

REDEFINING THE WORKSPACE

BRINGING VALUE AND VALUES TO MACHINE-HUMAN COLLABORATION

A Report of the 2019 Aspen Institute Roundtable on Institutional Innovation

RICHARD ADLER, RAPPORTEUR



**Redefining the Workscape:
Bringing Value and Values to
Machine-Human Collaboration**

Richard Adler
Rapporteur



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*This report is written from the perspective of an informed observer at the
Aspen Institute Roundtable on Institutional Innovation.
Unless attributed to a particular person, none of the comments or ideas contained
in this report should be taken as embodying the views or carrying the endorsement
of any specific participant at the Roundtable.*

Foreword

Momentous shifts in the workplace, largely driven by an increase in automation and artificial intelligence, has placed immense pressures on organizations to explore new ways to balance its utilization against the needs (and fears) of their human workforce. How should organizations approach these trade-offs? What can firms do to anticipate and mitigate employee concerns? How can organizations develop better metrics to understand the impact of increasing human and machine interactions in the workscape?

This report of the 2019 Roundtable, written by Richard Adler, explores *Redefining the Workscape: Bringing Value and Values to Machine-Human Collaboration*—focusing on how firms can address the inter-relationship between humans and machines. It features a robust discussion on the workscape of the future, employee benefit and meaning, paths for education, business structures, and leadership strategies that can maximize the opportunities presented by new smart technologies.

Adler begins the report by focusing on the many different strategies already happening within organizations—shifting from prioritizing skills to capabilities among hires to recognizing the multiple dimensions of employee trust, meaning and value. The report also includes a discussion on *Superminds* and the role computers can play to make them smarter. Next, the report emphasizes the need to deliberately create space—or an “adaptive space”—for innovation to emerge.

The report concludes with a discussion on how leadership can move to implement the various strategies. Specifically, it calls upon leaders in any organization to recognize the value-added in augmenting human skill and capabilities with technology, not just simply substituting one for the other. In order for firms to maximize their capabilities, increase efficiencies, pursue innovation and retain top talent, novel forms of collaboration of people working together with each other and with technology in new ways is imperative.

Acknowledgments

On behalf of Aspen Digital, I want to thank the Deloitte Center for the Edge, specifically co-chairmen John Hagel and John Seely Brown, Deloitte Global Human Capital, its lead, Jeffrey Schwartz, and Alexi Robichaux, CEO of BetterUp, for sponsoring this Roundtable. Without their innovative thinking and leadership, this exchange of ideas would not be possible.

Additionally, the Program extends its gratitude to Richard Adler, our rapporteur, for capturing the discussions and translating them into an engaging, thoughtful report. As is typical for our roundtables, this report is the rapporteur's distillation of the dialogue. It does not necessarily reflect the opinion of each participant at the meeting, or their employers.

Thanks, also, to Kristine Gloria, associate director of the Emerging Technology Initiative and Tricia Kelly, managing director, for their work on the conference and bringing this report to fruition. I also want to thank, Charlie Firestone, for his long-standing role as the roundtable's moderator and as the executive director of the Communications & Society Program. Finally, none of the content in this report would be possible without the insights and expertise of the Roundtable participants. We thank them for their valuable contributions to this project.

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April 2020

**REDEFINING THE WORKSPACE:
BRINGING VALUE AND VALUES TO
MACHINE-HUMAN COLLABORATION**

Richard Adler
Rapporteur

Redefining the Workscape: Bringing Value and Values to Machine-Human Collaboration

Richard Adler

All That Jazz

Thirty years ago, John Clarkeson, who was then Chief Executive Officer of the Boston Consulting Group, wrote an essay that began by stating that “most of our organizations today derive from a model (such as the Ford assembly line) whose original purpose was to control creativity,” a model that was becoming less and less viable in a “rapidly changing environment.”¹ The challenge in such an environment was to get employees to cross professional boundaries and learn to work together in new ways. Rather than seeing themselves as controlling an elaborate machine, corporate leaders needed to take on the role of orchestrating a group of talented but disparate musicians.

An obvious model for such a role was the conductor of a symphony orchestra, but Clarkeson noted that the “flaw in this analogy” was that “no one gives a CEO the music he should play.” A better model, one drawn directly from the American experience, was the leader of a jazz group. To illustrate his point, he described the leadership style of Duke Ellington, not in terms of his musical gifts, but his ability to work collaboratively with and inspire others:

His players were good but not without equal. He knew their quirks, their gifts, their problems, and he encouraged them to learn to do things they didn't think they could do.... They developed through their membership in the group, and they learned from each other. Most of all, their capacity for innovation grew as they built on their cumulative experience.... The results were astonishing.

Clarkeson concluded by predicting that in the future, successful leaders “will be in the flow, not remote ... [and] talented people will be attracted by the ability...to learn from other knowledgeable people and by the opportunity to create and grow.” This view of the evolving role of leaders and leadership has been a major theme of the Aspen Institute Roundtable on Institutional Innovation for the past decade.

... algorithms, like other tools, are human creations and subject to human limitations.

– *Mickey McManus*

At the Roundtable, Mickey McManus, Research Fellow at Autodesk, offered a new perspective on this theme by suggesting that we are now in “the Jazz Age of Cognition.” He began by noting the scale of the challenges that humans are facing: billions more people are coming, most of them concentrated in urban areas where they will need food, shelter and more. To accommodate this growth, we will need to construct some 8,500 new buildings every day—the equivalent of adding an entire New York City of buildings every month—even as much of the existing infrastructure is falling apart and in need of repair. If we are going to meet these demands in a sustainable way, we need to get much better at producing things: nearly one-third of the waste in the world is created by construction, while building materials and construction account for 11 percent of global greenhouse emissions, and building operations generate another 28 percent of GHGs;² some 70 percent of spare parts created for automobiles are never used.

Even as the urgency of finding new ways of working is increasing, technology is providing both new insights about the processes that underlie creativity and new means for encouraging innovation. For example, researchers have been studying how the brain works when it is engaged in creative activity. In 2008, a group of researchers at the National Institutes of Health and Johns Hopkins University School of Medicine used an fMRI machine to study the mental activity of professional jazz pianists as they played. When the musicians were engaged in improvising (but not when they were playing previously memorized compositions), there was a marked decrease in activity in the dorsolat-

eral prefrontal cortex, the area of the brain associated with planning and self-censorship. What this research suggests is that a key to fostering creativity is the ability to, at least temporarily, reduce one's normal inhibitions in order to explore a path that is new and untested.³

Perhaps even more significant is the emergence of new digital technologies that can enable new forms of collaborative innovation. With the advent of AI techniques such as deep learning,⁴ machines now have the ability to begin with a set of inputs (data) and then apply algorithms that are capable of generating novel connections, including connections that humans would be unlikely to make on their own—in other words, to engage in what looks like creative activity.

McManus suggested that these new tools seem to have “a weird sense of agency” that is distinctly different from older, simpler tools like a hammer: they have the ability to “surprise and confound us” with unexpected results that can push us to question and perhaps go beyond our unconscious assumptions and limitations. Computers are rapidly learning to drive cars as well or perhaps better than humans. It has become so common to see Waymo vehicles (built by Alphabet, Google's parent) driving around the streets of Silicon Valley that it has become almost routine. And almost every day, we hear of new discoveries coming from the combination of deep learning and big data. In healthcare, AI systems have demonstrated the ability to read certain types of x-rays better than radiologists and to come up with ideas for promising drugs that humans had failed to find. In journalism, AI is being used to help reporters find important trends hidden in large datasets and to spot fake news stories.

A distinctive characteristic of AI systems, which can be either a weakness or a strength, is that they do not have common sense, the ability to draw conclusions and make decisions from practical matters. This can be a flaw that generates impossible or impractical solutions to a given problem. But it can also be a means of escaping conventional boundaries to find truly novel solutions, just as inspired jazz musicians can push beyond the conventional boundaries of music. What AI systems excel at is identifying patterns that are difficult or impossible for humans to see.

A skilled practitioner who understands how algorithms function can use them to work in new ways. A recent example is Autodesk's Generative Design software that functions in a distinctly different way than traditional CAD/CAM software. Rather than being a tool that aids

in visualizing the ideas of a human designer, this software takes a set of high level design goals for a particular products and a set of parameters (such as a type of material or cost or weight) and then generates a large set of alternatives by rapidly evaluating all possible solutions and identifying those that satisfy the initial criteria. It then invites the user to pick what the 20th century designer Raymond Loewy called the “most advanced yet acceptable” (MAYA) solution.

Much as a jazz musician improvises by responding in real time to musical ideas from fellow musicians, so a designer can learn to interact with novel ideas being generated by an AI program and create something new. The difference between the two types of collaborations is that musicians are the same species. Generative Design, on the other hand, is a process that involves collaboration between a digital tool that has vast pattern recognition capabilities and a human who brings creative thinking, common sense, and a range of subjective feelings. This new tool has already been incorporated into some of Autodesk’s more traditional design software packages and is being used to find new, innovative solutions in fields ranging from architecture and aerospace engineering to consumer products and automotive design.⁵

FIGURE 1: Example of Generative Design



One part, a seat belt latch (right), created through a Generative Design process, that replaces an assembly of nine different parts (left): Lighter, stronger and capable of being manufactured via 3D printing, the new part is almost impossible for a human to design unaided. *Source: Mickey Manus presentation for the 2019 Aspen Institute Roundtable on Institutional Innovation.*

McManus concluded on a cautionary note: even though artificial intelligence may seem to be super intelligent, algorithms, like many other tools, are created by humans and therefore subject to human error or limitations. As we explore the potential of these new tools, we need to pay attention to initiatives such as *aiweirdness.com*, that uses humor to illustrate “how machine learning algorithms can get things wrong,” or the Algorithmic Justice League that uses storytelling to highlight the ways in which algorithms can encode human biases—especially gender or racial bias—in systems that purport to be objective.

Beyond Creativity

While enhancing creativity can be valuable, it is not the only human quality that is important for a productive and humane society, and for a successful company. Margaret Levi, Professor of Political Science at Stanford University, stated that empathy is a critical capability for the future. Without empathy, how can a leader—or any worker—relate to others?

Michael Arena, Vice President of Talent at Amazon Web Services, told a story about a senior executive at General Motors (Arena’s former employer) who was tasked with finding a “mobility solution” for an aging population. To explore this problem, he visited several retirement homes and asked residents questions like, “What was it like the day you gave up the keys to your car?” When he heard the response that “it was the worst day of my life,” he committed himself to taking on the problem of mobility. One outcome has been an emphasis at GM on the needs of older drivers, which has included developing self-driving vehicles specifically designed for retirement communities.

**...empathy is a critical capability for the future.
Without empathy, how can a leader—or any
worker—relate to others? – Margaret Levi**

Erica Muhl, Dean of the Iovine and Young Academy, shared a similar story about a project undertaken by a group of students in the Academy, a new undergraduate school at the University of Southern California

(USC) whose mission is to nurture critical thinking and creativity at the intersection of arts and design, engineering and computer science, business and venture management, and communication. The project was a collaboration between the Academy and USC's Convergent Sciences Initiative to utilize a user-centered design approach to tackle problems in the field of cancer research and patient care. While traditional medical research focuses on understanding a disease, user-centered design starts with exploring and empathizing with the perspective of the users of any potential solution. This approach yielded a number of valuable insights, such as the fact that patients themselves can be the source of massive amounts of clinically relevant data, "if they can be sourced in ways that are encouraging (and therefore engaging), humanizing as well as quantifiable." In addition to generating data that was scientifically useful to the researchers, the project showed that feeding data back to the patients themselves empowered them to track and control the progress of their care.

For a number of the researchers, this project provided the first opportunity to interact with and learn from patients on a human rather than a clinical level. Muhl noted, "In every case, [this experience] was life- and work-changing, due to the creation of empathy." Muhl added that she is convinced that empathy can be taught and, in fact, is being added to the undergraduate curriculum at USC.

From Skills to Capabilities

Empathy is just one example of what John Hagel and John Seely Brown, Co-Chairs of the Deloitte Center for the Edge, have described as "enduring (human) capabilities" that, they argue, have become increasingly important attributes for workers. In a recent paper,⁶ they note that "through much of the 20th century, businesses depended almost wholly on skills to get work done." The archetypal corporation was seen as a collection of individuals with a variety of specialized skills closely linked to a set of well-defined processes or disciplines (e.g., manufacturing, financial management, logistics, engineering, research, sales, HR, etc.) that were organized to produce high quality products and deliver them to customers as efficiently and reliably as possible. Guided by this model, organizations focused on recruiting workers with specific skills and/or providing training programs that teach needed skills. Many identify this as the traditional workscape.

Then the world changed: technology kept evolving and generating new challenges and opportunities, customer expectations grew more varied and volatile, and competition grew more intense. To keep up, many organizations placed greater emphasis on “reskilling” and “upskilling” their workforces, while others opted for a strategy of firing workers with obsolete skills and hiring new workers with new skills. But according to Hagel and Brown, in such a volatile environment, “skills aren’t all that are core to success.” Beyond having a workforce that is good at executing standardized, repeatable processes and techniques, long-term success will depend on the ability of organizations to find and support workers with the “enduring human capabilities” that are needed for a “mindset and disposition to rapid learning that is required to thrive in an environment of constant disruption.” Thus enters a redefined workscape.

...in a volatile environment, “skills aren’t all that are core to success.”

– John Seely Brown and John Hagel

Hagel and Brown identify two different types of capabilities that are becoming critical for business success: innate capabilities—such as imagination, empathy, curiosity, and creativity—that are largely inborn, but that can be cultivated through use and encouragement; and developed capabilities—such as emotional and social intelligence, teaming and adaptive and critical thinking—that can be acquired and improved over time (see Table 1). These capabilities are not only valuable assets in themselves, but workers with these capabilities are well-equipped to identify and learn, often on their own or with minimal corporate support, specific skills they see as important in their work. The same curiosity and resilience that spur them to tackle new business opportunities also serve them well in keeping current in terms of needed skills. In fact, the most effective form of learning is “just in time”—learning not in formal training programs but rather learning in the course of tackling a new challenge that may call for new skills to be mastered—growth that is reminiscent of the way Duke Ellington’s jazz musicians continually improved by working together and pushing themselves to try new things.

TABLE 1: Example of Generative Design

Enduring human capabilities underlie individual effort and effectiveness	
INNATE but can be amplified	DEVELOPED through experience and practice
Imagination Seeing through variety of lenses that challenge present assumptions of what is possible	Emotional intelligence Understanding others' emotions and experiences and how they shape human interactions
Empathy Understanding and considering others' feelings, thoughts, and experiences	Teaming Collaborating effectively across spatial, organizational, and cultural boundaries
Curiosity Seeking out new information and experiences; striving for understanding; asking questions	Social intelligence Understanding interpersonal dynamics and behavioral impacts of human interactions
Resilience Persisting despite challenges, obstacles, and disruptions	Sense-making Creating meaning and awareness out of collective experiences
Creativity Innovating and applying improvisation; using resources in unexpected ways	Critical thinking Analyzing, evaluating, synthesizing, and reconstructing information
	Adaptive thinking Recognizing new patterns and applying patterns in new contexts
CONDITIONS: Organizational culture and mindset influence if, and how, we demonstrate capabilities	
Source: Deloitte analysis.	

Source: Deloitte Center for the Edge, *Deloitte Insights: Skills Change but Capabilities Endure*. See: www2.deloitte.com/content/dam/insights/us/articles/6332_From-skills-to-capabilities/6332_Skills-change-capabilities-endure.pdf

Alexi Robichaux, Co-Founder and Chief Executive Officer of BetterUp, noted that it is tempting for organizations to get overly focused on the importance of skills because they are relatively easy to define and measure. But it is the underlying capabilities such as curiosity and a willingness to change that provide the psychological resources needed to acquire new skills. Other capabilities like empathy, compassion and cognitive agility are also important—and, like skills, can be learned and inculcated into the modern workscape.

The Dimension of Trust

Another vital attribute for a healthy organization identified by the Roundtable participants is trust. Starling Trust Sciences works with financial services firms to manage non-financial risk by identifying the human factors that erode trust or build trust. According to Starling Chief Executive Officer Stephen Scott, rather than developing elaborate technology-based risk management systems that rely on multiple layers of defense—the conventional method of defending companies against internal and external threats—the company focuses on supporting the human factors that enhance trust. Through a combination of behavioral science, organizational network analytics and machine learning, Starling helps organizations to identify and harness “networks of trust” and to build on those by “cultivating a sense of belonging and community, fostering camaraderie and collaboration, and engaging people in a shared mission and a common culture”⁷—in other words, relying on the human dimensions of trust rather than trying to impose technology-based solutions.

Trust is also a critical factor at the National Aeronautics and Space Administration (NASA). According to Robert Gibbs, the agency’s Chief Human Capital Officer, assuming positive intentions on the part of all employees is a working principle at NASA, where virtually every decision can be a matter of life or death. In areas where the stakes are lower, there is a strong culture of experimentation where people are encouraged to learn from their failures. The organization is very much mission driven, which plays a big role in inspiring employees to take their jobs seriously. One measure of worker commitment at NASA is that there is almost no churn in its workforce.

Michael Arena of Amazon Web Services noted that trust needs to be seen contextually. That is, there are circumstances where trust is essential and other situations where it can be disastrous. Large organizations do not consist of a single, homogenous culture, but rather are made up of a collection of subcultures that are shaped by their leaders and by the nature of their mission and goals. Some parts of Amazon are mainly focused on stabilizing performance in order to improve efficiency and reliability while others are committed to pursuing innovation.

For most large commercial organizations, the dominant goal is still achieving scalable efficiency—driving down costs by optimizing and

standardizing operations, a goal that discounts the value of individual contributions. In such an environment, John Hagel noted, the most important questions are, “How quickly can I automate my operations?” and “How many jobs can I eliminate?” And the only purpose of learning is to get work done faster and cheaper.

In fact, according to Sarah Gretczko, Chief Learning and Insights Officer at Mastercard, in many large corporations, the budget for severances can be up to five times larger than the budget for training.

While CEOs like to talk about the need for reskilling their workforce, they often fail to make the connection to individual workers and their needs. Many leaders vacillate between the desire to innovate and grow and the imperative to drive down expenses. Increasing the commitment of leaders to their employees, especially in publicly traded companies where pressure for consistently increasing profitability is unrelenting, may require a convincing demonstration of the superior return on investment (ROI) of retraining existing workers versus firing less skilled workers and hiring new ones.

Employee Cost, Value, and Meaning: Building Superminds

Is it possible for an enterprise to create new value and meaning even as it reduces costs?

Achieving these disparate goals is possible but will depend, according to Tom Malone, Professor of Management at the MIT Sloan School of Management, on tapping into the power of “superminds.” Malone defines a supermind as a group of people acting together in ways that seem intelligent. Like individuals, but unlike computers, superminds exhibit what can be described as general intelligence, the ability to perform well across a variety of tasks.

Although the term may be unfamiliar, superminds are all around us. In fact, Malone believes that superminds run the world. For example, every company is a supermind. A company can be defined as a machine made of people, but also as “a mind made of people” who work together to carry out complex tasks. Think about how General Electric is able to build a jet engine, or how a movie studio produces a film, or how a shipping company can deliver a package anywhere in the world in a few days. All of these are tasks that are too large and compli-

cated for any single person to accomplish on his or her own, but require the skills and the coordinated effort of scores of people.

In addition to companies, communities, democracies, markets and ecosystems are other kinds of superminds. Although they all consist of groups of people working together, they differ in terms of their structure and, particularly, their method of decision-making, a key aspect of collaboration:

- *Companies* function through a hierarchical decision-making process, where people higher in the organization determine what people below them should do;
- *Communities* (which may be geographic or communities of practice) typically make decisions through a process of informal consensus based on shared social norms;
- *Democracies* decide through voting, where the majority generally rules; while markets operate through a myriad of decisions between pairs of individuals (buyers and sellers) who agree to trade resources with one another;
- *Ecosystems* are yet another type of supermind, in which “decisions are made based on who has the most power and the greatest ability to survive and reproduce,” describes Malone. This kind of supermind activity can be found in military conflicts, but also in other types of conflicts between superminds, such as struggles for marketplace dominance between competing companies or in a scientific field where conflicting theories compete for acceptance.

Byron Auguste, Chief Executive Officer and Co-Founder of Opportunity@Work, noted that we are simultaneously members of multiple superminds, and that there are a variety of connections between different types of superminds: for example, companies function within and are influenced by communities, states, and markets. While corporations were historically answerable to states and communities that regulated their behavior, they are now primarily answerable to markets that determine their value.

Movements represent yet another type of supermind. Typically led by evangelists who help them to grow, movements tend to be more focused on a single goal than communities or other types of super-

minds that typically function as arenas in which their purposes are worked out. One useful way to think about movements (like gay rights or #MeToo) is as a sub-community that influences a larger community to change its values.

Not all superminds are equally effective. In earlier research, Malone and colleagues explored what determines the “collective intelligence” of a group.⁸ It turned out that the individual IQs of the members of a group were less important to the group’s collective intelligence than three other factors: the average social intelligence of group members (their ability to “read” the emotional state of others, a factor that correlated closely to the percentage of women members in a group), the degree to which members participated about equally in group interactions, and the cognitive diversity of the group (the differences in thinking and perceiving styles of members).

Making Superminds Smarter

Although superminds have been around since the dawn of civilization (think about the pyramids or other wonders of the ancient world that required complex, coordinated effort over time), there is something distinctively new in recent times that has the power to make superminds smarter: the computer. Although computers have demonstrated the ability to function in surprisingly intelligent ways, Tom Malone at the MIT Sloan School of Management is skeptical that computer-based AI will achieve any real measure of “general intelligence” in the foreseeable future. But there are a number of ways in which groups can make use of computers to function more effectively... and more intelligently.

Among the activities that are vital to how groups function, there are a number that can be supported and enhanced by incorporating computers with people in what Malone describes as “cyber-human systems” that take advantage of the strengths of each. These activities include sensing the world (identifying important signals or spotting unseen patterns through mechanisms like the Internet of Things, neural nets or big data analytics); remembering the past (via historical records); creating options for action or deciding what actions to take (for example, via a system that generates and evaluates millions of possible strategies), and even learning from experience (by automating the process of experimentation and discovery).

Malone has also identified four distinct roles that computers can play to make a supermind smarter. In order of increasing sophistication, they are:

- As *tools* that can either “increase the specialized intelligence of individuals,” as in the case of an accountant using a spreadsheet or facilitating more effective communication among members of a group. Connecting people has, in fact, been the most important contribution of computers to date and is likely to continue to be so for several more decades. Computers are now enabling people to be “hyperconnected,” linking them together in ways that were not previously possible.

Applications such as email and texting are so pervasive that it is hard to imagine working (or living) without them. Newer tools, like Slack or Microsoft Teams, have been designed explicitly to support group work. But computers, along with computer networks, are enabling entirely new ways of collaborating. One good example is Wikipedia, the joint creation of a highly decentralized group of individuals who have compiled an unprecedented repository of human knowledge that is being continuously expanded and updated and is available at no cost to anyone on the Internet. With a few exceptions (see below), all of the content of Wikipedia has been created by computer-linked humans working independently but all following a relatively small set of rules and standards that ensure the coherence and reliability of the larger endeavor.

- As *assistants* that can automate some of the routine tasks that can occupy much of the time of group members. Voice-based virtual assistants such as Apple’s Siri or Amazon’s Alexa can take on tasks and execute them without continuous supervision from a user. When customers call a bank or an airline, or almost any institution to seek support, they often begin by interacting with a voice-response system that gathers information about the customer’s account and particular concern before passing them on to a human. While the tasks that these AI-based systems perform today are relatively simple, future systems will be capable of carrying out much more complex tasks.⁹

- As *peers* that take on some of the functions of a fellow team member. For example, Wikipedia now employs bots that have the ability to make certain kinds of edits autonomously, essentially carrying out tasks that previously would have required human attention. Thus, one bot is able to undo edits that are likely to be instances of malicious vandalism (e.g., adding obscene comments), while another is able to check for content that may have been plagiarized.

Another example of a tool to connect people in a new way is InnoCentive, an online “crowdsourcing” platform that enables organizations to seek help in dealing with difficult problems by posting challenges online and offering rewards for the best solutions. Interestingly, the majority of prizes have been won by individuals or groups who had not previously won any awards and who often lacked the kinds of credentials or experience that “experts” in the various fields would be expected to have. By widening the pool of potential problem solvers available to an organization, InnoCentive has also effectively widened the scope of potential solutions.¹⁰ Autodesk’s Generative Design software, described above, serves more like computer-as-peer, as it is able to independently generate new design solutions.

- Finally, as *managers* that, like humans, assign tasks and coordinate and evaluate the work of people. In his book, Malone describes CrowdForge, an experimental computer-based system developed at Carnegie Mellon University that breaks down complex tasks into simpler micro-tasks, then automates the process of assigning these tasks and assembling the results into a finished product. The system has been used to create factual articles by dividing up a writing assignment among a group of individuals who all work online. It allocates to different individuals specific tasks that include producing an outline for an article, doing research, writing specific sections of the content, which the computer system then compiles into a complete article. Interestingly, readers judged the results of this automated management system as superior to similar articles written entirely by a single author.¹¹

Challenges for Superminds

As computers get smarter and more capable of taking on roles of greater responsibility, as they evolve from serving just as tools or assistants to acting as peers or managers, the issue of trust will inevitably arise. While humans have developed many strategies and systems for building trust in each other, what happens when machines take on a decision-making role? To what extent is it appropriate to trust their decisions? How can we determine how much to trust them? In an article in the *MIT Technology Review* titled “The Dark Secret at the Heart of AI,” author Will Knight explains that “no one really knows how the most advanced algorithms do what they do.”¹²

The first generation of AI systems were built from a series of rules that specified how a decision would be made and whose logic could therefore be analyzed. But because of the large effort involved with constructing step-by-step decision-making processes, such systems proved to be of limited value. AI really came into its own with the development of techniques like deep learning that make use of very large amounts of data to develop the ability to find connections in ways that exceed human abilities and perhaps humans’ ability to understand how they do so. The innate complexity of deep learning systems makes it difficult to determine how a decision is made.

**While humans have developed many strategies
and systems for building trust in each other,
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making role?**

The problem is that these systems may be very powerful, but they are not infallible. For example, it may be true that self-driving vehicles are safer than human drivers, but AI-powered vehicles have already been involved in several fatal accidents. If the technology is to become fully legal and widely adopted, it will be necessary to be able to understand what went wrong and how it can be fixed. Knight describes the research of computer scientists like Carlos Guestrin at the University

of Washington who are working to give AI systems the ability to automatically provide a rationale for their output in an effort to achieve “explainable AI.” Still, Guestrin acknowledges that “we’re a long way from having truly interpretable AI.”

Rather than working to build AI systems that solve problems autonomously, it may make more sense to build systems that enable humans and machines to work together to tackle the most critical and complex tasks. John Seely Brown pointed to free style chess as a good example of such a partnership. Instead of pitting computer programs against humans, freestyle chess allows individual players or groups of players to consult any expert they wish, including making use of computer-based chess programs. By combining the brute force of computer analysis with human intuition, freestyle players have shown themselves capable of levels of performance that can equal that of the world’s strongest players: “kids with computers can beat the best chess programs and grandmasters.”

In an article in *Wired*, Byron Auguste at Opportunity@Work argues that “the biggest technology opportunities have always augmented the work of humans rather than replaced it altogether” and predicts that “augtech” will emerge as an important, widely recognized category of software akin to fintech or biotech. The biggest barriers to its emergence are persistent institutional biases—including “tax codes, accounting standards, executive compensation systems, dysfunctional training systems [and] exclusionary hiring practices”—that favor automation over augmentation.¹³

Finding Meaning

Another critical dimension that remains unaddressed as people and machines learn to work together is that of meaning. How is meaning created and is there any role for computers in this process? According to Tom Malone, meaning is created when humans work toward a purpose that is larger than themselves. If “being smart” is measured by the ability to achieve goals, then wisdom is a matter of achieving goals that are worthwhile. Deciding what is good and worthwhile is a distinctly human activity, and one that would seem to be beyond the ken of computers. We may be in the age of artificial intelligence, but the prospect of artificial wisdom still seems distant.

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Max Mancini, Executive Vice President of Automation Anywhere, proposed that while people are responsible for identifying a common purpose for themselves, automation can free up a group's cognitive capability to enhance the pursuit of that purpose or even, perhaps, to go beyond it to seek a new purpose.

Inevitably, leaders are responsible for setting goals and managing the activities of their organizations. They are also responsible for creating a corporate culture that will determine whether workers feel empowered to take the initiative or are content (or resigned) to simply fill an assigned role.

The potential of superminds and the continued evolution of technology to enhance that potential represent a new management challenge. Robin Jones, U.S. Workforce Transformation Leader for Deloitte, suggested that leaders need to be educated on the variety of supermind models and the potential they offer. Seeing their organizations as a collection of superminds, each with its own capabilities, provides a new way of thinking about their role. The default "centralized hierarchical mindset" that typifies most corporate leadership might not be the best way to understand the challenge of managing a collection of superminds and, especially, the potential for building super-intelligent systems that blend human and machine intelligence.

How to best leverage the power of superminds is dependent on the context in which they operate. Lisa Chang, Chief People Officer of The Coca-Cola Company, noted that while superminds exist in all organizations, different organizations will prioritize different types. For example, the management structure in sports organizations is very hierarchical, while empowering all employees is more important in start-ups. Coca-Cola is a 134-year-old global enterprise with over 60,000 employees in The Coca-Cola Company, and approximately 700,000 people in the ecosystem including its bottlers. While the original founders of the company may be long gone the company culture is still quite strong. With so many employees globally the challenge now is communicating

and embedding one singular purpose that unifies and inspires people, a task for which technology is likely to be of little use.

Shaun Smith, Senior Vice President and Chief Human Resources Officer at New York-Presbyterian Hospital, added that employees are more motivated and more committed when they feel that they are part of the decision-making process. His organization decided that it needed to become more agile, which required a substantial culture shift. Even as it was embarking on a major transformation, the organization remained true to its core values to guide decision-making. Making sure that everyone was included in the conversation about how the change would happen helped keep everyone aligned around the same goals.

One of the most useful things leaders can do is to simply listen to their own teams, then reflect on what they have heard. John Hagel at Deloitte suggested that one of the best ways to empower and inspire superminds is to “frame powerful questions” for them to take on. Unfortunately, asking questions is generally viewed as a weakness in a leader and few CEOs are comfortable in asking for help. Yet, it is unrealistic to expect that any leader will have all the answers. Rather than trying to go at it alone, it is better to create a culture that can generate options for action.

Preparing for Work in the Digital World

New ways of working require new kinds of education. The Iovine and Young Academy was established at the University of Southern California in 2013 to provide a “degree in disruption” that would equip graduates with the skills needed to succeed in the new world of work. Rather than being conceived as an interdisciplinary program, the Academy was specifically intended to tap into “the power of undisciplined thinking.” Specifically, the school’s curriculum was designed to “nurture critical thinking and unbridled creativity at the intersection of arts and design, engineering and computer science, business venture management and communication.”¹⁴ The Academy initially offered a four-year BS degree and has added a master’s degree in Integrated Design and Technology. It is also planning to add a minor in health innovation and a master’s degree in product innovation. In 2018, it became USC’s 20th professional school.

The Academy's first class of 25 students enrolled in 2014 and graduated in 2018. Although it is difficult to generalize about a highly diverse group of students,¹⁵ Erica Muhl, the Academy's founding dean, described one member of the class. To be admitted, each applicant is required to submit a 60-second pitch video that poses a problem and suggests a possible solution. Joseph May chose to develop a new means of supporting people with hearing problems, a condition that he himself suffered from. His proposed solution was to create an augmented reality system that would turn sounds into visual images.

During his freshman year at USC, May wanted to take a graduate course in optics. The professor who taught the course agreed to admit him with the provision that he demonstrate that he was capable of keeping up with what was being taught. He had taken all of the math he needed for the course before he started school, and he ended up completing the course with a grade of B+. By his sophomore year, May had created a prototype of his augmented reality headset, which went on to win several design prizes. By the time he graduated, May had founded a company called Mira that raised \$2.5 million in venture capital funding.¹⁶ The company is now selling a smartphone-powered headset that is provided free with purchase of the company's AR software package.

The Academy's curriculum is built around an ethos of making and aims to inculcate an entrepreneurial "fail/learn/repeat" mindset in its students. In addition to teaching specific skills, the program is dedicated to building capabilities such as creativity and collaboration. The Academy is built on the assumption that the half-life of data science or other technical degrees is five years, so the program is designed to promote lifelong learning, which includes ensuring that the students are adept at adopting new technologies.

An important part of the program is experiential and service learning, which involves placing students in both businesses and nonprofit organizations. The goal is to produce strong problem solvers across a variety of domains. Graduates from the Academy's first two cohorts have gone into a variety of careers, including working in tech, product design, content creation, analytics, and start-ups.

...all higher education institutions need to consider how to accommodate students who arrive very familiar with technology and eager to work creatively and collaboratively with others.

– *Erica Muhl*

Muhl concluded by asserting that while the Academy's approach to education is unusual if not unique, all higher education institutions need to consider how to accommodate students who arrive very familiar with technology and eager to work creatively and collaboratively with others.

The Arts and the Sciences

Several Roundtable participants raised the question of whether this kind of tech and innovation-focused educational program could or should replace a conventional liberal arts education. Margaret Levi at Stanford University worried that these students could end up ignorant about history, literature, and politics. Even at Stanford, she encounters faculty members with strong technical backgrounds but with little knowledge of the history of issues that they find themselves dealing with.

Tom Malone responded by suggesting that creating problem solvers, creative thinkers and lifelong learners is, in fact, the essential goal of a liberal arts education. Still, employers seem to value specific technical skills over those with broad liberal educations, which has narrowed students' views of the career ladders they need to climb. Mickey McManus at Autodesk proposed that liberal arts may have failed "by having been too successful." Liberal arts were the foundation for enlightenment culture but became dispensable when its people began to doubt its value in the marketplace.

But it may be premature to give up on the value of traditional academic disciplines, which still retain a lot of clout. There do not seem to be any academic journals for "undisciplined professors." It is not clear how an academic culture that still values professional publication will

measure their effectiveness. And there is still value in “going deep” in one specific discipline. Carnegie Mellon University’s program in game design, which is celebrating its 20th anniversary, serves as an example of an academic program that has successfully combined traditional studies with nontraditional subject matters.

Erica Muhl noted that in order to graduate, Academy students are required to take ten to twelve regular university courses in addition to participating in their own program. And the Academy’s curriculum is not exclusively focused on technology and business but includes an extensive process of self-analysis focused on exploring the implications of their projects.

John Seely Brown at Deloitte proposed that the question of the sciences versus the humanities should not be seen in terms of “either-or” but rather as a matter of both/and. To deal with the kinds of problems that workers are increasingly facing, they must transcend the distinction between the two fields and combine the skills and knowledge of both. In *Design Unbound*,¹⁷ Brown and his collaborator, Ann Pendleton-Jullian, describe a new set of practices that are required to deal with the complex problems that are increasingly common in a “whitewater world” that is rapidly changing, hyperconnected, and radically contingent.

...we are now living in a hyperconnected “age of entanglement” – John Seely Brown

Traditionally, when making long-range plans and strategies, individual problems could be identified and analyzed more or less in isolation and the solutions could be expected to remain valid for a significant period of time. But as the rate of change in our world has accelerated and connections have multiplied, the skills that are needed to survive and flourish are more like those of a whitewater kayaker who must be constantly attuned to the ever-shifting conditions that surround him and that demand responses that are holistic and instantaneous.

Moreover, we are now living in a hyperconnected “age of entanglement” in which everything is linked to everything else. We are no longer

just dealing with complicated problems but with complex problems that morph as soon as we start to solve them: “you cannot learn about a problem without trying solutions, but every solution you try has lasting unintended consequences,” wrote Brown.¹⁸ In the words of philosopher Karl Popper, today’s most pressing problems are “clouds” not “clocks”:

To understand a clock, you can take it apart, look at its individual pieces, study the pieces.... A cloud you can’t take apart. A cloud is fundamentally a dynamic system. A cloud you can only study as a whole.¹⁹

To work effectively in this world, Brown and Pendleton-Jullian make the case for development of a “pragmatic imagination” that is not limited by the linear logic of the sciences even as it grapples with the practical constraints of real-world problem solving. They describe this new approach as a “fusion” of the disparate fields that incorporates elements of both but has its own characteristics, just as fusing two different metals can produce a powerful new alloy with its own distinctive properties that differ significantly from either component.

Alternative Paths to Employment

One hopeful sign of change is that some companies are taking a new, broader view of the qualifications for a job. Sarah Gretczko at Mastercard noted that a growing number of employers are willing to hire students without four-year degrees if they have interesting nontraditional credentials. But more needs to be done: a study published in March 2020 by Opportunity@Work, *Reach for the STARS*, reports on research that finds that there is a large and underappreciated talent pool of 71 million Americans who are “Skilled Through Alternative Routes” (STARS).²⁰ These are workers who are currently in low wage jobs but have “suitable skills sets to succeed in work that is more highly valued and therefore better paid than they work they do now.”

The main barrier that these workers face is that although they have high school diplomas, they lack a BA, which many employers require for higher-level jobs. The report found that there are five million “Shining STARS” who have managed to get higher-paying jobs despite their lack of a college degree; 30 million “Rising STARS” who have the skills now that should qualify them for a job in a higher wage category;

and 36 million “Forming STARS” who have some skills needed for a better paying job but are not currently well situated to get a better job, a group that is “especially susceptible to the impact of automation.” The report notes that it is ironic that in a time when many companies see themselves engaged in a “war for talent” to keep themselves competitive, they are overlooking the vast potential of this pool of workers.

An Adaptable Workforce?

But what will happen to jobs in the future as AI becomes more capable and takes on a broader spectrum of tasks? Hans Peter Brondmo, Robot Whisperer at Google X, asked whether, as more and more jobs with standardized, repetitive components become automated, will we be creating a new “useless class” of workers? While the elite students in programs like the Academy will flourish in such a world, what will happen to the mass of workers with fewer skills? A recent research study provides a reason to be optimistic about the ability of workers to adapt to the changes that are coming in the wake of automation and other new technologies. In a 2019 article in the *Harvard Business Review*, a group of researchers led by Joseph B. Fuller, co-chair of the Project on Managing the Future of Work at Harvard Business School, reported on the results of a large survey on the future of work conducted in the U.S. and seven other developed countries in Asia, Europe, and South America.²¹

The survey, which included 6,500 business leaders and 11,000 workers, found that “the two groups perceived the future in significantly different ways.” The business leaders who participated in the survey “felt anxious as they struggled to marshal and mobilize the workforce of tomorrow” and were worried about how they “can find and hire employees who have the skills their companies need and about what they should do with people whose skills have become obsolete.” By contrast, “the workers didn’t share that sense of anxiety. Instead, they focused on the opportunities and benefits that the future holds for them.” The surprising bottom line: workers were “much more eager to embrace change and learn new skills than their employers gave them credit for.” The authors use these results to argue that managements need to recognize workers’ willingness to change and to collaborate with them in reinventing their jobs.

Redesigning Work, Adding Value

Much like 30 years ago when John Clarkeson wrote about the need for new ways of working, most jobs today still consist of tightly specified routine tasks, precisely the kinds of jobs that are most susceptible to being automated. Having workers spend time with unexpected problems is often seen as a detriment to efficiency, a sort of necessary evil that must be accommodated but should be kept to a minimum. But creating solutions to unanticipated problems can provide valuable opportunities to create new value. And, as Fuller and his colleagues found, many workers are very open to taking on new challenges in their day-to-day jobs.

To illustrate the power of redesigning work, John Hagel described the experience of Quest Diagnostics, the country's largest provider of clinical test services to health care companies, as it tried to deal with serious problems at the company's call centers.²² In 2013, the company had reduced the number of its call centers from 20 regional centers to just two national centers located in Kansas and Florida. The centers were organized in a traditional hierarchical structure in which managers closely supervised the front-line workers who were regularly evaluated on the number of calls they handled per day and the average time spent in answering customer questions.

The two centers, which handled some 55,000 calls a day from doctors, hospitals, and patients, were experiencing high turnover and absentee levels, and low productivity due to the inexperience of customer service reps. Callers were getting frustrated by their inability to get their questions answered or get the results of lab tests promptly. As a result, the company was losing customers to competitors who were providing better service.

Three years ago, the company launched an effort to address these problems by rethinking and redefining the work of call center representatives. Front line workers were organized into small pods of 10 to 15 people who were encouraged to work together to address customers' problems. Pod members met weekly to discuss their work experiences and identify problems that needed attention. Quest also committed to harnessing technology to improve call center performance. The company undertook an effort to identify routine tasks performed by customer service reps that could be automated, but it involved the reps themselves in the process and made a commitment that no one would be laid off because of automation. A key result of the process was a

major upgrade of the company's website that made it possible for customers to get many of their questions answered online.

As the day-to-day demands on reps lessened, they were able to spend more time on finding new ways to provide value. They invested their time in developing a deeper understanding of the company's products and how Quest could better serve its customers. For example, the company was able to focus on the management of chronic care and on being more proactive in preventing health problems. These changes resulted in a 17 percent decrease in overall call volume, even as the total number of customers increased. And annual worker turnover at the call centers fell from 34 percent to 17 percent. The project was so successful that Quest is now expanding it to other parts of the company.

The most important lesson from this project, Hagel suggested, is that it focused not at how to use technology to automate operations or eliminate jobs but rather on strategies to make existing workers more productive and provide customers with greater value. Quest discovered that there was actually a hunger among its workers to work in ways that are more satisfying and meaningful.

The project also illustrates the value of engaging front line workers, who often have the best view of customer needs, in the process of deciding how to deploy technology in operations. And this story demonstrates that the focus of attention should be on small groups rather than on individuals. Workers are able to learn more and improve faster when they are organized into teams of five to 15 people who can share learnings and develop a strong sense of trust in each other (from Tom Malone's perspective, each pod could be seen as a supermind, and the result of the project was to increase the collective intelligence of each one.) Finally, the job redesign was successful because the company was able to identify a set of "metrics that matter" to guide its effort and provide meaningful feedback on what worked.

Strategies for the New Workplace: The Importance of Meaning

One of the central assumptions of the Aspen Roundtable has been that providing opportunities for meaningful work is good both for employers and employees. But, in addition to stories about the desire for meaning in work, is there any hard evidence that this is actually the case? And, if so, does it matter?

A study done by BetterUp in 2017 attempted to answer these questions. The study “Meaning and Purpose at Work”²³ was based on a survey of 2,285 professional workers in the U.S. and explored how important meaningful work was to them, how meaningful they judged their current jobs to be, and what factors contributed to making a job meaningful.

Alexi Robichaux of BetterUp, presented the key findings from the survey that provide strong support for the importance of meaning to workers:

- Employees whose work feels meaningful work longer hours and are absent less. They also are less likely to leave their jobs and are more likely to receive raises and promotions.
- On average, workers say that their jobs are about half as meaningful as they would like them to be. Just one in 20 respondents said that their current job “is the most meaningful work they could imagine having.”
- Meaning and social support at work are closely related.
- More than nine out of ten workers would be willing to trade a percentage of their lifetime earnings for greater meaning at work.

The survey also documented the fact that in addition to making workers happier, providing meaningful work yields tangible benefits for employers. For every 10,000 workers who have meaningful jobs, a company can expect to enjoy \$82 million in annual productivity gains, 19,500 fewer days of paid leave per year, and savings of \$55 million in reduced annual manager turnover costs.

Providing meaningful work seems to offer many benefits to both employees and employers. But what, exactly, makes a job meaningful? The survey identified three key dimensions of work that are vital to a sense of meaning: providing for personal and professional growth, a shared sense of purpose with fellow employees, and an opportunity to be in service to others. Other important factors that contribute to meaning are a sense of balance between personal and corporate priorities, a chance to be inspired by work, and having a corporate culture that supports honesty (see Figure 2).

FIGURE 2: Contributors to Meaning at Work



Source: BetterUp, *Meaning and Purpose at Work*.

See: <https://get.betterup.com/rs/600-WTC-654/images/betterup-meaning-purpose-at-work.pdf>

Robichaux offered four concrete strategies for supporting meaning at work based on the survey results:

1. Allow for flexibility at work—e.g., give employees the ability to set their own schedules or to work remotely (at least one-third of employees prefer working remotely, at least part-time).
2. Provide opportunities for self-care—time to exercise, rest, or find quiet time away from disturbances. Particularly valuable is time for “self-reflection;” those who do this most regularly are more likely to be promoted or get a pay raise.
3. Strive for alignment between individual and corporate values—for example, managers can help foster a sense of meaning by tying the goals of a specific project to those of the larger organization.
4. Guard against “toxicity” in the workplace—by strongly combatting bullying, discrimination or harassment of any kind. Meaningful work and a positive, supportive culture build on each other.

Making Space for Innovation

How can large organizations that have been shaped by the pursuit of scalable efficiency change themselves to be more agile and more hospitable to creativity and innovation?

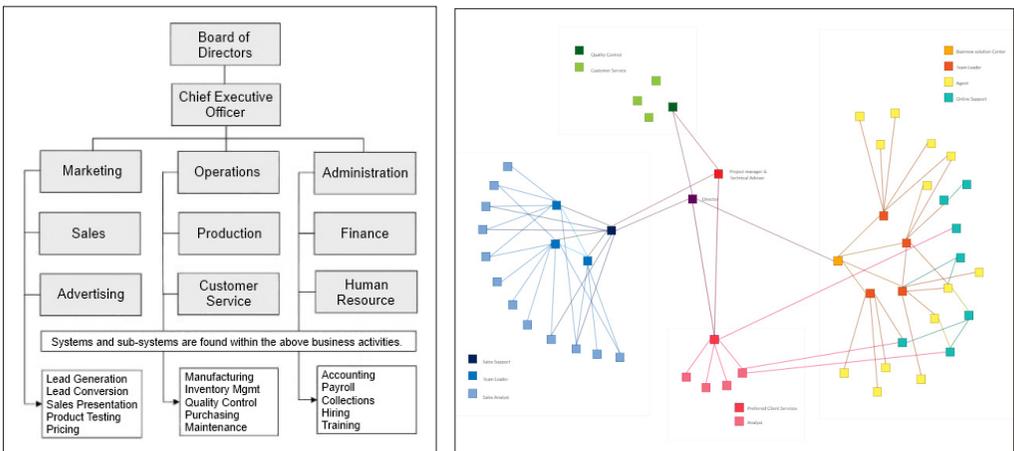
Perhaps the most impressive account of transforming an existing institution came from General Stanley McChrystal at an earlier Aspen Institute Roundtable on Institutional Innovation. He related how shortly after he took command of the Joint Special Operations Command (JSOC) in Iraq and Afghanistan, he realized that, although his troops were superb fighters and had a strong record of achieving the goals of the missions they were assigned, they were losing the critical battle for intelligence. They needed a different mission and a different structure.²⁴ McChrystal’s account of how he did this—literally under fire—is inspiring and contains a number of useful lessons for leadership (some of which he shared in his 2015 book, *Team of Teams*).

Another perspective on how to make traditional companies more agile comes from Michael Arena, who served as Chief Talent Officer

at General Motors before moving to become Vice President for Talent at Amazon Web Services. Arena also spent two years as a Visiting Scientist at MIT where he studied the relationship between how large companies are organized and their ability to innovate successfully. He found that while we tend to look at the formal hierarchical structure of organizations, which is designed to enable smooth, efficient operations and is easily represented in a traditional organizational chart, structure tells us very little about how innovation actually happens.

Arena contends there is another way to visualize connections within organizations (see Figure 3). This approach uses techniques of network analysis to map how information flows among a group of people in order to identify the actual connections within an organization, which may have little to do with its formal org chart. Arena's research suggests that rather than hoping to make things better by rearranging the boxes on an org chart, a more useful approach is based on understanding the ways in which informal corporate networks operate to either stifle or support innovation.

FIGURE 3: Org Chart vs. Network Chart



[Left] Source: Ron Carroll, *The Systems Thinker Blog*, *BoxTheoryGold.com*. See: www.boxtheorygold.com/blog/bid/105210/The-Organization-Chart-Your-First-Business-System

[Right] Source: *Creately.com*, *Network Organizational Chart*, *Template*. See: <https://creately.com/diagram/example/jgq69t2z1/Network+Organizational+Chart>

To demonstrate the usefulness of network analysis, Arena addressed the question of why so many acquisitions fail. He cited one big bank's acquisition of a smaller but more innovative financial services company. A network graph created six months after the two companies were combined showed that, in fact, few connections had been established between the two organizations. In order to create more connections, the large bank intentionally began recruiting staff from the smaller company to join the parent company. The result was that more innovations began to spread from the smaller company to the whole organization.

Another example comes from a company that was judged to be good at operations but bad at innovation. The firm was organized into a number of small groups with cohesive teams, a structure that increased the speed of development of new ideas by up to ten times, but also resulted in a high likelihood that those innovations would not be accepted and implemented by the entire organization. Expanding "bridge connections" between these groups not only increased the rate of discovery by 25 percent but also led to a threefold increase in the speed of diffusion and adoption of these discoveries.

...“adaptive space”... provides “the freedom for ideas to flow into and throughout an organization, a sort of free trade zone for ideas within large, complex organizations.” – *Michael Arena*

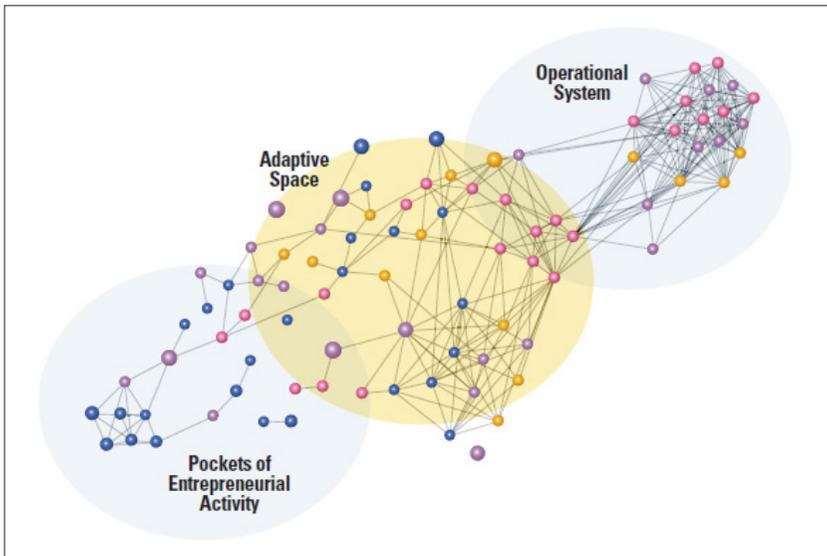
Arena readily conceded that there is a fundamental mismatch between the needs and priorities of an organization's core activities, which he describes as its "operational system," or "the blob," that is responsible for "managing, coordinating, and controlling activities... to drive operational efficiencies." He also acknowledged that in an environment that demands steady growth and punishes failures to meet quarterly goals, taking risks on new and unproven ideas is difficult if not impossible. Those who are in the blob are unlikely to do anything truly bold or risky.

In order to foster innovation, many companies create separate R&D operations or skunk works, encourage them to act entrepreneurially,

and attempt to protect them by keeping them separate from the larger enterprise. But unless there is some sort of bridge between these two radically different environments, the odds are low that good ideas will be adopted by the larger organization.

The missing component is what Arena describes as “adaptive space” that provides “the freedom for ideas to flow into and throughout an organization, a sort of free trade zone for ideas within large, complex organizations”²⁵ (see Figure 4).

FIGURE 4: Adaptive Space (not to scale)



Source: The Plexus Institute, *Adaptive Space*.

See <https://plexusinstitute.org/2018/06/11/the-adaptive-space-imperative>

The secret of creating robust adaptive spaces that ensure that a company’s discoveries and innovations will pay off in increasing corporate performance comes from understanding how people in an organization connect with each other. In other words, an organization’s success depends on focusing not only on building human capital—its workforce of highly talented individuals, but also on nurturing social capital—the relationships of trust among its workers. In fact, leveraging social capital is the key to moving innovations from their inception,

which often happens on the periphery of an organization, to adoption by the blob.

...an organization's success depends on focusing not only on building human capital—its workforce of highly talented individuals—but also on nurturing social capital—the relationships of trust among its workers.

While he was at General Motors, Arena worked on building two different types of organizations: a core that was hierarchical and required traditional talent management, and a second model that was more agile and team oriented. But making both successful depended on ensuring that there were people who would act as bridges between the two.

According to Arena, effective adaptive spaces need people who play four roles, which cannot be found on an org chart but can be identified through network analysis. These roles perform critical but distinctly different functions:

1. *Brokers* who are responsible for the discovery of new ideas, which often come from outside an organization. Brokers typically maintain extensive external networks as well being well connected across internal groups. By providing bridges across groups, they have the ability to overcome their natural insularity. A quintessential example of an effective broker is Steve Jobs whose “genius was his ability to synthesize ideas across his network” and bring them back to Apple for development.
2. *Connectors* who foster collaboration by forging teams that carry out the hard work of turning ideas into useful products. Connectors are able to build trust within teams that “provides a safe and creative environment for experimentation and iteration.” Within an organization, they are the ones who are most frequently contacted for information and are consulted on making critical decisions. Thomas Edison, who, contrary to popular myth, was not a lone inventor, but rather the inspirational leader

of a dedicated team of workers who perfected his ideas, exemplifies the power of an effective connector.

3. *Energizers* who encourage the diffusion of promising innovations by “attracting others to an initiative and inspiring them to take action.” They make sure that ideas that have been developed within a cohesive group get attention from others outside the group, giving them a chance to get more widely adopted. Arena cites research by Rob Cross and Wayne Baker that shows that “providing energy outweighs managing performance and information by a factor of four in driving innovation.”²⁶ “Crazy” Jack Ma, founder and former chairman of the Alibaba Group, is a classic energizer. However, effective energizers are not necessarily leaders, but may be connected to leaders who rely on them to make things happen.
4. *Challengers* who have the role of provoking positive disruption within an organization by ensuring that ideas that may seem improbable or subversive have a chance of being accepted and even turned into the “new normal.” Often in a position of leadership, they “enable agility by positively disrupting the status quo and breaking down barriers to progress.” To a large extent, the remarkable growth of Amazon is a result of Jeff Bezos relentless focus on challenging assumptions and driving the company into uncharted territories.

The techniques of network analysis can be used to identify specific people in an organization who play these key roles.²⁷ For example, one good indicator is the inflows and outflows of information that can be determined by an analysis of email activity. It is not necessary to have access to the content of messages, but simply to analyze email traffic in terms of date and whom messages are being sent to and received from (a website created to support Arena’s book includes a simple 20-minute personal network analysis: www.networkroles.com). Other useful techniques include surveys and the use of “sociometric badges” that track the proximity of wearers to others in the organization.²⁸

While network analysis is a powerful tool that can provide “an MRI of how work actually gets done,” Arena added that any effort to leverage the power of networks must be directly related to what an organiza-

tion is trying to achieve. Looking at an organization from a network perspective can lead to a number of practical ideas about how to promote innovation. For example, when a good idea occurs to someone inside an organization, Arena suggests that it is generally not a good idea to immediately take the idea to one's boss, who is likely to dismiss it as unworkable or irrelevant. A better strategy is to begin by first sharing the idea with peers. If the idea is able to attract others to support it, and especially if they are genuinely enthusiastic about its potential, it becomes more difficult for a supervisor to kill it. Another insight is that a good way to strengthen the connections between the core of an organization and an innovative acquisition is to take someone from the blob with high credibility and send them out to protect and promote ideas from the acquisition. Finally, to ensure that good ideas have a chance to get rapidly diffused, it is useful to invite individuals who have been identified as energizers to presentations of new innovations because of their ability to promote good ideas (Arena noted that GM did exactly this when it organized internal Shark Tank-type pitch events to showcase new ideas.)

Another useful set of insights based on understanding social capital has to do with what happens to new hires when they join an organization. It generally takes two to three years for someone from the outside to assimilate into a strong organization. But those who are "fast movers" are able to become useful, contributing members of an organization two to three times faster based on a few behavioral strategies that differentiate them from other new hires:

- Develop connections with opinion leaders in the organization.
- Rapidly build a broad internal network with cross-functional connections, peer connections and "energized ties" to others.
- Begin co-developing innovations with others early on, using their newness in the organization to get access to ideas.

John Hagel observed that when promoting innovation, it is advisable not to underestimate the power of a corporate immune system to resist change. Unfortunately, the current business climate that demands consistent positive quarterly results reinforces the resistance to risk taking. Hagel argued that focusing on threats to a business (the "burning platform") as a means of motivating a willingness to change is much less

effective than promoting new opportunities, such as how technology can free up human capacity to work on creating greater value for an enterprise. The best way to drive innovation is through “small moves, smartly made.” This means making one change, then demonstrating its impact on operations before moving to larger goals, recognizing that it may be more feasible and more effective to concentrate on improving operating results rather than immediately expecting to boost income or profitability.

Conclusion

Large organizations face challenges in becoming more agile and innovative, and in attempting to shift from pursuing scalable efficiency as the best path to profitability to a commitment to scaling learning as a means of adapting to new circumstances. In a more stable world, developing reliable mechanisms that minimize costs while maximizing outputs made sense. But in a “whitewater world” of intense global competition and constant, rapid change, such an approach can lead to rigidity that hampers the ability to respond to unexpected problems or opportunities. Rather than simply getting better and better at doing the same things over and over, organizations need to support continuous learning as a necessary condition for remaining competitive. In addition, organizations that offer environments that are conducive to learning are also better positioned to attract top talent that is increasingly scarce and valuable.

...organizations that offer environments that are conducive to learning are also better positioned to attract top talent that is increasingly scarce and valuable.

The recent emergence of “exponential enterprises”—companies that have sustained high-speed growth and shown that they have kept the ability to keep innovating even as they have grown—poses a challenge, and in some cases, a direct threat, to existing organizations that have been operating according to more traditional rules.²⁹ Think, for example, of Tesla, founded in 2003, whose market value at the beginning

of 2020 was greater than that of GM and Ford combined, or Amazon that in just over 25 years single-handedly reshaped the retail landscape. Most of the companies that have remained highly innovative in terms of developing new products and even entering (or inventing) new markets as they have continued to grow are relatively new firms that are digitally based or digitally enabled. The number of traditional enterprises that have successfully made the “big shift” toward scaling learning and increasing agility remains small.

Participants in this Aspen Roundtable offered a number of promising ideas about strategies that can help established enterprises to adapt more successfully to the new environment, as well as examples of organizations that have actually done so. For example, Autodesk’s AI-based Generative Design software is providing a new way of creating novel products with characteristics that can depart radically from previous designs, and represents a more creative way for humans to interact with technology. Tom Malone’s notion of superminds suggests that leveraging the power of people working together, especially when augmented by AI-based tools, can substantially increase the value of individual contributions. The BetterUp study of the importance of meaning in work and how meaning is supported or stymied by organizations also points to a number of strategies for improving corporate performance by understanding human needs. And perhaps most concretely, the work of Michael Arena provides a practical roadmap for creating mechanisms that can allow large enterprises to overcome the resistance to accepting new and untested ideas that is typically innate to an organization’s core functions and to reap the benefits of entrepreneurial groups or activities that often operate on the periphery of an organization. The key is creating a middle ground—an adaptive space—that can resolve the impedance mismatch between two disparate cultures.

These approaches and strategies share two common premises. First, there are enormous gains to be had by understanding the potential of intelligent machines to supplement and augment human abilities rather than being a simple substitute for human resources. Instead of abolishing jobs, by automating routine functions, AI-based tools can free up human capacity to take on higher-level challenges and create new value. Second, there is growing evidence of the power of looking at organizations not in terms of their formal structure but rather by using the techniques of network analysis to reveal how influence flows

and how decisions get made within an organization, which may differ dramatically from titles and positions. This shift in perspective also highlights the importance of building organization's social capital—the way in which people are connected with and collaborate with each other—as well as its human capital which is typically measured in terms of the capability of each individual worker.

Finally, a new workscape calls for new kinds of workers. Shifting the priority from seeking individuals with specific skills to recognizing the value of more fundamental capabilities could enrich corporate workforces, as could tapping into underutilized talent pools, including millions of workers who are qualified to do higher level jobs but lack the traditional credentials used by many employers. To prepare young people for this new world of work, institutions like USC's Iovine and Young Academy are pioneering innovative models of education that cross traditional disciplinary lines. Rather than relying on a store of knowledge accumulated during their formal education—the kind of knowledge whose half-life is increasingly short—these graduates can expect to keep learning as they tackle new challenges and generate new knowledge. And as they find themselves confronting increasingly complex problems, they will need to develop a pragmatic imagination that is a fusion of the traditionally distinct practices of the sciences and the humanities.

... a new workscape calls for new kinds of workers.

It is likely that most large enterprises, particularly in their core functions, will continue to march to the music of the standardization of operations in the pursuit of scalable efficiency. But new rhythms and new kinds of music are beginning to be heard that could be harbingers of novel forms of collaboration of people working together with each other and with technology in new ways. This new kind of music may be coming mainly from the edges of organizations where creativity and experimentation are more accepted, but perhaps the most significant trend is the development of practical strategies for integrating them more effectively with core operations. The real breakthrough will be when the two styles of music learn to play well with each other.

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APPENDIX

***Redefining the Workscape:
Bringing Value and Values to
Machine-Human Collaboration***

Aspen, Colorado
July 31 – August 2, 2019

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About the Author

Richard Adler is a Distinguished Fellow at the Institute for the Future, Palo Alto. He is also president of People & Technology, a consulting firm located in Silicon Valley. His research has focused on the impact of new technologies on fields including business, education, healthcare and aging.

Richard is the author of nine previous reports from the Aspen Roundtable on Institutional Innovation: *The Exponential Shift* (2017); *Making the Invisible Visible* (2016); *Navigating Continual Disruption* (2015); *Fragmentation and Concentration in the New Digital Environment* (2014); *Connecting the Edges* (2013); *Institutional Innovation: Oxymoron or Imperative?* (2012); and *Solving the Dilbert Paradox* (2011); *Leveraging the Talent-Driven Organization* (2010); and *Talent Reframed* (2009).

He has written a number of other reports for the Aspen Institute, including: *Setting the Communications Policy Agenda for the Next Administration* (2017); *Preparing for a 5G World* (2016); *Updating Rules of the Digital Road: Privacy, Security, Intellectual Property* (2012); *News Cities: The Next Generation of Healthy Informed Communities* (2011); *Media and Democracy* (2009); and *m-Powering India: Mobile Communications for Inclusive Growth* (2008). He also served as the primary writer of *Crisis in Democracy: Renewing Trust in America* (2019), the report of the Knight Commission on Trust, Media and Democracy.

Non-Aspen reports Richard has written include *Toward a Better Understanding of Internet Economics* (Internet Association/Columbia University, 2018); *Catalyzing Technology to Support Family Caregiving* (National Alliance for Caregiving, 2014); *After Broadband: Imagining Hyperconnected Futures* (Wharton, 2012); and *The Future of Broadband* (Broadband for America, 2012).

As a consultant, he has worked on projects related to technology and telecommunications policy in Europe, Asia and the Middle East.

Richard is Fellow of the World Demographic Association and serves on several local and national boards. He holds a BA from Harvard, an MA from the University of California at Berkeley, and an MBA from the McLaren School of Business at the University of San Francisco.

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Previous Publications of the Aspen Institute Roundtable on Institutional Innovation

(formerly the Aspen Institute Roundtable on Talent Development)

The Future of Work 2.0: Navigating the Transition to New Possibilities
(2018)

The report of the 2018 Aspen Institute Roundtable on Institutional Innovation explores the Future of Work 2.0—focusing on how all stakeholders can realize the opportunities and possibilities of automation in the work landscape. ISBN: XXX, \$12.00 per copy.

The Exponential Shift: Rethinking Organizational Business Models
(2017)

In a world of rapid fluctuations, disruptive innovations and exponential growth, organizations are finding that their business operating models are in need of significant revision. This report, titled “*The Exponential Shift: Rethinking Organizational Business Models*,” examines new ways of thinking about organizational performance and conceptualizes what it takes for an organization to shift from pursuing efficiency to embracing continuous learning and constant change. 67 pages, ISBN: 0-89843-667-2, \$12.00 per copy.

Making the Invisible Visible: Redesigning Business Processes for Exponential Organizations (2016)

Making the Invisible Visible, the report from the 2015 Roundtable on Institutional Innovation, explores how corporate leaders are thinking about exponential business operations—utilizing digital technologies to leverage assets and scaling learning to accelerate innovation. It delves into strategies of modularization, rapid iteration, and utilizing transparent metrics, among others, all with the aim of becoming more adaptive and increasing performance of the organization. The report is written by Richard Adler. 63 pages, ISBN Paper: 0-89843-644-3, \$12.00 per copy.

Navigating Continual Disruption (2015)

Navigating Continual Disruption, the report from the 2014 Roundtable on Institutional Innovation, explores ways to manage organizations in the face of continual disruption—the constant onslaught of new offerings or business models that can challenge the dominance of core businesses. The report is written by Richard Adler. 66 pages, ISBN Paper: 0-89843-617-6, \$12.00 per copy.

Fragmentation and Concentration in the New Digital Environment (2014)

Fragmentation and Concentration in the New Digital Environment explores the impact of digital technology infrastructures on the fragmentation and concentration of economic activity. This report, written by Richard Adler, maps the effects of the digital revolution on the business environment, the nature of work and the role of leadership in navigating the organization through the constantly changing landscape. 54 pages, ISBN Paper: 0-89843-606-0, \$12.00 per copy.

Connecting the Edges (2013)

Connecting the Edges is the report from the 2012 Roundtable on Institutional Innovation. In the current economic environment, growth and underemployment are two outstanding national, indeed international, problems. While technological advances and globalization are often cited as instigators of the current plight, they are also beacons of hope for the future. The report concludes that by integrating the core of an organization with the edge, where innovation is more likely to happen, we can create dynamic, learning networks. 46 pages, ISBN Paper: 0-89843-589-7, \$12.00 per copy

Institutional Innovation: Oxymoron or Imperative? (2012)

Institutional Innovation: Oxymoron or Imperative is the report of the 2011 Roundtable on Institutional Innovation. It explores the consequences of the growing disconnect between the fundamental design of most firms and the capabilities of the business infrastructure in which they operate. The report, written by Richard Adler, captures the insights of the participants with a focus on identifying conditions that are favorable to institutional innovation and maximizing the effectiveness of institutional leadership. 63 pages, ISBN Paper: 0-89843-572-2, \$12.00 per copy

Solving the Dilbert Paradox (2011)

Solving the Dilbert Paradox is the volume resulting from the 2010 Aspen Institute Roundtable on Talent Development. This “Dilbert Paradox” finds expression in wasted opportunities for organizational learning, collaboration, and access to knowledge and ideas outside the corporate hierarchy. The report, written by Richard Adler, captures the insights of the participants during the conference and details how some large organizations, as well as start-ups and small companies, are experimenting by giving employees new opportunities to maximize innovation. 48 pages, ISBN Paper: 0-89843-545-5, \$12.00 per copy

Leveraging the Talent-Driven Organization (2010)

Leveraging the Talent-Driven Organization details how a number of firms are using social networking tools to open up communication, collaboration and learning across boundaries, and leveraging these tools to develop new products and real-time solutions for customers. The report, written by Richard Adler, is the result of the Inaugural Roundtable on Talent Development. 48 pages, ISBN Paper: 0-89843-519-6, \$12.00 per copy

Talent Reframed: Moving to the Talent-Driven Firm (2009)

Talent Reframed: Moving to the Talent-Driven Firm offers new rules for organizations seeking to attain and develop a talented workforce amid a rapidly changing and increasingly globalized business environment. The report, which sets the premise for a new series of Aspen Institute Roundtables on the Talent-Driven Firm, explores how organizations can build talent by relying less on traditional command-and-control structure and more on horizontal collaboration and shared learning. The report, written by Richard Adler, also features a white paper by John Hagel and John Seely Brown. 46 pages, ISBN Paper: 0-89843-498-X, \$12.00 per copy

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