April 11, 2011 Staples High School

WESTPORT BOARD OF EDUCATION

*AGENDA

(Agenda Subject to Modification in Accordance with Law)

PUBLIC SESSION/PLEDGE OF ALLEGIANCE:
7:30 p.m. Staples High School, Cafeteria B (Room 301)

ANNOUNCEMENTS FROM BOARD AND ADMINISTRATION

PUBLIC QUESTIONS/COMMENTS ON NON-AGENDA ITEMS (15 MINUTES)

MINUTES: April 4, 2011

PRESENTATIONS:

1. Music Education in the Westport Public Schools		Mr. Winer Mr. Fagan
2. Westport Education 2025: Meeting the Global Challenge	(Encl)	Dr. Landon Ms. Comm Ms. Kay

DISCUSSION/ACTION:

1. Policy P4118.25: Social Networking By Staff	(Encl)	Dr. Landon

ACTION:

1. Discussion and Action Upon Findings of Fact and Recommendation dated April 4, 2011 of the Impartial Hearing Panel in the Matter of the Administration of the Westport Public Schools and Sally Wanamaker

ADJOURNMENT

*A 2/3 vote is required to go to executive session, to add a topic to the agenda of a regular meeting, or to start a new topic after 10:30 p.m.
The meeting can also be viewed on cable TV on channel 78.

PUBLIC PARTICIPATION WELCOME USING THE FOLLOWING GUIDELINES:

- Comment on non-agenda topics will occur during the first 15 minutes *except* when staff or guest presentations are scheduled.
- Board will not engage in dialogue on non-agenda items.
- Public may speak as agenda topics come up for discussion or information.
- Speakers on non-agenda items are limited to 2 minutes each, except by prior arrangement with chair.
- Speakers on agenda items are limited to 3 minutes each, except by prior arrangement with chair.
- Speakers must give name and use microphone.
- Responses to questions may be deferred if answers not immediately available.
- Public comment is normally not invited for topics listed for action after having been publicly discussed at one or more meetings.

WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

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To: Members of the Board of Education

From: Elliott Landon

Subject: Presentation: "Westport Education 2025: Meeting the Global Challenge"

Date: April 11, 2011

Since the beginning of the school year and in accordance with the Board of Education goal for the 2011-12 school year which states: "Implement a plan of action that ensures that all students are equipped with globally competitive learning skills," a small group of educators has been meeting to find ways to enhance the way our school system develops students, K-12, as global citizens who possess the skills, habits and dispositions necessary to participate fully and contribute meaningfully in a more complex, sophisticated and multi-cultural world.

The participants who met, discussed and created this project included Janna Bell, Principal, CES; Lisabeth Comm, 6-12 English Department Chair; Frank Corbo, 6-12 Math Department Chair; Susie Da Silva, Principal, KHS; James D'Amico, 6-12 Social Studies Department Chair; Lauren Francese, Social Studies Teacher, BMS; Kelly Harrison, Teacher, KHS; Melissa Kay, Principal, BMS; A.J. Scheetz, 6-12 Science Department Chair; Beth Semaya, English Teacher, SHS; and, me. Working together since the beginning of October, we have come to recognize that for our students to be able to compete in an increasingly global, technologically and economically interdependent world, they must have such key 21st Century skills as the ability to engage in deep critical and creative thinking, including the facility and resourcefulness to solve non-standard, real-world problems using cross-disciplinary approaches.

Now that our planning has been completed and a broader Task Force has been created to steer this project through to completion, at our meeting of April 11we plan to introduce the Board and the community to our efforts to date and our plans for the future.

In preparation for the above-referenced presentation, I submit to you the following documents for your perusal:

1. Membership of the Task Force that will be overseeing this project.
2. Article: "Rigor Redefined," by Tony Wagner, Harvard University.
3. Article: "Comparing Frameworks for '21st Century Skills'" by Chris Dede, Harvard University.
4. Report: "The Future of Work: What It Means for Individuals, Businesses, Markets and Governments," by David Bollier for The Aspen Institute.

WESTPORT PUBLIC SCHOOLS

WESTPORT EDUCATION 2025: MEETING THE GLOBAL CHALLENGE

Membership List – April 8, 2011

STAPLES HIGH SCHOOL

Lis Comm
Frank Corbo
James D'Amico
Trudy Denton
Nat Dewey
John Dodig
Ashley Gayanilo
Vicki Mazzarelli
Julia McNamee
A.J. Scheetz
Beth Semaya
Kristin Simonsen
Karen Thomas
David Winer

BEDFORD MIDDLE SCHOOL

Emily Elterich
Anthony Formato
Lauren Francese
Melissa Kay
Rebecca Marsick
Michele Niedermeier
Colleen Rondon

COLEYTOWN MIDDLE SCHOOL

Erik Dey
Sarah Martin
Jodi Rieman
Michael Rizzo
Christina Zadravec

COLEYTOWN ELEMENTARY SCHOOL

Janna Bell
Mary Jo Lombardo
Lauren Pedrotty

GREEN'S FARMS SCHOOL

John Bayers
Amanda Ryan

KING'S HIGHWAY SCHOOL

Susie Da Silva
Kelly Harrison
Linda Johnson

LONG LOTS SCHOOL

Michael Brownstein
Joanne Fasciolo

SAUGATUCK ELEMENTARY SCHOOL

Patricia Finnegan
Kristen Gerner
Wendy Sobelman
Peter VonEuler

TOWN SCHOOL OFFICE

Natalie Carrignan
Marge Cion
Cyndy Gilchrest
Elliott Landon

Rigor Redefined

Tony Wagner

Even our "best" schools are failing to prepare students for 21st-century careers and citizenship.

In the new global economy, with many jobs being either automated or "off-shored," what skills will students need to build successful careers? What skills will they need to be good citizens? Are these two education goals in conflict?

To examine these questions, I conducted research beginning with conversations with several hundred business, nonprofit, philanthropic, and education leaders. With a clearer picture of the skills young people need, I then set out to learn whether U.S. schools are teaching and testing the skills that matter most. I observed classrooms in some of the nation's most highly regarded suburban schools to find out whether our "best" was, in fact, good enough for our children's future. What I discovered on this journey may surprise you.

The Schooling Students Need

One of my first conversations was with Clay Parker, president of the Chemical Management Division of BOC Edwards—a company that, among other things, makes machines and supplies chemicals for the manufacture of microelectronics devices. He's an engineer by training and the head of a technical business, so when I asked him about the skills he looks for when he hires young people, I was taken aback by his answer.

"First and foremost, I look for someone who asks good questions," Parker responded. "We can teach them the technical stuff, but we can't teach them how to ask good questions—how to think."

"What other skills are you looking for?" I asked, expecting that he'd jump quickly to content expertise.

"I want people who can engage in good discussion—who can look me in the eye and have a give and take. All of our work is done in teams. You have to know how to work well with others. But you also have to know how to engage customers—to find out what their needs are. If you can't engage others, then you won't learn what you need to know."

I initially doubted whether Parker's views were representative of business leaders in general. But after interviewing leaders in settings from Apple to Unilever to the U.S. Army and reviewing the research on workplace skills, I came to understand that the world of work has changed profoundly.

Today's students need to master seven survival skills to thrive in the new world of work. And these skills are the same ones that will enable students to become productive citizens who contribute to solving some of the most pressing issues we face in the 21st century.

1. Critical Thinking and Problem Solving

To compete in the new global economy, companies need their workers to think about how to continuously improve their products, processes, or services. Over and over, executives told me that the heart of critical thinking and problem solving is the ability to

ask the right questions. As one senior executive from Dell said, "Yesterday's answers won't solve today's problems."

Ellen Kumata, managing partner at Cambria Associates, explained the extraordinary pressures on leaders today. "The challenge is this: How do you do things that haven't been done before, where you have to rethink or think anew? It's not incremental improvement any more. The markets are changing too fast."

2. Collaboration and Leadership

Teamwork is no longer just about working with others in your building. Christie Pedra, CEO of Siemens, explained, "Technology has allowed for virtual teams. We have teams working on major infrastructure projects that are all over the U.S. On other projects, you're working with people all around the world on solving a software problem. Every week they're on a variety of conference calls; they're doing Web casts; they're doing net meetings."

Mike Summers, vice president for Global Talent Management at Dell, said that his greatest concern was young people's lack of leadership skills. "Kids just out of school have an amazing lack of preparedness in general leadership skills and collaborative skills," he explained. "They lack the ability to influence."

3. Agility and Adaptability

Clay Parker explained that anyone who works at BOC Edwards today "has to think, be flexible, change, and use a variety of tools to solve new problems. We change what we do all the time. I can guarantee the job I hire someone to do will change or may not exist in the future, so this is why adaptability and learning skills are more important than technical skills."

4. Initiative and Entrepreneurialism

Mark Chandler, senior vice president and general counsel at Cisco, was one of the strongest proponents of initiative: "I say to my employees, if you try five things and get all five of them right, you may be failing. If you try 10 things, and get eight of them right, you're a hero. You'll never be blamed for failing to reach a stretch goal, but you will be blamed for not trying. One of the problems of a large company is risk aversion. Our challenge is how to create an entrepreneurial culture in a larger organization."

5. Effective Oral and Written Communication

Mike Summers of Dell said, "We are routinely surprised at the difficulty some young people have in communicating: verbal skills, written skills, presentation skills. They have difficulty being clear and concise; it's hard for them to create focus, energy, and passion around the points they want to make. If you're talking to an exec, the first thing you'll get asked if you haven't made it perfectly clear in the first 60 seconds of your presentation is, 'What do you want me to take away from this meeting?' They don't know how to answer that question."

Summers and other leaders from various companies were not necessarily complaining about young people's poor grammar, punctuation, or spelling—the things we spend so much time teaching and testing in our schools. Although writing and speaking correctly

are obviously important, the complaints I heard most frequently were about fuzzy thinking and young people not knowing how to write with a real voice.

6. Accessing and Analyzing Information

Employees in the 21st century have to manage an astronomical amount of information daily. As Mike Summers told me, "There is so much information available that it is almost too much, and if people aren't prepared to process the information effectively it almost freezes them in their steps."

It's not only the sheer quantity of information that represents a challenge, but also how rapidly the information is changing. Quick—how many planets are there? In the early 1990s, I heard then–Harvard University president Neil Rudenstine say in a speech that the half-life of knowledge in the humanities is 10 years, and in math and science, it's only two or three years. I wonder what he would say it is today.

7. Curiosity and Imagination

Mike Summers told me, "People who've learned to ask great questions and have learned to be inquisitive are the ones who move the fastest in our environment because they solve the biggest problems in ways that have the most impact on innovation."

Daniel Pink, the author of *A Whole New Mind*, observes that with increasing abundance, people want unique products and services: "For businesses it's no longer enough to create a product that's reasonably priced and adequately functional. It must also be beautiful, unique, and meaningful."[1] Pink notes that developing young people's capacities for imagination, creativity, and empathy will be increasingly important for maintaining the United States' competitive advantage in the future.

The Schooling Students Get

I've spent time observing in classrooms across the United States for more than 20 years. Here is a sampling of what I've seen recently. These examples come from secondary honors and advanced placement (AP) classes in three school systems that enjoy excellent reputations because of their high test scores.

AP Chemistry

Students work in groups of two and three mixing chemicals according to directions written on the chalkboard. Once the mixtures are prepared, students heat the concoction with Bunsen burners. According to the directions on the board, they are supposed to record their observations on a worksheet.

I watch a group of three young men whose mixture is giving off a thin spiral of smoke as it's being heated—something that none of the other students' beakers are doing. One student looks back at the chalkboard and then at his notes. Then all three stop what they are doing, apparently waiting for the teacher to come help them.

"What's happening to your mixture?" I ask the group.

"Dunno," one mutters. "We must have mixed it up wrong."

"What's your hypothesis about what happened—why it's smoking?"

The three look at one another blankly, and the student who has been doing all the speaking looks at me and shrugs.

AP U.S. Government

The teacher is reviewing answers to a sample test that the class took the previous day. The test contains 80 multiple-choice questions related to the functions and branches of the federal government.

When he's finished, he says "OK, now let's look at some sample free-response questions from previous years' AP exams." He flips the overhead projector on and reads from the text of a transparency: "*Give three reasons why the Iron Triangle may be criticized as undemocratic.* How would you answer this question?"

No one replies.

"OK, who can give me a definition of the Iron Triangle?"

A student pipes up, "The military-industrial-congressional complex."

"OK, so what would be three reasons why it would be considered undemocratic?" The teacher calls on a student in the front row who has his hand half raised, and he answers the question in a voice that we can't hear over the hum of the projector's fan.

"Good. Now let's look at another one." The teacher flips another transparency onto the projector. "Now this question is about bureaucracy. Let me tell you how to answer this one. . . ."

AP English

The teacher explains that the class is going to review students' literature notes for the advanced placement exam next week. The seven students are deeply slouched in their chairs, arranged in a semicircle around the teacher's desk.

The teacher asks, "Now what is Virginia Woolf saying about the balance between an independent life versus a social life?"

Students ruffle through their notebooks. Finally, a young woman, reading from her notes, answers, "Mrs. Ramsey sought meaning from social interactions."

"Yes, that's right. Now what about Lily, the artist? How did she construct meaning?"

"Through her painting," another student mumbles, her face scrunched close to her notes.

"So what is Woolf saying about the choices these two women have made, and what each has sacrificed?"

No reply. The teacher sighs, gets up, goes to the board, and begins writing.

A Rare Class

Once in a great while, I observe a class in which a teacher is using academic content to develop students' core competencies. In such a class, the contrast with the others is stark.

At the beginning of the period in an Algebra II class, the teacher writes a problem on the board. He turns to the students, who are sitting in desks arranged in squares of four that face one another. "You haven't seen this kind of problem before," he explains. "Solving it

will require you to use concepts from both geometry and algebra. Each group will try to develop at least two different ways to solve this problem. After all the groups have finished, I'll randomly choose someone from each group who will write one of your proofs on the board, and I'll ask that person to explain the process your group used."

The groups quickly go to work. Animated discussion takes place as students pull the problem apart and talk about different ways to solve it. While they work, the teacher circulates from group to group. When a student asks a question, the teacher responds with another question: "Have you considered . . .?" "Why did you assume that?" or simply "Have you asked someone in your group?"

What makes this an effective lesson—a lesson in which students are learning a number of the seven survival skills while also mastering academic content? First, students are given a complex, multi-step problem that is different from any they've seen in the past. To solve it, they have to apply critical-thinking and problem-solving skills and call on previously acquired knowledge from both geometry and algebra. Mere memorization won't get them far. Second, they have to find two ways to solve the problem, which requires initiative and imagination. Third, they have to explain their proofs using effective communication skills. Fourth, the teacher does not spoon-feed students the answers. He uses questions to push students' thinking and build their tolerance for ambiguity. Finally, because the teacher announces in advance that he'll randomly call on a student to show how the group solved the problem, each student in every group is held accountable. Success requires teamwork.

Rigor for the 21st Century

Across the United States, I see schools that are succeeding at making adequate yearly progress but failing our students. Increasingly, there is only one curriculum: test prep. Of the hundreds of classes that I've observed in recent years, fewer than 1 in 20 were engaged in instruction designed to teach students to think instead of merely drilling for the test.

To teach and test the skills that our students need, we must first redefine excellent instruction. It is not a checklist of teacher behaviors and a model lesson that covers content standards. It is working with colleagues to ensure that all students master the skills they need to succeed as lifelong learners, workers, and citizens. I have yet to talk to a recent graduate, college teacher, community leader, or business leader who said that not knowing enough academic content was a problem. In my interviews, everyone stressed the importance of critical thinking, communication skills, and collaboration.

We need to use academic content to teach the seven survival skills every day, at every grade level, and in every class. And we need to insist on a combination of locally developed assessments and new nationally normed, online tests—such as the College and Work Readiness Assessment (www.cae.org)—that measure students' analytic-reasoning, critical-thinking, problem-solving, and writing skills.

It's time to hold ourselves and all of our students to a new and higher standard of rigor, defined according to 21st-century criteria. It's time for our profession to advocate for accountability systems that will enable us to teach and test the skills that matter most. Our students' futures are at stake.

Endnote

[1] Pink, D. (2005). *A whole new mind: Moving from the information age to the conceptual age*. New York: Riverhead Books, pp. 32–33.

Tony Wagner is Codirector of the Change Leadership Group at the Harvard Graduate School of Education; tony_wagner@harvard.edu; www.schoolchange.org. The themes of this article are discussed more fully in his book *The Global Achievement Gap: Why Even Our Best Schools Don't Teach the New Survival Skills Our Children Need—and What We Can Do About It* (Basic Books, 2008).

Comparing Frameworks for "21st Century Skills"

Chris Dede
Harvard Graduate School of Education
July, 2009

Many groups have called for all students to learn "21st century skills." In response, some organizations have developed, as part of their institutional brand, frameworks for the new millennium content and processes teachers should convey as part of students' schooling. How diverse are these definitions for "21st century skills," and is the term becoming an umbrella phrase under which advocates from various groups can argue for almost any type of knowledge? Lack of clarity about the nature of 21st century skills would be problematic, since many educational reforms have failed because of a reverse Tower-of-Babel problem, in which people use the same words, but mean quite different things. What do the various frameworks for 21st century skills have in common, and what does each uniquely add to an overarching conception about the knowledge that graduates at this time in history should have as effective workers and citizens? After defining the nature of 21st century skills, this chapter provides a comparison of the themes major organizations' frameworks are presenting about what students need to know for full participation in the 21st century.

The Rationale for Formulating "21st Century Skills"

The 21st century is quite different than the 20th in the capabilities people need for work, citizenship, and self-actualization. 21st century skills are different than 20th century skills primarily due to the emergence of very sophisticated information and communications technologies. For example, the types of work done by people—as opposed to the kinds of labor done by machines—are continually shifting as computers and telecommunications expand their capabilities to accomplish human tasks. Economists Frank Levy and Richard Murnane (2004) highlighted a crucial component of what constitutes 21st century knowledge and skills:

> Declining portions of the labor force are engaged in jobs that consist primarily of routine cognitive work and routine manual labor—the types of tasks that are easiest to program computers to do. Growing proportions of the nation's labor force are engaged in jobs that emphasize expert thinking or complex communication—tasks that computers cannot do. (pp. 53–54)

These economists went on to explain that "expert thinking [involves] effective pattern matching based on detailed knowledge; and metacognition, the set of skills used by the stumped expert to decide when to give up on one strategy and what to try next" (Levy & Murnane, 2004, p. 75). What a skilled physician does when all diagnostic are within normal limits, but the patient is still feeling unwell is expert decision making: inventing new problem solving heuristics when all standard protocols have failed. "Complex communication requires the exchange of vast amounts of verbal and nonverbal information. The information flow is constantly adjusted as the communication evolves unpredictably" (Levy & Munane, 2004, p. 94). A skilled teacher is an expert in complex

communication, able to improvise answers and facilitate dialogue in the unpredictable, chaotic flow of classroom discussion.

As another illustration of how 21st century skills differ from the knowledge communicated by schooling through the 20th century, sophisticated information and communication technologies are changing the nature of "perennial" skills valuable throughout history, as well as creating new "contextual" skills unique to new millennium work and citizenship (Dede, in press). For example, "collaboration" is a perennial capability, always valued as a trait in workplaces across the centuries. Therefore, the fundamental worth of this suite of interpersonal skills is not unique to the 21st century economic context. However, the degree of importance for collaborative capacity is growing in an era where work in knowledge-based economies is increasingly accomplished by teams of people with complementary expertise and roles, as opposed to individuals doing isolated work in an industrial setting (Karoly, 2004).

Further, the nature of collaboration is shifting to a more sophisticated skillset. In addition to collaborating face-to-face with colleagues across a conference table, 21st century workers increasingly accomplish tasks through mediated interactions with peers halfway across the world whom they may never meet face-to-face. Thus, even though perennial in nature, collaboration is worthy of inclusion as a 21st century skill because the importance of cooperative interpersonal capabilities is higher and the skills involved are more sophisticated than in the prior industrial era.

In contrast, the ability to rapidly filter huge amounts of incoming data, extracting information valuable for decision making, is a "contextual" capability. Due to the prevalence of information and communications technologies, for the first time in human history people are inundated by enormous amounts of data that they must access, manage, integrate, and evaluate. Rather than rummaging through library stacks to find a few pieces of knowledge, an activity characteristic of information access in the 20th century, users of modern search engines receive thousands or even millions of "hits." However, many of these resources are off-target, incomplete, inconsistent, and perhaps even biased. The ability to separate signal from noise in a potentially overwhelming flood of incoming data is a suite of 21st century skills not in degree – because this is novel in history as a valuable capability – but in type.

Weinberger (2007) describes the power of "digital disorder," which takes advantage of the fact that virtual information can transcend the limited properties of physical objects (like books or index cards). Rather than relying on a single method of organization with a fixed terminology (such as the Dewey Decimal System as a means of categorizing knowledge), modern information systems now can respond to natural language queries and can instantly sort digital data into whatever category structure best suits a particular person's immediate needs. This creates a new set of contextual 21st century skills centered on "disorderly" knowledge co-creation and sharing.

Overall, the distinction between perennial and contextual skills is important because, unlike perennial capabilities, new, contextual types of human performances are typically not part of the legacy curriculum inherited from 20th century educational systems. Conventional, 20th century K-12 instruction emphasizes manipulating pre-digested information to build fluency in routine problem solving, rather than filtering data

derived from experiences in complex settings to develop skills in sophisticated problem finding. Knowledge is separated from skills and presented as revealed truth, not as an understanding that is discovered and constructed; this separation results in students learning data about a topic rather than learning how to extend their understand beyond information available for assimilation. Also, in 20th century instruction, problem solving skills are presented in an abstract form removed from their application to knowledge; this makes transfer to real world situations difficult. The ultimate objective of education is presented as learning a specific problem solving routine to match every situation, rather than developing expert decision making and metacognitive strategies that indicate how to proceed when no standard approach seems applicable.

In the legacy curriculum, little time is spent on building capabilities in group interpretation, negotiation of shared meaning, and co-construction of problem resolutions. The communication skills stressed are those of simple presentation, rather than the capacity to engage in richly structured interactions that articulate perspectives unfamiliar to the audience. Face-to-face communication is seen as the "gold standard," so students develop few capabilities in mediated dialogue and in shared design within a common virtual workspace.

Given that the curriculum is already crowded, a major political challenge is articulating what to deemphasize in the curriculum – and why – in order to make room for students to deeply master core 21st century understandings and performances. This is not a situation in which one must eliminate an equivalent amount of current curriculum for each 21st century understanding added, because better pedagogical methods can lead to faster mastery and improved retention, enabling less reteaching and more coverage within the same timeframe (Van Lehn and the Pittsburgh Science of Learning Center, 2006). However, what education should emphasize as its core outcomes is politically controversial even if substantial sections of the 20th century legacy curriculum are not eliminated.

Beyond curricular issues, classrooms today typically lack 21st century learning and teaching in part because high-stakes tests do not assess these competencies. Assessments and tests focus on measuring students' fluency in various abstract, routine skills, but typically do not assess their strategies for expert decision making when no standard approach seems applicable. Essays emphasize simple presentation rather than sophisticated forms of rhetorical interaction. Students' abilities to transfer their understandings to real world situations are not assessed, nor are capabilities related to various aspects of teamwork. The use of technological applications and representations is generally banned from testing, rather than measuring students' capacities to use tools, applications, and media effectively. Abilities to effectively utilize various forms of mediated interaction are typically not assessed. As discussed later, valid, reliable, practical assessments of 21st century skills are needed to improve this situation.

Lack of professional development is another reason 21st century skills are underemphasized in today's schooling. Providing educators with opportunities to learn about the ideas and strategies discussed in this volume is only part of the issue. A major, often unrecognized challenge in professional development is helping teachers, policy makers, and local communities unlearn the beliefs, values, assumptions, and cultures underlying schools' industrial-era operating practices, such as forty-five minute class

periods that allow insufficient time for all but superficial forms of active learning by students. Altering deeply ingrained and strongly reinforced rituals of schooling takes more than the superficial interchanges typical in "make and take" professional development or school board meetings. Intellectual, emotional, and social support is essential for "unlearning" and for transformational relearning that can lead to deeper behavioral changes to create next-generation educational practices. Educators, business executives, politicians, and the general public have much to unlearn if 21st century understandings are to assume a central place in schooling.

Reflecting educators' usage of 20th century pedagogy, current approaches to using technology in schooling largely reflect applying information and communication technologies as a means of increasing the effectiveness of traditional, 20th century instructional approaches: enhancing productivity through tools such as word processors, aiding communication by channels such as email and threaded asynchronous discussions, and expanding access to information via Web-browsers and streaming video (Dede, 2009a). All these have proven worthy in conventional schooling, as they have in workplace settings; however, none draw on the full power of information and communications technologies for individual and collective expression, experience, and interpretation – human capabilities emerging as key work and life skills for the first part of the 21st century. So how are various organizations that advocate for 21st century skills formulating these capabilities?

Current Major Frameworks for 21st Century Skills

Current conceptual frameworks for "21st Century Skills" include the Partnership for 21st Century Skills (2006), the Metiri Group and NCREL (2003), the American Association of Colleges and Universities (2007), and the Organization for Economic Cooperation and Development (2005). In the particular area of information and communications technology, which as discussed above is richly interwoven with 21st century skills, 21st century frameworks include the revised ISTE student standards for technology in the curriculum (2007), as well as digital literacy standards from the Educational Testing Service ICT Literacy Panel (2007). Individual scholars such as Dede (2005) and Jenkins et al (2006) have also formulated lists of "digital literacies" that complement reading, writing, and mathematics as core capabilities for the 21st century. In the boxes that follow, highlights of each framework are presented, followed by an analysis of what each formulation adds to the Project for 21st Century Skills (P21) framework.

The Partnership for 21st Century Skills Framework (2006) and P21's many ancillary publications produced since then serve as a baseline for this analysis because P21's conceptualization of 21st Century skills is more detailed and more widely adopted than any of the alternatives discussed later. For reasons of space, this chapter can present only a bare-bones outline of the P21 framework, which the reader is urged to browse in order to comprehend its full extent (http://www.21stcenturyskills.org).

Partnership for 21st Century Skills (P21)

Core subjects. The No Child Left Behind Act of 2001, which reauthorizes the Elementary and Secondary Education Act of 1965, identifies the core subjects as English, reading or language

arts; mathematics; science; foreign languages; civics; government; economics; arts; history; and geography.

21st century content. Several significant, emerging content areas are critical to success in communities and workplaces. These content areas typically are not emphasized in schools today:
- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Health and wellness awareness

Learning and thinking skills. As much as students need to learn academic content, they also need to know how to keep learning — and make effective and innovative use of what they know — throughout their lives. Learning and thinking skills are comprised of:
- Critical-thinking and problem-solving skills
- Communication skills
- Creativity and innovation skills
- Collaboration skills
- Contextual learning skills
- Information and media literacy skills

ICT literacy. Information and communications technology (ICT) literacy is the ability to use technology to develop 21st century content knowledge and skills, in the context of learning core subjects. Students must be able to use technology to learn content and skills — so that they know *how* to learn, think critically, solve problems, use information, communicate, innovate and collaborate.

Life skills. Good teachers have always incorporated life skills into their pedagogy. The challenge today is to incorporate these essential skills into schools deliberately, strategically and broadly. Life skills include:
- Leadership
- Ethics
- Accountability
- Adaptability
- Personal productivity
- Personal responsibility
- People skills
- Self-direction
- Social responsibility

21st century assessments. Authentic 21st century assessments are the essential foundation of a 21st century education. Assessments must measure all five results that matter — core subjects; 21st century content; learning and thinking skills; ICT literacy; and life skills. Assessment of 21st century skills should be integrated with assessments of core subjects. Separate assessments would defeat the purpose of infusing 21st century skills into core subjects. To be effective, sustainable and affordable, assessments must use modern technologies to increase efficiency and timeliness. Standardized tests alone can measure only a few of the important skills and knowledge students should learn. A balance of assessments, including high-quality standardized testing along with effective classroom assessments, offers students and teachers a powerful tool to master the content and skills central to success.

In contrast to the P21 framework used as baseline in this analysis, in 2003 the Metiri Group and NCREL produced a 21st century skills framework that pre-dated P21:

EnGauge Framework from Metiri/NCREL

Digital-Age Literacy
- Basic, Scientific, Economic, and Technological Literacies
- Visual and Information Literacies
- Multicultural Literacy and Global Awareness

Inventive Thinking
- Adaptability, Managing Complexity, and Self-Direction
- Curiosity, Creativity, and Risk Taking
- Higher-Order Thinking and Sound Reasoning

Effective Communication
- Teaming, Collaboration, and Interpersonal Skills
- Personal, Social, and Civic Responsibility
- Interactive Communication

High Productivity
- Prioritizing, Planning, and Managing for Results
- Effective Use of Real-World Tools
- Ability to Produce Relevant, High-Quality Products

The EnGauge Framework adds "visual literacy" as related to information literacy. "Curiosity" and "risk taking" are included as core skills, as is "managing complexity." "Prioritizing, planning, and managing for results" is stressed. "Multicultural literacy" is an explicit component. With the exception of the "Effective Communication" category, this shorter list focuses less than does P21 on the overlap with 20th century curriculum. More emphasis is placed on new contextual skills and knowledge.

In 2005, the Organization for Economic Cooperation and Development provided its conception of 21st century skills:

Organization for Economic Cooperation and Development

Competency Category 1: Using Tools Interactively
A. Use language, symbols and texts interactively
B. Use knowledge and information interactively
C. Use technology interactively

Competency Category 2: Interacting in Heterogeneous Groups
A. Relate well to others
B. Co-operate, work in teams
C. Manage and resolve conflicts

Competency Category 3: Acting Autonomously
A. Act within the big picture
B. Form and conduct life plans and personal projects
C. Defend and assert rights, interests, limits and needs.

The OECD competencies highlight "using language, symbols, and texts," as well as "managing and resolving conflicts." "Acting autonomously" is a major category in this framework that includes "life plans" and "defending and asserting rights, interests, limits, and needs." This framework focuses less than P21 on overlaps with the 20th century curriculum and, like the Metiri/NCREL skillset, more on new contextual skills. Affective and psychosocial skills receive greater emphasis than in frameworks generated by US organizations.

In 2007, the American Association of Colleges and Universities developed a framework delineating the 21st century skills graduates of higher education should attain:

American Association of College and Universities

The Essential Learning Outcomes

Beginning in school, and continuing at successively higher levels across their college studies, students should prepare for twenty-first-century challenges by gaining:

Knowledge of Human Cultures and the Physical and Natural World
• Through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts

Focused by engagement with big questions, both contemporary and enduring

Intellectual and Practical Skills, including
• Inquiry and analysis
• Critical and creative thinking
• Written and oral communication
• Quantitative literacy
• Information literacy
• Teamwork and problem solving

Practiced extensively, across the curriculum, in the context of progressively more challenging problems, projects, and standards for performance

Personal and Social Responsibility, including
• Civic knowledge and engagement—local and global
• Intercultural knowledge and competence
• Ethical reasoning and action
• Foundations and skills for lifelong learning

Anchored through active involvement with diverse communities and real-world challenges

Integrative Learning, including
• Synthesis and advanced accomplishment across general and specialized studies

Demonstrated through the application of knowledge, skills, and responsibilities to new settings and complex problems

The AACU college-level essential learning outcomes (presumably developed as a foundation in K-12 schooling) add "knowledge of human cultures" to the P21 framework. This skillset stresses "engagement with big questions, both contemporary and enduring," an intellectual capability that higher education has long sought to inculcate. "Inquiry" and "quantitative analysis" are specifically cited as important analytic skills. Learning by doing, rather than by assimilation of information, is tacitly stressed in the language the AACU uses.

Current Conceptual Frameworks for Digital Literacies

In part to emphasize the ways in which information and communications technology skills are central to the 21st century, in 2007 the International Society for Technology in Education (ISTE) revised its student standards for technology in the curriculum:

International Society for Technology in Education ICT Skills

1. Creativity and Innovation
Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:
a. apply existing knowledge to generate new ideas, products, or processes.
b. create original works as a means of personal or group expression.
c. use models and simulations to explore complex systems and issues.
d. identify trends and forecast possibilities.

2. Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:
a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
c. develop cultural understanding and global awareness by engaging with learners of other cultures.
d. contribute to project teams to produce original works or solve problems.

3. Research and Information Fluency
Students apply digital tools to gather, evaluate, and use information. Students:
a. plan strategies to guide inquiry.
b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
d. process data and report results.

4. Critical Thinking, Problem Solving, and Decision Making
Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:
a. identify and define authentic problems and significant questions for investigation.
b. plan and manage activities to develop a solution or complete a project.
c. collect and analyze data to identify solutions and/or make informed decisions.
d. use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship
Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:
a. advocate and practice safe, legal, and responsible use of information and technology.
b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
c. demonstrate personal responsibility for lifelong learning.
d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts
Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:
a. understand and use technology systems.
b. select and use applications effectively and productively.
c. troubleshoot systems and applications.
d. transfer current knowledge to learning of new technologies.

Beyond P21, the ISTE ICT skills stress "creating original works as a means of personal or group expression," "using models and simulations to explore complex systems and issues," and "identifying trends and forecasting possibilities." Other capabilities include "identifying and defining authentic problems and significant questions for investigation" and "using multiple processes and diverse perspectives to explore alternative solutions." "Safe, legal" use of information and technology is highlighted, as is "digital citizenship." "Troubleshooting systems and applications" and "transferring current knowledge to learning of new technologies" are seen as key skills. As might be expected, the digital literacies this educational technology organization articulates are more detailed than those in the overall P21 framework.

In a similar vein, in 2007 the Educational Testing Service (ETS) ICT Literacy Panel released its digital literacy standards:

Educational Testing Service ICT Literacy

ICT LITERACY

ICT Proficiency

Access Manage Integrate Evaluate Create

Cognitive Proficiency Technical Proficiency

Cognitive Proficiency — the desired *foundational skills* of everyday life at school, at home, and at work. Literacy, numeracy, problem solving, and spatial/visual literacy demonstrate these proficiencies.

Technical Proficiency — the basic components of digital literacy. It includes a foundational knowledge of hardware, software applications, networks, and elements of digital technology.

ICT Proficiency — the integration and application of cognitive and technical skills. ICT proficiencies are seen as enablers; that is, they allow individuals to maximize the capabilities of technology. At the highest level, ICT proficiencies result in innovation, individual transformation, and societal change.

As an illustration of the five levels listed above (2007, pg. 20):

Access Select and open appropriate e-mails from inbox list.

Manage Identify and organize the relevant information in each e-mail.

Integrate Summarize the interest in the courses provided by the company.

Evaluate Decide which courses should be continued next year, based on last year's attendance.

Create Write up your recommendation in the form of an e-mail to the vice president of human resources.

The ETS Digital Literacy skills add "technical proficiency: a foundational knowledge of hardware, software applications, networks, and elements of digital technology." The example digital literacy activities provided in this framework seem less sophisticated than those implied by the other frameworks analyzed; the illustration is closer in spirit to the ISTE framework for digital literacies developed in the late 1990s.

As the ISTE and ECS ICT frameworks suggest, much of what distinguishes 21st century skills from 20th century competencies is that a person and a tool, application, medium, or environment work in concert to accomplish an objective unobtainable otherwise (e.g., remote collaboration via groupware among a problem finding team scattered across the globe). However, ICT are not mere mechanisms for attaining the desired behavior; through distributed cognition, the understandings they enable are intrinsic to the fluent performance (e.g., a group co-constructing a sophisticated conceptual framework using the representational tools available in a wiki).

Frameworks that discuss new "literacies" based on the evolution of ICT help to illuminate this aspect of 21st century learning. With funding from the Macarthur Foundation, Henry Jenkins and his colleagues produced a list of digital literacies (2006):

Jenkins' Literacies based on New Media

Play — the capacity to experiment with one's surroundings as a form of problem-solving

Performance — the ability to adopt alternative identities for the purpose of improvisation and discovery

Simulation — the ability to interpret and construct dynamic models of real-world processes

Appropriation — the ability to meaningfully sample and remix media content

Multitasking — the ability to scan one's environment and shift focus as needed to salient details.

Distributed Cognition — the ability to interact meaningfully with tools that expand mental capacities

Collective Intelligence — the ability to pool knowledge and compare notes with others toward a common goal

Judgment — the ability to evaluate the reliability and credibility of different information sources

Transmedia Navigation — the ability to follow the flow of stories and information across multiple modalities

Networking — the ability to search for, synthesize, and disseminate information

Negotiation — the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms

These digital literacies have a different tone than the ISTE and ETS frameworks above. The emphasis is not on proficiency with the tool, but on types of intellectual activity performed by a person working with sophisticated ICT. While some perennial capabilities are listed (e.g., judgment), other skills (e.g., performance) are contextual in their emphasis on new types of 21st century capacities.

All these digital literacies not only represent skills students should master for effective 21st century work and citizenship, but also describe the learning strengths and preferences people who use technology now bring to educational settings. Dede (2005) presented a framework of "neomillennial learning styles" that are based on new digital literacies:

Dede's Neomillennial Learning Styles

Fluency in multiple media, valuing each for the types of communication, activities, experiences, and expressions it empowers.

Active learning based on collectively seeking, sieving, and synthesizing experiences, rather than individually locating and absorbing information from some single best source.

Expression through non-linear, associational webs of representations as well linear media (e.g., authoring a simulation and a webpage to express understanding, in contrast to writing a paper).

Co-design by teachers and students of learning experiences personalized to individual needs and preferences.

Since the articulation of this framework, the emergence of Web 2.0 media has fueled a shift in leading-edge applications on the World Wide Web that reinforces these learning strengths and preferences. The predominant learning activities on the Internet have changed from the presentation of material by website providers to the active co-construction of resources by communities of contributors. Whereas the twentieth-century web centered on developer-created material (e.g., informational websites) generated primarily by a small fraction of the Internet's users, Web 2.0 tools (e.g., Wikipedia) help

large numbers of people build online communities for creativity, collaboration, and sharing.

Dede (2009b) delineated a category system for current Web 2.0 tools:

1. *Sharing*
    - Communal Bookmarking
    - Photo/Video Sharing
    - Social Networking
    - Writers' Workshops/Fanfiction
2. *Thinking*
    - Blogs
    - Podcasts
    - Online Discussion Forums
3. *Co-Creating*
    - Wikis/Collaborative File Creation
    - Mashups/Collective Media Creation
    - Collaborative Social Change Communities

This framework shows a loose progression from top to bottom, with sharing leading to thinking together and then collective action in which sophisticated groups seeking change use subsets of the nine media listed earlier to accomplish their collective objectives. Overall, growing usage of these Web 2.0 tools has led to an intensification of the learning styles and digital literacies described above.

Leu and his colleagues (2007) described four characteristics of the "new literacies" generated by ICT. First, emerging ICT tools, applications, media, and environments require novel skills, strategies, and dispositions for their effective use. Second, new literacies are central to full economic, civic, and personal participation in a globalized society. Third, new literacies constantly evolve as their defining ICT continuously are renewed through innovation. Fourth, new literacies are multiple, multimodel, and multifaceted. These characteristics are in accord with the media-based styles of learning presented above and with the 21st century capabilities this chapter discusses.

Comparing Alternative Frameworks for 21st Century Skills

In summary, all these 21st century skills frameworks are generally consistent with each other. The additions to the P21 skillset the alternative frameworks offer are of two types. First, other groups identify some subskills within P21 categories as particularly important. As an illustration, "troubleshooting systems and applications" is seen as a key subskill by ISTE within the P21 overall category of ICT Literacy, and this ISTE subskill requires the foundational subskill of "technical proficiency: a foundational knowledge of hardware, software applications, networks, and elements of digital technology" advocated by ETS. Highlighting this subskill may reflect an assessment of which aspects of a larger capability teachers are likely to overlook given the current culture of schooling; for example, students seldom have opportunities to learn "troubleshooting" because teachers instinctively don't ever want problems to emerge in an instructional situation.

Second, groups other than P21 stress some areas they feel are underemphasized in its categories. As an illustration, "students acting autonomously" is a major category for OECD that, again, is contrary to the current culture of US schooling. Similarly, the Metiri/NCREL framework stresses student "risk taking," but this is unlikely to be encouraged by many US teachers unless special emphasis is put on this skill as crucial to 21st century work and citizenship.

The stress on what may be underemphasized because those skills are inconsistent with current classroom culture highlights a substantial challenge to infusing these 21st century skills frameworks into educational practice and policy. At this point in history, the primary barriers to altering curricular, pedagogical, and assessment practices are not conceptual, technical or economic, but instead psychological, political, and cultural. We now have all the means necessary to move beyond teaching 20th century knowledge in order to prepare all students for a future quite different from the immediate past. Whether society has the professional commitment and public will to actualize such a vision remains to be seen.

Advances in the Assessment of 21st Century Skills

Several metrics for assessing 21st century skills are discussed in the Education Board's report, "Measuring Skills for the 21st Century" (Silva, 2008). Which parts of the synthesized 21st century skills framework do these assessments cover?

The College Work and Readiness Assessment

The College and Work Readiness Assessment (CWRA) measures how students perform on constructed response tasks that require an integrated set of critical thinking, analytic reasoning, problem solving, and written communication skills. The CWRA is delivered entirely over the Internet in a proctored setting... Critical thinking, analytical reasoning, problem-solving, and writing are "collective outcomes" that cannot fully be taught in any one class or year; so all teachers and faculty have a responsibility to teach for such skills within each subject area and discipline.

Performance Tasks Students must complete a "real-life" activity (such as preparing a memo or policy recommendation) by using a series of documents that must be reviewed and evaluated. Completion of these instruments does not require the recall of particular facts or formulas; instead, the measures assess the demonstrated ability to interpret, analyze and synthesize information.

Analytic Writing Tasks Evaluate students' ability to articulate complex ideas, examine claims and evidence, support ideas with relevant reasons and examples, sustain a coherent discussion, and use standard written English.

The Programme for International Student Assessment (PISA)

PISA is based on the OECD Definition and Selection of Key Competencies project (DeSeCo), discussed earlier under formulations of 21st century skills. PISA seeks to measure how well young adults, at age 15 and therefore approaching the end of compulsory schooling, are prepared to meet the challenges of today's knowledge societies – what PISA refers to as "literacy". The assessment is forward looking, focusing on young people's ability to use theirknowledge and skills to meet real-life challenges, rather than merely on the extent to which they have mastered a specific school curriculum. This orientation reflects a change in the goals and objectives of curricula themselves, which increasingly address what students can do with what they learn at school and not merely whether they can reproduce what they have learned.

The domains of reading, mathematical and scientific literacy are covered not merely in terms of mastery of the school curriculum, but in terms of important knowledge and skills needed in adult

life. Pencil-and-paper tests are used, with assessments lasting a total of two hours for each student. Test items are a mixture of multiple-choice items and questions requiring students to construct their own responses. The items are organized in groups based on a passage setting out a real-life situation. A total of about seven hours of test items is covered, with different students taking different combinations of test items. Students answer a background questionnaire, which takes 20-30 minutes to complete, providing information about themselves and their homes. School principals are given a 20-minute questionnaire about their schools.

Key Stage 3 ICT Literacy Assessment

This ICT literacy assessment gauges students' ICT capability at the end of "Key Stage 3" (ages 12-13) in Great Britain's national curriculum. The test not only assesses students' ICT skills, but also their ability to use those skills to solve a set of complex problems involving research, communication, information management, and presentation. Test results provide both summative information - in the form of a national score for each student - and detailed feedback about student performance that could be used formatively to inform future teaching and learning.

The ICT test is set in a complex virtual world, within which students carry out tasks using a "walled garden" of assets (e.g., text, pictures, data and "canned" websites) to take the test without access to the Internet. Students are also provided with a toolkit of applications to enable them to complete the tasks; all of these assets are generic software programs developed by the QCA to provide the same capabilities as familiar productivity software on the level playing field of a non-brand-specific platform. As students work through the test session, their actions are tracked by the computer and mapped against expected capabilities for each level of the national curriculum; this includes both technical skills and learning skills, such as "finding things out," "developing ideas" and "exchanging and sharing information." The information collected about a student's performance allows a score to be awarded along with a profile of individual strengths and weaknesses.

All three assessments potentially could cover substantial amounts of the 21st century skills delineated in the frameworks above. However, CWRA and PISA are limited in their effectiveness by their formats: paper-based and at times test-item-focused. The Key Stage 3 has more potential to measure the full range of 21st century capabilities, including digital literacies, because it is conducted in a virtual world and based on activities more sophisticated than making forced-choice decisions among a limited number of alternatives.

Beyond these current assessments, many researchers are working on virtual performance assessments for specific higher order intellectual performances, such as scientific inquiry, that soon may provide reliable, usable, and valid measures for many 21st century skills (Ketelhut, Dede, Clarke, Nelson, & Bowman, 2007). Research has documented that higher order thinking skills related to sophisticated cognition (e.g., inquiry processes, formulating scientific explanations, communicating scientific understanding, approaches to novel situations) are difficult to measure with multiple choice or even with constructed-response paper-and-pencil tests (Resnick & Resnick, 1992; Quellmalz & Haertel, 2004; National Research Council, 2006). In the late 1980s and 1990s, educators attempted to use performance assessments in accountability programs. However, the developers of both hands-on and virtual performance assessments encountered a number of technical, resource, and reliability problems in large scale administration (Cronbach, Linn, Brennan, & Haertel, 1997; Shavelson, Ruiz-Primo, & Wiley, 1999). At that time, these problems were substantial enough to undercut the potentially greater construct validity for science inquiry that performance assessments can provide over paper-and-pencil tests. Now, however, teams of scholars are using

modern technologies to develop virtual performance assessments of various types (e.g., http://virtualassessment.org) that may solve this problem of providing reliable, valid measurements for sophisticated intellectual and psychosocial skills (Quellmalz & Pellegrino, 2009).

Overall, the increasing availability of valid assessments for 21st century skills is leading to calls for all states to participate in "international benchmarking": comparing their educational processes and outcomes to the best models around the world (National Governors Association, Council of Chief State School Officers, and Achieve, Inc., 2008). Widely used international assessments centered on curricular areas include the Trends in International Math and Science Study (TIMSS) for grades four, eight, and twelve, as well as the International Association for the Evaluation of Educational Achievement PIRLS assessment of fourth grade reading levels (Silva, 2008). "Benchmarking for Success: Ensuring US Students Receive a World-class Education" calls on states to implement five types of benchmarking (page 6):

Action 1: Upgrade state standards by adopting a common core of internationally benchmarked standards in math and language arts for grades K-12 to ensure that students are equipped with the necessary knowledge and skills to be globally competitive.
Action 2: Leverage states' collective influence to ensure that textbooks, digital media, curricula, and assessments are aligned to internationally benchmarked standards and draw on lessons from high performing nations and states.
Action 3: Revise state policies for recruiting, preparing, developing, and supporting teachers and school leaders to reflect the human capital practices of top-performing nations and states around the world.
Action 4: Hold schools and systems accountable through monitoring, interventions, and support to ensure consistently high performance, drawing upon international best practices.
Action 5: Measure state-level education performance globally by examining student achievement and attainment in an international context to ensure that, over time, students are receiving the education they need to compete in the 21st century economy.

Recent US federal activities to promote coordination among states in developing comparable, high quality curriculum standards are building momentum to generate and use assessments that can measure sophisticated intellectual and psychosocial skills needed for the 21st century.

Conclusion

Fortunately, groups developing conceptualizations of 21st century skills have built sufficiently on each other's ideas to avoid a "Tower of Babel" situation. As this analysis shows, organizations that argue for 21st century skills have frameworks largely consistent in terms of what should be added to the curriculum. However, each group has different areas of emphasis within the overarching skillset. As an illustration, taking the P21 framework as a baseline, groups focused on technical skills--such as ISTE, ETS, and those who advocate for digital literacies--emphasize that aspect of P21 and articulate in greater detail which fluencies in information and communications technologies are most important.

Each rganization also each introduces complementary ideas to the concept of 21st century skills. For example, as discussed earlier additions to the P21 framework from OECD and Metiri/NCREL incorporate autonomous actions by students that typically are not a part of conventional classroom culture. This highlights a meta-cognitive challenge

for the 21st century skills movement: to systematically examine all the tacit beliefs and assumptions and values about schooling that are legacies from the 20th century and the industrial age. Compilations such as this volume are making important contributions in aiding this reconceptualization of education for the 21st century.

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This report is written from the perspective of an informed observer at the Nineteenth Annual Aspen Institute Roundtable on Information Technology. 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 conference.

Foreword

The speed by which information can now be shared—instantly and on a large horizontal scale—is causing tremors in many institutions that have enjoyed relative stability in the past. The "digital disruption" has come to industries, such as music and news, economies, such as the global financial markets, and even diplomacy and governance, as Wikileaks has shown.

The nature of work is no exception to this trend. Many people now earn their livings in an environment of constant connectivity and change. Mobile devices, social networks and cloud computing present new opportunities for individuals and organizations that are altering the DNA of the workplace and the worker.

People now have a multitude of jobs and career changes over the course of their working lives, different from the norm just a few decades ago. In the last year, the *New York Times* reports, the percentage of temporary workers hired in the private sector has skyrocketed, with many businesses now organizing "around short- to medium-term projects that can be doled out to temporary or contract workers."[1] It is unclear how the security and benefits of the traditional permanent job will be replaced. Firms utilize crowdsourcing to build innovations and markets, meaning they are able to slim down their employee base and simultaneously expand it by millions. Work and compensation are changing dramatically, with enormous implications for firms, the economy, governance and individual well-being.

There was no shortage of these matters to discuss when the Aspen Institute Roundtable on Information Technology met from August 3-6, 2010, to take on the "The Future of Work." Bringing together a diverse group of technologists, innovators, business leaders, entrepreneurs, academics and international politicians, the Roundtable's objective was to identify how long-term as well as quickly fomenting technological and social trends are changing the nature of work and firms, and also, importantly, to understand what comes next from it. Ultimately it sought to define a world of work that was not just more economically efficient but better for the people living in it.

1. Motoko Rich, "Weighing Costs, Companies Favor Temporary Help," *New York Times*, December 19, 2010, at http://www.nytimes.com/2010/12/20/business/economy/20temp.html

This report captures the themes and insights that arose over the three days, placing them in an understandable context and narrative, which rapporteur David Bollier is exceptionally adroit at doing.

In examining 21st century business realities such as decentralized workforces and firms leveraging communities and networks, the report captures the opportunities present for more rapid innovation, more efficient production and greater global reach. But questions arise about how workers gain skills and satisfaction from work, how they embrace change and how to govern the firm and society. When people are hyper-connected with no clear demarcation between work and home-life, how does the individual balance the two?

As work moves towards more open platforms, becoming less hierarchical, other aspects of society are also affected. The report explores how this changing force in the workplace poses the need for various institutional reforms to address increasing economic inequality, social marginalization, and systems of education and governance that are not keeping up with the changes. Or, as one participant asks, "What is the core competency of a government in a world where the old business model is not necessarily relevant any more?" How do employers, workers, educators and governments respond to the changing nature of work and the movement of firms to the virtual?

This report raises the right questions. The answers will no doubt change as rapidly as the technology does.

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THE FUTURE OF WORK

What it means for Individuals, Businesses, Markets and Governments

David Bollier

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By David Bollier

Introduction

Over the course of the past generation, but especially since the World Wide Web emerged in 1994, digital technologies have been transforming the nature of work, the architectures of markets and the inner dynamics of organizations. They have also been altering the global economy and national cultures, which in turn is forcing governments to change how they build infrastructure, meet social needs and provide services.

Historically, the pace of change has been fairly incremental, which has partially masked the depth of transformation underway. In recent years, however, the metabolism of change has accelerated. Novel media platforms and new efficiencies introduced by a convergence of technologies—computing, telecommunications, wireless systems, mobile devices and more—are sending shockwaves across society. The worlds of work, the marketplace, organizations of all sorts, personal life and global commerce are being transformed as systems from Facebook to Twitter and smart phones to e-readers give rise to a strange new social-economic-political ecosystem.

Some things are clear. The networked environment is rapidly changing employment relationships while offering new opportunities for boosting productivity and competing more effectively. It is also disrupting centralized organizations and fueling the rise of flexible work teams and dynamic, niche markets. It is less clear how employers, individual workers and governments should respond to these changes, or how these changes will play out over the long term. Any map of the emerging landscape still has numerous blank spots bearing the warning, "Here be dragons!"

To explore this rich territory and try to develop a better map of its topography, the Aspen Institute Communications and Society Program convened a three-day conference, "The Future of Work," August 4–6, 2010. The event brought together 23 technologists, entrepreneurs, venture capitalists, computer industry experts, management consultants, workforce specialists and academics to try to make sense of the changes now transforming work in its many dimensions. The discussions were moderated by Charles M. Firestone, Executive Director of the Communications and Society Program. This report is an interpretive synthesis of those discussions and the key themes raised.

We start in Part I with an overview of how 20th century business models—based on large standardization and mass production to maximize efficiency and profit—are giving way to a new breed of business models that seek to leverage the power of digital networking.

As we will see in Part II, this new context for businesses—a world of ubiquitous Internet access, capacious bandwidth and memory storage, and rapidly evolving software and devices—is dramatically changing the organization of work and empowering workers. Despite the uncertainties and risks, enterprises that embrace open platforms and relationship-driven business strategies are discovering new competitive advantages.

Leveraging the new business models, however, requires that the "worker of tomorrow" be able to cultivate certain dispositions and skill sets that are not necessarily prized in conventional work environments. These themes are explored in Part III. The firm of the future will be different, too. Business leaders, therefore, need to understand the competitive strategies and organizational norms that will succeed in the networked environment—the focus of Part IV.

The repercussions of digital networks go beyond the marketplace. They implicate government and public policy in significant ways. The question is whether and how governments, educational institutions and other social institutions will address the formidable challenges that lie ahead. These questions are explored in Part V.

It remains an open question what sorts of institutional and policy reforms may be needed to address the disruptive, antisocial aspects of the new marketplace: economic inequality, social marginalization, defi-

cient educational opportunities. Governments and schools at all levels are only beginning to explore how they may need to change to help individuals, firms and social institutions thrive in the new environment.

Any assessment of these issues is necessarily fraught with uncertainties, disagreement and sheer speculation. That said, the participants of this roundtable identified many powerful trends—some hopeful, others alarming—that will surely intensify in coming years.

I. The 21st Century Workplace

A good place to start this exploration of the future of work is by reviewing the past: the familiar 20th century patterns of employment, education, training and career advancement. These models continue to guide our thinking, even as they begin to crumble in the face of new 21st century realities.

In his 2001 book, *The Future of Success*, former U.S. Labor Secretary Robert Reich writes that the idea of the steady, permanent job is becoming a relic of another era, or more precisely, the postwar period of American life.[1] During this period, he notes, people implicitly expected that a job would consist of "steady work with predictably rising pay," especially if they were loyal to the company and accrued seniority at the firm.

Employees in the second half of the 20th century were generally paid more for their "clock time" at work than for specific outcomes, in part because most individual employees had strictly prescribed responsibilities. Most jobs were designed as "mechanical" cogs in a larger production apparatus whose purpose was to maximize economies of scale. "The organization ran by rules," writes Reich. "Factory workers were not paid to think. Henry Ford once complained that when he hired a pair of hands, he also got a human being. Where no rules were available, there were rules for setting new rules. If the vast organizational machine was to attain maximum efficiency, all behavior had to be fully anticipated."[2]

Michael Chui, Senior Fellow at the McKinsey Global Institute of the McKinsey & Company consulting firm, offered a short presentation contrasting the "Sloan Age" of organizational management—a shorthand for workplace design in the 20th century—with emerging

trends in work structures and practices (Alfred P. Sloan was the legendary Chairman of General Motors from 1937 to 1956 who introduced extensive "scientific management" techniques in organizing automobile production).

Chui summarized the conventional wisdom about organizing work in the 20th century this way:

> The best way to harness human talent is through full-time, exclusive employment relationships where people are paid for the amount of time they spend at a common location. They should be organized in stable hierarchies where they are evaluated primarily through the judgment of their superiors, and what and how they do their jobs is prescribed.

Chui proceeded to isolate key phrases from this summary in order to show the contrast between old norms and emerging trends:

"Full-time, exclusive employment relationship." Work tasks are increasingly being accomplished through "crowdsourcing" techniques, in which software platforms enable Internet users to contribute to a project without necessarily getting paid.

"Paid for the amount of time [spent at work]." Companies are increasingly hosting contests as a way to elicit new ideas and tap into community knowledge, noted Chui. For example, in 2006, Netflix offered a prize of $1 million to anyone who could increase the accuracy of its movie recommendation system by 10 percent. The company offered a data set of over 100 million movie ratings from more than 480,000 users rating 18,000 movies, and they received numerous useful suggestions that offered "sub-10 percent improvements" before finally awarding $1 million in equity in September 2009.

The toymaker Lego took a similar approach with its Lego CAD [computer-aided design] package, a toy that both children and adults use to design their own Lego systems. By hosting a website called the Lego Digital Designer, Lego received many toy designs that they proceeded to re-package and sell. The site leverages the community of customers to obtain free research and development.

"Common location." The idea of a workplace as a fixed, physical location is changing as work becomes more distributed through technology, said Chui. So, for example, some companies use "nearshoring"—the outsourcing of work to people working at home in the

U.S.—while other organizations are "born global" as virtual enterprises that electronically link management, designers, manufacturing, marketing and other tasks.

"*Stable hierarchies.*" The flattening of corporate hierarchies is now quite familiar, but some companies are going much further, using social-networking technologies to staff their projects, said Chui. Instead of specific jobs, some companies are modularizing their work into discrete projects and sourcing them not just with current employees but with former ones as well. Still other companies are using online markets to identify talent, make predictions about the future and generate new ideas and knowledge.

"*Evaluated primarily through the judgment of their superiors.*" Instead of a single boss or management team evaluating the performance of an employee, alternative means of appraising performance are emerging. Chui described a "720-degree evaluation"—a twist on the "360-degree evaluation" in which everyone within a company evaluates an employee. In a 720-degree evaluation, people *outside* of the organization also evaluate the employee. A person's *degree of connectedness* and *influence in a network* is also evaluated. Finally, some employees are evaluated based on their "trading ability" on online prediction markets.

"*What and how they do their jobs is prescribed.*" A new management mindset is needed in the "post-Sloan Age" environment, said Chui. In the 20th century, managers focused on standardized procedures, patterns of interaction among employees, the work plan and predicted outcomes. But in the new environment, managers must focus on how employees participate in informal communities of work or practice. Following fixed work plans is seen as less valuable than the ability to experiment and follow up. "You don't know ahead of time what's going to work," said Chui, "so you have to follow the successes and figure out how to make them really powerful and scale them." The central role of technology, then, might not be enforcing compliance, but enabling participation.

For business analysts John Hagel III, John Seely Brown and Lang Davison, work in the 20th century embodied a "push" worldview—an approach to business organization that is based on forecasting market demand and then "pushing" out production outputs to customers.[3] As the authors write in their 2010 book, *The Power of Pull*, "Push works

mightily to ensure that the right people and resources are delivered at the right place and the right time to serve the anticipated demand."

Under "push" systems, companies build up inventory in advance of demand. They develop standard routines that use "tightly scripted specifications of activities designed to be invoked by known parties in predetermined contexts." Push strategies are exemplified by thick process manuals, regimented manufacturing and service models, schools that teach the same curricula to everyone, and television networks that adhere to programming formulas guided by fixed demographic metrics and ratings.

The scientific management of work as pioneered by Frederick Taylor is a classic "push" approach. It is a top-down administered regime that seeks to control activities in great detail in order to maximize predictable outcomes. It seeks efficiency and uniformity throughout the system. Not surprisingly, workers and consumers alike are regarded as passive vessels who must conform to the needs of system; most workers are now allowed to express their own human agency beyond narrow limits.

The philosophy of "push," write Hagel, Brown and Davison, requires small groups of elites and experts to direct an enterprise's operations and allocate resources. In turn, this requires a centralized hierarchy committed to command and control of an apparatus of mass production and consumption. The firm of the 20th century, write Hagel et al., "was built on the premise that the primary role of the firm was to arrive at lower costs by getting bigger—to make the most of the scale economies available through the new infrastructures of the day [electricity, railroads, airfreight, containerized shipping], what we call 'scalable efficiency'."[4]

The rise and proliferation of computers, the Internet and other digital technologies are shattering many of the core premises of 20th century firms and markets. In the turbulent new world of ubiquitous networks and digital technologies, Taylorite schemes of work and business organization tend to be less effective, moot or counterproductive.

We will examine some of these tensions between the old and new in coming sections, but first, it is useful to pause and reflect on the very definitions of "work" and "workplace." What were once fairly stable, self-evident terms are themselves becoming more fluid, blurry and postmodern.

What Is "Work"?

It is not self-evident how to define "work," given that work is not just an artifact of the marketplace, but equally a personal and social phenomenon. For Robert Morris, Vice President of Services Research for IBM Research, it is useful to apply systems analysis to define work. Work can be seen as "human activity" bounded only by the amount of waking time in a day (with a concession that sleep may help organize productive thought).

"It's a beautiful, gigantic *system*—a 'stock-and-flow' model—that produces goods, services, fun and happiness," said Morris. "It's a systems model of peoples' time and behavior as an input together with positive and negative feedback in the form of incentives that determine the productivity and quality of the outputs."

For most workers in the 20th century, it is fair to say that there was a clear demarcation between "work" and "home" and between "work" and "play." One's identity and focus at work—in producing some measurable unit of market value for a manufacturer, service provider or government—was quite separate from one's identity and focus at home.

No more. "Work" is no longer confined to a specific time and place. As if to reinvent the lost world of artisanal tradition, technology is blurring the lines between work and home and between work and personal life. Tens of millions of people now work at home offices, telecommute or participate in "virtual companies" whose members are scattered across the country or the globe. Many others work for startup firms in improvised settings.

"Work in the future will be organized in ways that are far more decentralized."

Thomas Malone

"Work in the future will be organized in ways that are far more decentralized," said Thomas W. Malone, Director of the MIT Center for Collective Intelligence. "I think we are in the early stages of an increase in human freedom in business that may, in the long run, be as important a change for business as the change to democracy was for governments. This is happening because cheap communication lets more people have enough information that they can make sensible decisions for themselves instead of just following orders from people above them in the hierarchy. And that means

we can have the economic benefits of large-scale enterprises, such as efficiency and scale, and at the same time have the human benefits of small scale, such as motivation, creativity and flexibility."

The workplace of the 21st century may not even *be* a workplace, noted Dwayne Spradlin, President and CEO of InnoCentive, Inc., a virtual business that offers an "open innovation" platform for the crowdsourcing of solutions. Work is no longer an activity that occurs at a particular *place*, nor is it even an activity confined to a distinct period of *time*.

Work is also moving beyond familiar cognitive definitions, said John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge. "We've got to recognize that the real high-value work, ironically, may not fit within our classical cognitive framework, but may actually have an *imaginative* component. A tremendous amount of my work is done in my sleep. That is to say, there are parts of imaginative thinking that are definitely not conscious, but probably subconscious, that require 'lateral connections' that are not necessarily cognitive."

"Beyond cognitive competencies," said Maryam Alavi, Vice Dean of the Goizueta Business School at Emory University and holder of the John and Lucy Cook Chair of Information Strategy, "there is a whole arena of emotional intelligence. This involves knowing one's self, being able to self-manage, being able to connect to others and being able to show empathy toward others. There are also competencies around social relations that relate to teamwork, negotiation and conflict management. And then there are behavioral competencies that involve our actions." In short, the work of the future may require much more "holistic thinking."

"The most effective individuals," Alavi continued, "are those who have a well-rounded development of these sets of skills, and they know which one to apply. In fact, there are some newer studies of brain imaging that show that very effective strategic thinkers fire on various parts of the brain related to these different sets of competencies."

Does a person's motivation matter in how we define "work"? Is the fact that someone is paying for work what makes it "work"? Kim Taipale, Founder and Executive Director of the Stilwell Center for Advanced Studies in Science and Technology Policy, said, "When my gardener weeds, it's work, but when I weed, it's sort of what I do."

Work seems to involve activity that is being done *at someone else's behest.* It is something that has to be done whether or not you enjoy doing it. Or as Shami Khorana, President of HCL America, Inc., put it, "Work is working with people to bring value to some entity."

The globalization of work has made it more complicated to define what work is, said Tammy Johns, Senior Vice President for Innovation and Workforce Solutions at Manpower, Inc. Work responsibilities are becoming more complex and specialized, the boundaries between work and personal life are blurring, and the shift from manufacturing to services is putting a greater premium on people's ability to solve complex problems and show sophisticated judgment. Job responsibilities call for a richer, more subtle array of human talents.

With the profusion of such work, many people's jobs are coming to reflect their way of life. Personal and social motivations are very important to many entrepreneurs, for example, and also to many "free agents." "Right now I'm tracking about 50 virtual work marketplaces where work is being done on the Internet as either task-based work or projects," said Tammy Johns. "And what you see in those marketplaces is people working for the love of it. You also see people working to maintain a certain lifestyle." She added that a large number of these workers are "women and students who can work in these marketplaces from anywhere because it suits their lifestyle."

For much of the world, of course, work or its particular appeal is hardly an elective choice. It is a physical and personal necessity. Work is essential to eating and living. In India, for example, some 70 percent of the population is still dependent on agriculture, noted S. Gopalakrishnan, CEO and Managing Director of Infosys Technologies Ltd. Physical labor still predominates over the mental or "symbolic work" done via computers or offices.

The Coming Crisis in Organizing Work

In considering the future of work, roundtable participants shared a broad consensus that there is an unacknowledged crisis brewing. The fears were diverse: that individuals will not have the necessary skills to obtain paying work; that organizations will have trouble adapting to the networked environment and global competition; and that governments

will not have the foresight, sophistication or courage to craft new types of public policies and governance structures.

Although participants agreed that information and communications technologies will yield many economic and social benefits, they worry about a future with greater economic inequality, social polarization, spasms of nationalism and protectionism, and international instability.

"We've got organizations that need to figure out how to make talent and work pools function globally," said Dwayne Spradlin of InnoCentive, Inc. "Organizations need to figure out a way to move from fixed procedures and infrastructure to variable ones in organizing and optimizing resources. And now we've got the millennial generation coming in, and if anything, they're more project-based, not jobs-based, which means we need to think about how to orchestrate work talent in an environment of constant churn. There is a need for a whole new business science that can help organizations function more effectively in this 'new normal,' if you will."

"There is a need for a whole new business science that can help organizations function more effectively in this 'new normal.'"

Dwayne Spradlin

Spradlin continued: "My sense is that there is a constant move toward globalization, outsourcing and the 'free-agent nation.' People are engaging the workplace in a very different way. I think over the next five years we're going to see a massive shift in demographics among young people and how they engage their organizations. In general, companies are wholly unprepared for what's about to come."

Robert Morris of IBM Research agreed that an "extreme state of crisis" is gathering, one that is driven by many factors. He cited a growing "bifurcation" of the workforce—those who are benefiting from economic development and those who are not. This trend is not only occurring within countries, but among them, he said. "A few billion people on the planet don't even get a K–12 education." The lack of education and opportunity is not only hurting the most impoverished people of the world, skill shortages can prevent companies and investors from growing their business and expanding the economy.

All of these trends are intensified by the velocity of change that technology is driving. Paul Inouye, Partner at Perella Weinberg Partners, noted that the major trends of computing—mainframes in the '60s, PCs and client-servers in the '80s and the web in the late '90s—were once crashing upon society at a pace that might now be considered leisurely. Today, the growth of mobile communications, cloud computing, open software platforms and other major arenas of innovation are "condensing," he said. "Things are moving *very* quickly." Moreover, Inouye noted, what used to be a U.S.-centric phenomenon has become a large, international trend.

As the technological convergence proceeds, the dynamics of the communications/computing/social ecosystem are becoming more bewildering and complex. Competition, cooperation and conflict can take place simultaneously among the same companies in a given market. People across the world are being knit together into virtual spaces, said Inouye, resulting in "this weird, dynamic collaboration in which you're physically not even near the person you're actively collaborating with."

Yet with the focus so much on external customers, said Shami Khorana, workers organized to function in discrete work "silos" often find that they cannot coordinate and collaborate adequately with other workers in their own companies, "There is little focus on what their internal customers are saying, and how they should respond."

Any discussion of the future of work means "coming to grips with the problems of the world economy, world governments and business models," said Tim H. El-Hady, Director of Business Planning and Operations for Microsoft U.K. Ltd. "It means developing a vision."

El-Hady commended the Confucian philosophy in China and other religious philosophies that see the interests of society as overriding those of individuals and that honor the spirit of service to others. "The world is just so diversified, and only in the past 50 or 60 years have we been able to recognize our global connectedness, to view our wonderful planet with one eye, with a global perspective." El-Hady suggested that any new vision for the future of work must strive to integrate diverse human concerns into a coherent philosophical system that can reconcile divergent values as efficiency, equality and justice.

As these comments suggest, discussions about the future of work can take place at many levels—world historical trends, ethical philoso-

phy, global and domestic politics, economics, public policy, business strategy, and education policy, among other fields. All are implicated. But Dwayne Spradlin spoke for many conference participants when he accented the practical implications of failing to address the future of work: "If firms don't visualize what their futures look like and begin to make the changes that are necessary, those firms may cease to exist as we know them. We need a vision of what these firms should look like and how to transform our existing organizations."

II. How Technology is Changing Work

Jacques Bughin, Director of the Brussels Office of McKinsey & Company, argues—with co-authors James Manyika and Roger Roberts—that information technology is calling into question many time-honored premises about work, management and the corporation itself: "New degrees of freedom can be discovered in where and how companies compete, in how value is created, and in the nature of the corporation and how it is managed. Companies that exploit these new degrees of freedom can change the competitive game in their favor."

The authors make this case in an article, "New Degrees of Management Freedom: Challenging Sloan Age Business Orthodoxies," which appeared in the *McKinsey Technology Initiative Perspective.* [5] They continue:

> Transaction costs have tumbled in this wired world, and nearly ubiquitous connectivity has made new and unexpected ties with customers, talent and suppliers not only possible, but also easy. Digitization has changed the economics of creating and distributing products, services and content across a growing number of categories. It has the potential to revolutionize business, managerial and organizational models.

Bughin et al. provide a table of 10 business orthodoxies that are now being supplanted by "new freedoms" enabled by information technologies:

Orthodoxies		**New Freedoms**
1. Roles of companies and customers are distinct	→	Partners in co-creation
2. Competitive advantage from owning assets	→	Open assets—orchestration
3. Businesses start from traditional markets	→	Born global and blowback
4. Paying for value and talent	→	Value for free
5. Seek blockbusters	→	Mining the tail
6. Goods wear out	→	Goods improve with use
7. Power of bigness	→	Radical empowerment
8. Full-time employees in hierarchies	→	Everyone an employee
9. Batch	→	Real-time business
10. Trust your gut	→	Management science

One of the most intriguing "new freedoms" that networking technologies afford is item 4, the ability to generate value more efficiently, using "free" resources. "The Net allows the creation of 'multisided' markets, where one of the 'sides' can be free, and the other very profitable," write Bughin et al. "On the web, however, distribution costs are close to free, and the market is vast, creating adjacent profit pools that can be large. Web content sites from news sites to blog and photo sharing sites are prime examples of companies exploiting this freedom. These sites provide services for free in one market, e.g., for content, and then monetize their usage in another market, such as through advertising or by providing premium services...."

Other "new freedoms" are familiar but of growing importance. The Long Tail, for example, is the idea that that Internet can help bundle small, disaggregated consumer demand into viable niche markets, displacing the pressure to make "blockbuster" products that appeal to large, undifferentiated masses of consumers. The idea of consumers acting as co-creators with companies—as illustrated in the Lego and Netflix examples above—is also gaining momentum among many web-oriented businesses.

Important caveats were made, however: much of the world's work, especially hard, physical labor in Asia, Africa and other developing regions, is not likely to be affected by these trends in the near future, if ever. Even in India, only two million workers are in information technology businesses in a nation of one billion people, and many IT systems are not likely to transform many existing enterprises and types of labor. And yet, as the proliferation of mobile phones in the developing world has shown, the tech revolution is not confined to advanced capitalist economies. Furthermore, said Chui, there are already "weak signs" that post-Sloan Age dynamics are reaching many improbable business sectors and countries.

Crowdsourcing as a New Template for Work

The distributed outsourcing of work through an "open call" to any web user—a technique often called "crowdsourcing"—has become popular in many quarters as a way to reap smart, innovative research results quickly and efficiently.

One of the first major crowdsourcing projects, in 2005, was Amazon.com's Mechanical Turk, a Web 2.0 platform that enabled the creation of specific "Human Intelligence Tasks," or HITs, which self-selected people could carry out and get paid for.[6] "Crowdsourcing" now applies to many sorts of mass collaborations or competitions. It includes contests that gives prizes for the best, most innovative solutions to problems; open invitations to mass participation in solving design and software challenges; and distributed volunteer projects such as Distributed Proofreaders (to proofread public-domain texts) and the NASA Clickworkers Project (to classify craters on Mars).[7]

Crowdsourcing has become a full-fledged business model for some companies.

More than a technique for mass collaboration, crowdsourcing has become a full-fledged business model for some companies. InnoCentive, Inc. may be one of the most successful such enterprises. Based in Waltham, Massachusetts, the company acts as a broker between "seekers" with research and development problems and "solvers," who propose solutions that meet the desired criteria. Seekers are frequently large corporations with vexing challenges in

engineering, computer science, chemistry and many other scientific fields. Solvers win cash awards for their efforts.

InnoCentive was started as a wholly owned subsidiary of Eli Lilly, the pharmaceutical maker, in 2001, when it realized that the cost of innovation in drug development was increasing faster than the revenue. The idea of distributed, open innovation seemed like a compelling idea worth exploring. InnoCentive is a virtual firm whose employees work from locations around the world using remote-networking technologies.

Dwayne Spradlin, President and CEO of InnoCentive, noted that knowledge-management systems of the 1980s and 1990s were "a complete and utter failure" because they focused on indexing and "pushing out" knowledge. InnoCentive seeks to mobilize "vast pools of productivity and intellectual capacity" in a very different way, through open platforms and mass participation. "We define a goal in a concrete way and then try to get people galvanized around that," said Spradlin.

"None of our crowdsourcing is about a free ride for business organizations," he added. "This is about getting the right people to work on the right problems at the right time. Why? Because our systems are failing." Recent InnoCentive projects—from among hundreds listed on its website—include "challenges" that invite freelance researchers to develop a cost-effective system to clean water in Sub-Saharan Africa, to propose ways to build a novel technology platform for the analysis of cellular metabolites, and to find efficient ways to discover freely available and openly accessible learning resources.

The work culture that Spradlin as CEO has cultivated at InnoCentive exemplifies many of the principles of the post-Sloan Age environment. It is a paragon of openness, with all financial numbers except core revenues and costs available for anyone to see. Employees are not required to sign nondisclosure agreements or noncompete contracts.

Employees are expected to be highly conversant with digital networking and virtual collaboration. And they are also expected to be passionate about their jobs. "It doesn't matter if you answer the phones or if you're a Ph.D.," said Spradlin, "you better be passionate about what we do. It's a calling. As a result, we have no turnover, absolutely no turnover."

He noted that InnoCentive also evaluates its employees on "outcome-based measures" that assess the impact they are having on the company's markets. Employees are also judged for their "relationship management skills" and their leadership. "Thirty percent of my team's bonuses and variable compensation is based upon leadership," Spradlin said. Since 2006, InnoCentive has expanded its services to a variety of new industry sectors, and its annual revenue growth has typically been between 50 and 80 percent.[8]

A notable feature of InnoCentive, observed Thomas Malone of the MIT Center for Collective Intelligence, is the fact that "hundreds of thousands of people all over the world are doing the core work of the company—that is, coming up with innovative ideas." This is a future trend, to be sure, said Bill Coleman, the serial software entrepreneur and Partner in Alsop Louie Partners. "The world is turning into a guild, so you can leverage all sorts of open-source collectives without having to do any of the drudge work to build platforms, systems and tools that you need."

The grand hope, of course, is that participatory technologies will enhance productivity among workers, especially among the highest level of "knowledge workers," whose work involves critical thinking, sophisticated judgment and problem solving. Machines can already do most of the work of bank tellers and supermarket-checkout clerks. But can we improve the productivity of a salesperson, healthcare worker, general manager or university professor, asked Michael Chui, Senior Fellow at the McKinsey Global Institute. "I think we are very early in this S-curve," he said, "and nowhere near the inflection point."

...technology can function as "reflective amplifiers" to enhance an individual worker's performance.

John Seely Brown

Still, John Seely Brown of the Deloitte Center for the Edge believes that technology can function as "reflective amplifiers" to enhance an individual worker's performance. He cited the on-screen "dashboards" used by players of the online game "World of Warcraft" to assess their performance. "What would happen if employees could crate their own 'dashboards,' not for management, but to examine their own performance, how they're spending their

time, and so on?" Brown asked. Such IT-assisted feedback loops could prove highly motivational and assist employees to continuously learn and modify their behaviors.

As cloud computing becomes more pervasive, Peter Jackson, Chief Scientist and Vice President of Corporate Research and Development at Thomson Reuters, envisions a similar improvement in employee performance. "Once the cloud becomes a reality and people have raw, undifferentiated computing power available to them as a utility, they will be able to stop worrying about infrastructure and platforms," said Jackson. "Then they will be able to start thinking about intangibles: innovation and imagination—the things that build higher quality services. I think this will raise everybody's game."

The Future of the Firm and the Importance of Size

The rise of crowdsourcing and other networking techniques raises a provocative question: Is the venerable "theory of the firm," as propounded by economist Ronald Coase in his famous 1937 essay, obsolete?

Coase's celebrated "transaction cost" theory of the firm stated that the economic rationale for forming a business enterprise is its ability to manage employees and production more efficiently than by contracting these functions out to the marketplace. A firm can minimize transaction costs, which are otherwise higher if one must buy those goods and services in the marketplace.

But now, if online markets can radically reduce transaction costs, over and above what a firm can achieve, is the economic justification for the business firm disappearing? Does the firm still need to exist?

Maryam Alavi, Vice Dean of the Goizueta Business School, thinks the answer is that organizational forms are going to become a lot more complex *internally* in order to respond to the increasing *external* complexity of the business environment. "This is based on the 'law of requisite variety' in systems theory. There are parts of the organization that are going to be more hierarchical because of the uncertainties that they deal with or don't deal with. And there are parts of the organization that will need to be highly dynamic, open and changing."

"So managing that complexity and form is going to be very important to organizations in the future," said Alavi. "And that's why quality

of leadership is going to be increasingly important to organizations. It's important to realize that hierarchy and openness is not an either/or thing. It's a both/and kind of thing."

As a corollary to Alavi's insight, Kim Taipale, Founder and Executive Director of the Stilwell Center for Advanced Studies in Science and Technology Policy, cited Bateson's Rule, which holds (among other things) that "the only source of new patterns or new learning is *noise*." An organizational structure or hierarchy naturally attempts to suppress the noise of the network, in order to amplify the meaningful information, or signal. "But you can't take out all of the noise," said Taipale, "because then the network will never be resilient enough to deal with the shocks from the outside. So we have to find some way to balance noise and signal."

An analysis based on "transaction costs" may be missing the point. Perhaps the more meaningful axis for organizing firms today is their ability to intelligently filter "noise" from the network. Firms and employees must learn to balance noise and learning, so that they can respond appropriately, flexibly and rapidly to the complex and changing market environment.

If the boundaries of the firm are becoming more permeable and elastic, and if the internal structures of firms are themselves undergoing great change, does the size of firms matter? Will small firms have strategic advantages over large firms?

People no longer need to work through organizational hierarchies to do important work.

Thomas W. Malone

In a 1987 paper, Thomas W. Malone of MIT, working with co-authors JoAnne Yates and Robert I. Benjamin, concluded that information technology, by reducing the costs of coordination, would lead to an overall shift toward proportionately greater use of markets—rather than hierarchies—to coordinate economic activity. They predicted that the new efficiencies in coordination would result in "fundamental changes in how firms and markets organize the flow of goods and services."[9]

Drawing upon his 2004 book, *The Future of Work*,[10] Malone, speaking at the Aspen conference, suggested a different calculus for con-

templating the future of the firm. Instead of asking, Where shall the organizational boundaries of the firm be drawn, Malone suggested we should be asking, What is the future of big and small decision making? People no longer need to work through organizational hierarchies to do important work. Because they are connected electronically, they can undertake "small activities" on their own, without authorization, and still have significant, often global impact.

The sheer proliferation of "small activities" occurring on digital networks, however, is generating some formidable challenges. Legacy hierarchies and elite managers continue to act as bottlenecks. This creates an insane crush of responsibilities for gatekeepers and decision makers. Not only is the flow of useful information and innovation inhibited, decision makers are being personally overwhelmed.

This phenomenon prompted Michael Chui to pose a disturbing question, What happens when external demands for connectivity exceed human capabilities to cope?

Chui cited a comment made by Eric Schmidt, the Chairman and CEO of Google, during an interview published by McKinsey Quarterly in September 2008: "For senior executives, it's probably the case that [life] balance is no longer possible. I would love to have balance in my life except that the world is a global stage and, when I'm sleeping, there's a crisis in some country, and I still haven't figured out how not to sleep. So the fact is that you're going to select executives who like the rush of the intensity. They're going to be drawn to the sense of a crisis. The sense of speed. And they are the ones, ultimately, who are going to rise to the top."

And the more balanced, well-rounded CEOs? As one CEO of a global corporation put it, "Pretty soon it'll get to the point where being the CEO of a major public company is no longer a desirable job."

The problem with these laments, said Thomas Malone, is that they presume the need for organizational hierarchies. "If you assume that there has to be a hierarchy and somebody has to be at the top of it, and that organizations will get bigger and bigger, and the connectivity will get greater and greater, then you're bound to reach a point where no human can really cope with it all. And the few that come close will not even want to."

So maybe we need to reframe the question, said Malone. Perhaps we should ask, "How can we redesign our organizations so that the demands for external connectivity do not exceed human abilities to cope?"

The standard response is to flatten and decentralize an organization, so that knowledge and decision making become more decentralized. In tackling this challenge, Kim Taipale suggested that perhaps we should shift the framework of discussion about value-creation from *firms* to *platforms*. The future may belong less to firms organized as hierarchies than to participants in open, networked platforms. Perhaps the most salient issue in generating value these days is not transaction costs, but *interaction costs*, said Taipale, because easy, efficient interaction among multiple participants on a network is the most powerful engine for innovation today.

The future may belong less to firms organized as hierarchies than to participants in open, networked platforms.

Kim Taipale

To put this in historical perspective, software entrepreneur Bill Coleman noted that the most powerful inflection points in the history of mankind have come when new tools were developed to leverage and expand collective intelligence. "The first instance was the development of language, and the second was the invention of the printing press. The third major inflection point is the rise of the Internet, said Coleman, because it represents two inflection points at once: "the quantity of communication and the speed of knowledge-creation and -formation."

III. The Workers of Tomorrow

What will the future of work mean for workers? S. Gopalakrishnan, CEO and Managing Director of Infosys Technologies Ltd., enumerated a list of skills and personal attributes that successful workers will need to succeed in the networked environment.

Every worker will have to become a continuous learner, he said, and will likely hold multiple jobs over the course of his or her lifetime, if not multiple careers. Many workers will need to work at part-time jobs and perhaps hold down multiple jobs simultaneously, he added. The

ability to multitask and deal with interruptions to work will become mandatory skills.

Because work will become more modularized, workers will need to be specialized in certain skills—while still being able to communicate with the rest of a team. Many projects will be performed as "swarm work," in which "everybody jumps in and tries to solve the problem," Gopalakrishnan said. "This is becoming a viable model for certain types of work."

Many projects will be performed as 'swarm work,' in which "everybody jumps in and tries to solve the problem."

S. Gopalakrishnan

A great deal of existing work will be automated, he noted, but a great deal of work is likely to become less routine and more exception-based, especially in knowledge-based jobs. That said, even familiar jobs will begin to use information systems and become more knowledge intensive. "Many fishermen in India actually use their cell phones before coming ashore to find out which markets will offer the best prices for their fish," said Gopalakrishnan. "And the knowledge content for a bus driver today is very different from a bus driver of 30 or 40 years ago, because of the technology of the bus itself."

A great deal of useful product and service information can be gleaned from customers, using various sorts of electronic feedback. This advance will spur the development of new systems to actively solicit the views of customers as well as those of business partners and employees. "Today," said Gopalakrishnan, "We bring 10 people into the room and say, 'You're the experts! Help us design the system.' But in the future, mechanisms will be created to leverage the wisdom of diverse participants. The new platforms and designs for this process will have questions of ownership and how participation is paid for," he said.

Since competition is becoming more global, a new set of problems is coming to the fore: differential labor costs, cultural differences, variable regulatory requirements, and tax and payment complications.

The personal lives of workers are also changing as new work practices evolve. It is becoming more common for workers to have no fixed work location or permanent office; work is happening at people's

homes or in virtual spaces. People's professional and personal lives are starting to blur, and the workday itself is becoming a boundaryless, 24/7 experience. This is adding to workers' stress, which tends to be more mental and emotional than physical in nature.

In this environment of ubiquitous, transparent networks, any employee can publicize information about company behavior and become a social activist, said Gopalakrishnan. He cited the example of Coca-Cola bottlers in India, whom local activists had accused of contaminating water supplies. These charges soon went viral, and international, leading to boycotts of Coca-Cola on college campuses in the United States.

The Disposition of Workers

In the networked environment, the mindset and disposition of workers will matter more than ever. Employers must recognize that they are not just hiring a set of skills, they are hiring people based on their personal temperaments. "In a world of continual and rapid change, maybe the most important things are *dispositions* that allow you to embrace change," said John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge.

In the networked environment, the mindset and disposition of workers will matter more than ever.

John Seely Brown

Two critical dispositions among the "millennial generation," Brown proposed, are the *questing* disposition—the constant desire to be "on the edge" of breaking developments—and the *productive inquiry* disposition—the passion to probe and question a problem in an attempt to make sense of it and work with it. The questing workers are keenly experimental, audacious and actively searching for the new. Productive-inquiry workers have fierce problem-solving skills and are able to scan, select, analyze, disseminate and discard information on the fly.

Seeing workers through the lens of dispositions helps reframe the challenge facing employers. "You can't *teach* dispositions," said Brown. "You *cultivate* them." Employers cannot simply communicate information to

workers; they must provide a hospitable, immersive environment for workers to satisfy their dispositions and talents.

Framing work as a disposition also suggests that work in the future will go beyond 9-to-5 responsibilities. Workers will regard their work lives as an experience, a lifestyle and an identity—not just a paycheck. Employers will have to take cognizance of this fact if they are going to elicit the best from their employees and retain them.

Indeed, said Dwayne Spradlin, President and CEO of InnoCentive, Inc., employers need to recognize that the younger generation of workers, at least among tech enterprises in the U.S., are disdainful towards authority and regimented work processes. They prefer to work in low-structure, improvisational, self-organized environments. They bridle at rules imposed from above. And they are personally committed to social causes.

Spradlin told the story of supervising "hyperactive, very qualified, driven young people" at a business information company in Austin, Texas in the late 1990s. Because he was uncomfortable with the unstructured environment, Spradlin tried to institute all sorts of measurement systems, work plans and deadlines to organize the workplace better. "But every time we would add a required date to fix a problem, particularly for the IT teams," said Spradlin, "they missed the deadline. Every time we would use conventional tools like a deadline for a really big deliverable, or offer a $500 bonus for each worker, the project would crater, time and again."

After a major reassessment of worker incentives, said Spradlin, the company let workers design their own approaches to meet deadlines. Instead of prescribing work processes or mandating "key performance indicators," the firm let work teams self-structure their work and acquire "ownership" of the project. Groups were then judged on outcome-based measures.

This not only enhanced predictability, it lowered costs to the organization and produced better quality products. To cultivate worker loyalty and engagement, the firm also became actively engaged in a variety of philanthropic and social causes such as Habitat for Humanity and fundraising marathons. Spradlin conceded that American high-tech workers may not be representative of global workers, let alone the American workforce, yet he believes these work attitudes are representative of the millennial generation.

How Will Training and Mentoring Happen?

If Spradlin's experience with the millennial generation is a bellwether, it suggests a certain challenge with no obvious answer: How will the workers of tomorrow obtain the training, mentoring and sense of affiliation and identity that used to happen as a matter of course in "steady jobs"? Where will workers acquire a sense of security and the tools for career development?

In a "free agent" work environment driven by sequential, modular projects, it is not clear how workers will pick up the skills and socialization they will need. There is not necessarily any company that will teach the social protocols of serious business or instill a sense of loyalty and larger purpose.

"You used to get an education from the corporations you worked for," said Tammy Johns of Manpower Inc., "and then you would have some mentorship for life. As skills for work needed to change, corporations would help you learn, and you would get compensated for learning. But now, as we say at Manpower, 'Career management has been outsourced to its owners.' The concept of a single company giving you the skills you need is gone. And higher education is struggling with how rapidly skills are changing."

"Career management has been outsourced to its owners."

Tammy Johns

So how will workers obtain continuous learning, training and mentorship in the future, asked Johns. "Workers of tomorrow need to be able to develop a very clear understanding of what skills they are going to need," she said. One knowledge worker surveyed by Manpower described his plight this way: "I feel like I'm in an airplane at 60,000 feet, destination unknown. I have no idea what skills an employer will need from me in the future."

Manpower has created a website called MyPath to help IT, engineering and accounting professionals assess their skills and manage their careers, and it has innovated with "learning platforms" at Second Life and other immersive online environments to promote workplace collaboration. But if workers will increasingly have to manage their own learning, skills-development and career management, new approaches will be needed.

The core problem may be that education, training and mentorship amount to public goods with no obvious funder. This may be a "market failure," said Thomas Malone of the MIT Center for Collective Intelligence. "Even though creating knowledge and passing it on is of great economic value, the heart of that value-creation isn't economically rewarded in proportion to its value." Tammy Johns recommended new types of private/public partnerships to help address the need for education, training and lifelong learning.

But Kim Taipale noted that it is an open question *where* and *how* these things should occur. "Exceptional competencies occur where human knowledge is created, at the cutting edge, in a community of practice," he said. "This raises an interesting question about where education should happen."

Taipale believes that business itself must become "a platform that supports personal learning environments." It must help workers learn the rules of business and society, transfer "knowledge stories" to new generations of workers, and provide the skills to "exploit knowledge flows."

IV. The Firm of the 21st Century

There is no question that old models of corporate organization and business strategy will persist in the years ahead, especially in underdeveloped nations. Although there will surely be many notable exceptions, only a small percentage of firms in these countries will have the means or foresight to reinvent themselves using information technologies. Most of their workers, too, will likely remain insulated from the trends described above and be grateful for any paid work, period.

And yet in the advanced capitalistic economies of the West, and also in the BRIC countries (Brazil, Russia, India, China), the accelerating innovations in computing, telecommunications, digital networking and related fields will assuredly transform the nature of the firm in the 21st century.

There was general agreement that large corporations using centralized hierarchies and command-and-control management systems will be vulnerable. They will be the least able to adapt their systems to the dynamic changes of a decentralized, networked world. They will also be the most culturally resistant to this new environment.

"To me, we are in a transition moment," said Patrick Gross, Chairman of the Lovell Group, a private investment and advisory firm. "Big organizations tend to operate on a 'Don't change it unless it's broken' philosophy, which is very backward looking. Therefore, by the time that they need to change something, they run into all kinds of problems." Dwayne Spradlin of InnoCentive, Inc. wonders whether "the large company as we know it, as an organizational form, will persist that much longer. Quite frankly, there are not that many terribly big organizations any more. They are either holding companies or lots of smaller companies, which is where the real action is."

However large firms evolve, Spradlin believes they will not be as monolithic in the future: "They're going to be less fixed in structure than they were in the past, and I suspect that everything from the layers of operating systems to the legal frameworks will evaporate." S. Gopalakrishnan of Infosys Technologies Ltd. noted that "there are fewer and fewer large firms in every industrial sector. In technology, there's a consolidation happening, creating larger firms."

Large organizations, as traditionally structured, may simply be inadequate to meeting the myriad needs and structural realities of our time.

John Rendon

Large organizations, as traditionally structured, may simply be inadequate to meeting the myriad needs and structural realities of our time. John Rendon, President and CEO of The Rendon Group, Inc., a global strategic communications consulting firm, believes this poses a major challenge to both business and governmental organizations.

He told the story of dozens of young national security analysts, recruited after 9/11, who are deeply frustrated by the bureaucratic norms of their agency. "They feel they could do more *outside* of the institution than they could do *inside* of the institution with every [electronic] toy imaginable.... What happens if the institution is so Industrial Age that it never adapts, and desperately seeks to force the past as a solution-set on an emerging workforce that I consider to be genetically different?" asked Rendon.

Instead of trying to become lifelong employers of people, government agencies should try to embrace the velocity of people's job and

career changes, he said. They should enrich their agencies by welcoming the diversity of experiences that job-changing employees bring.

If they are to attract the best employees, work organizations of the future will also need to expand their sense of mission beyond the bottom line, numerous participants argued. "Is the purpose of the firm in the 21st century simply to organize labor and maximize shareholder returns?" asked Dwayne Spradlin. "Or will it need to deliver a greater kind of social good?" Spradlin said that among young employees in the tech sector, a company's social engagement matters a great deal.

Work organizations of the future will also need to expand their sense of mission beyond the bottom line.

But however it reaches out to provide personal and social satisfactions to employees and customers, there is a real challenge in how to *measure* such performance. And however the firm is structured, said Spradlin, it will still have to work "as a structural entity that actually delivers shareholder return and predictability, unless we want to rethink those dimensions altogether."

Can the Big Firm Adapt to the New Environment?

Can the large corporation successfully adapt and compete in the networked environment? That is an open question that elicited a variety of answers.

IBM, with 400,000 employees, is renowned for having reinvented itself at least five different times over the course of its history. Once the leading computer hardware company, IBM now relies predominantly on software and services; 80 percent of its information technology revenues come from selling legacy equipment.

Amazon is also celebrated for making a transformation from an Internet commerce model to a web services model. When asked how this dramatic change was orchestrated, John Seely Brown, who sits on Amazon's board of directors, noted that Amazon had already been building web services for internal purposes; it then realized that it might be able to sell them to the outside world, as a business proposition, which it proceeded to do.

Aside from IBM and Amazon, Michel Chui, Senior Fellow at the McKinsey Global Institute of McKinsey & Company, is skeptical of the ability of large firms to change their business models. "In practice I've really only seen companies change their business models in small startups. I don't know how a big organization can flexibly change its business model quickly in that way."

Robert Morris, Vice President of Services Research for IBM Research, agreed that "transformation is the hardest thing." It can occur through external disruptions or through induced internal disruptions, but the latter are quite difficult to pull off. "It's all about talent management, and it's very hard to transform talent," he said. "The easy way to do it is through acquisitions and through putting new people in new places."

Still, conference participants offered a number of ideas for how large corporations might try to adapt to the networked world.

One of the most counterintuitive ideas is "employees first, customers second," which is the title of a book by Vineet Nayar, the CEO of HCL Technologies, an information technology firm. As described by Shami Khorana, President of HCL America, "Everything in the company has to revolve around empowerment and transparency." Management must strive to "create value for the employee," so that the employee will be motivated to interact with customers (both "internal customers" within the company and conventional customers) in honest, effective ways. The point is to improve the interface between the customer and the company, the so-called "value zone."

CEO Nayar was able to transform HCL Technologies over the course of several years without instituting employee satisfaction programs, massive restructurings or major technology initiatives. As he describes it in *Employees First, Customers Second* (Harvard Business Press, 2010), Nayer spoke bluntly about the company's troubled situation to employees around the world. He opened up the company's books and shared that financial information freely, which in turn spurred employees and managers to begin asking hard questions of each other.

HCL Technologies also "inverted the pyramid" of the company structure so that management and all supporting functions served the employees first—who, as a result, became more effective and motivated about their work. Finally, Nayar "destroyed the office of the CEO" by "transferring responsibility for change from the office of the CEO to

the employees in the value zone." The idea was to make leadership and responsibility more distributed, and less dependent on a single CEO or corps of elite executives.

In this vision of a large company, "managers are all about creating value for employees," said Khorana. "They help provide context and meaning for employees." He cited the story of the bricklayer who in one scenario is "laying bricks" and in another conceptualization of his work is "building a cathedral." The CEO needs to help employees see how they are building a cathedral.

Dwayne Spradlin offered his own story of promoting distributed leadership at a demoralized customer service department at a large tech company. In the face of indifference from other company departments, Spradlin urged the staff to emulate Winston Churchill's resolve and leadership to force change within the company—a process that fed on itself as small victories were won. The internal disruptions proved to be effective and changed the morale and effectiveness of the customer service department.

Kim Taipale of the Stilwell Center for Advanced Studies in Science and Technology Policy said that the way to transform a static organization into a dynamic, flexible one is to foster internal disruptions. He said that, as a young investment banker in the 1980s, he was once singled out by a partner to play the role of internal disrupter. Taipale was using computer spreadsheets to evaluate deals at a time when the prevailing custom among senior partners was to rely on back-of-the-envelope calculations. As a Young Turk, Taipale could play a disruptive role that was seen as inappropriate to the senior partners.

Another way that large firms can instigate internal change is "by creating multiple agents of growth within the firm," said S. Gopalakrishnan of Infosys Technologies Ltd. Instead of trying to instigate "one big change," companies should empower "second- or third-tier leaders to undertake multiple change initiatives," which they will usually regard as their opportunity to become "tier-one leaders."

As a former change management consultant, Tim H. El-Hady, Director of Business Planning and Operations at Microsoft U.K. Ltd., believes that any change must be articulated through a vision that people can buy into: "What are we trying to achieve? What is the role of everybody in the transition process?" A vision is important because

it can emotionally engage employees. But advancing a vision can only be achieved through humility and consultation, El-Hady stressed. The process must be "very clear, open and truth-seeking" so that everyone will participate and be willing to support the plans that are eventually adopted.

As these stories imply, transformation within large companies depends a great deal on leadership. "I think we need to think about innovation in management models, in leadership models," said Maryam Alavi of the Goizueta Business School at Emory University. "In business schools, we still teach the more traditional, classical models of leadership and management. When they are superimposed on today's realities, they don't really accommodate the challenges we face."

One way to reorient management is to focus on the long term, said Robert Morris. At IBM, he said, the company has been providing five-year estimates for its earnings. This reorients the attention of employees and shareholders to the company's strategic priorities.

Another management model is to regard the internal relations of a firm itself as a network, so that the various "silos" of the organization can more freely interact with each other, exchange information and collaborate. This is important because, "if information technology increases the metabolic rate of information processing within organizations," said Alavi, "then you need to come up with innovative management models."

However one looks at it, large corporations will have trouble adapting to the networked environment, and many may not survive. As Thomas Malone put it, "We should probably expect that the main way that this transition will occur is with new companies—startups—that are different from the beginning, rather than old companies that are transformed."

The Firm as a Talent-Management Organization

If the business enterprises of the Sloan Age were about orchestrating diverse production activities and centrally managing work rules and norms, most participants agreed the firms of the 21st century will mostly be about talent management.

A good business plan and available capital are no substitute for a talented workforce whose members passionately buy into the vision. Spradlin calls it "the single core differentiator and probably predictor of success in organizations."

... the firms of the 21st century will mostly be about talent management.

When talent is highly fluid and moving in and out of organizations, access to talent becomes a serious challenge. So how to assure reliable access to talent? Trust and transparency are important in attracting the best workers. Clarity of mission and purpose are becoming important in galvanizing people to contribute their best. "It's not just about acquiring, developing and retaining talent," said Spradlin. "It's about doing that with style and purpose." To focus people's attention and earn their loyalty, it helps to organize work among smaller teams and pods, so that people can feel a sense of ownership and control in how they structure their work. A sense of passion and mission among employees is key to reducing turnover, he said.

For the software entrepreneur Bill Coleman, the most important ingredient in a successful startup today is the initial people who are hired. "All I really need to own is the core competencies," he said; most of the other costs of starting a business, especially one based on intellectual property, are relatively low.

"So my principles are simple," said Coleman. "I call it the 'three Vs: vision, value and values.' You have to have a *vision* of how you're going to transform the marketplace, and how you are going to add *value* for customers that is totally differentiable, compelling and urgent. And the final one, *values*, is obvious. It's all about people. The only people you hire are the core competencies."

Coleman sees the CEO and management as "coaches" attempting to elicit the best from employees: "You want to set up a system that breaks work down so that the people making decisions—about products and channels of distribution—are the ones closest to the products and channels, and they are held accountable. On the software development side, people work in the smallest possible teams—of no more than six to ten people—so that they 'own' what results in the marketplace."

"If you do it right," said Coleman, "the company will always be adapting, always changing course, because you will be there ahead of the market, not when the wave hits. Even more, you will be segmenting your customers as they pull you into different products."

A firm is not just about talent management, objected John Seely Brown. "It's equally about talent *development.*" By that, he means that firms must provide a learning environment if they are going to attract and retain the best employees.

He cited the example of the Chinese company Li & Fung, which got its start in the apparel industry by providing a networked platform to manufacture clothing for apparel designers using more than 10,000 business partners in 40 countries.[11] Operating as a loose but highly responsive and fluid network, Li & Fung coordinates nearly everything in the supply-network process, from raw material sourcing and production to logistics and quality checks.

Li & Fung operates under a so-called 30/30 rule, which guarantees the companies that belong to its network that Li & Fung will buy at least 30 percent of their output, but they must look to other customers for at least 30 percent of their output. That is, Li & Fung will never pay for more than 70 percent of the vendor's output, lest the vendor become too captive and subservient to Li & Fung.

This arrangement cultivates trust among network partners, and virtually forces Li & Fung partners to learn and innovate all the time. The 30/30 rule also assures that all vendors will work with Li & Fung's competitors, which means that new ideas and market signals quickly circle back to Li & Fung management. The company acquires a constant, efficient source of market intelligence and early cues for adapting its competitive practices.

This loosely networked arrangement has dramatically lowered transaction costs among companies in the network, said Brown. The company reaps $1 million per employee in revenue—in a business based on high-volume, low-margin work.

Is the Network the Successor to the Firm?

Whether it is talent-management or risk-management, one of the clear implications for the future is that "the firm is essentially moving

to a platform," said Kim Taipale. "The firm is moving to become an enabling environment in an ecosystem, whose goal is to create value in some market niche. The firm will become about building a platform where people can create value, and the firm will then capture some part of that value stream."

"The firm is essentially moving to a platform."

Kim Taipale

This theme is explored in a reading for the conference, "Enterprise 2.0: The Dawn of Emergent Collaboration," which describes how corporate intranets are becoming a "constantly changing structure built by distributed, autonomous peers—a collaborative platform that reflects the way work really gets done."[12] The author, Andrew P. McAfee, notes, "Current platforms are not doing a good job of capturing knowledge. New platforms focus not on capturing knowledge itself, but rather on the *practices* and *outputs* of knowledge workers." By making the practices and outputs more visible, companies can more readily exploit them for competitive purposes.

As described earlier, the pharmaceutical industry realized years ago that a "virtual pharma company" was an attractive way to minimize risk and leverage distributed knowledge. "It's a more effective form," explained Dwayne Spradlin, "because you're compartmentalizing investment and risk management. That's all that a big company becomes—a management of risk and capital. It sets a strategy and makes choices about what molecules and diseases they are going to investigate. I think you're beginning to see this more and more."

As a firm's activities become more integrated with a network platform, the boundaries that once defined a firm will become more porous and blurry. The relationships among people within the company and with "outsiders" will become more ambiguous. In a sense, the many vendors who use eBay and the participants in InnoCentive's research queries are "part of the company" even though they are not employees in a strict sense. They are participants on a shared network platform.

Kim Taipale calls these "3C" platforms. At any given time, any two entities on the network platform will be engaged in competition, cooperation and conflict simultaneously. "Firms are going to open their borders, and it will mean that your clients and competitors are going to

be 'inside' your network," said Taipale. "You're going to have to figure out how to work in that environment."

If the network is going to generate value, it will need to support adaptation among players in the network, he continued. It will need to foster entrepreneurship and "edge ventures." Indeed, the market itself is going to move away from "core deciding" by large market players, and move to the hosting of "market forces on the edge."

V. The Social Implications of Globally Organized Work

If the future of work holds many great possibilities for businesses that are creative and flexible, it also holds many formidable and frightening risks for society. The biggest dangers are greater inequalities of wealth and potentially destructive social polarization. These trends make it imperative that government, education and social institutions learn how to respond to the emerging networked environment.

The biggest dangers are greater inequalities of wealth and potentially destructive social polarization.

Social alienation is a significant risk. Kim Taipale, Founder and Executive Director of the Stilwell Center for Advanced Studies in Science and Technology Policy, showed a music video from the 1990 movie *Joe Versus the Volcano* depicting an alienated young man who works in a dreary, routinized office job at which he is always fantasizing about escaping to a tropical island. The soundtrack is an Eric Burdon version of "Sixteen Tons," the Merle Travis song about the alienation of coal miners in the 1930s, now applied to an advanced, high-tech workplace.

Taipale argued that while network platforms offer a greater equality of access in principle, a network in practice tends to produce a "power-law distribution," in which a small minority of players tend to dominate the rest—a "winner take all" scenario. "The Long Tail may represent 'opportunity' for businesses," said Taipale, "but as a social matter, it represents a serious problem. How do you manage the inequalities implicit in the Long Tail? If the power law governs networks, leading to winner-take-all scenarios, then how will government or some other mechanism allocate the spoils of greater productivity?"

There are several levels of inequality arising at work. There are those workers who are able to use information technology and reap some of its benefits and those who cannot. Among those in the first group, there are those who are empowered by the technology as creative knowledge workers or managers and those who are stuck in socially alienating entry-level and dead-end jobs. How shall educational institutions respond? Governments? International bodies for commerce, social welfare, the environment and human rights?

Mircea Geoana, President of the Romanian Senate and President, Aspen Institute Romania, is wary about the future: "I believe inequalities are here to stay, and I believe that the shift in global work and global economies will increase tensions at the global level. I don't think we are heading toward a peaceful, serene world. We are now in an economic war; this is what is going on. In terms of its global implications, this economic war has the magnitude of the Second World War."

"We are now in an economic war; this is what is going on. In terms of its global implications, this economic war has the magnitude of the Second World War."

Mircea Geoana

Geoana identified three specific problems that are likely to intensify in coming years: lack of access to education, troubles in renegotiating the "social contract" between citizens and governments, and difficulties in revamping systems of taxation and redistribution that are necessary to pay for public goods and assure minimal standards of social well-being.

European governments are currently grappling with the future of their social contracts with citizens and the specific services they provide, said Geoana, who noted that there are in fact many variations of the European social contract—Anglo-Saxon; Scandinavian; the so-called Rhine model of Germany, France, Belgium, and Luxembourg; Mediterranean; and those of the former communist countries. In each instance, global competition is challenging the scope of government powers and the financing of services.

This raises some difficult, unresolved questions: How can governments regulate markets while protecting the environment and citizens,

and how can they provide education as a public good even as tax revenues dwindle?

"If we have a tier of global elite producing most of the returns on investment, how is this going to affect taxation and the redistribution of wealth in the society?" asked Geoana. "How can we provide for the whole planet? We'll have ten billion inhabitants—and all of them will be doing highly cognitive work? No."

Geoana characterized the recent financial crisis as "one of the most intense periods of global competition and realignment we have witnessed, probably in the history of humankind. Nobody anticipated that the economic downturn would change the world so quickly and have such intense geopolitical implications." Geoana finds it plausible that the Gross Domestic Product of the West could be eclipsed by that of the emerging powers of the world within 20 years.

However current trends unfold, Geoana sees the need for rethinking "the architecture of this new world." Groups like the G-20 and G-7 may have to be enlarged to accommodate other countries, he said, and "the relationships between the big-deficit countries and the surplus countries" will have to be re-aligned. All of these changes will be complicated by the intensifying global competition for resources now underway, which is directed not only at energy and natural resources but at human talent. Many smaller countries, such as Romania, are experiencing a serious brain-drain of talented professionals, Geoana said. More medical doctors and nurses leave the country than graduate from health care training facilities each year, for instance.

Geoana fears for the "civic fabric" and "social harmony" of countries as the power of traditional counterforces—trade unions and nongovernmental organizations—declines, making it more difficult for governments to perform their traditional functions.

"What will be the new 'commanding heights' of a successful society in the 21st century?" Geoana asked. "We are trying to find a new answer" because the free-market vision promoted by the Chicago School of Economics, Ronald Reagan and Margaret Thatcher is now obsolete.

And yet the Keynesian social welfare model is experiencing major difficulties, too. Geoana believes that it is an illusion to think that information technologies and a knowledge economy can generate a global

middle class in a simple, linear way. The big challenge in building a new society, he insisted, is finding a way to preserve social cohesiveness and trust under the immense pressures of disruptive economic and technological forces.

Geoana confessed to "an intense sense of danger" because of "new tensions in key places of the tectonic plates of the planet. There could be open war, new competition, violence, terrorism, or something else," he said, "but you can be sure that the realignments of finance, political power, access to resources, national identities and global identities will matter."

Madeleine Albright, the former U.S. Secretary of State, now the Chair of Albright Capital Management LLC and the Albright Stonebridge Group, shared many of Geoana's concerns, but called herself "an optimist who likes to worry a lot." She added: "We are at a moment where there is no faith in our institutional structures, whether domestic or international. You see it across the board—the G-20, G-7, the United Nations. The question is, "What are the institutional structures that can move us from here to there?"

"The gap is more dangerous because of information technology—because the poor know exactly what the rich have."

Madeleine Albright

But one of the deepest challenges, said Albright, is "the division between the rich and poor. By absolute numbers there are fewer poor people in the world today, primarily because China has lifted so many people out of poverty. But the gap is growing, and the gap is more dangerous because of information technology—because the poor know exactly what the rich have." Poor people see that they are disenfranchised and disadvantaged relatively. Albright sees "the beginnings of class warfare in various places" right now.

An article in the *Wall Street Journal* by Robert Frank asked the question, Do the Rich Need the Rest of America?[13] Frank proposed the possibility that "the economic fate of Richistan [his term for the super-rich] seems increasingly separate from the fate of the U.S." Citing policy analyst Michael Lind, Frank writes that "the wealthy increasingly earn their fortunes with overseas labor, selling to overseas consumers

and managing financial transactions that have little to do with the rest of the U.S." According to Lind, "a member of the elite can make money from factories in China that sell to consumers in India, while relying entirely or almost entirely on immigrant servants at one of several homes around the country."

Meanwhile, the disenfranchised poor who are not well-served, or served at all, by their governments, may turn to extremist movements. S. Gopalakrishnan reported that in India, the Naxalites, a movement of Marxists who believe in revolutionary change through violence, control large parts of the country. "The movement has instituted its own parallel government, tax system and sets of rules," he said, "because they don't see government benefiting them. So they're turning to alternate forms of justice."

Social polarization and lack of education can also undermine the economic system in many countries, said Robert Morris of IBM Research, and it is beginning to pose significant technological, infrastructure and security problems. In particular, he noted that there is a significant portion of the world's population who are largely disenfranchised from the benefits of economic growth.

How Should Governments Respond?

How might governments respond to this daunting array of economic, technological and social pressures? Any answer, said Kim Taipale, requires us to recognize that the very premises of the nation-state themselves are under intense pressure from the Internet and digital technologies. "All of our existing organizations and rules, from nation-states to firms, essentially assume the inefficiencies of the old ways of doing things," he said. The nation-state is premised on the basic rootedness of human beings in a fixed territory and on language barriers preventing people from communicating with other peoples.

"Nation-states came into being to manage those inefficiencies," said Taipale, "and now those inefficiencies are being challenged." He added that they are being challenged not just with new information flows, but with human migration, capital flows and many other things. The centrifugal energies of information technologies and global commerce

are breaking down the "Westphalian premises" of the nation-state, which cannot exercise absolute control over what occurs within its own boundaries—*viz.*, how people may communicate, how resources may be exploited, how capital may flow and how the economy is managed.

The question we should be asking, said Taipale, is, "What is the core competency of a government in a world where the 'old business model' is not necessarily relevant any more?"

His answer is that government should regard itself as a platform for human and social development. And just as firms try to capture some of the value generated by network platforms to sustain themselves, so governments need to gather some value from their platforms and reinvest that value for their own constituencies. Taipale conceded that it is not self-evident how governments can extract taxation and reinvest it constructively when so many flows of information, capital and people are beyond its control.

There was general consensus among conference participants, however, that governments need to try to mitigate inequality and provide public goods that the market cannot. Government can also adopt information technologies to improve the efficiency and effectiveness of its own services. In many countries, said Robert Morris, "Services quality is in a state of absolute breakdown, especially in the provision of health, education and government services.... We must do things differently, and one major lever is to increase the quality of services offered." One major forum at which such things are being discussed is the annual Government 2.0 conference held in Washington, D.C. each September.[14]

It would be highly useful if governments around the world began to share knowledge and best practices about the future of work, said John Rendon, President and CEO of The Rendon Group, Inc. "We're desperately trying to return to the past, when things made sense. But the world has moved on, and we haven't. We need to understand that the status quo has changed globally in education and in business practices."

There was consensus, too, that international institutions and cooperation must change in order to take account of the increased connectedness and mobility among people. "The mobility of people across

nations and migration to cities are creating new social tensions," said S. Gopalakrishnan, "because the numbers are unprecedented." But there are no institutional mechanisms to make sure that the immigrants are welcome or not welcome. Within the next 10 to 20 years, added Michael Chui of McKinsey & Company, it is estimated that another 100 cities will see their populations top one million people, creating enormous pressures on civic infrastructure and government services, not to mention basic social order.[15]

A number of participants urged a greater harmonization of regulatory regimes across international boundaries, so that compliance with various labor-related laws would be less cumbersome. For example, many laws governing wages, employment standards, taxes and retirement are highly inconsistent or outmoded, said Marion McGovern, Co-Founder of M Squared Consulting, Inc.

Similarly, an international infrastructure to enable easy payment to employees and contractors across national borders is needed, said Tammy Johns, Senior Vice President at Manpower. For instance, when workers outside of the United States participate in Amazon's Mechanical Turk, they are paid in Amazon.com gift certificates rather than the official currency of their country.

In response, Thomas Malone of the MIT Center for Collective Intelligence proposed an innovative scheme for dealing with incompatible regulatory regimes for employment: "an international regulatory regime to facilitate remote work, telework or virtual work." Malone likens the idea to international tax treaties that assure the collection of tax revenues from citizens of one nationality performing work in another nation. The point would be to harmonize, or at least find some universal accommodation, among the diverse income tax and labor laws as they apply to online work. Individuals would be able to pursue work across national borders and enhance economic growth while governments would be able to assure minimal work standards and reap tax benefits.

There was keen interest in this idea as well as rueful acknowledgment of its great complexities. Yet the idea may also offer a valuable test case for Taipale's idea that "the successor to the firm is the network." The challenge, said Taipale, can be summarized thus: "For distance work across national borders, what is the governance structure that lowers interaction costs so that individuals can plug into it, and yet govern-

ments can feel like they're getting their share of the pie?"

In sum, as governments face the conflicting pressures in the networked environment, they must try to facilitate trans-border employment and commerce while finding the means to reinvent education and other government services essential to their own citizenries.

National governments and regional governance will remain important forces in solving this quandary, said Robert Morris, if only because they create some very fundamental and necessary institutions. Governments play vital roles in supporting education, research and infrastructure, and in crafting immigration policies that ensure a diversity of talent.

But it remains an open question how governments will come to understand the new paradigm of networked work, let alone adapt to it through new structures and policies. One especially vexing issue is how to assure accountability in a networked environment. Governments and organizations need to be accountable; traditionally, we look to some individual "leader" or executive. But in a network that is quasi-autonomous and self-organizing, how does anyone assert control, accept responsibility or provide accountability?

These realities make it all the more important that we develop "network governance protocol structures," as Kim Taipale put it, so that there can be certain structural design features to foster trust and accountability for interactions on a network. For example, if we wish to have global contract enforcement and global security—to prevent email scams or destructive software viruses—we need to develop appropriate and effective protocols. "The problem is, How do you get those standards applied across the board, so that everybody is playing by the same rules?" Taipale asked.

An interesting test case may be the Vermont "virtual corporations law," which provides state chartering of virtual corporations much as Delaware provides an attractive state law for chartering multinational corporations.[16] But how does one assure that the standards of the Vermont law, or any such law for virtual entities, is universally recognized and enforced? That is the scaling problem for government in the networked environment.

John Seely Brown noted that the future will require a great deal of institutional innovation if we are to meet the challenges of the net-

worked environment. When he was asked what innovation led to more wealth creation than anything else, Brown said that he was presumably expected to name the microprocessor. But in fact, he said, the more significant innovation was not technological but institutional: the limited liability corporation.

So, today, he said, we need to investigate new forms of institutional management that can more effectively deal with the emerging challenges. He cited the work in this regard by Yochai Benkler, a law professor at Harvard, and by John Clippinger, head of The Law Lab at Harvard's Berkman Center for Internet and Society. Clippinger is currently exploring the idea of an "open governance" project that would investigate new institutional models of governance.

In that regard, David Bollier, the rapporteur and long-time student of "the commons" as a paradigm of governance and resource management, suggested that "technology now allows for all sorts of self-organized governance to collectively manage shared resources, mostly in a non-market fashion." He cited open-source software, Wikipedia, collaborative websites and wikis, and social networking platforms as examples. All rely upon online communities of shared purpose to generate serious economic value outside of traditional market structures in socially satisfying ways.

...commons-based governance holds great promise for dealing with social alienation and inequality.

David Bollier

These sorts of commons-based governance hold great promise for dealing with social alienation and inequality, Bollier suggested, while also providing stable resource management. He cited the work of Professor Elinor Ostrom of Indiana University, who won the 2009 Nobel Prize in Economics for her pioneering research about how commons regimes manage natural resources sustainably and effectively.

How Should Education Change?

A related challenge is the transformation of education. There was wide consensus that existing educational institutions are generally

deficient in providing quality education to the masses in ways that recognize the new realities of the marketplace and digital networks. Although it was beyond the scope of the conference to "solve" this massive, complicated issue, there were a number of specific suggestions for how to reform public education.

Among them: better incentives for teachers and greater specialization in instruction (Tim H. El-Hady); a new focus on continuous education and teaching by great teachers (Olivier Mellerio); new curricula that "encourage the art of dialogue and collaboration" (Marion McGovern); and the coordination of education with private job needs (John Rendon).

Another key theme was the importance of internationalizing education. American schools, in particular, should develop ties to universities around the world, many participants urged. This should occur at all levels of education, from kindergarten through 12th grade, and at all levels of higher education.

"The U.S. Secretary of Education could convene the top 50 universities in the United States and urge their presidents to develop relationships with universities in other parts of the world, at a sub-regional level, and to make a commitment to lifelong learning," said John Rendon. With leadership from the White House and private sector, the first five or ten schools to make such a commitment could be recognized and rewarded in some fashion as a way of encouraging other schools to emulate them. Universities could also leverage their alumni to participate in the process.

"We are not preparing business school students for the new environment," said Maryam Alavi of the Goizueta Business School at Emory University. "We don't teach our graduates how to learn." She believes business schools ought to teach critical thinking and foster global awareness by instigating an international collaboration among business schools, going well beyond "study abroad" programs that last only a semester or two.

Kim Taipale stressed that any attempt to internationalize education should not just be focused on a "push model" of simple school affiliations with a network. The endeavor should be conceived of as a "pull model" that establishes network standards and best practices that then attracts an emergent network of schools. New patterns and practices

of education should emerge from the network over time, rather than existing institutions simply "pushing" a prescribed set of programs and activities.

Tim El-Hady, Director of Business Planning and Operations for Microsoft U.K. Ltd, proposed that it should be a mandatory qualification for membership in international bodies, whether the World Trade Organization or the United Nations, that a nation have "a viable social entrepreneurship program" to stimulate focused action on social and economic problems. The goal should be to nurture a new kind of global citizenship, which in turn could influence policy efforts in education, work and commerce. "The well-being of mankind, its peace and security, are unattainable unless and until its unity is firmly established," said El-Hady, quoting Bahá'u'lláh, the Prophet Founder of the Bahá'í Faith. One enterprising model for social entrepreneurship, noted Charles Firestone, Executive Director of the Aspen Institute Communications and Society Program, is a website called HopePlus.org, which functions as "a kind of online Peace Corps."

Conclusion

The questions raised in the course of this conference were far more numerous than the answers. Still, the spirited dialogue illuminated many murky corners of a vast constellation of interconnected issues: the power of distributed knowledge and open platforms, the profound transformations that they are bringing to market structures and business organizations, the necessary shifts in business strategy and worker skills in the new environment, and the barely recognized challenges facing governments in adapting to the new environment.

The transformation underway is so difficult to grapple with because the changes are occurring on multiple levels at the same time in a confusing, interconnected web. People's everyday habits and social practices are changing as the technology is evolving. And those changes are co-evolving with institutional structures, the economic logic of networks and diverse cultures on an international stage.

Government and public policy can play a tremendously helpful role in guiding the forces that are emerging. But historically, government and public policy have tended to be more reactive and short-term oriented, not pro-active and visionary. This is an ominous reality because

larger governance structures are desperately needed to assure benign, if not constructive, network protocols and to prevent dominant companies or industries from compromising the promise of open platforms and digital networking. New sorts of government leadership are needed to address social inequality, education and training, and improvements in government services. New sorts of self-organized, commons-based governance regimes can provide useful group provisioning and coordination as well.

There is a keen imperative, in short, for serious institutional innovation. There is a need for new forms of governance and a renegotiated social contract between governments and citizens. These are epic challenges, of course, but simply naming them and understanding their key implications are necessary first steps to tackling them.

Notes

1. Robert Reich, *The Future of Success* (New York: Knopf, 2001).

2. Ibid., 95.

3. John Hagel III, John Seely Brown, and Lang Davison, *The Power of Pull: How Small Moves, Smartly Made, Can Set Big Things in Motion* (New York: Basic Books, 2010). See also the report of the 2005 Aspen Institute Information Technology Roundtable: *When Push Comes to Pull: The new Economy and Culture of Networking Technology* (Washington, DC: The Aspen Institute, 2006).

4. Hagel et al, *The Power of Pull*, 39.

5. Jacque Bughin, James Manyika, and Roger Roberts, "New Degrees of Management Freedom: Challenging Sloan Age Business Orthodoxies," *McKinsey Technology Initiative Perspective* (October 2008).

6. Amazon's Mechanical Turk, https://www.mturk.com/mturk/welcome

7. "List of Crowdsourcing Projects," *Wikipedia*, last modified November 12, 2010, https://secure.wikimedia.org/wikipedia/en/wiki/List_of_crowdsourcing_projects.

8. InnoCentive profiled at length in Henry Chesbrough, *Open Business Models: How to Thrive in the New Innovation Landscape* (Cambridge: Harvard Business School Press, 2006), 141–148.

9. Thomas W. Malone, Joanne Yates, and Robert I. Benjamin, "Electronic Markets and Electronic Hierarchies," *Communications of the ACM* 30, no. 6 (June 1987): 484–497.

10. Thomas W. Malone, *The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style, and Your Life* (Boston: Harvard Business School Press, 2004).

11. See Hagel et al, *The Power of Pull*, 83–85.

12. Andrew P. McAfee, "Enterprise 2.0: The Dawn of Emergent Collaboration," *MIT Sloan Management Review* 47, no. 3, (April 2006), 21–28, http://sloanreview.mit.edu/the-magazine/articles/2006/spring/47306/enterprise-the-dawn-of-emergent-collaboration.

13. Robert Frank, "Do the Rich Need the Rest of America?" *The Wealth Report* (blog) *Wall Street Journal*, August 2, 2010, http://blogs.wsj.com/wealth/2010/08/02/do-the-rich-even-need-the-rest-of-america-anymore.

14. Government 2.0 Summit, http://www.gov2summit.com/gov2010

15. See, e.g., Richard Dobbs, "Megacities," *Foreign Policy* (September/October 2010), http://www.foreignpolicy.com/articles/2010/08/16/prime_numbers_megacities, which describes how migration from the countryside to cities will result in 289 cities in India and China having more than one million residents by 2030. http://www.foreignpolicy.com/articles/2010/08/16/prime_numbers_megacities

16. Vermont Virtual Corporations law, http://www.sec.state.vt.us/corps/corpindex.htm.

WESTPORT PUBLIC SCHOOLS

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To: Members of the Board of Education

From: Elliott Landon

Subject: Policy P4118.25: Social Networking By Staff

Date: April 11, 2011

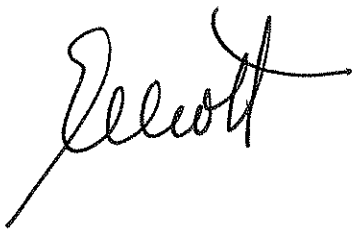
You will find appended to this memorandum a draft of a new policy entitled, "Social Networking By Staff." It is being presented to you at this time because of the expansive use of such social networking sites as Twitter, Facebook, LinkedIn, YouTube and MySpace. It has been prepared for our use by Shipman & Goodwin and is consistent with all applicable state and federal statutes and regulations. It was presented to you for a first reading on December 20, 2010, but has since been amended (additions may be found in blue; deletions are shown as strikethroughs).

This policy will serve as a supplement to Board of Education Policy P4118.5, Acceptable Computer Network Use.

The Board is being requested to review and comment on this proposed policy once again at our meeting of April 11. If there are no objections expressed by the Board, I would respectfully request that the Board adopt this policy at that time.

ADMINISTRATIVE RECOMMENDATION

Be It Resolved, That upon the recommendation of the Superintendent of Schools, the Board of Education adopts Policy P4118.5, Acceptable Computer Network Use, a copy of which will be appended to the Minutes of the meeting held on April 11, 2011.



Personnel – Certified

Social Networking By Staff

The Board of Education recognizes the importance of social media for its employees, and acknowledges that its employees have the right under the First Amendment, in certain circumstances, to speak out on matters of public concern. However, the Board will regulate the use of social media by employees, including employees' personal use of social media, when such use:

1) interferes with the work of the school district;
2) is used to harass coworkers or other members of the school community;
3) creates a hostile work environment;
4) breaches confidentiality obligations of school district employees;
5) disrupts the work of the school district;
6) harms the goodwill and reputation of the school district in the community; or
7) violates the law, board policies and/or other school rules and regulations.

The Board of Education, through its Superintendent, will adopt and maintain administrative regulations to implement this policy.

Legal References:

U.S. Constitution, Amend. I

Conn. Constitution, Article I, Sections 3, 4, 14

Conn. Gen. Stat. § 31-48d
Conn. Gen. Stat. § 31-51q
Conn. Gen. Stat. §§ 53a-182; 53a-183; 53a-250
Electronic Communication Privacy Act, 28 U.S.C. §§ 2510 through 2520

ADOPTED: _____

Personnel – Certified

Administrative Regulations Regarding Use of Social Media

Definitions:

Social media includes, but is not limited to, social networking sites, such as Twitter, Facebook, LinkedIn, YouTube, and MySpace.

Board of Education includes all names, logos, buildings, images and entities under the authority of the Board of Education.

Rules Concerning Personal Social Media Activity

1. An employee may not mention, discuss or reference the Board of Education, the school district or its individual schools, programs or teams on personal social networking sites in a manner that could reasonably be construed as an official school district communication, unless the employee also states that the post is the personal communication of the employee of the school district and that the views posted are the employee's alone and do not represent the views of the school district or the Board of Education.

2. Employees must ~~refrain from~~ use caution in mentioning other Board of Education employees or other members of the school community (*e.g.*, parents or others) on personal social networking sites, without such individuals' express consent unless the employee is addressing an issue of public concern and the employee's speech falls under applicable constitutional protections pertaining to same. Such postings are outside of the employee's job responsibilities, and employees are subject to potential personal liability as described in paragraph 6 below.

3. Employees are required to maintain appropriate professional boundaries with students, parents, and colleagues. For example, absent an unrelated special relationship (e.g., relative or family friend), it is not appropriate for a teacher or administrator to "friend" a student or his/her parent or guardian or otherwise establish special relationships with selected students through personal social media, and it is not appropriate for an employee to give students or parents access to personal postings unrelated to school.

4. Unless given written consent, employees may not use the Board of Education's logo or trademarks on their personal posts. Please note that this prohibition extends to the use of logos or trademarks associated with individual schools, programs or teams of the school district.

5. Employees are required to use appropriately respectful speech in their personal social media posts; and to refrain from harassing, defamatory, abusive, discriminatory, threatening or other inappropriate communications. Such posts reflect poorly on the school district's reputation, can affect the educational process and may substantially and materially interfere with an employee's ability to fulfill his/her professional responsibilities.

6. Employees are individually responsible for their personal posts on social media. Employees may be sued by other employees, parents or others, and any individual that views an employee's social media posts as defamatory, pornographic, proprietary, harassing, libelous or creating a hostile work environment. As such activities are outside the scope of employment, employees may be personally liable for such claims.

7. Employees are required to comply with all Board of Education policies and procedures with respect to the use of computer equipment, networks or electronic devices when accessing social media sites. Any access to personal social media activities while on school property or using school district equipment must comply with those policies, and may not interfere with an employee's duties at work.

8. The Board of Education reserves the right to monitor all employee use of district computers and other electronic devices, including employee blogging and social networking activity. An employee should have no expectation of personal privacy in any personal communication or post made through social media while using district computers, cellular telephones or other electronic data devices.

9. All posts on personal social media must comply with the Board of Education's policies concerning confidentiality, including the confidentiality of student information. If an employee is unsure about the confidential nature of information the employee is considering posting, the employee shall consult with his/her supervisor prior to making the post.

10. An employee may not link a personal social media site or webpage to the Board of Education's website or the websites of individual schools, programs or teams; or post Board of Education material on a social media site or webpage without written permission of his/her supervisor.

11. All Board of Education policies that regulate off-duty conduct apply to social media activity including, but not limited to, policies related to public trust, illegal harassment, code of conduct, and protecting confidential information.

Rules Concerning District-Sponsored Social Media Activity

1. If an employee seeks to use social media sites as an educational tool or in relation to extracurricular activities or programs of the school district, the employee must seek and obtain the permission of his/her supervisor prior to setting up the site. ~~and, once approved by the supervisor, must notify parents of his/her intent to do so.~~

2. If an employee wishes to use Facebook or other similar social media site to communicate meetings, activities, games, responsibilities, announcements etc., for a school-based club or an school-based activity or an official school-based organization, or an official sports team, the employee must also comply with the following rules:

   - The employee must set up the club, etc. as a group list which will be "closed" (e.g. membership in the group is limited to students, parents and appropriate school personnel), and "moderated" (e.g. the employee had the ability to access and supervise communications on the social media site).
   - When Facebook is used as the social media site, members will not be established as "friends," but as members of the group list. When other social media sites are used, the employee will establish a similar parameter on the basis of the functionality of the social media site utilized.
   - Anyone who has access to the communications conveyed through the site may only gain access by the permission of the employee (e.g. teacher, administrator, supervisor or coach). Persons desiring to access the page may join only after the employee invites them and allows them to join.
   - Parents shall be permitted to access any site that their child has been invited to join.
   - Access to the site may only be permitted for educational purposes related to the club, activity, organization or team.
   - The employee responsible for the site will monitor it regularly.
   - The employee's supervisor shall be permitted access to any site established by the employee for a school-related purpose.
   - Employees are required to maintain appropriate professional boundaries in the establishment and maintenance of all such district-sponsored social media activity.

3. Employees are required to use appropriately respectful speech in their social media posts on district-sponsored sites; and to refrain from harassing, defamatory, abusive, discriminatory, threatening or other inappropriate communications.

4. Employees are required to comply with all Board of Education policies and procedures and all applicable laws with respect to the use of computer equipment, networks or devices when accessing district-sponsored social media sites.

5. The Board of Education reserves the right to monitor all employee use of district computers and other electronic devices, including employee blogging and social networking activity. An employee should have no expectation of personal privacy in any communication or post made through social media while using district computers, cellular telephones or other data devices.

6. All posts on district-sponsored social media must comply with the Board of Education's policies concerning confidentiality, including the confidentiality of student information. If an employee is unsure about the confidential nature of information the employee is considering posting, the employee shall consult with his/her supervisor prior to making the post.

7. An employee may not link a district-sponsored social media site or webpage to any personal social media sites or sites not sponsored by the school district.

8. An employee may not use district-sponsored social media communications for private financial gain, political, commercial, advertisement, proselytizing or solicitation purpose.

9. An employee may not use district-sponsored social media communications in a manner that misrepresents personal views as those of the Board of Education, individual school or school district, or in a manner that could be reasonably construed as such.

Disciplinary Consequences

Violation of ~~this~~ the Board's policy concerning the use of social media or these administrative regulations may lead to discipline up to and including the termination of employment consistent with state and federal law.

Legal References:

U.S. Constitution, Amend. I

Conn. Constitution, Article I, Sections 3, 4, 14

Conn. Gen. Stat. § 31-48d
Conn. Gen. Stat. § 31-51q
Conn. Gen. Stat. §§ 53a-182; 53a-183; 53a-250
Electronic Communication Privacy Act, 28 U.S.C. §§ 2510 through 2520

ADOPTED: _____