The Death of Command and Control?

Leaders of large organizations in business, politics, and even the military are in for some big surprises

By Marc Prensky

An SNS Special Newsletter

[6163 words]

"Command and control may have reached a cul-de-sac."
– Christopher Locke, Introduction to *The Cluetrain Manifesto*

My argument:

- The unprecedented changes in technology we have seen in the last 30 years have led to **new patterns of thinking**, especially in young people – the biggest users of that technology. The extent and magnitude of these changes is largely underappreciated.

- This has led to **changes in the behavior** of young people, many of which have been noticed individually, but which have been rarely, if ever, grasped in their totality.

- These changes are creating, and will continue to create, important **changes in society**.

Although these changes will be many, the biggest and most revolutionary will be, it seems to me, in our concepts of leadership and in the way that our largest groups – business, government and military – are organized and controlled. While traditional leadership has been top-down and hierarchical, I think we will soon see much more bottom-up control of many things, even such traditional top-level prerogatives as setting strategy. Future leaders will be much more directly influenced by those whom they lead, in a true democratization of all organizations.

Whether this is good or bad I do not know; I suspect it is some of each. But it is happening, and it is almost certainly irreversible, so we'd better be prepared. Examples:

- In the late '90s, Microsoft was rolling along with billg at the helm setting company strategy, just as a good CEO should. (Harvard Business School teaches that *the* job of the CEO is, in fact, to set the strategy for the company.) Younger MS employees, more in tune with today's technology, began banging on his e-mail that there was something important out there called the Internet. The banging finally got loud enough to induce the change in strategy expressed in the now-famous "everything we do going forward…" memo. Result: Microsoft now has a different strategy. **A company was transformed – from the bottom up.**

- Over the past 20 years, Walkmen, Diskmen, and MP3 players have made music a ubiquitous part of young people's experience and lives. A few years ago, peer-to-peer technology written by some young programmers, such as 19-year-old Shawn Fanning of Napster, made it easy to exchange songs for free. Most kids agreed that this was a good thing. Result: recorded music *became* free. Yes, some people are still paying Apple 99 cents a song for the moment, but downloading of the music-sharing software is up (despite the Pew study), and paying for songs is doomed, as the programmers will get around this. **An industry was transformed – from the bottom up.**

- Recently a number of young Americans came to a consensus that Howard Dean was *their* candidate. With support from Dean's manager, Joe Trippi, some of their number wrote and used software to connect and spread the message. As a result, Dean will possibly beat the Democratic machine, win the nomination and maybe even win the election. And his methodology has already been co-opted by other candidates. **Our political system was transformed – from the bottom up.**

- Soldiers on the ground in Afghanistan and Iraq were not, as it turned out, issued the perfect "kit" for the job. But with a little searching, they were able to find on the Internet clothing and equipment much better suited to the environments in which they found themselves. So they began ordering their own gear directly, over the Internet, based on what they needed, eventually getting military approval. **Military procurement was transformed – from the bottom up**. These stories are repeating themselves over and over, and will likely soon be joined by thousands of others.

In 2002, Howard Rheingold published *Smart Mobs: The New Social Revolution* (Perseus). Although his choice of title may be strange, his ideas are, I believe, very much on the money. Rheingold's thesis is that the new technologies of today, technologies of communication and networked interactions, are leading to new, ad-hoc forms of social organization. He points as examples to the political changes in the Philippines, to "mobile phone tribes" in Japan, to supercomputers and grids, to cheap embedded sensors and "wireless quilts," and to the rise of online "reputation systems."

But as visionary as Rheingold is, and as far as he takes the concept and implications of mobile ad-hoc social networks, he does not, I think, go far enough. Nor do others who have written about "crystalline" organizations, nor do consultant-like teams, nor even writers like Kevin Kelly who have compared organizations to natural systems.[1]

For what is truly different and remarkable about this "social revolution" is not just that people use the tools available to them to form ad-hoc groups and communicate. It is rather that they *control* these tools, and can adapt them and use them in new ways – their own ways – to accomplish their own ends. As Alan Kay, founder of the Viewpoints Research Institute, told a group of SNSers recently at the Project Inkwell launch, the great difference in the new tools is that they are *programmable*. And the great difference in today's young people is that they are programmers of the technology of their age. Almost *all* of them program unconsciously to some extent. Remember those flashing 12:00's on VCRs that only the kids could get rid of? And notice how quickly they set up and personalize their devices? And of course, some of them program to a phenomenal degree.

Now, for the first time in history, when large numbers of young people have a common purpose, they can harness technology, adapt it to serve their purpose and take collective action. If they think companies are standing in their way, they will support those who write the software to get around the companies. If something is bothering them, such as spam, they will encourage and support those who write anti-spam tools.

The great father of this movement, as it happens, is not a kid at all. It is 49-year-old Tim Berners-Lee, or rather *Sir* Tim Berners-Lee, who transformed the Arpanet to serve the hypertexting needs of his peers. There is also Marc Andreessen, who made the Internet mass-friendly. And Jerry Yang of Yahoo, who organized it, and the guys at Google, who made it searchable. And Pierre Omidyar, who sat down and bent code into auction software. And the game designers, mostly anonymous, who began bending the rigidity of text messaging and the inherent location-based capabilities of cellphones into games and dating devices. And, most recently, 20-year-old Zack Rosen, who organized the team of young programmers who wrote the software that is behind the Howard Dean campaign.

Most readers of this newsletter are familiar with these names and their stories. But while most of us, I would guess, celebrate them as brilliant innovators, inventors and entrepreneurs, I'm going to suggest that they are, in fact, something different. I suspect that they are, in another sense, merely the "scribes" (or "amanuenses") of their generation, writing down, in language that others yet can't, the collective wishes and requirements of their peers. (Joi Ito, founder of Neoteny Co. and a participant and speaker at last year's FiRe conference, calls them the "toolmakers.") We have a new, uniquely literate group inside this generation, the tool-creating "scribe-tribe." These scribes are in many ways analogous to the literate priests of old who wrote down the collective stories of their group, in documents such as the Bible. (Note: This perspective is not meant to demean their skill, but rather to give some context to their inventiveness.)

The other "high priest" of the tribe (along with Saint Tim) is Linus Torvolds, with his "write-it-and-give-it-away-free" "hacker" ethic. Torvolds brought the digital generation the message that (1) they could create their own collective versions of even the most complex software, and (2) there were thousands – or even millions – of potential scribes, both greater and lesser, itching to work on this software and improve it, often for free.

Linux is the great work-in-progress "cathedral" of the scribe tribe, but there are many other "churches." The same hacker ethic is found among game "modders" who spend countless hours modifying off-the-shelf games to their own liking and preferences, generally for free distribution and use. Many of the scribe-tribe write and post tools that help their non-scribe peers do their modding better and faster, with tools created and shared for the common good.

Will Wright and Electronic Arts found recently, to their delight, that more and more scribes were writing and posting free tools to enhance the experience of those playing *The Sims* (<http://thesims.ea.com/us/index.html>). Scribe-tribe–created tools, generally downloadable and free, have allowed fan-based content to become a major part of the game world, enabling the non-programming masses to shape their games to fit their own needs.

So this is a generation that can – remarkably – collectively figure out the tools it needs to get what it wants, inspire some of its number to create the tools to do what is needed for free, and then use the tools to their advantage. Other examples, in addition to those we have already seen, include important and world-changing tools such as:

- **instant messaging** (created to fulfill the need for synchronous communication)
- **blogging** (created to fill the need for personal expression), and
- **wiki** (created to fill a need for easy collaboration)

Not surprisingly, when tools already exist or are offered by companies (such as "short message service" [SMS] texting or camera phones), young people are also quick to adapt them to their own needs, such as games and moblogging. The scribe-tribe quickly finds ways to extend new tools to fill the particular demands of the generation.

That is why I say that what we are seeing here is more than just ad-hoc groups coming together. Today, and in the future, when a consensus forms among young people that something is the right thing, it is likely to happen, whether or not the rest of society agrees with it. Period.

Why? *Because the tools to make it happen are in the people's hands, and they know how to use them. And if they don't exist, or need modifications, the scribe-tribe is ready to write them.* Although we have recently seen Thermadorian reactions to such developments in cases such as Napster and the IRAA, I am certain the trend will continue.

Digital Natives, Digital Immigrants

Let's go back for a minute. Who *are* this generation? Are they really so different? As I have written extensively elsewhere (see <www.marcprensky.com/writing/default.asp>, and especially <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>), people born after roughly 1980 have had an extraordinary, never-before-seen set of formative experiences: an average of close to 10,000 hours playing videogames, over 200,000 emails and instant messages sent and received, close to 10,000 hours of talking, playing games and using data on digital cellphones, over 20,000 hours of watching TV (a high percentage being fast-speed MTV), almost 500,000 commercials seen – all before the kids leave college. And, maybe, *at the very most,* 5,000 hours of book reading.[2]

We know from contemporary neurobiology that experiences of this intensity **alter the brains** of those who receive them in ways that enable them to accommodate and deal with these experiences more easily. So we now have a generation that is better at taking in information and making decisions quickly, better at multitasking and parallel processing; a generation that thinks graphically rather than textually, assumes connectivity, and is accustomed to seeing the world through a lens of games and play. (These are just some of the most salient of many important changes.)

I call this generation the "Digital Natives," in contrast to the "Digital Immigrants" – those of us who are older, and who arrived at the digital shores later in life. This distinction is important, because those of us who were not "born into" the technology – *no matter how fluent we become with it* – are different from the Natives. We will always retain to some degree a "digital immigrant accent," which can range from printing out our e-mails to preferring to type with our fingers rather than our thumbs. And we will never understand or use the technology in precisely the same way as the Natives do.

New Behaviors

So what kinds of new behaviors have the Digital Natives evolved from their unique formative experiences and new skills?

Tens of windows open at once on a Digital Native's computer screen. They become bored and fidgety by the slow pace of school versus their games and lives (symptoms often misdiagnosed as ADHD). We marvel – or despair – at their ability to simultaneously do homework and watch TV, or to listen and type – a skill that results from their having practiced all their lives. We see research showing that doctors who are Digital Natives appear to have greater ability to read X-rays than older doctors.[3] We notice, if we listen, that Digital Natives don't talk about "information overload" as Digital Immigrants do; rather, they crave more of it.

In fact, if we examine the totality of the ur-Digital Natives' e-life, we see that it contains new ways of:

- **Communicating** – e.g., e-mail, IM, chat

- **Sharing –** through blogs and webcams
- **Buying & Selling –** such as on eBay
- **Exchanging –** of music, movies, homework and humor
- **Creating –** of websites, avatars and mods
- **Meeting –** in chat rooms, distance learning classrooms, collaborative online tools and live meetings set up by sites such as meetup.com
- **Dating –** now "the most lucrative form of legal paid online content"[4]
- **Collecting –** of MP3s, videos and sensor data
- **Coordinating –** in projects, workgroups and Massively Multiplayer Online Role-Playing Games
- **Evaluating –** through reputation systems on sites like Epinions, Amazon and Slashdot
- **Gaming –** solo, 1-on-1 and in small and large groups, both live and online
- **Learning –** about stuff that interests them
- **Searching –** for information, connections and people
- **Analyzing –** through SETI and drug-molecules research screen savers
- **Evolving –** new, emergent behaviors at the periphery of their systems
- **Reporting –** via moblogs and phone cameras
- **Programming –** of search engines, game mods and open source software
- **Socializing –** learning acceptable online social behavior and how to (and how not to) influence others online
- **Growing Up –** through online exploring and transgressing

Not that Digital Immigrants can't do these things as well – many of us do. But the activities are not "native" to us – we do them differently, less fluently, and retain access to our former "backup" methods, which the Digital Natives don't have.

In fact, we often see two versions of the same networks and technologies side by side, one for Natives, and one for Immigrants.

Take blogging. For Immigrants, the blog world is an "intellectual" place with a relatively few highly interconnected sites (some run by Natives, but most not). But to Natives, as pointed out in the January 12, 2004 *New York Times Magazine*[5], it is often a highly emotional space, connected in very different ways.

The same is true of music. While the Immigrants laud iTunes and think it will solve music's intellectual property problems, the Natives, who see no reason to pay, use such systems only if they have to, and go around them whenever possible. Why? Because music to them is a self-defining experience, which is a part of their personality. Who, besides Immigrants with shrinks, pays for one's personality?

So the Natives have their own nets, operating for their own benefit, independent of any formal, or Immigrant, channels. We see this in websites established for students to rate their teachers, in sites for workers to rate their bosses and share business rumors, and in independent military sites such as <www.companycommander.com> (originally an

independent site, later co-opted by the U.S. Army). And these separate nets are increasingly international and global, increasingly wireless, and increasingly accessible from anywhere.

What Is the Result?

At the end of *Smart Mobs*, Howard Rheingold (who is an advisor to Howard Dean's campaign) talks about "investigating the dynamics of cooperation" and the possibilities of new technologies becoming "cooperation amplifiers."[6] He cites Doug Engelbart, who opined that new "social" technologies can "raise the intellectual IQ of organizations," and Robert Wright, who claims that the technologies can "trigger human societies to reorganize at a higher level of cooperation."[7]

Although cooperation is an important piece of the puzzle, I'm not so sure "more cooperation" is fundamentally what this "command and control revolution" is really about. I think it is more about expressing "collective will," or what former Microsoft sociologist Marc A. Smith calls "collective action."[8] (Part of this also relates to what Steven A. Johnson writes about in his book *Emergence*, part to David Weinberger's ideas in *Small Pieces Loosely Joined*, part to Albert-Laszlo Barabasi in *Linked*, and part to *The Clutrain Manifesto*, all cited at the end of a recent *Wired* piece on the Dean campaign, by Gary Wolf.[9])

In the past, individuals could express their opinions only when larger groups were ready to collect the data, and only for the "big" things – electing government representatives, confirming a board of directors, supporting a cause. The small and day-to-day decisions were typically left to representatives ("leaders"), whom we empowered to make decisions for us. Why? Not necessarily because large groups of people didn't care, but because there was no easy means of polling individuals – or of informing them – on every decision.

But now there is. The needed information is readily available – on the Internet, on peoples PDAs, phones, and now even on their watches, if they want it – and voting is easy and instantaneous.

And Digital Natives are already using it to effect immediate action. Not the silly yes/no CNN polling model – that's Digital Immigrant stuff.

On the opening day of the movie *The Hulk*, which was anticipated to be a *Spiderman*-like blockbuster, bored kids in the theaters began SMSing their peers outside to let them know the movie was a dud *before it had even ended*. They provided feedback to fellow potential product users around the world in the middle of the initial product experience. Compare the immediacy and power of this to the previously available alternatives, such as walking out, or posting a review in the underground press, or even online.

I heard the above story at a recent White House conference on "Exploring the Digital Generation" (aka "the Millennials, or those who are under 25 today), sponsored by John

Bailey, Director of the U.S. Department of Education's Office of Information Technology. (Some parts of the DoE are more enlightened than others.) As observer after observer, pollster after pollster, spoke at the conference, the key descriptor that emerged of the Digital Generation was "empowered." Speakers pointed to the millennials' $84 billion in direct annual spending[10] (and hundreds of billions more in influence), for everything from toothpaste and cereal to the family car – enormous economic power of which the millenial/Digital Native generation is very much aware.

But the Digital Natives' true power is actually far greater. Through their tool-making scribe-tribe, and their use of the tools created, they have the power to truly change things – big things, including major parts of society – quickly, profoundly, and, I think, permanently.

Coming Changes

So what "revolutionary" changes can we expect to see? While I'm sure anything I say will under-predict the magnitude of what will happen, let me offer some ideas.

Let's start with the military, arguably the epitome of top-down command and control. In addition to the "small stuff" of proper equipment and changes to uniforms (Hey, we ALL want berets!), we are starting to see fundamental changes.

The communications connections between U.S. troops on the ground – now with headsets built into their helmets – are often more horizontal than vertical, despite satellites and other technology connecting them with their commanders. As the nature of America's "new enemies" demands a more "ground truth"–based approach, "autonomous units" are becoming a new tool. But what happens when the "ground truth" such units uncover suggests a different course of action than a commander's intent?

Perspectives in war can differ radically within the military. We have already seen blogs that tell the war story from the soldiers' rather than the generals' point of view. Someday soon, all military personnel will be connected through their own informal channels as well as the formal ones. I was recently surprised to hear someone describe Secretary of State Colin Powell as a "coward." What if he were still the head of the military and that were a shared point of view among the troops? Or what if it became the military's view of the president? How quickly would it circulate, given today's and tomorrow's technology? What might our soldiers be able do about it?

New technologies will no doubt allow soldiers to have a parallel private, personal network, possibly through implanted devices (or will the army take them out?). Could our own soldiers infiltrate and shut down the military's technology? Or of much greater concern: what might the impact be of Digital Natives from countries considered as "enemies" at any given time?

This is one reason why many U.S. military leaders are opposed to reverting to a draft. An army of Digital Native draftees might very well decide for itself when to fight or not. The

generals are much more concerned – with good reason – about Digital Natives who are *not* from our military, or even our country, but who we consider as enemies. Already, hidden steganographic and other messages are coursing across the Internet. How much will the power of today's enemies increase when they are networked in new and unexpected ways? And you can bet that their own scribe-tribe is working furiously to make it happen.

The New Politics

In the areas of politics, public policy and education we are also seeing big changes. "Much as thousands of connected techies perfected the Linux operation system's code through open collaboration," writes Frank Rich in the *New York Times*,[11] "so Dean online followers collaborate on organizing and perfecting the campaign, their ideas trickling up from the bottom, rather than being superimposed from the top."

Joi Ito, also an advisor to Dean (along with Rheingold, Howard Weinberger, Lawrence Lessig, Clay Shirky and Ross Mayfield) talks about a political concept in which, as a candidate, "you are not a person, you're a place…[where] people are attracted."[12] In his online paper on Emergent Democracy, Ito cites Lee Hock: "In complex systems the role of the leader is not about determining the direction and controlling the followers, but about … representing the will of the followers and influencing and communicating with peers and leaders above."[13] Ito continues: "The leader becomes more of [a] facilitator and a custodian of the process than a power figure, and is often the catalyst or manager of a critical debate or the representative of a group engaged in one."[14]

Digital Immigrant Howard Dean admits that all these ideas were new to him, and that he was "taught by the community."[15] Suppose he (or someone else who has been technologically educated) *does* get elected, further empowering the cadre and base of young supporters. Will the new tools and sets of skills of the Digital Natives trump the activism of the aging activist Boomers? There are more Americans today who use file-sharing software than voted for Mr. Bush in the last presidential election.[16]

In the public policy arena, The Woodrow Wilson Center has started an initiative to help people make better public policy through specially created games (<www.seriousgames.com>). A new political language is emerging as the scribe-tribe writes more and more games for political and social commentary (see <www.socialimpactgames.com>).

In education, as schools and teachers struggle with technology, scribe-tribe tools for such things as searching, sharing, collaboration and reputation are allowing more and more students to bypass the classroom altogether and learn at home. Lots of undocumented learning also goes on from the scribe-tribe–created computer and video games that Digital Natives play.[17] Young Digital Natives are even using scribe-tribe software to search for their peers who have disappeared, voluntarily or by abduction .

Digital Natives are carefully watching as their purported "leadership" makes its own decisions, contrary to the wishes of many of their number. What will happen when the Natives' generation, en masse, decides it really wants something from the government, from health benefits to environmental protection, to privacy? What tools will their scribe-tribe write for them? What will they be able to get? How will this change democracy as we know it?

The New Business Leadership

"I spend 90 percent of my time just saying no," says a friend of mine from business school about his CEO job, "to ideas that would take us off our strategy." That's the classic definition of a business leader, but I'll bet that is changing, too. The days of the "imperial CEO" are, I strongly suspect, coming to an end. What will take its place?

Leaders in some businesses are already talking differently. "We are enablers, not doers," says Jeff Jordan, SVP and head of US operations for eBay, in a recent television interview. "We find out most of what's going on from eBay users." He cites as a case in point that eBay recently ditched a checkout system that its users "just didn't buy." To be a successful executive in this new kind of world, says Jordan, "you're giving up control and power."

Many astute observers agree that leadership has always come down to listening. But since listening to very large numbers of people was, in the past, difficult or impossible, leaders listened mainly to their immediate subordinates (who listed to their subordinates, etc.). More often than not Digital Natives, typically at the bottom of any organization, have been totally ignored.

I've recently seen this firsthand. Since 9/11 I have been to several dozen "think tank" and "new idea" conferences commissioned by political and military leaders, and not one of the invitees has been under the age of 30. Still, the most effective leaders usually tried to go among people at the lower levels, to talk and listen to a few here and there in order to get a feel for what they thought as a group. There was no way to listen to everyone.

Now there is. Along with ways to filter, sort and make sense of all the data. Finally there are ways to find out what your employees are really thinking – if you care.

IBM has, for several years, conducted internally a series of "jams" – World Jams, Technology Jams, Marketing Jams – where everyone could talk via e-mail to executives, including, at times, the CEO. Such systems have been very useful. "They have already caused executives to manage differently," says longtime IBM executive Ken Landau.[18] Many companies, along with the military, have also instituted "360" programs for feedback in all directions.

But while such feedback methods are nice, they are all "official," and are run on company systems. All employees, of course, also carry cellphones, and soon, no doubt, there will be an easy way for employees at any company to rate their CEO – and *all* their

bosses – anonymously, on every decision they make. How hard would it be, in the face of massive layoffs or an unpopular merger, for the scribe-tribe to quickly create tools to help the Digital Natives organize instant sabotage or work stoppages? As the website www.fuckedcompany.com shows us, supposedly internal "executive" information can get around incredibly quickly. What else could a quickly organized group of Native corporate employees want and obtain? Open salary information, perhaps? Will corporations, like countries, need to start monitoring their employees' cellphone chatter?

It's going to be impossible in the future to hide not only which employees, but also which leaders, are seeking new positions. Job posting, applying, interviewing and even decision making has already become full of scribe-tribe written tools.

On the positive side, motivated employees can use the power of new scribe-tribe–created tools to improve the way they work. But it will be harder and harder for companies to keep any such tools proprietary – the pressure to share them over informal networks is too great, as we have already seen on the Internet.

So the questions leadership must ask are changing. As opposed to maintaining secrecy and keeping everything proprietary, giving things away is suddenly not only an option to be considered, but in some cases the best business strategy. Leaders who are searching for new business models should certainly be seeking out Digital Native ideas that are "bubbling up."

Leaders should also be consulting with Digital Natives about new ways of connecting with their customers. The old idea of "go see them and look them in the eye" may no longer be important – or even desired – by people accustomed to running their relationships online and judging reputations through scribe-tribe created tools. Perhaps, rather than having their companies flounder for years to design products that people will actually buy, Digital Natives can get their scribes to write tools to express buyers' needs more directly.

Then and Now

And what will happen when the Digital Natives grow up and run the world?

One big question, of course, is whether the changes we are talking about are revolutionary, only happening once and having to do only with this "transitional" (to digital) generation, or whether they are evolutionary and ongoing. I think the answer to this lies in Steven Jay Gould's concept of "punctuated evolution." The millennial generation is clearly a period of great punctuation. But the evolution, both of technology and of people, will continue. My guess, though, is that until the next punctuation comes along – probably quite some time from now – there will be no other generation that experiences a magnitude of change such as the Digital Natives have, with the resulting consequences I have just described.

Unfortunately, many Digital Immigrant leaders – including many of those who claim to be "plugged in," "open" and "forward thinking" – are just not getting, or not accepting, the changes. Or else they are getting some of them, but are caught in the middle, between their old, Immigrant beliefs and the new realities they observe.

For example, I recently heard a well-known executive who thinks of himself as "hip" and "with it" speak at a conference of European business leaders. He expressed pride that his (normal Digital Native) daughters downloaded free music ("See how much I understand this generation," he implied), but followed this admission immediately by saying: "But that's wrong – it's stealing."

I asked if he thought his daughters and her generation were perhaps finding their way to a new paradigm, and whether he thought that any of what is happening to music was related to how to run a company. Without pausing to give the question thought, he spouted his Digital Immigrant belief that "one person has to set the business strategy."[19]

Elsewhere, he has said: "Blogging has proven the vitality of participatory journalism. Now there are people like me coming along and trying to figure out how to package it."[20] This message is not one likely to appeal to Digital Natives. And this is an executive who thinks of himself as being on the cutting edge.

So even those who *think* they get it often don't. As the business press was writing laudatory articles about Tony Perkins, Digital Native bloggers were calling his ideas and articles "clueless" and "as organic as vinyl siding."[21] It is also interesting to note that he considered it forward-thinking to ask his bloggers to provide the materials for a book on Google that he would sell under his own name.

The reaction from the Natives was fierce.[22]

Sadly for them, Tony's public activities include serving on the Information Technology Advisory Council of our current president – a leader who hangs on tightly to the old ways of leadership.

Command and control is not yet dead – and may never totally be. We will always need people with clear heads and hearts in the right place to make (or at least implement) certain kinds of decisions.

But the nature of leadership in organizations is certainly changing. The kinds of input and the number of individuals that influence leaders' decisions, and the ways in which they do this, are on the verge, I believe, of an immense transformation. Those who aspire to the risks and rewards of organizational leadership are likely to be in for a rough ride over the next several years, and possibly for decades. After all, half of the people in the world are under the age of 25!

Marc Prensky is an internationally acclaimed thought leader, speaker, writer, consultant, and game designer in the critical areas of education and learning. He is the author of Digital Game-Based Learning (McGraw Hill, 2001) and the founder and CEO of Games2train, a game-based learning company, whose clients include IBM, Bank of America, Nokia , and the Department of Defense. He is also the founder of The Digital Multiplier, an organization dedicated to eliminated the digital divide in learning worldwide, and creator of the sites www.SocialImpactGames.com, www.DoDGameCommunity.com , and www.GamesParentsTeachers.com . Marc holds an MBA from Harvard and a Masters in Teaching from Yale. More of his writings can be found at www.marcprensky.com/writing/default.asp . Marc can be contacted at marc@games2train.com .

Notes

1. Kelly, Kevin. *Out of Control: The New Biology of Machines, Social Systems and the Economic World* (Perseus, 1995).

2. These numbers are intended purely as "order of magnitude" approximations; they obviously vary widely for individuals. They were arrived at, when I wrote my book in 2001, in the following ways (Note: I am very interested in any additional data anyone has on this):

- *Videogames* Average play time: 1.5 hours per day. (Source: "Interactive Videogames," *Mediascope*, June 1996.) It is likely to be higher five years later, so 1.8 x 365 x 15 years = 9,855 hours.
- *E-mails and Instant Messages:* Average 40 per day x 365 x 15 years = 219,000. This is not unrealistic even for pre-teens. In just one instant messaging connection there may be over 100 exchanges per day – and most people do multiple connections.
- *Cellphones:* Assuming 1/2 hour per day for kids 6-12, 3 hours per day for teenagers and 2 hours a day for college students (voice and data) – see http://arxiv.org/ftp/cs/papers/0109/0109007.pdf – (.5 x 5 x 365) + (3 x 5 x 365) + (2 x 4 x 365) = 9,307 hours. This may be high for the past (although not in Beverly Hills), but low for the future.
- *TV:* "Television in the Home, 1998: Third Annual Survey of Parent and Children" (Annenberg Policy Center, June 22, 1998) gives the number of TV hours watched per day as 2.55. M. Chen, in the *Smart Parents' Guide to Kids' TV* (1994) gives the number as 4 hours per day. Taking the average, 3.3 hours per day, 3.3 x 365 x 18 years = 21,681.
- *Commercials:* There are roughly 18 30-second commercials during a TV hour. 18 commercials x 3.3 hours/day x 365 x 20 years (infants *love* commercials) = 433,620.
- *Reading:* Eric Leuliette, a voracious (and meticulous) reader who has listed online every book he has ever read (<www.csr.utexas.edu/personal/leuliette/fw_table_home.html>), read about 1,300 books through college. 1300 books x 200 pages (average) per book x 400 words per page = 10,400,000,000 words. Read at 400 words/minute, that gives 260,000 minutes, or 4,333 hours. This represents a little over 3 hours per book. Although others may read more slowly, most have read far fewer books than Leuliette.

3. "New Radiologists May Read Mammograms Most Accurately" (*The Wall Street Journal*, February 19, 2003). "It is counter-intuitive that a doctor fresh out of school would do a better job than a seasoned veteran"… [but the study's author] "found a small but significant drop in cancer detection for each year beyond a doctor's residency training." Could this be related to Digital Natives' familiarity with technology?

4. Egan, Jennifer, "Love in the Time of No Time" (*The New York Times Magazine*, November 23, 2003).

5. Nussbaum, Emily, "My So-Called Blog" (*The New York Times Magazine*, January 12, 2004).

6. Rheingold, Howard, *Smart Mobs: The Next Social Revolution* (Perseus, 2004). Pp. 208-215.

7. *Ibid.*

8. Ibid., pp 30-33.

9. Wolf, Gary, "How the Internet Invented Howard Dean" (*Wired Magazine,* Issue 12.01, January 2004).

10. Yankelovich "Youth Monitor" ("The Influence of Millennials": A presentation prepared for "Exploring the Digital Generation", August 23, 2003).

11. Rich, Frank, "Napster Runs for President in '04" (*The New York Times,* December 21, 2003).

12. E-mail from Joi Ito, cited in Wolf, Gary, *op. cit.*

13. Hock, Dee, "Leader-Follower." Online at <http://futurepositive.synearth.net/stories/storyReader$173>

14. Ito, Joi, "Emergent Democracy." Online at <http://joi.ito.com/joiwiki/EmergentDemocracyPaper>

15. Rich, Frank, *op. cit*.

16. *Ibid.*

17. Prensky, Marc, "Really Good News About Your Children's Video Games –They're the best learning tools we have." Online at <http://www.marcprensky.com/writing/Prensky%20-%20Really%20good%20news.pdf>
and Prensky, Marc, "What Kids Learn That's POSITIVE From Playing Video Games." Quite a bit, as it turns out..." Online at <http://www.marcprensky.com/writing/Prensky%20-%20What%20Kids%20Learn%20Thats%20POSITIVE%20From%20Playing%20Video%20Games.pdf>

18. Phone call with Kenneth S. Landau, Director, Technology Enabled Learning, IBM Global Learning.

19. At the Corporate University Exchange's Summit for International Learning Leaders, Les Fontaines, France, October 8-10, 2003.

20. <http://www.cnn.com/2003/TECH/internet/03/10/bloggers.ap/index.html>

21. <http://www.blogads.com/weblog/comments/278_0_1_0_C/ and <http://joi.ito.com/archives/2003/03/22/is_tony_perkins_and_alwayson_taking_blogging_to_the_next_level.html>

22. See, for example, <http://www.brianstorms.com/archives/000207.html>.