despite the company mission to put the customer first, the decision was being made based on internal requirements. By linking up the initiative with the strategic mission and values, she generated support for the idea of re-aligning the operational system to be able to accept the new method. A creative solution was then found to partner with an external vendor to provide the technological support necessary, and the idea was successfully implemented in the system (e.g., aligning and executing).

Entrepreneurial Leadership

Entrepreneurial leadership is the creation and development of novelty (e.g., ideas, innovative solutions, new products or services) in ways that help an organization adapt to pressures or capitalize on opportunities. It operates in local contexts (a *local* is the network of relationships and contexts actors engage in to get work done), and is often motivated by complexity pressures that challenge individuals and groups to come up with new ways of working, or new products and services.

Entrepreneurial leadership is consistent with research showing that creativity is often a collective process. An example is the creation by a company called Design Continuum of the Reebok Pump shoe, which in its first year accounted for over \$1 billion in revenue. As described by Andrew Hargadon and Beth Bechky, a few individuals with knowledge about client demands interacted in a brainstorming session with another person who had knowledge of inflatable splints. This group then linked their idea up with another person who had knowledge of IV bags that could

be adapted to provide air bladders. These individuals subsequently connected with individuals with expertise in pumps. It was only through these unfolding interactions that they came to recognize how their disparate knowledge could be relevant to building a better basketball shoe. The linking up of diverse agents (e.g., individuals, information, technologies) resulted in an emergent outcome that none of them could have imagined or predicted.

This example is even more interesting in that Reebok had to broker for new insights, i.e., they had to go outside for its entrepreneurial leadership. This is not an uncommon experience, as many organizations are not set up to support the entrepreneurial system. However, some level of brokerage with other groups can act as a spark for the local group to test out new ideas. The challenge for entrepreneurial leaders is to keep their energy and spirit alive in the face of operational systems that are not set up to accommodate novelty.

Entrepreneurial leaders achieve success in multiple ways. Individuals who are adept at entrepreneurial leadership have a bias toward action. Building on the strength of deep trust within cohesive groups, they work to quickly get new ideas implemented in the local environment with a limited set of resources. Entrepreneurial leaders also recognize the importance of timing and use it to their advantage. They know that an idea that is rejected at one point may become more desirable if pressures from the environment open adaptive space and loosen up the system up for change. They are persistent as well as patient. Entrepreneurial leaders emphasized to us the importance of tenacity (the actual quote was “tenacious as hell”).

Effective entrepreneurial leaders are also flexible. A key refrain we heard from these leaders was the importance of not falling in love with your idea. They recognize that ideas morph and evolve as they move out of local contexts and into adaptive space and operational systems (see 4). Therefore, entrepreneurial leaders link up with enabling leaders (or become enabling leaders themselves) who can broker and iterate ideas for scale into the operational system. In the case of General Motors, this is exactly how a new car-sharing service called Maven was created. A few internal engineers successfully brokered an idea for an app-based solution into a new “personal mobility” platform, creating an adaptive response for GM to meet the demands of a rapidly changing marketplace.

Enabling Leadership

While operational and entrepreneurial leadership exist in our current leadership lexicon, enabling leadership is a new way of thinking arising in response to complexity. Our research shows that although many people are practicing enabling leadership, it often goes unrecognized because we don't have a leadership language to describe it. Worse, because it does not fit our traditional conceptualizations of what leaders do, the actions of those who engage in it can be misunderstood or misconstrued. *A key implication of our research is that understanding, developing and rewarding enabling leadership practice is critical for organizational success and survival in today's complex world.*

Enabling leadership operates in the interface between the operational and entrepreneurial system in an organization

(see Fig. 4). It works to nurture and enable adaptive space that feeds and fuels emergence for adaptive responses in a system. Effective enabling leadership helps initiate and amplify support for novelty, innovation and change. It does this by engaging the principles and practices of complex adaptive systems described above to leverage network structures and complexity dynamics in ways that unleash the collective intelligence in an organization to adequately and proactively meet the demands of complexity pressures.

Enabling Leadership Principles and Practices

One of the important early findings from our research is that there is no shortage of ideas in organizations: No matter how stifling a system can be, people still have the natural capacity to ideate and innovate in their work. The challenge is in how to capture ideas and engage them in networked interactions that allow them to be developed, tested and refined for innovation and adaptability in an organization. That is the role of enabling leaders. Enabling leaders work to nurture and protect the adaptive function and those who engage in it in an organizational system.

Enabling leaders do this in myriad ways. While there are no set formulas, we can identify a set of principles and practices

that underlie the successful enactment of the enabling leadership role. Because these practices fall outside the realm of traditional leadership understanding, most people who engage in them act on tacit knowledge, and when asked to describe what they are doing, the nuances are often lost. When viewed through a complexity lens, however, the behaviors become clear: Successful enabling leaders use complexity thinking to catalyze and energize networked interactions that enable emergence and adaptability in an organization (see Table 1).

At the core of enabling leadership principles and practices is complexity thinking—the understanding of how to read a system for signs of emergence and engage with it (see Table 2). Engaging with emergence means understanding the forces that are driving it and either energizing these forces, or trying to suppress them (e.g., by severing linkages, cutting off information flows, disengaging or redirecting the energy motivating them). It also means enabling network structures that trigger and amplify information flows in and across adaptive space. Exactly how enabling leadership does this differs depending on the context in which it occurs. In highly innovative and adaptive organizations, conditions for adaptive space are typically built into the system; therefore,

Table 1 Enabling Leadership Principles and Practices.

Enabling leadership principles	
Principle	Principle description
Apply Complexity Thinking	Complexity thinking involves understanding how to read a system and watch for signs of emergence. Those who can apply it know how to use pressures, conflicting, linking up, and timing to anticipate, interact with, and channel emergence.
Enable Adaptive Space	Adaptive space represents the adaptive function in the organization. Enabling adaptive space involves leveraging complexity dynamics and network structures to feed and fuel emergence for adaptive responses.
Leverage Network Structures	Network structures represent the informal system in the organization. They facilitate the movement of ideas and information across a system, and include brokerage, group cohesion and network closure.
Engage Complexity Dynamics	Complexity dynamics make a complex system adaptive. They include conflicting (adaptive tension), linking up, information flows, and tags and attractors.
Play in the Pressures	Pressures motivate a system to elaborate and adapt by opening up adaptive space, providing a basis for initiating and amplifying emergence. Playing in the pressures means using pressures to drive and enable adaptive responses.
Enabling leadership practices	
Practice	Practice description
Brokerage	Ideas are triggered at the intersection of networks. Brokerage allows for ideas to be generated and creates bridges for information to flow and agents to link up.
Leveraging Adaptive Tension	Increasing and decreasing tension to manage levels of conflicting. Too much conflicting distresses a system, reducing its ability to create; too little conflicting keeps a system and agents in status quo.
Linking Up	Creating or energizing network connections that enable information flows, or amplify movements, to feed and fuel emergence.
Tags and Attractors	Listening for language (messages, stories) and symbols (pictures, objects) that “stick” in a system and attract energy & using them to create tags to amplify and channel emergence.
Simple Rules	Creating simple guidelines for behavior that enable network & complexity dynamics (e.g., brokering, cohesion, energizing, conflicting, linking up, network closure) without requiring agents to have an understanding of complexity.
Network Closure	Network closure lets the others make the sale for you. It uses reputation and gossip to get attention and support of sponsors.

Table 2 Understanding and Watching for Signs of Emergence.

Sign	Description
Trends	Trends in the internal and external environment can reveal signs of agents and pressures that, under the right conditions, might link up and generate phase transitions associated with emergence.
Tensions	Tensions are signs of pressures indicating that a system may be poised for change.
Opening of Adaptive Space	Complexity pressures open up adaptive space, creating conditions for emergence.
Information Flows	Information flows enable greater interconnectivity, increasing the possibility for brokerage and linking up that can lead to emergence.

enabling leaders in these organizations spend most of their time engaging with and capitalizing on adaptive space. In organizations that are hierarchical and bureaucratic, adaptive space is usually missing; therefore, enabling leaders in these organizations expend most of their time and energy in opening up and nurturing adaptive space.

Enabling leaders open adaptive space by leveraging network dynamics (see Fig. 5). Network research shows that ideas are triggered at the intersection of networks. Therefore to create conditions rich in idea generation, enabling leaders create contexts for brokerage through adaptive practices such as co-labs, adaptive salons and adaptive summits. While brokerage events can help spark ideas, they are not as good at elaborating them. That is the purview of cohesive networks. Enabling leaders thus encourage brokers to take ideas to back to their local networks where they can engage with connectors to further ideate, socialize and iterate them in a safe context. Once ideas are iterated, they are ready come back out into adaptive space to begin the process of scaling. At this stage enabling leaders work to amplify ideas by mobilizing energizers who can broker connections that build the reputation of the idea—building momentum that garners attention and support.

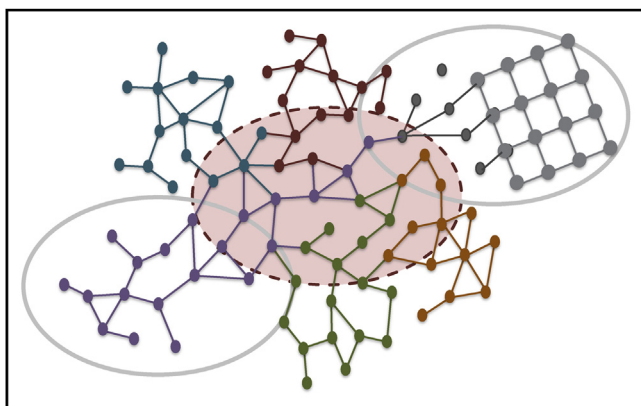


Figure 5 Network Structure in Adaptive Space.

Recognizing that emergence is only as good as its ability to translate into results, a key role of enabling leaders after mobilizing emergence is helping tip it into the operational system for implementation as new, adaptive order. Tipping into the operational system requires an understanding of the political system and the motivations and constraints of operational leaders, as well as the creativity to navigate around challenges presented by the limitations of administrative systems and structures. It also requires a shift in focus from brokerage and cohesion to network closure. Network closure uses reputation and gossip to get attention and support of sponsors. It occurs when information flowing across multiple networks begins to close in around the sponsor attracting their notice and, ultimately, formal endorsement.

Enabling leadership thus engages different principles and practices from what we typically consider to be effective leadership. In fact, it could be considered a form of *invisible leadership*. These practices are easier in organizations that are highly adaptive and nurture innovation, and can be challenging for those in environments that don't necessarily recognize or support it. Regardless of the environment in which it occurs, enabling leadership is critical to the creation and protection of adaptive space that enables and sustains adaptability in organizations.

Enabling Leadership Skills

Enabling leadership brings with it a unique set of skills. Enabling leaders must be personally adaptive to adjust their style and approach based on unfolding dynamics and their read of the situation. Understanding the nature of complexity and emergence, they must initiate the emergence process by mobilizing and energizing others to act and then, when the shift begins, be disciplined enough to step into the background so the movement can emerge. Enabling leaders know that the only way to build an adaptive organization that is sustainable over time is unleashing the capacity of many local agents to regularly see and enact adaptive responses. Enabling emergence and adaptive space is an active process of learning. It involves an ongoing balance of knowing when to be highly visible to catalyze others and when to be invisible to enable others. Therefore, at times they need to act as the catalyst, standing up and challenging the organization to be bolder, and at other times they need to step away so that others can rise up.

Being an extraordinary enabling leader requires a combination of deep conviction and humility. Enabling leaders must be convicted enough in what they are doing to take great risks in opening up adaptive space for others, and humble enough to step back so others can step forward. They have to be comfortable with tension and willing to engage in it, including putting others in tension in ways that may at times make them uncomfortable. Experimentation means they will have to take some risks and be able to cope with failures. Enabling leaders trust in emergence, and engage it using strategic thinking and a keen sense of timing. They are comfortable with uncertainty, confident that, even in ambiguity, information and patterns will provide clues for guiding action.

Enabling leaders do all this because they know the cause is bigger than them. Their satisfaction comes from creating adaptive responses, not personal recognition. Seeing others engaged and systems that are innovating give them a sense of

meaning, purpose and fulfillment. And for those motivated by creativity and the challenges of intellectual stimulation, enabling leadership is both rewarding, and fun.

CONCLUSION

In light of escalating challenges facing political and business leaders in today's complex environments, it is imperative that we as leadership scholars and practitioners begin to take on the hard work of pioneering new models for researching and developing leadership. A new world requires a new way of thinking. Reflecting on events like Brexit and the U.S. political election in 2016, German Chancellor Angela Merkel recently said: "I think we live in a period of profound transformation, very similar to when we had a transition from agricultural societies to industrial societies." This period calls for us to understand the rich interconnectivity that underlies the forces of change in our societies and organizations, and learn to interact and engage with it. We must learn

to enable adaptive, rather than ordered, responses to complexity.

Our research uncovers a way to do this. What we discovered from a decade-long research program is that the key to adaptability in organizations is adaptive space. Adaptive space enables the rich interconnectivity (i.e., complexity) of a networked system and its agents to "meet complexity with complexity." It allows a complex system to become a complex *adaptive* system. As shown in the *Complexity Leadership* model, the role of leaders in these systems is to enable adaptive space in ways that nurture and protect the adaptive function of the organization. They do this using three main leadership functions. Entrepreneurial leadership works to generate innovation, learning and growth in an organizational system. Operational leadership works to transform innovation into new adaptive order to enhance performance and results. And enabling leadership works to open up adaptive space to ensure the ongoing viability and fitness of the organization.



SELECTED BIBLIOGRAPHY

The IBM CEO study to which we refer is titled “Capitalizing on Complexity: Insights on the Global Chief Executive Officer Study.” You can find it on IBM’s website at: <http://www-935.ibm.com/services/c-suite/series-download.html>.

To read more about the theoretical basis of complexity leadership see Mary Uhl-Bien, Russ Marion and Bill McKelvey’s paper in *The Leadership Quarterly* titled “Complexity Leadership Theory: Shifting Leadership from the Industrial Age to the Knowledge Era” (2007, Vol. 18, pp. 298–318). Further information on the complexity dynamics underlying adaptive space can be found in “Complexity Leadership in Bureaucratic Forms of Organizing: A Meso Model” (Uhl-Bien & Marion, 2009, *The Leadership Quarterly*, Vol. 20, pp. 631–650) and “Leadership in Complex Organizations” (Marion & Uhl-Bien, 2001, *The Leadership Quarterly*, Vol. 12, pp. 389–418).

A practical view of complexity leadership is offered by Michael Arena and Mary Uhl-Bien in “Complexity Leadership Theory: Shifting from Human Capital to Social Capital” (*People & Strategy*, Vol. 39, Issue 2, pp. 22–27).

You can learn more about emergence in Benjamin Lichtenstein’s book *Generative Emergence* (Oxford University Press, 2014). For articles in which you can apply your own emergence lens to see how emergence works in social movements you can check out “Fractured Lands: How the Arab World Came Apart” by Scott Anderson (*New York Times*, August 10, 2016) and “The Great Unraveling: Republicans Rode Waves of Populism Until They Crashed the Party” by Gerald F. Seib and Patrick O’Connor (*Wall Street Journal*, Oct. 26, 2016).

Andrew Hargadon and Beth Bechky’s discussion of collective creativity can be found in “When Collections of Creatives Become Creative Collectives: A Field Study of Problem Solving at Work” in *Organization Science* (July-August, Vol. 17, No. 4, pp. 484–500). You can read more about the relationship between creativity and group cohesion in Jasjit Singh

and Lee Fleming’s 2010 article “Lone Inventors as Sources of Breakthroughs: Myth or Reality?” in *Management Science* (Vol. 56, No. 1, pp. 41–56).

Numerous articles address network dynamics. Lee Fleming and colleagues describe the relationship between network structures and creativity in “Creativity in Small Worlds” in *California Management Review* (Fleming & Marx, 2006, *California Management Review*, Vol. 48, No. 4, pp. 6–27) and “Collaborative Brokerage, Generative Creativity, and Creative Success” in *Administrative Science Quarterly* (Fleming, Mingo & Chen, 2007, Vol. 52, pp. 443–475).

You can read further on brokerage and network closure in Ron Burt’s “Brokerage and Closure: An Introduction to Social Capital” in *Administrative Science Quarterly* (2005, Vol. 52, No. 3, pp. 482–485) and “Structural Holes and Good Ideas” in *American Journal of Sociology* (2004, Vol. 110, No. 2, pp. 349–399). Ray Reagans and Bill McEvily describe “Network Structure and Knowledge Transfer: The Effects of Closure and Range” in *Administrative Science Quarterly* (2003, Vol. 48, pp. 240–267).

You can also check out Rob Cross’s work on network structures in “Tie and Network Correlates of Performance in Knowledge Intensive Work” in *Academy of Management Journal* (Cross & Cummings, 2004, Vol. 47, No. 6, pp. 928–937) and “Leading in a Connected World: How Effective Leaders Drive Results Through Networks” (Cross, Cowen, Vertucci & Thomas, 2009, *Organizational Dynamics*, Vol. 38, No. 2, pp. 93–105).

For more on invisible leadership see “Invisible Leadership” by Gill Robinson Kickman in *Encyclopedia of Leadership* (edited by George Goethals, Georgia Sorenson and James MacGregor, Sage, 2004, pp. 750–754) and “The Power of Invisible Leadership: How a Compelling Common Purpose Inspires Exceptional Leadership” by Gill Robinson Hickman and Georgia Sorenson (Sage Publishing, 2014).

Mary Uhl-Bien, Ph.D. is the BNSF Railway Endowed Professor of Leadership at the Neely School of Business at Texas Christian University. She is an expert in complexity leadership, relational leadership and followership. She is active in executive education nationally and internationally, and has taught at Gallup and the Brookings Institute (BNSF Railway Endowed Professor of Leadership, Neeley School of Business, Texas Christian University, United States; e-mail: mary.uhlbien@gmail.com).

Michael Arena, Ph.D. is Chief Talent Officer at General Motors. At GM he is responsible for talent management, talent analytics, leadership development and learning, strategic workforce planning and the Innovation Xchange Lab. He employs an evidence-based approach to driving performance, leveraging network analysis and predictive analytics to empirically determine leadership and talent needs across the pipeline (Chief Talent Officer, General Motors, United States).