The Aspen Institute Communications and Society Program

POWER-CURVE SOCIETY

The Future of Innovation, Opportunity and Social Equity in the Emerging Networked Economy

David Bollier, Rapporteur

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Communications and Society Program
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Washington, D.C.
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This report is written from the perspective of an informed observer at the Twenty-First 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

Many of us grew up learning about bell curves as the shape of normal distribution of most problems we faced. Certainly, in a high middle class society such as the United States, the bell curve described the wealth and income distribution of American society: starting low with the few rich, rising up to reflect a large middle class, and tapering off with a sizeable but still diminishing poverty class.

As the technology boom of the 1990s increased productivity, many assumed that the rising water level of the economy was raising all those middle class boats. But a different phenomenon has also occurred. The wealthy have gained substantially over the past two decades while the middle class has remained stagnant in real income, and the poor are simply poorer. This has led some to wonder if America is turning into a *power-curve society*: one where there are a relative few at the top and a gradually declining curve with a long tail of relatively poorer people.

Indeed, a recent report by the Pew Research Center prompted an ominous headline: "Middle class share of America's income shrinking."[1] The report seems to bolster already compelling arguments that mid-level jobs, the kind that helped create economic stability in the 1950s and 1960s, are becoming rarer. For the first time since the end of World War II, the middle class is apparently doing *worse*, not better, than previous generations. If these statistics are an accurate measure of how people are doing, then this is an alarming trend.

What is the role of technology in these developments? How will future generations fare in a world defined less by broad distributions of wealth and more defined by power-curves? Will a small number of "winners," accumulate the larger share of wealth through an increasingly automated and globalized economy? If this is our trajectory, how can we brace ourselves for it?

To answer these and similar questions the Aspen Institute Communications and Society Program assembled a knowledgeable group of thinkers, leaders, innovators and entrepreneurs seasoned in the digital economy for a three-day dialogue in Aspen, Colorado in

1. "The Lost Decade of the Middle Class," Pew Research Center, August 22, 2012. Available at http://www.pewsocialtrends.org/2012/08/22/the-lost-decade-of-the-middle-class/.

August of 2012. The event focused on the broader economic and social implications of an economy being redefined by new networks, behaviors and rules. A significant portion of the discussion also explored personal data as a possible untapped source of economic empowerment.

Rapporteur David Bollier details the results of that dialogue in the following report. He begins with a sweeping look at the relationship between innovation and productivity, summarizing key insights offered by Robert Atkinson of the Information Technology and Innovation Foundation. Next, he examines the "New Economy of Personal Information," offering cutting-edge insights and recommendations from leaders in the field such as Michael Fertik of Reputation.com, Shane Green of Personal.com, and John Clippinger of MIT's ID3.

Bollier then delves into the workings of the "Power-Curve Society," presenting arguments from Kim Taipale and Bill Coleman, whose earlier email exchanges sparked the topic of the Roundtable itself. The report then focuses on the critical question of the future of jobs, highlighting presentations by MIT's Erik Brynjolfsson and Andrew McAfee, whose recent book *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy* has brought significant attention to the subject.

Lastly, the report covers the social, policy and leadership implications of the "Power-Curve Society," collecting insights and summarizing forward-thinking recommendations for action, particularly in the realm of education, from the likes of Reed Hundt, Joi Ito, Leila Janah, James Manyika, and many others.

Acknowledgements

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listed in the Appendix, for their valuable input at the Roundtable. Lastly, I want to acknowledge and thank Peter Thomas Keefer, Digital Media Strategist, and Tricia Kelly, Assistant Director of the Communications and Society Program, for their efforts in producing this report and the Roundtable itself.

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January 2013

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By David Bollier

Introduction

It is now nearly twenty years since the World Wide Web exploded, helping to insinuate the Internet and countless digital technologies into all aspects of the economy and everyday life. Yet even as businesses struggle to come to terms with this revolution, a new set of structural innovations is washing over businesses, organizations and government, forcing near-constant adaptation and change. It is no exaggeration to say that the explosion of innovative technologies and their dense interconnections is inventing a new kind of economy.

Although the new technologies are clearly driving economic growth and higher productivity, the distribution of these benefits is skewed in worrisome ways. Wealth and income distribution no longer resemble a familiar "bell curve" in which the bulk of the wealth accrue to a large middle class. Instead, the networked economy seems to be producing a "power-curve" distribution, sometimes known as a "winner-take-all" economy. A relative few players tend to excel and reap disproportionate benefits while the great mass of the population scrambles for lower-paid, lower-skilled jobs, if they can be found at all. Economic and social insecurity is widespread.

This report provides a sketch of the emerging "power-curve economy" and its far-reaching economic and social implications. We start by giving an overview of contemporary trends in technological innovation and their economic implications. We then continue with an assessment of a major component of this new economy, Big Data, and the coming personal data revolution fomenting beneath it that seeks to put individuals, and not companies or governments, at the forefront. Companies in the power-curve economy rely heavily on big databases of personal information to improve their marketing, product design,

and corporate strategies. The unanswered question is whether the multiplying reservoirs of personal data will be used to benefit individuals as consumers and citizens, or whether large Internet companies will control and monetize Big Data for their private gain.

Why are winner-take-all dynamics so powerful? We next examine why networks often produce power-curve distributions, and how these dynamics appear to be eroding the economic security of the middle class. Is this an inexorable structural trend, and if so, how might its impacts be mitigated? A special concern is whether information and communications technologies are actually eliminating more jobs than they are creating—and in what countries and occupations.

Finally, this report looks at the broader social implications of the emerging economy. How is the power-curve economy opening up opportunities or shutting them down? Is it polarizing income and wealth distributions? How is it changing the nature of work and traditional organizations and altering family and personal life? Although there are obvious benefits from the wealth creation that stem from innovation and growth, many observers fear a wave of social and political disruption if a society's basic commitments to fairness, individual opportunity and democratic values cannot be honored. An important question, therefore, is what role government should play in balancing these sometimes-conflicting priorities. How might educational policies, research and development, and immigration policies need to be altered?

To address this complex mix of issues, the Aspen Institute Communications and Society program convened a diverse group of twenty-eight experts from the worlds of information technology, venture capital, economics, government policymaking, philanthropy, academia and management consulting, for three days of discussion, from August 1 - 3, 2012, in Aspen, Colorado. Charles M. Firestone, Executive Director of the Aspen Institute Communications and Society Program, moderated. This report is an interpretive synthesis of the highlights of those talks.

The Innovation Economy

Although technological innovation has long been linked to economic prosperity, the emergence of the Internet and digital technologies over the past thirty years has transformed the very processes of innovation

and boosted economic growth in dramatic new ways. This impact is elusive, however, because the actual effects of information and communications technology (ICT) investment are not always immediately felt, properly measured or well-understood.

In an opening presentation, Robert Atkinson, Founder and President of the Information Technology and Innovation Foundation, argued that when it comes to what is more important to economic growth—"more tools, a better ability to use them, or new tools," the answer is fairly clear. In building a house, for example, a pneumatic nail gun is more likely to increase productivity than multiple hammers or a training class on how to use a hammer better.

Conventional economics says that progress comes from new infusions of capital, whether financial, physical or human. But those are not necessarily the things that drive innovation, said Atkinson: "What drives innovation are new tools and then the use of those new tools in new ways." Over the past twenty years, he said, the new tools provided by ICT have affected all industries and all aspects of what we do. He estimated that at least 50 percent of the acceleration of productivity over these years has been due to ICT and that the world economy has grown $1.5 trillion larger just because of the "dot-com" component of the Internet.

Measuring the actual impact of technological innovations and plotting their acceleration or deceleration is the challenge, however. In the 1950s, economist Robert Solow used an "eliminationist" methodology to argue that whatever was left over after counting capital, labor and other known variables was "the residual," a growth factor that he attributed to innovation. Since then, economists have developed a number of proxy metrics for innovation, such as research and development expenditures.

But even with such metrics, Atkinson believes that economists both underestimate and overestimate the scale and scope of innovation. Some sorts of innovation may add social value without necessarily increasing market output as measured by GDP. An example is the large amount of time and talent that people voluntarily contribute to Wikipedia. Yet other sorts of innovation, such as doubling of computing power in personal computers, are over-counted, said Atkinson. This can be seen in the practice of the U.S. Bureau of Economic Analysis of counting increases in processing power or hard-drive capacity as meaning that computer companies had produced *more computers.*

Calculating the magnitude of innovation is also difficult because many innovations now require less capital than they did previously. According to traditional economics, the shrinkage of capital investment should lead to a decline in the growth rate of productivity. But in fact, productivity and utility gains from innovation may be greater, as seen in the substitution of digitized music for physical CDs. If computing moves to quantum processes, Atkinson wondered how economists would measure that gain in productivity and innovation.

There are several ways to regard the arc of innovation over time. A conventional approach is to see innovation as a linear, exponential phenomenon—a path of improvement that is accelerating in predictable, straight lines. The idea of linear, exponential growth in innovation leads to gross errors, said Atkinson, citing the predictions of futurist Herman Kahn in the 1970s for the year 2000. By extending contemporaneous trends, Kahn under-estimated the impact of Moore's law (the doubling of computing power every 18 months) while over-estimating the societal impact of ICT. Others scholars such as economist Joseph Schumpeter and economic historian Carlotta Perez, author of *Technological Revolutions and Financial Capital*, see innovation as going in cycles, not steady trajectories.

For his part, Atkinson, writing with his co-author Stephen J. Ezell, in their new book *Innovation Economics: The Race for Global Advantage*, believes that technological innovation follows the path of an "S-curve," with a gradual increase accelerating to a rapid, steep increase, before it levels out at a higher level. One implication of this pattern, he said, is that "you maximize the ability to improve technology as it becomes more diffused." This helps explain why it can take several decades to unlock the full productive potential of an innovation.

Atkinson believes that there is a serious "innovation failure" in the U.S. economy because of insufficient investment and inadequate government policies. But he adds that the types of innovation that are possible today are more daunting: "Why isn't there more innovation when we're spending more on it as a planet than we've ever spent on it before? I think it's because innovation keeps getting harder. It was pretty easy to invent stuff in your garage back in 1895. But the technical and scientific challenges today are huge."

Some conference participants took issue with this critique, however, noting that the costs of innovation have plummeted, making it far easier and cheaper for more people to launch their own startup businesses and pursue their unconventional ideas. Joi Ito, Director of the MIT Media Lab, noted that his father, an academic physician, could only acquire animals for laboratory experiments by traveling to the single producer of most research mice for North America. Now, said Ito, it's possible to order all sorts of experimental materials quickly and cheaply from the Internet. Or consider gene fabrication, said Ito: "When you try to print a gene, it gets sent to a factory in China where 700 people manually do things. There is usually about one error per 100 base pairs. Now we can print genes in a 'bio-fab' and there is only one error per 10,000 base pairs. What has limited gene fabrication in the past has been an inability to print genes. At the MIT Media Lab, we will soon have half of the world's capacity. Moore's Law will hit bio-fabs."

John Clippinger, Co-Founder and Executive Director of ID3, a non-profit that deals with digital identity and authentication, agreed that innovation costs are plummeting. "Biotech and genomics are starting to make Moore's Law look flat. The cost of genomic sequencing has gone from $1 million to $1,000 in three years. It doesn't even make sense to get a PhD in certain fields because the skill set is obsolete by the time the person finishes."

Atkinson conceded such cost-efficiencies, but wonders if "the real question is that problems are getting more complicated more quickly than the solutions that might enable them." He noted that in the life sciences, for example, problems invariably are revealed to be far more complicated than originally thought. Certain tools may be radically less expensive or useful, but the problems to be solved may remain "wicked problems."

Bright Simons, Director of Development Research for the IMANI Center for Policy and Education, suggested that we may need to parse the different stages of innovation: "The cost of innovation generally hasn't dropped," he argued. "What has become less expensive is the replication and diffusion of innovation."

This prompted a call to clarify what is meant by "innovation," which is, after all, a fairly elastic concept. A standard framing of "innovation"

sees it as "invention plus implementation." But even this definition may be inadequate if "implementation" is seen only as a technical capacity to implement. A lot of barriers to innovation can be found in the lack of financing, organizational support systems, regulation and public policies.

The problem is that there is a serious mismatch between the pace of innovation unleashed by Moore's Law and our institutional and social capacity to adapt.

The engineering innovations for high-speed rail in California are entirely feasible, noted John Kunzweiler, Chief Executive Officer of M Squared Consulting, Inc., but various governmental institutions cannot let it happen. Professor Erik Brynjolfsson, Director of the Center for Digital Business at the MIT Sloan School of Management, noted that his research found that "90 percent of innovation costs involve organizational capital," such as people's ability to learn to use an innovation and institutions being able to manage them. The problem, it appears, is that there is a serious mismatch between the pace of innovation unleashed by Moore's Law and our institutional and social capacity to adapt.

This raises the question of whether old institutions *can* adapt—or whether innovation will therefore arise through other channels entirely. "Existing institutions are often run by followers of conventional wisdom," said Zoë Baird Budinger, President of the Markle Foundation. "Large companies may not be able to innovate, but they can *acquire* innovation. They can't be capable of thinking of the next generation of innovation." Rather than trying to tinker with existing regulatory structures or corporate practices, Baird Budinger urged greater focus on new sorts of policy and regulatory architectures that can support innovation. The best way to identify new sources of innovation, as Arizona State University President Michael Crow has advised, is to "go to the edge and ignore the center."

The Accelerating Pace of Innovation

Paradoxically, one of the most potent barriers to innovation is the accelerating pace of innovation itself. Institutions and social practice cannot keep up with the constant waves of new technologies. "I find that I have to completely reinvent the skills and practices that I use about every eighteen months to two years," said John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge. The S-curves that may have characterized technology innovation and diffusion over the past three centuries may be coming to an end, he said. "We are moving into an era of constant instability," Brown asserted, "and the half-life of a skill today is about five years."

Part of the problem, he continued, is that our economy is based on "push-based models" in which we try to build systems for scalable efficiencies, which in turn demands predictability. "But in the world we are moving into," said Seely Brown, "that makes less and less sense. The real challenge is how to achieve radical institutional innovations that prepare us to live in periods of constant two- or three-year cycles of change. We have to be able to pick up new ideas all the time." Of course, adapting to the faster pace of innovation implies profound changes in institutional structures, social practices, education and culture. (Brown explains more about the "push" and "pull" economy in his 2010 book, *The Power of Pull.*)

Julius Genachowski, Chairman of the Federal Communications Commission, agreed that the pace of innovation is a major story in our economy today. "Two companies that are less than four years old, LivingSocial and Groupon, have created about 15,000 jobs between them, about half of them in the United States," he said. These are not just engineering jobs in Silicon Valley, but jobs for salespeople around the country, selling and distributing products of value to small businesses.

The rise of the "App Economy" is a vivid example of the ripple effects of innovation. The App Economy consists of a core company that creates and maintains a platform (such as Blackberry, Facebook or the iPhone), which in turn spawns an ecosystem of big and small companies that produce apps and/or mobile devices for that platform. "Almost a million apps have been created for the iPhone, iPad and Android alone," writes Michael Mandel, Chief Economic Strategist

of the Progressive Policy Institute, "greatly augmenting the usefulness of mobile devices." Mandel calculates that "the App Economy is now responsible for roughly 466,000 jobs in the United States, up from zero in 2007 when the iPhone was introduced."[1]

The App Economy has become a robust global phenomenon, and the U.S. has regained global leadership in mobile. "In Japan and South Korea," said Genachowski, "they're using American operating systems and American apps." He tied this success back to the open, innovative infrastructure and competition in the U.S. for mobile devices: "The U.S. is becoming the first country in the world to roll out 4G LTE [a standard for wireless communication of high-speed data] at scale. It's going to dramatically change the nature of our mobile infrastructure in the U.S. and put us ahead of Europe, China and India by a substantial distance."

The App Economy illustrates the rapid, fluid speed of innovation in a networked environment—a trend that is likely to accelerate as new sets of global players prepare to enter markets for technological development. Shantanu Sinha, President and Chief Operating Officer of Khan Academy, an educational nonprofit that provides "a free world-class education for anyone anywhere," pointed to the impact that MIT's Open Courseware and edX initiatives have had. "Bringing seven billion people into the innovation conversation is something that has never happened before in society. That's a major shift in where innovation is going to come from."

This reality can be seen in new crowdsourcing models such as Kaggle, an online data prediction competition that invites people to submit the most predictive algorithms. On Kaggle, the winning submissions are not closely correlated to the world's great universities or to the U.S., but are globally distributed in an absolute sense, said Andy McAfee of the Center for Digital Business at the MIT Sloan School of Management. The project demonstrates that problem-solving is a global, Long Tail phenomenon. All you need is a lot of good data, smart algorithms and an EC2 account ("Elastic Compute Cloud"), a supercomputer capacity that Amazon and others offer as a paid, utility service.

As a technical matter, then, many of the legacy barriers to innovation are falling. Enormous computing capacity is more readily available through vendors like Amazon; small businesses are becoming more

comfortable using such systems to improve their marketing and lower their costs; and, vast new pools of personal data are becoming extremely useful in sharpening business strategies and marketing.

… "permissionless innovation" is crucial.
– Robert Pepper

Another great boost to innovation in some business sectors is the ability to forge ahead without advance permission or regulation, said Joi Ito, Director of the MIT Media Lab. "In bio-fabs, for example, it's not the cost of innovation that is high, it's the cost of regulation," he said. "How can America be competitive in that space with all the regulatory requirements around it?" The reason that Internet took off in the U.S. but not so much in Europe and Japan, said Ito, is because Americans did not try to regulate it.

This notion of "permissionless innovation" is crucial, agreed Robert Pepper, Vice President, Global Technology Policy, at Cisco Systems, Inc. "In Europe and China, the law holds that unless something is explicitly permitted, it is prohibited. But in the U.S., where common law rather than Continental law prevails, it's the opposite—if something is not prohibited, it is permitted. We let people go forward and then figure out the consequences later. That was a huge driver for all Internet innovation, and that's something that I don't think we should lose."

The New Economy of Personal Information

One of the most significant developments affecting innovation is the rise of large databases of personal information. As the number of electronic devices proliferate and interconnect, many more opportunities are being created to collect "data crumbs" of personal information resulting from web visits, credit card transactions, cell-phone transmissions and online purchases, among many other activities. This flood of data, if properly organized and analyzed, contains potentially powerful market intelligence for companies, which is precisely why "Big Data" is becoming a far more central element of the emerging economy. (For a fuller treatment of this subject, see the 2010 Aspen Institute report, *The Promise and Peril of Big Data.*[2])

Michael Fertik, Founder and Chief Executive Officer of Reputation.com, an online reputation management company, gave a brief overview of the ways in which digitized personal information is transforming commerce and jeopardizing people's privacy. On the one hand, data is often regarded as the "new oil" of the Internet because of its value to companies. On the other hand, people are becoming increasingly concerned about the erosion of their privacy as more third parties, from banks to government to retailers, learn some very intimate, everyday details about people's social identities, consumer tastes, travel movements, social cohorts, political views and much else.

Large companies that collect personal data, such as Google and Facebook, have pointed out that information disclosures that occur through Internet searches or Facebook usage are entirely voluntary—and the users of such services get back something of value for free. What's the harm in such consensual arrangements? they argue.

Fertik pointed out, however, that such arguments are either incomplete or false: "Most of the people who think they are giving their data to a certain website do not know how it or a company will use it. Moreover, the vast majority of data being collected about us when we interact with a machine are collected without our knowledge in the first place. Even the people who run these companies, large and small, often don't really know how the data is ultimately used. That's not because they are operating with any malicious intent, but because they literally don't know." Fertik noted the irony that "the companies that often benefit from the transparency of the Internet are often the most intransigent in their unwillingness to tell you what data they have about you. They do not want to disclose it." That is because information brokers and large Internet companies make a lot of money controlling vast amounts of personal data.

A number of fairly new companies are now trying to disrupt this standard model by empowering individuals to control their own data. Some of the new companies targeting individuals include Fertik's own company, Reputation.com as well as Personal.com and ID3. These ventures each take different approaches toward protecting personal information but are all focused, at their core, on enabling people to better control and leverage data about themselves and their lives. Reputation.com helps individuals and businesses identify and correct inaccurate,

misleading or outdated material about them on the Web. Personal provides a safe and secure data vault for storing, importing and reusing a person's important data, notes and files, and a private network for sharing that information with trusted people, organizations and apps. ID3 is building an ambitious set of new Internet protocols and an adaptable, open-source software platform that will let users control the types of information that they wish to disclose, and to whom.

These latest ventures represent a new approach to protecting privacy and empowering people with their data in the wake of failures by an earlier generation of companies and software innovations by the hacktivist community. Some companies in the late 1990s and early 2000s positioned themselves as "infomediaries," as Fertik put it. "They tried to sit between you and advertisers, curating information for you and taking a cut of revenue from companies that wanted to reach attentive, receptive audiences," he said. This business model did not work at that time for a number of reasons, including technological and other limitations. It was the dawn of e-commerce and people were just beginning to understand that Internet use could result in any compromise to privacy, let alone the tracking or plundering of their personal data by others for financial gain. As it turned out, these companies learned quickly that profits could be achieved far more rapidly by selling access to the very personal information they sought to represent, without any involvement by the individuals. In effect, at that time, the foxes really were guarding the henhouse. This is in stark contrast to the rise of personal data companies in the 2000s, such as Reputation.com, Personal.com, and others.

Ten years ago Microsoft attempted to introduce a set of software protocols for privacy known as Passport, which aimed to let people curate and control any transfers of their personal data. But this innovation also failed, in part because Internet users lacked appropriate knowledge and awareness about the need for privacy protections at this early stage of Web 2.0. In addition, as Fertik pointed out, many viewed data intermediaries like Microsoft as inherently less trustworthy than a peer-to-peer system that is globally distributed across the Internet.

For their part, hacktivists have tried to address privacy concerns by building software to aggregate enough people to interact in the cloud,

with the hope that a large collective of users could then have fruitful negotiations with commercial interests. But these experiments—such as Diaspora, a "privacy-friendly" alternative to Facebook—have not succeeded either.

Circumstances are changing, however. "Large companies are coming to see the enormous value propositions for growth in developing new ways of managing people's data," said Fertik. Interestingly, the industries that are most eager to find socially acceptable ways to monetize Big Data are currently the most constrained and regulated: banks, credit card companies, insurers and Internet service providers. But these companies tend to have few practical ideas for exploiting the data, perhaps because they have been constrained, legally or otherwise, from actually doing so.

The industries that are most resistant to any change in the status quo, said Fertik, are Internet-based media incumbents such as Google and Facebook, which argue that new requirements to protect privacy will destroy innovation. Shane Green of Personal said that when he talks to people at large Internet companies that gather lots of personal data, he is "amazed" at their resistance to disclosing how they capture data, what they do with it and how much money they make from it. "They sound just like Ma Bell from way back," said Fertik. "They have absolutely no interest in talking about privacy. Why won't [these companies] open up and talk about how they capture data and what they do with it? Because they're controlling things in a way that benefit them and not everyone else." Green noted that, in the digital world, people are experiencing a variant of "Stockholm syndrome" in which victims come to identify with their captors. In the current model of the Internet, companies and governments are capturing and exploiting people's data every day with very little benefit of the data accruing to the individual. Yet, individuals have not objected to these practices, mostly because individuals have not been properly educated about the value of their data and they have not been given the tools to appropriately leverage it, Green added.

Nonetheless, a great deal of experimentation in software and business models is now underway. The diverse approaches include businesses that offer "data lockers" or "data vaults" to users; private data exchanges or "trust frameworks" that let users selectively share their

data; vertical "silos" of data sharing in healthcare systems; client-oriented software systems to protect privacy; and private cloud-based technologies; among others.

But even with this diversity of approaches, Fertik believes there are essentially only four strategies for monetizing data in today's environment: to give people coupons or discounts for disclosing data; to give people special privileges such as frequent flyer miles; to give people cash payments; or to simply protect people's private information from any disclosures. "I list these strategies in that order," said Fertik, "because that is the order in which I believe the future will unfold." Green added that he also sees a subscription model taking shape for the storage and management of one's data.

The ultimate achievement in privacy protection in the network environment, said Fertik, would consist of consumers being able to "purchase a product through a double-blind API [Application Protocol Interface], which can confirm that you have a valid Web address and that you are a real person and you are eligible to buy the product. But the vendor would never be able to find out your identity; the shipping label would come from some other vendor's printer. So the vendor would get the commercial transaction and social trust, and you would get the ongoing relationship. That is a new and different way of thinking about the Internet, but it is quite feasible."

John Clippinger, Co-Founder and Executive Director of ID3, thinks there may be another, better approach to achieve user control over personal data—through a "pool economy." He explained, "You can aggregate lots of different users into a pool in a principled and protective way, and then help create new markets by offering this aggregated consumer demand to sellers, through reverse-auctions and other mechanisms. This could create enormous efficiencies."

Perhaps the most cost-effective way to pursue this vision, said Clippinger, is to "bake the protocols for authentication, security and identity into the infrastructure of the Internet. Instead of allowing banks and other information intermediaries to establish themselves as artificial 'chokepoints' controlling data flows—introducing huge inefficiencies and costs in the process—the system could commoditize these functions by making it a standard set of Internet protocols." This is an increasingly credible vision because the sophistication of online authentication, security and identity is getting very advanced, he said.

The virtue of "baking the protocols into the infrastructure" is its ability to enable much more fluid types of social exchange (both market and nonmarket) while also protecting people's personal information, said Clippinger. Such a change would also disintermediate many of the information brokers that now act as gatekeepers over access to credit or that certify qualifications or membership for various purposes. If this certifying of identity and credentials could be democratized, and performed in a more dynamic, real-time fashion, it could enable the creation of entirely new sorts of digital institutions. Self-organized groups of users or consumers could aggregate their own resources and declare their own standards of eligibility and credentials. Highly efficient, secure and reliable software systems could manage digital identities and access to privileges.

A question was raised if this scenario would yield only modest benefits, as in discounts through Groupon-like aggregations of consumers. Another question is whether the data would be confined to "stovepipes" that would restrict access to only a narrow group of users. The answer in both instances is no, Clippinger stated: it is possible to design a system that simultaneously enables data-driven markets, significant consumer benefits and user-centric control of personal information. Green added that one of Personal.com's primary goals is to break down the multitude of stovepipes that exist already and to make data truly portable and reusable for the individual.

Michael Fertik of Reputation.com believes that data-driven insight is the key to new business opportunities in the new economic ecosystem. The first phase of the Internet, which is still going on, is *content*, he said, as exemplified by Yahoo!, Facebook and Twitter. The second phase has been the story of *search*, he said, which has now expanded into such things as facial recognition search. But the third phrase will be about *insight* drawn from aggregating huge stores of data. A simple example, he said, is counseling professionals about their future career paths based on the data income of large numbers of people in a given field.

John Clippinger of ID3 cited a project that his venture is involved with for DARPA (U.S. Defense Advanced Research Projects Agency), which seeks to explore the pro-social uses of data-mining from mobile phones. "If you take behavioral data and combine it with personal data, financial data and health data, and then you do data mining of the com-

bined results, it is going to tell you a lot about yourself—and you will get a much more accurate signal of who you are and what you want. By controlling this signal for whatever purposes—medical care, personal affiliations, consumer purchases—you can provide a very powerful signal to companies about what you want. This would constitute a new kind of identity—and trustworthy signal of consumer demand—in the emerging digital economy." In this scenario, users who control their data—but selectively disclose it to vendor *x* and institution *y*—would reap direct and substantial benefits from their personal data.

But would people's personal data truly be secure? Charles Firestone of the Aspen Institute noted that there is "an arms race" now underway to disaggregate anonymized data in order to identify specific individuals.

The key question for the future is the specific terms under which data will be shared.

"This is where the design principles of the technology are really important," replied Clippinger. He explained that the personal data store can be made more secure by scattering a person's data across many web servers rather than centralizing it in one place. In addition, it is possible to allow third parties to make queries of the data and receive useful replies without disclosing any specific personal information. (For example, does this person have sufficient income to qualify for this loan? The system could truthfully answer yes or no without disclosing specific personal data.)

Clippinger noted that security/authentication technology can also be designed to raise the technical and economic costs of "breaking" the data locker, which would greatly deter security breaches. For example, the system could constantly refresh codes so that there is a very strong access-certification process; it could create digital "noise" so that it is harder for snoopers to trace IP addresses; and it could virtualize network interactions so that any calculations "disappear" after a transaction, leaving no links to be traced or correlated with anything.

Imagining an Open, Trusted Data-Driven System

Given the enormous value to be had from sharing data, the key question for the future is the specific terms under which data will be shared. There are obvious benefits from amassing large quantities of personal data and then sifting through them to make insightful, actionable inferences. But how can users be induced to share their data in the first place if they believe that the institutions controlling that data cannot be trusted? If data is to be shared in commerce, what should market transactions look like and how might they be regulated to prevent antisocial abuses?

Many entrepreneurs want to overturn the current business models that let large companies like Facebook and Google monetize people's personal data in exchange for free services (search, social networking). The new models envision giving users exclusive control over their personal information, and not just for monetization. Shane Green of Personal does not envision data markets in which people might sell their children's health information to the highest bidder, for example. Rather, he envisions a "very responsible, controlled marketplace in which the individual has the ultimate ability to decide what to reveal about himself." It would be entirely feasible to protect one's anonymity and yet also selectively disclose personal information in order to learn about and buy desired products or services.

"The two most important pieces of data from the perspective of advertisers," said Shane Green, "is your interest in buying something and the fact that you actually did buy it later." Marketers dream of linking those two data-points. But if data-vendors, with individuals' consent, could identify specific people as prospective buyers, sellers could treat them as "a certified [potential] buyer" of a class of products or services. The seller would get a more likely buyer than they could elicit through advertising; the individual buyer could get the product they want and perhaps a discounted price; and the data-vendor would make pennies from each data-driven transaction.

This would be a far more efficient system for linking buyer and seller than existing advertising, and it would also dramatically reduce expensive transaction costs that are otherwise folded into prices. "This is a totally 'inverse type' of approach, so it can be really hard for people oriented to the current model to get their minds around it," said Green.

Green cited other business models based on "structuring data" for people in useful ways. For example, filling out forms can be a time-consuming and tedious "friction" that impedes commercial transactions. If data could be delivered onto forms automatically, it would help consumers and boost commerce.

Green said that he admires the direct, value-added propositions of Evernote and Dropbox, which both allow users to collaborate and share their notes or files stored in the services. He sees them as trailblazers for products focusing on data-driven cloud storage solutions that have achieved scale. The companies have also introduced straight-forward subscription models that do not hide their monetization or the economic value exchange from the user. As for the social contract between users and companies with respect to data, he sees the bargain in these terms: "I'll give you, the vendor, use of my data, but you can't keep it and do whatever you want with it. You can use it only for the specified purpose. If you come up with a new purpose, you're going to ask me permission—but if I tell you to stop using it, you will stop using it." This scenario just does not exist today, said Green.

Clippinger added to Green's scenario by suggesting that the future of privacy control may also reside with "member networks," not just with individuals dealing with sellers. Under plans being pursued by ID3, individuals would indeed control their personal data, but they could opt to belong to "branded trust networks" that would act on their behalf in certain circumstances, said Clippinger. "So it would not just be you, an atomized individual, negotiated with a company, but you, as a member of a collective (whether commercial or nonprofit) that is representing all of its members," he said.

Many conference participants made the point that the key to the success of any scheme for privacy protection will be transparency, trust and accountability—and that these will be best fulfilled by empowering individuals. "I think it's an inane notion that companies, regulators or other people are going to be better able to decide than individuals how their privacy should be protected," said Shane Green. "Obviously, they will play a major role, he said, but as people discover the value of their privacy as well as their data—and the fact that companies are hoarding all the benefits that flow from their data for themselves—they will demand and make the new rules for how their data should be treated."

The ultimate goal, said Michael Fertik, is to find new ways to enable "knowing, voluntary exchanges" of personal data that can be trusted: "This will allow greater benefit to the end-user, greater benefit for the retailer and lower prices down the line." But achieving this goal will be difficult in the new data-driven universe, he said, because it is unclear if usage of large, highly fluid datasets can be properly monitored and their owners held accountable. This is a fundamental problem that will have to be overcome in a world of large, interconnected databases.

"It's an inane notion that companies, regulators or other people are going to be better able to decide than individuals how privacy should be protected." – *Shane Green*

Reed Hundt, former FCC Chairman and now Principal of REH Advisors, believes that datasets ought to be treated as "public goods" and overseen by laws and social norms dictating their appropriate use. He cited familiar categories of public concern such as health, education, energy, national security and the democratic process. The real question is how we might go about creating systems for treating data in these categories as public goods, he said.

There are some efforts underway to "liberate government data" and treat it as public goods, noted Zoë Baird Budinger of the Markle Foundation. She cited Todd Park, the Chief Technology Officer at the White House, who is trying to "liberate" government datasets on health, energy and other subjects by making them openly available to all. The idea is to emulate the government's release of weather information, which has become a public good that various business models and research projects use to build innovative new services.

One initiative in this vein is the U.S. Veterans Administration's "Blue Button" (www.va.gov/bluebutton), which allows individuals to access and download their personal health records in a very simple text file or PDF document. Such downloads can help patients more easily inform emergency room doctors or other healthcare providers about their medical conditions. Another is the U.S. Department of Education's

My Data Button for federal education data, which will allow 20 million students to download individual information about themselves, such as their own federal financial aid records (see http://www.ed.gov/edblogs/technology/mydata/).

Datasets ought to be treated as "public goods" and overseen by laws and social norms dictating their appropriate use. *– Reed Hundt*

The need for better privacy protections is quite urgent, said Joi Ito of MIT Media Lab, because privacy "is a fundamentally important thing in any open society. Diminishing the privacy of individuals makes it easier for those in power to squash dissent," he said. "Without dissent, you don't have democracy. So I think the cost to democracy is something that everyone needs to think about."

The Power-Curve Phenomenon and its Social Implications

A profound change is occurring in both the global and national economies as more commerce migrates to networked platforms. This change is the rise of a power-curve distribution of wealth and income as network platforms reduce the friction that previously impeded economic productivity in the old economy. A power-curve embodies the principle of what is known as a power law distribution, in which a small number of people reap a disproportionate share of the benefits of a market (or other network-based activity) while the bulk of participants receive very modest gains. This is sometimes referred to as a winner-take-all or 80/20 rule, in which 20 percent of the participants reap 80 percent of the gains, and 80 percent of the people receive 20 percent of the gains. Power-curve distributions are entirely predictable in many physical and biological contexts, but they also appear to describe structural inequalities produced on human networks, particularly on the Internet.

The conference devoted a session to this issue as a result of several email exchanges months earlier between Kim Taipale, Founder and Executive Director of the Stilwell Center for Advanced Studies, and Bill Coleman, Partner in the venture capital firm Alsop Louie Partners.

The lively exchange was provoked by a March 6, 2011, column by *New York Times* columnist Paul Krugman about the loss of American jobs to automation and globalization; one response that Krugman urged was a restoration of bargaining power for organized labor.[3]

In reading Krugman's analysis, Taipale saw evidence of a power-law distribution in the network-based markets that are transforming more and more segments of the U.S. and global economies. Taipale asked: How will power-law distributions affect jobs creation, incomes, and wealth in the future? Will social inequality and instability result if nothing is done about the growing disparities of rewards from the emerging network-based economy?

Existing organizational structures are being replaced by platforms or networks. – ***Kim Taipale***

Below, we excerpt portions of the email dialogue between Taipale and Coleman before recounting how conference participants reacted to the arguments set forth.

Taipale's thesis can be succinctly stated: "The era of bell curve distributions that supported a bulging social middle class is over and we are headed for the power-law distribution of economic opportunities. Education per se is not going to make up the difference."

The kinds of work performed by "information creators, exploiters and decision-makers"—entertainers, artists, CEOs, entrepreneurs, technology architects, etc.—will continue to have a future, said Taipale. But the jobs of information managers who make up the bulk of the upper middle class—lawyers, accountants, programmers—are seriously endangered as new forms of software-based automation and outsourcing accelerate. There will continue to be many low-paid, relatively unskilled working-class jobs as service providers, Taipale argue, but "the spoils from the economy will be increasingly distributed on the power-law curve."

Existing organizational structures are being replaced by platforms or networks, said Taipale. This is significant because it is taking so much friction out of the system, and it is happening faster and faster. In the

Industrial Age, when information was managed in analog form—i.e., unstructured and on paper—businesses needed lots of workers in the "middle" to manage information inefficiency, he said. That's why General Motors had ten layers of management between the shop floor and the executive suite. It was a vast, inefficient, paper-based information sorting and distribution organization that was responsible for creating many "well-paying" middle class jobs. A great many of those jobs have been lost over the past thirty years, replaced first by computers and later by networks that allowed decisionmakers to have greater direct oversight and control over production.

Today, skill sets are becoming obsolete within five years…disruptive changes are occurring ten times or more in a single generation.

This process is now accelerating as new types of "connecting platforms" and associated apps—iPhone, EC2, YouTube, the cloud infrastructure itself, among others—are deployed. These technologies are lowering interaction costs for collaboration, coordination and market-making. The shift is making markets more efficient, competitive and productive—and in the process, destroying the jobs that have historically sustained the middle class, said Taipale: "The only reason we have the middle class is because it was over-compensated for what it contributed to the system, thanks to the relative inefficiencies of technologies at the time."

Those inefficiencies could not be automated and outsourced previously—but now they can, said Taipale. And that is introducing more aggressive power-law distributions as participation in network platforms (and thus the value of those platforms) grow. The technology-enabled efficiencies may create greater wealth and broader distributions of it, said Taipale, but not enough to maintain existing middle class standards of living in "high-cost silos" such as the U.S.

A key issue here is not just the displacement of middle class jobs but the *accelerated rate* at which they are being displaced and thus the inability of society and the economy to adapt. The Industrial Revolution

went through a similar transformation, with old jobs destroyed and new ones created. But that transformation occurred over a period of generations, Taipale pointed out. Today, skill sets are becoming obsolete within five years, which means that systemic, disruptive changes are occurring ten times or more in a single generation. Our society is not prepared for this kind of hyper-accelerated pace of change, he said. We simply do not have the policy architectures or social organization to handle it, said Taipale, and no one in the private sector, public sector or emerging social systems are even close to grappling with what these trends imply.

"The more freedom there is in a system, the more unequal the outcomes become." – ***Kim Taipale***

The paradoxical result of network effects, Taipale noted, is that "freedom results in inequality. That is, the more freedom there is in a system, the more unequal the outcomes become." This is because of the power-law distribution that tends to prevail on open platforms, as wealth flows to the "super-nodes," a phenomenon sometimes called "preferential attachment."

In the 20th century economy, wealth and income tended to be allocated broadly to the middle class in the pattern of a classic *bell curve*. But in the new *power-curve* economy that appears to be emerging, distributions are scale-free and therefore "there is no characteristic node and the average has no useful meaning." There is no "representative" member of the whole because distributions are so skewed.

For example, even though 90 percent of Americans self-identify as middle class, the mean income in the U.S. is now $63,000, said Taipale—but the *median* household income (in which there are an equal number of people earning more and earning less than that amount) was $50,054 in 2011.[4] This disparity suggests the mismatch between "average" and actual income distribution; the disproportionate number of lower-wage earners reduces the mean income by a one-third, making "the average" far less meaningful. This polarization of incomes could grow worse in the power-curve economy, Taipale contends.

Although some observers tout the App Economy as a redemptive force for economic growth and social benefit, Taipale scoffs: "Even if 400,000 'new jobs' are created by hiring app developers, those are not stable, middle class jobs of the sort that previously existed. Companies that would have been hiring Web developers last year are now hiring app developers for a 'B round' or 'C round' of [venture financing]." The point is that the overall distribution of productivity gains in the networked economy is increasingly subject to power-law distribution and control. Only a relatively small number at the top reap the lion's share of gains.

If power-curve distributions become the norm in the new economy, it could result in greater social polarization and even social disruption.
– Kim Taipale

In very approximate terms, said Taipale, the bottom 80 percent of app developers are making, say, three percent of the revenues. The mean revenue that a developer reaps from an app is $3,000 a year, but the median is $600 a year. That means that some people are making a huge amount of money, and the rest are not. But the cost of making an app is between $15,000 to $30,000. So what's making up the difference? asked Taipale. It's either venture capital money or cross-subsidization [within a company], he said. Taipale's conclusion from this data is that "the 400,000 jobs that the App Economy is supposedly creating doesn't necessarily mean long-term, middle class jobs for the economy."[5]

If power-curve distributions become the norm in the new economy, said Taipale, it could result in greater social polarization and even social disruption. It is not clear what should be done about this trend, however, particularly if it might disrupt productivity and growth. For Taipale, the vexing question is: "How do we redistribute the spoils (or opportunities) to maintain a system in which there is sufficiently widespread prosperity to avoid the problems of political distribution that Krugman proposes in his column, i.e., 'class struggle' by politically empowering 'labor' to demand its fair share." Taipale thinks it is a better strategy to focus on devising a suitable economic *architecture* for fair

allocations of wealth and income in the first place, rather than mandate new *redistribution* schemes, because the latter are far more prone to the vagaries of politics.

As Taipale sees it, there are only a few choices: "Regulate freedom—or redistribute the spoils at the backend, through tax policy. Or do nothing and live with it." By this formulation, Taipale explained that if governments are going to intervene to address the problem of power-curve distributions, they can either constrain markets and/or the architectural design of technical systems in the first place—which amounts to a regulation of opportunities and freedom—or they can redistribute the spoils of the economy after the fact. Both choices involve some level of political choice, but the latter may be more subject to cronyism and political muscle than the former.

In any case, it is inescapable that the power-law curve has social implications. The question is how far can you let those inequalities continue before the social implications become troublesome.

In his response, Bill Coleman, the venture capitalist, challenged some of the assumptions in Taipale's analysis. (This account draws upon the original Taipale-Coleman email exchange as well as the conference itself.) In essence, Coleman believes that we are in a period of historic economic transition that will eventually result in greater prosperity, widely distributed, if the economy is allowed to pursue its course. We should take comfort in the course of the Industrial Revolution, he said, which, despite a rocky transition from a more agrarian society, ultimately created a higher standard of living *and* a broad middle class.

At the turn of the 20th century, said Coleman, the U.S. had widespread child labor, no public education, limited electricity, and a university system for elites only. But as a result of "disruptive innovations ranging from globalism, financial services, information technology, transportation and medicine, to mention but a few, as well as the Populist movement, a mass economy emerged which built the middle class." This provided an emancipation from the power-curve distribution of wealth and income that prevailed between 1860 and 1920, he said. "Inequality really began to change," Coleman said, "when Henry Ford realized that if Ford and other businesses did not create a middle class, businesses would not be able to sell their products. And this strategy *did* raise all boats, and the average income of the world went up quite dramatically. That's what productivity does," he said.

So Coleman's critique about the power-curve economy looks to industrial history and concludes, "We have just gotten off the ground [with an epochal wave of new innovation], and our problems are a result of our success." We can grow past our current power-curve inequalities and disruptions, but we need to look at the long sweep of history. "The Industrial Revolution was about an increase in the capital base and the leveraging of capital and a higher velocity of capital, starting with the Dutch 400 years ago. There are only two ways to get a 'free lunch' in economics—through innovation and specialization—and that's how productivity improved. The rest is all just redistribution of capital." The "Internet Revolution" will bring about higher standards of living just as the Industrial Revolution did, said Coleman, who predicted that "the next 100 years will raise the average productivity of the world so high that there will be no need for anyone to have to live in poverty."

Coleman continued: "The basis of the problem [of unequal distribution] has been unrelenting innovation and globalization. Over the last century, the cycle from disruptive innovation to commoditization has shortened as globalization has made creative destruction easier and faster. As this has proceeded, incremental innovation and automation have further accelerated productivity, ultimately automating all but the highest value-added positions in the economy. In fact, the total number of manufacturing jobs in the world has been *decreasing* for almost twenty years."

In light of his theory of sweeping historical cycles of innovation, Coleman believes that the economic future resembles a "glass half-full," not half-empty. The productivity revolution being ushered in by the Internet and digital technologies will reprise the Industrial Revolution in a new guise, he said: "In the coming century, capital costs and barriers to entry will be fundamentally disrupted, and human self-actualization on an individual basis will drive participation in an open, global chain of commerce," said Coleman. "In the coming 'pull world,' where everyone has the opportunity to participate, people will work through 'guilds' in every specialty—music, writing, film and even law, medicine and financial services. I also believe in an evolution of monetization, in which guilds (not unions) will lead innovation and demand compensation commensurate with their contributions. Meanwhile, the concept of a vertical enterprise will morph as it becomes more adaptive and fluid."

In Coleman's scenario, the power-curve economy is a transitional, disruptive phenomenon that will eventually produce much greater prosperity and broad social distributions of gains. So in terms of job creation, he disagreed with Taipale's analysis that "the power-curve economy is going to send us either into purgatory or hell."

Is the Power-Curve Economy that Influential?

Some conference participants questioned the basic premise of Taipale's analysis that the U.S. is moving from a "bell-curve nation" to a "power-curve nation." Michael Mandel, the former *Business Week* journalist who is now the Chief Economic Strategist for the Progressive Policy Institute, questioned whether the economy at large, and even the App Economy, are in fact exhibiting power-law distributions. "The power-law assumes that everything in the system is functioning in the same way. But the data show that there's a lot of App Economy hiring outside of the power law; there are churches and nonprofits doing so, for example. If you overlay such things over the data, the distributions no longer look quite so explosive." In the same vein, Robert Pepper of Cisco Systems, Inc., questioned whether U.S. wealth and income distribution was ever subject to a bell-curve distribution. Perhaps the bell-curve description of the "old economy" is a bit too simplistic, he suggested.

"The App Economy is part of the solution, not the problem." - *Julius Genachowski*

Julius Genachowski challenged Taipale's negative assessment of the App Economy, asserting that "the App Economy is part of the solution, not the problem. The fact that venture capitalists may be underwriting new companies and apps is not a negative, even if those ventures fail," said Genachowski. Those are positive developments because they are bets that those companies will succeed and become platforms for many new jobs. Moreover, the App Economy is helping to create "new categories of jobs," he said, at a time when many "old categories" of jobs are going away forever. "This trajectory is very positive, and it's more likely to create many more jobs in the future than it did in the past."

Finally, Genachowski said, the declining costs of technological innovation are opening up opportunities for many small businesses and ordinary people to enter the App Economy. This itself is helping to mitigate the impact of power-curve dynamics, he said. One example is Amazon's Web Services Division, which provides cheap and affordable access to data storage, servers and computing services to small businesses that might not otherwise be able to afford such high-end technologies.[6]

Jerry Murdock, Co-Founder and Managing Director of Insight Venture Partners, elaborated on this trend, noting that the App Economy is likely to really take off when "the local Internet" matures as a business opportunity. Murdock sees local data as transforming the Internet into a more personal, utilitarian experience, but he assesses the local content on his smartphone today at only 5 percent. When local data becomes the "major chunk" of smartphone content, he says, "that's when the App Economy becomes real."

Yet amidst these positive signs, Laura Bailyn, Senior Director at the Markle Foundation, reminded people that poverty and inequality remain a stark human reality in America today. "One in four children in the U.S. today are hungry," she said. "Their parents don't have enough money to eat, and the limited resources that they do have are spent on very calorie-dense, inexpensive foods, which of course leads to obesity, which leads to chronic illness and a lifetime of suffering—and a great deal of expense for our economy."

Leila Janah, Founder and Chief Executive Officer of Samasource, questioned whether the App Economy would truly yield the economic gains that we need. The problem, she said, is that the App Economy is a more precarious alternative to an economy with full-time jobs that have benefits. In the App Economy, companies offer short-term, freelance assignments that provide little stability and no benefits. Productivity gains do not necessarily accrue to workers, she argued, because "the technology reduces transaction costs and friction, making it easier to divvy up full-time jobs into freelance jobs. Companies can then pay a person half of what they would have paid a person to do it full time, and get freelancers to work half-time."

This is producing a distressing "portfolio approach" to income among many low-wage people in the U.S. and developing countries alike, Janah noted. "People earn a paycheck by doing six or seven dif-

ferent economic activities, none of which are particularly productive or stable," she said. "These dynamics are changing the nature of work in ways that don't always benefit the worker."

But perhaps inequality is not as severe as it seems. Some conference participants believe that statistics measuring income inequality are exaggerated because government support programs such as food stamps and welfare serve as substitutes for income. A more meaningful measure of disparities in social well-being would be *consumption levels*, not *income*, they argued.

"We're going to have to invent a new set of narratives, a new set of common-sense terms, to understand the realities in a power-curve economy." – *John Seely Brown*

Conversely, Philip Auerswald, Associate Professor at the George Mason School of Public Policy, pointed out that many technological innovations are creating social benefits outside of the marketplace, which means that standard economic metrics may fail to capture them. For example, in certain areas where there has been innovation, such as the sharing of digital music, "There may be fewer transactions and less monetization occurring—but greater enjoyment of life. That's not a bad thing. But the statistics for market transactions aren't capturing well-being," Auerswald said.

This raises a very interesting question about our very notions of valuation, said John Seely Brown of Deloitte Center for the Edge: "If we shift our narrative to focus not just on financial capital, but on social capital, we can begin to start looking at how we actually value social capital, reputational capital and the quality of life."

The problem with the power-curve economy, he said, is that it disrupts our "cognitive architecture"—the stories that we tell to make sense of the world. In the bell-curve economy, stories could be taken as representative case examples—but in the power-curve economy, that representational logic is flawed. Stories are not prototypical when there are "scale-invari-

ant power laws," meaning there are radical discontinuities (in income, performance, rewards) between one level and the next increment and that averages are not meaningful. "In such an environment," said Brown, "there is *no* example that is representative of anything else. And so, since we tend to reason from example, we are exceptionally poor when our past strategies and mental models don't carry over to this new world."

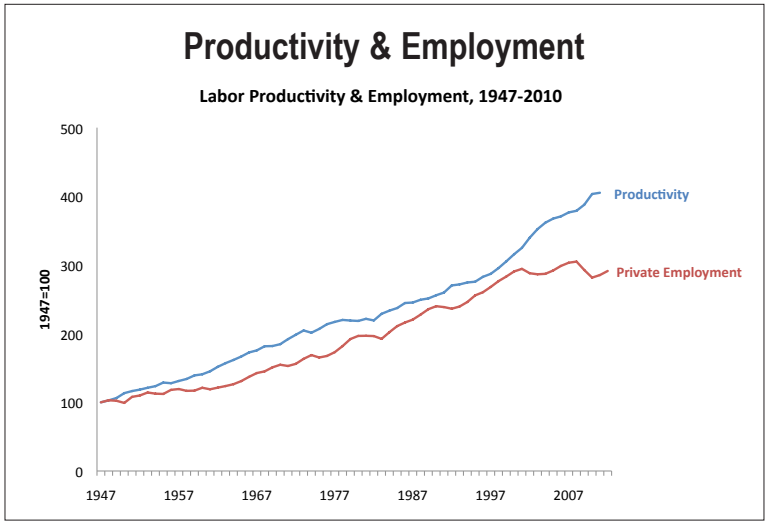
As an example, he cited the challenge of persuading very sophisticated university presidents and trustees that perhaps the value of intellectual property generated by their institutions might be seen in broader ways—leading to different policies to manage such knowledge. But invariably, such discussions focus on a few aberrational, high-earning patents that make billions of dollars for the institutions, as if they were representative stories. Brown's point: "We're going to have to invent a new set of narratives, a new set of common-sense terms, to understand the realities in a power-curve economy."

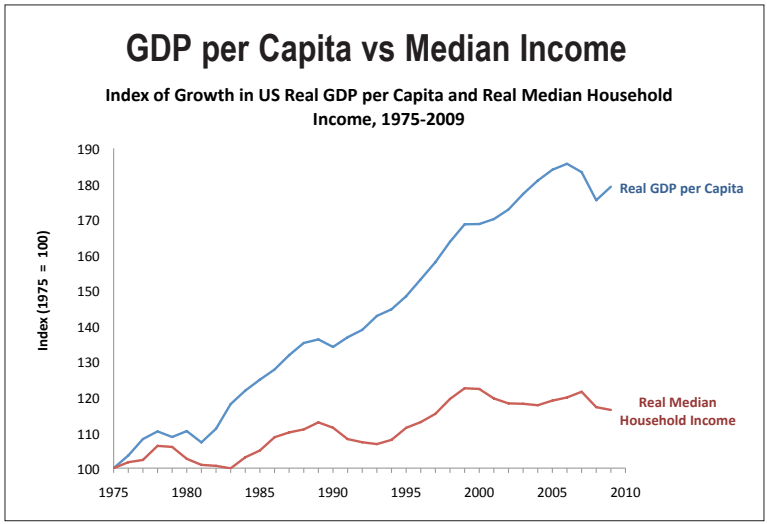
Jobs in the Power-Curve Nation

How might the power curve be affecting the creation and distribution of jobs in the U.S.? Two MIT professors—Erik Brynjolfsson, Director of the MIT Center for Digital Business, and Andrew McAfee, Associate Director and Principal Research Scientist at the Center for Digital Business—addressed this issue, drawing upon their 2011 book, *Race Against the Machine*. The book's thesis is captured in its subtitle: *How the Digital Revolution is Accelerating Innovation, Driving Productivity and Irreversibly Transforming Employment and the Economy*.

Brynjolfsson and McAfee explore the special role that digital technologies seem to be playing in restructuring the economy, work and incomes. The authors are especially interested in how technology can simultaneously boost innovation and productivity while eliminating jobs faster than new ones are created. They are also concerned with declines in median household income levels. In his presentation, Brynjolfsson noted, "Productivity is making the pie bigger, but it is entirely possible that some people, even a majority of people, are being made worse off by these advances in productivity." This is the "race against the machine" described in the book title—the relentless effort by workers to try to capture their share of gains from productivity and technological innovation, and not fall behind or be made unemployable.

"It may seem paradoxical that faster progress can hurt wages and jobs for millions of people," write Brynjolfsson and McAfee in their book, "but we argue that's what's been happening." They contend that the accelerated pace of innovation is causing enormous displacement of jobs and reductions in income, especially as new technologies encroach on human skills once thought to be impossible to automate. The professors call this phenomenon "digital encroachment."





Source: Erik Brynjolfsson and Andrew McAfee, Presentation at Aspen Institute Roundtable on Information Technology, August 5, 2012.

The two charts above illustrate how productivity has been rising for the past 10 to 15 years, along with Gross Domestic Product—and yet private employment levels and real median household incomes have both stagnated. "The person in the 50th percentile is not really seeing any benefit," said Brynjolfsson. "The pie is getting bigger, but most of that is going to a relatively small group of people. About 65 percent of the income growth in the past ten years has been earned by less than 1 percent of the American people."

Brynjolfsson and McAfee offer three basic theories to explain the mismatches between economic winners and losers. The theories center on "divergences between higher-skilled and lower-skilled workers; between superstars and everyone else; and between labor and capital."

The first theory points to a "skills-bias" in new technologies. The economic benefits of new technologies tend to accrue more to higher-skilled, more educated workers than to less-skilled, less-educated workers. Brynjolfsson and McAfee also point to the rise of the "superstar economy" as a factor that is aggravating economic inequality. Recent rounds of technological innovation are notable for enabling a small group of very talented "superstars" to replicate their talents, via software, thereby reaping disproportionate rewards from their work.

While the amplification is especially visible in software and digital media, it is evident to some degree in almost every industry, as more and more processes are embedded in digital platforms. They cited as an example the CVS drugstore chain, which seized upon an innovation in its prescription drug ordering system at one of its pharmacies and replicated it at more than 4,000 CVS retail locations nationwide via an enterprise information system. The story illustrates how technological innovation can prove to be far more influential in boosting productivity than, say, the skills of store managers at each of those locations. Similarly, said Brynjolfsson, "Information technologies have given CEOs a greater span of control over their companies. This means that the incrementally better performance of a CEO has a bigger impact on a company than previously." This is the "superstar" effect that information technology enables and amplifies, said Brynjolfsson.

Brynjolfsson and McAfee cautioned that technology is not *exclusively* responsible for these types of changes; public policy, tax changes and globalization are also very important factors. But they believe that

digital encroachment onto activities that only humans were capable of performing is also a significant factor. Only eight years ago, it was considered highly improbable that an autonomous, computer-driven automobile could ever be made because of the extreme difficulties in coordinating multiple sensory inputs, on-the-fly computing, machine learning about the formal rules of the road, etc. However, in 2012, Google introduced a completely autonomous test car that can drive down Interstate 101 near its offices in Mountain View, California. In another feat of advanced engineering, IBM has designed a supercomputer named Watson that beat the top-ranking *Jeopardy* quiz show player of all time, Ken Jennings, in a televised competition. Jennings had once won 74 *Jeopardy* games in a row. After Watson defeated Jennings, Jennings joked, "I, for one, welcome our new computer overlords."

Finally, Brynjolfsson and McAfee believe that inequality is worsening as capital reaps a higher share of productivity gains relative to labor. Throughout most of the 20th century, the respective shares of productivity gains reaped by labor and capital were unequal but fairly stable. After the year 2000, however, "The share of GDP going to labor fell off quite rapidly, and the share going to capital is at record highs right now, both in terms of profits and other metrics," said Brynjolfsson. "For the typical worker, this disparity is even greater than the statistics suggest because the numbers for 'labor' include the multi-million-dollar salaries of CEOs and senior executives."

In his recent book, *The Price of Inequality*, economist Joseph E. Stiglitz has pointed out that inequality does not just affect the quality of social life but also economic performance. He summarizes his argument: "Inequality leads to lower growth and less efficiency. Lack of opportunity means that its most valuable asset—its people—is not being fully used. Many at the bottom, or even in the middle, are not living up to their potential, because the rich, needing few public services and worried that a strong government might redistribute income, use their political influence to cut taxes and curtail government spending. This leads to underinvestment in infrastructure, education and technology, impeding the engines of growth…."[7]

The sting of inequality is made worse by another trend: declining economic mobility in American society. It is becoming harder for

children to improve upon their parents' standard of living. If you are born into the bottom income quintile of U.S. households, said McAfee, you are likely to stay in that quintile for your life as well. Interestingly, inequality is growing even in countries that have historically been quite egalitarian, such as Sweden. An ingenious study by Peter Tufano and colleagues vividly illustrated the practical meaning of worsening inequality. It showed that nearly 50 percent of U.S. households are in such a precarious financial state that, if an emergency struck, they could not come up with $2,000 within 30 days.[8]

Technology has been both creating and destroying jobs for centuries, Brynjolfsson acknowledged, but he believes that something different is happening now. "The job destruction seems to be happening a lot faster than new job creation. As tasks performed by tax preparers, bank tellers and people at airline checkout counters are automated, we need to come up with new industries that can gainfully employ those people."

In response to the Brynjolfsson/McAfee presentation, Reed Hundt suggested that a more accurate term for the "superstar economy" might be the "big winners economy"—because "superstars" implies that the winners' sheer talent took them to the top. In fact, said Hundt, "Intellectual property law and tax law have created an environment over the last thirty years in which it has been almost certain that there would be a category of big winners. The marginal income tax rate is less than half of what it was thirty years ago, for example. These rules have allowed big winners to continue to aggregate wealth without any demonstration that their work will in fact generate new wealth." The concentration of wealth is intensified, said Hundt, as wealthy people buy the machines that are used to generate more wealth, displacing or marginalizing labor.

The statistics bear out this polarization of wealth. One in six Americans lives in a family of four that makes less than $22,300, said Leila Janah of Samasource. She noted that the official government standards for determining poverty have not been adjusted in more than a generation. But Janah believes that technology can be a source of many new jobs because humans will always be needed to supplement what computers can do. Her company hires many people in less developed countries to use human judgment and skills to augment

computer-based optical character recognition, voice transcriptions, and so on.

Robert Atkinson, Founder and President of the Information Technology and Innovation Foundation, took issue with much of the analysis presented. "I just don't buy the notion that it has been returns to capital that have been the driver of increased inequality," he said, noting how contemporary corporate profit rates parallel those of the 1960s, a period when there was a wide sharing of gains among median income-earners. Atkinson also challenged the idea that new technologies disproportionately benefit the higher-skilled and better educated, noting that there is huge income inequality even among college educated workers.

Atkinson also believes that "productivity has been significantly overstated in the national income accounts by about 30 percent over the past decade. Adjusting that reduces the size of the income disparities somewhat. Finally, since 2000 about one-third of U.S. manufacturing jobs—or some 5.6 million jobs—have been lost. That's something that no other country has ever done in world history. That loss was not just about machines. It was about globalization, too." Atkinson's organization estimates that about 60 percent of the job losses can be attributed to the loss of U.S. global competitiveness, and the remaining 40 percent to technology and productivity.

Atkinson concluded, "I really don't think there is any fundamental problem with a loss of jobs from productivity gains, because the gains all go to the 'income side' (higher wages or lower prices); people spend them. And by spending them, people will create more jobs at places like restaurants, television makers and airlines. I don't see the problem as a 'race against the machine.'"

Brynjolfsson pointed to the numbers: "The assumption that you're working with, implicitly or explicitly, is that productivity gains make everyone richer. But you can't ignore the data showing that the median-income worker has *not* benefited from productivity gains. I think we have to seriously consider the possibility that the way technology is evolving, it is making particular job skills less valuable. We need to think consciously about what we can do to make people with those skills and talents more valuable so that they can continue to participate."

The Social Implications of the Power-Curve Economy

Despite agreement that new technologies are providing valuable productivity gains and economic growth, there was a subtle but significant division among conference participants about what issues require urgent attention. "Without overemphasizing this," said Charles Firestone of the Aspen Institute Communications and Society Program, "we can detect a split between those who see the new economy as a natural phenomenon that we must come to accept—'embrace the machines and figure out how to use them'—and those who worry about the people being left out economically, and who want to find effective interventions—government policies, institutional practices, education or other means—to help them."

"Education is what you *do to people*; learning is what you do *for yourself*." *- Joi Ito*

There was wide agreement that education is central to people's ability to participate in the new economy, so much conversation focused on how education is changing (and not changing), and what strategies can help people compete in the new economy. Joi Ito, Director of the MIT Media Lab, offered his own iconoclastic perspective on these questions.

To Ito, there is a major divide between *learning* and *education*, and that difference is particularly important when it comes to the technology-based economy. "Education is what you *do to people*," he said; "learning is what you do *for yourself*." Instead of trying to regiment students into mastering a certain body of knowledge, Ito believes that we need to promote practice-based, experiential learning. The learning/education distinction is implicitly a critique of traditional education and its more rigid, backward-looking orientation.

Ito regards much of American higher education as a "trailing indicator" because people go to college and get graduate degrees in fields that are already well-established in its intellectual and credentialing systems. "But as the world moves faster and faster," said Ito, "students are not picking the right things to study because, even if they're smart, they pick things that are already at the top." This approach virtually

assures a skills/jobs mismatch because technology and the economy are creating entirely new fields very rapidly, many established industries are declining, and job definitions are becoming highly malleable.

"Schooling should not be about making someone a professional; it should be about making somebody a professional learner." ***- Joi Ito***

Speaking from her own experience, Ann Winblad, Co-Founder and Managing Director of Hummer Winblad Venture Partners, said that "there were no job descriptions for entrepreneurs and computer programmers decades ago." This meant that she had to overcome the "safety" of studying for a familiar, well-defined career. This problem has become even more pervasive today as skill levels for new jobs continue to rise. One of the biggest problems today, said Winblad, is that there are no easy ways to describe the new jobs being created—and therefore it is hard to make them an aspirational goal for students. It's also hard because the conventional "career escalators" and "ladders" are increasingly disappearing, making it harder for people to plan their careers—a theme explored by Reid Hoffman's book, *The Startup of You*, she said.

"The most appropriate solution to these sorts of problems," said Ito "is to teach kids how to learn. Schooling should not be about making someone a professional; it should be about making somebody a professional learner." Learning skills are especially important—as opposed to formal education—because "skills are arguably more critical to the economy than credentials alone," said Ito. He continued: "At the MIT Media Lab, Ricardo Hausmann and Cesar Hidalgo did an analysis of imports and exports over the past fifty years.[9] They found that secondary education had almost no correlation to economic growth. Economic growth seems to be largely about the complexity of manufacturing that you can perform, and about the 'adjacent spaces' next to existing manufacturing sectors, not simply GDP."

Ito said that kids need to become engaged in participatory "connected learning," a topic that he is exploring with his sister, Mimi Ito, an anthropologist with the University of California, Irvine, and with

John Seely Brown. The project is attempting to examine a fundamental question, "How do you get kids to *want* to learn?" A hint at the answer is contained in the title of Mimi Ito's 2009 book, *Hanging Out, Messing Around and Geeking Out: Kids Living and Learning with New Media.* The book explores the social dynamics of peer learning and charts the progression that many kids make from "hanging out" to "messing around" (exploring a new challenge and developing a talent), and moving on to "geeking out" (becoming creatively engaged in developing a nerdy skill with social cachet).

"When you give people opportunities and a path towards a goal, all kinds of people show up and invest in themselves." - ***Shantanu Sinha***

The most interesting and rewarding jobs of the future are likely to require entrepreneurial talents, practice-based skills and a healthy sense of anti-authoritarianism, said Ito. Unfortunately, traditional education tends to stay confined within disciplines, "which teach more and more about less and less," while the more rigorous ways of learning come through social practice. "A lot of jobs are 'pigeonhole jobs,' " Ito conceded, but he stressed, "We need 'anti-disciplinary' jobs for people who don't fit into any pigeonholes. How do you raise those kids, hire them and match them with jobs?"

Ito offered a number of educational principles that he believes should guide future educational reform. These principles are:

Resilience over strength.

Pull over push.

Risk over safety.

Systems over objects.

Compasses over maps.

Practice over theory.

Disobedience over compliance.

Emergence over authority.

Learning over education.

In many respects, Khan Academy, the nonprofit educational website with over 3,400 video learning modules and a global network of six million users, embodies many of Ito's principles. The popular website caters to the "student, teacher, home-schooler, principal, adult returning to the classroom after 20 years, or a friendly alien just trying to get a leg up in earthly biology." Shantanu Sinha, President and Chief Operating Officer of Khan Academy, said that a huge number of people who learn through Khan Academy are probably at the extremes of the bell curve: "They are self-motivated people who want to get into Harvard and they are fifth-graders studying trigonometry. There are also many people who are left behind by the traditional educational system."

Sinha sees Khan Academy as "proof of the power of the human spirit when people really want to learn. When you give people opportunities and a path towards a goal, all kinds of people show up and invest in themselves. The levels of engagement increase tremendously." One lesson that might be learned from the Khan Academy style of learning is: Lower the barriers to educational access and encourage participation, open source style—and then let innovation and jobs emerge from that spirit of engagement. The participatory paradigm pioneered by open source software communities is expanding into other digital realms such as 3D printing and bio-fabs, where "guilds" of self-motivated practitioners are the leaning innovators.

This vision of practice-based innovation may be appealing, but does it scale?

James Manyika, Director of the McKinsey Global Institute, said he loves the idea of the App Economy and participatory learning, but "how scalable are these answers in an economy that needs 3.5 billion jobs? Do they only apply to a small group or entrepreneurial class? Can they solve the macro-employment challenge?" Manyika wondered whether contemporary institutions could in fact accommodate people who follow Ito's ideals of work and innovation, and whether everybody could learn in social, participatory ways. After all, any economy has enormous numbers of jobs that involve repetitive, boring, measureable tasks.

Ito is convinced that the Internet can help scale learning among small, practice- based groups into larger, commercially meaningful networks. He described a group of young people from East Detroit who repair bicycles whom he once connected with their counterparts

in Kenya, leading to Internet-mediated dialogues and fruitful collaborations. Similarly, the Internet is being used by many small urban farmers to develop supply chains that would otherwise not exist. The Internet is also fueling the "maker movement" of do-it-yourself artisans, inventors and tinkerers. "The neat thing about the Internet is the connections that it builds among people," said Ito. "I do think it scales for small tasks."

Ito also noted how small, networked players can often act more swiftly, more resourcefully than large institutions. He cited his own experiences in mobilizing a network of radiation experts following the March 2011 earthquake in Japan: "I knew nothing about radiation or radiation management, but within a week I knew more about how to measure, visualize and document radiation than anybody in the Japanese government. Today, we have taken four million radiation measurements. A small group of scrappy nonprofit people were able to do more after the earthquake than the government, after its decades of planning."

Several conference participants bemoaned the tendency of large institutions to see "jobs" in very static, conventional ways. As a result, most foreign aid to developing countries seeks to create "good jobs," which means conventional corporate or government jobs. And while that is helpful in one respect, in another respect such monies would be better spent on new models of self-directed learning and innovation, said Leila Janah of Samasource. She noted that even illiterate people can have useful feedback about work that can boost productivity, but "large institutions don't see this as 'learning.' They have no idea how to invest in this kind of learning."

For John Seely Brown, the inability of large institutions to embrace networked learning and innovation suggests a deeper problem: "broken institutional architectures." By that, he means "twentieth century systems" that simply cannot accommodate fluid new forms of collaboration, sharing and innovation. "We may be trying to put a new wine in an old bottle, and it isn't working. It could be that large scale corporations can't produce value anymore, and they may be useless in terms of helping us grow new talent." Brown suggested that we re-think the purpose of the corporation by seeing it as an institution for "scalable learning and talent development."

Can large corporations transform themselves in these directions? Padmasree Warrior, Chief Technology and Strategy Officer at Cisco Systems, told of an experiment in restructuring at Cisco seven years ago: "Cisco went to a model of pursuing market adjacencies through a collaborative internal structure with boards and councils. This model was too early in the accountability framework. [CEO] John Chambers' course corrected the company to focus on five priorities and has engaged in a successful transformation."

What happened in this model at Cisco, said Warrior, is that "participation in a project was not necessarily linked to results, so when no results were produced, everyone said, 'Not my problem. I didn't own that. I was just a participant.'" The challenge in instituting a pull model of participatory innovation within a large corporation is finding ways to drive accountability and ownership of results, said Warrior. The key to accountability in any structure is decision rights, according to Warrior. Since undertaking this experiment, Cisco has since retreated "halfway" to an older, more conventional corporate structure, she said. All the engineering is now together in one place, which avoids the fragmentation of corporate divisions and focuses decision-making with clear lines of sight, a change that has advantages and disadvantages.

The key to accountability in any structure is decision rights. - ***Padmasree Warrior***

For all the criticism directed at traditional, hierarchical institutions, Andrew McAfee, the MIT scientist, pointed to two strong affirmations of the status quo. First, a group of prominent European researchers recently concluded that American firms are among the best managed in the world. Traditional American management still earns a great deal of admiration, even among foreigners. Second, when Gallup CEO Jim Clifton commissioned a series of global surveys to understand what people want, said McAfee, Clifton was struck by a recurrent desire mentioned by nearly everyone no matter where they lived: the desire for a good job. "The primary goal of the world is no longer peace or freedom or even democracy," Clifton wrote. "It is not about having a

family and it is neither about God nor about owning a home or land. The will of the world is first and foremost to have a good job."

The idea of a "good job" is generally seen as a stable employer, a steady paycheck and at least 30 hours a week. This ideal, paradoxically, is increasingly less sustainable in the new economy. It would appear that people's near-universal desires and current economic trends are going in opposite directions.

Government Policies and Leadership Responsibilities

Much of the conference discussions focused on the diminishing ability of technological innovation, productivity and economic growth to address a series of worrisome social trends. Historically, these economic forces have bolstered the middle class and social opportunity; in recent years, however, their ability to create new jobs and career opportunities, mitigate inequality, and help improve education and meet other social needs, has declined. Americans in the middle- and lower-third income levels, and especially young people, are pessimistic about the future.

As Reed Hundt, former FCC Chairman, pointed out, the ratio of people employed to the general population is a useful measure of a country's social and economic health. A ratio of 70 percent is considered great while 50 percent is dismal. In the U.S., the employment/population ratio was 65 percent in 2000. That ratio has now declined to 58 percent. Meanwhile, the overall, official unemployment rate is 8.3 percent. Although the steep job losses of the 2008-2009 financial crisis have eased, the same general downward trends that have prevailed over the past thirty years (with the exception of the 1995-2000 boom) continue today.

A final session of this conference dealt with possible "solution categories" that governments and policy leaders might advance to deal with these trends. The specifics of any single solution could not be adequately addressed here, but there was a broad consensus that meaningful reforms must attempt to stimulate new public and private investment; improve public education; foster a spirit of entrepreneurship; and expand the U.S. relationship with the rest of the world, especially in trade. At a more intangible, cultural level, there is a need to come up with a new, more credible grand narrative for economic security and social progress.

It helps to name some of the hidden presumptions about economic and social progress that may no longer be operative. James Manyika of the McKinsey Global Institute identified four such presumptions that may need to be re-thought:

- "So long as the economy is going great, jobs and other things will do fine, too."
- "Innovation and productivity is going to stimulate the same kind of employment growth as it has in the past."
- "What was good for a corporation fifty years ago is probably good for America, and vice versa."
- Our individual interests as consumers, workers, citizens and investors are more or less identical and aligned.

Each of these ideas now seems problematic, said Manyika. Increases in GDP no longer necessarily boost employment. Productivity gains are not flowing to workers in the proportionate measures that they once did. And as commerce has become more globalized, corporations can now pick and choose the countries to which they will bring investment, technology and employment. Countries are often regarded as superior or deficient "service environments" (in Joi Ito's phrase) for serving corporate needs.

"GDP…is not a meaningful target for the twenty-first century." - ***Philip Auerswald***

Another presumption that may be limited or mistaken is the idea that GDP is the best metric for social and personal well-being, said Phil Auerswald, Associate Professor at the George Mason School of Public Policy. "The most rapidly growing country of the past fifty years," he said, "is Equatorial Guinea. That's because of resource extraction. There's no real development whatsoever. The point is that GDP may measure something better than nothing, and it may serve as a guidepost

for public policy, but it is not a meaningful target for the twenty-first century. When we talk about well-being in society and what it is to be a human being, we don't have measures for that."

Lasting solutions will need to look beyond short-term political or electoral needs, and focus on longer-term structural change in the following areas:

Public and private investment. A number of conference participants made the point that spending on infrastructure is one way to serve both public and private needs, while stimulating economic growth and jobs. Rob Atkinson of the Information Technology and Innovation Foundation said that the U.S. ranks 27th in the generosity of its tax credit for research and development. He urged improvement there as well as more generous incentives for investments in worker training and new machinery and equipment. More generally, he believes that the U.S. needs to develop "a big-picture vision of transforming American society through digital platforms."

Public education reform. There was widespread agreement among participants that the American educational system does not do a very good job of producing literate, skilled workers. Much of higher education seems more focused on narrow fields of disciplinary inquiry rather than practice-driven skills development, which is arguably more important for job-seekers and for national economies. There are a number of innovative projects that are stimulating self-motivated learning—and not just formal education to obtain professional credentials—but recognition and support for the former remains very limited.

Support for entrepreneurship. The "secular trend in entrepreneurship is a downward trend" in two senses, according to Andrew McAfee of MIT. The number of new businesses started and the new number of jobs that they create, are trending downward, he said. He also pointed to the "regulatory thicket" as an impediment to new business creation that needs to be resolved. A recent study by the New America Foundation's Markets, Enterprise and Resiliency Initiative concluded: "The number of new entrepreneurs and business owners has been dropping—as a percent of the working-age population—for more than a generation, declining by 53 percent between 1977 and 2010. The share of self-employed Americans, meanwhile, has been declining since 1991; by 2010 it had dropped by more than 20 percent."[10]

A more expansive U.S. relationship with the rest of the world, especially in trade. Economic and social policy is often made with little regard for global dynamics, said Bright Simons, President of the mPedigree Network, the biggest network of telecom companies in the world dedicated to addressing the counterfeit medicines threat in Africa and South Asia (www.mPedigree.net). Simons noted that the U.S. exports only $23 billion worth of goods to sub-Saharan Africa and yet it imports $90 billion. "This massive trade deficit tells you that Africa is the biggest opportunity for the U.S. because there are frontier markets to be developed," Simons said. "If the U.S. were to expand its trade with Africa by ten-fold, to say 50 percent per annum, that would be sufficient to create more than 500,000 jobs over a three-year cycle."

As a general strategic approach, Reed Hundt is skeptical that current policies to boost economic growth and incomes could ever alleviate inequality or produce a sufficient quality of life for all people. He acknowledged that the standard economic wisdom is to try to do so. The basic idea is to improve productivity and thereby incomes in order to help people *buy* a better standard of living. "That has no chance of working," said Hundt. "No chance." That's because the benefits of productivity are reaped by *some* citizens, but not all citizens, he said. "If you look at productivity gains over the past twenty years, you'll find that they have not benefited all citizens." Current economic trends aggravating inequality "are very hard to reverse," said Hundt, "and they won't be reversed in any rapid way, perhaps not for generations. After all, we have had this trend for forty years."

But if neither governments nor the economy can assure a broader distribution of productivity gains, what might be a viable alternative? Hundt suggested that attention be focused on how to capture the efficiencies and value that networks can generate, and then distribute them at no cost to those who need them. In other words, leverage some of the benefits generated by open networks, whether through market activity or non-market collaborations. This could be a fruitful approach to generating social benefits beyond the exclusive pursuit of higher income and redistribution of wealth (which many people oppose for philosophical or political reasons in any case, he noted).

Phil Auerswald of George Mason University had a categorical piece of advice for policymakers: *stop favoring incumbents so much.* His ratio-

nale: it crowds out innovative approaches that are desperately needed. "By favoring incumbents less, you can help create a space for the future," he said. Auerswald pointed to philanthropic and government support for stodgy, old-style educational institutions. "All this goodwill toward educational incumbents is actually making the problem much worse," he said, arguing that it entrenches archaic institutional practices rather than nurturing more appropriate, innovative ones.

Conclusion

The challenges of the power-curve economy are formidable indeed. In the more optimistic scenario, the coming surges of productivity, innovation and economic growth will be disruptive, but tolerable and hopeful because they will also usher in enormous efficiencies and bounties that could eradicate poverty and improve standards of living. Under this scenario, the transition we are in must be understood as something on the scale of the Industrial Revolution itself.

In a more troubling scenario, the power-curve economy poses a series of disruptions that have no easy or recognized solutions. We appear headed for a greater polarization into haves and have-nots and more acute economic hardship and unemployment. Greater social and political unrest seem inevitable if no interventions are taken to deal with the current arc of economic activity.

Clearly the discussion about how to anticipate and address the dynamics of the power-curve economy is still in its very early stages. It will take more study to reach a deeper understanding of the socio-economic and technological dynamics at play. We will need more time to see how technological innovation and network effects play out in specific industry sectors, and what general conclusions might be drawn from such developments.

The worlds of politics and public policy may have the steepest learning curve to navigate, however, because so many of its guiding narratives are based on twentieth-century economics and governance models. Much more serious attention must therefore be paid to the "edge" of contemporary technology, networks, markets and culture, where the harbingers of the future first manifest themselves before moving to the center. But even this task requires escaping the gravitational pull of established institutions and treating emergent phenomena with greater seriousness.

This report is an early attempt to do just that. But we if are to truly understand the emerging power-curve economy and its social ramifications, and if we wish to maintain a sustainable balance between innovation, opportunity and social equity, we must probe more deeply into the challenges explored in the preceding pages. It seems likely that we need to devise entirely new sorts of policy approaches and institutional systems to deal with the novel, global dynamics of the power-curve economy.

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APPENDIX

The Twenty-First Annual Aspen Institute Roundtable on Information Technology

POWER-CURVE SOCIETY

The Future of Innovation, Opportunity and Social Equity in the Emerging Networked Economy

Aspen, Colorado • July 31—August 3, 2012

Roundtable Participants

Robert Atkinson
Founder and President
Information Technology and Innovation Foundation

Philip Auerswald
Associate Professor
The George Mason School of Public Policy

Laura Bailyn
Senior Director
Markle Foundation

David Bollier (Rapporteur)
Independent Journalist and Principal
Commons Strategies Group

John Seely Brown
Independent Co-Chairman
Deloitte Center for the Edge

Erik Brynjolfsson
Director, MIT Center for Digital Business
and
Schussel Professor of Management
MIT Sloan School of Management

Zoë Baird Budinger
President
Markle Foundation

Michael Chui
Principal
McKinsey Global Institute

John Clippinger
Co-Founder and Executive Director
ID3

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Note: Titles and affiliations are as of the date of the conference.

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Julius Genachowski
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Federal Communications Commission

Shane Green
Co-Founder, President and Chief Executive Officer
Personal

Patrick Gross
Chairman
The Lovell Group

Reed Hundt
Chair, Aspen Institute IDEA Project
and
Principal, REH Advisors

Joi Ito
Director
MIT Media Lab

Leila Janah
Founder and Chief Executive Officer
Samasource

John Kunzweiler
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Michael Mandel
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Jerry Murdock
Co-Founder and Managing Director
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Robert Pepper
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Note: Titles and affiliations are as of the date of the conference.

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Shantanu Sinha
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The Khan Academy

Kim Taipale
Founder and Executive Director
Stilwell Center for Advanced
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About the Author

David Bollier is an author, activist, blogger and independent scholar who has served as rapporteur for Aspen Institute Communications and Society conferences for more than 20 years.

Bollier's primary focus is on the commons as a new paradigm of economics, politics and culture. He has pursued this work for more than ten years, first as founding editor of Onthecommons.org (2002-2010), and now with variety of international and domestic partners. He is Co-Founder and Principal of the Commons Strategies Group, an international consulting project that works with the global policy activists, and co-director of the Commons Law Project, a collaboration with international human rights scholar Professor Burns H. Weston.

In 2002, Bollier co-founded Public Knowledge, a Washington advocacy organization for the public's stake in the Internet, telecom and copyright policy. He collaborated with television producer/writer Norman Lear from 1985 to 2010 in a variety of non-television related public affairs and political projects. He has also been Senior Fellow at the Norman Lear Center at the USC Annenberg School for Communication and Journalism since 2002, and rapporteur for the Aspen Institute Communications and Society Program for more than twenty years.

Bollier has written twelve books, including the forthcoming anthology, *The Wealth of the Commons: A World Beyond Market and State* (co-edited with Silke Helfrich) and the forthcoming *Green Governance: Ecological Survival, Human Rights and the Law of the Commons* (co-authored with Burns Weston). Bollier's previous books include *Silent Theft: The Private Plunder of Our Common Wealth* (2002), *Brand Name Bullies: The Quest to Own and Control Culture* (2005) and *Viral Spiral: How the Commoners Built a Digital Republic of Their Own* (2009).

Bollier blogs at Bollier.org, and lives in Amherst, Massachusetts, with his wife Ellen.

Previous Publications from the Aspen Institute Roundtable on Information Technology

The Future of Work: What It Means for Individuals, Businesses, Markets and Governments (2010)

David Bollier, rapporteur

New digital technologies and trends are challenging conventional notions of work and organization. As the velocity of change increases, institutions and individuals must adapt. Yet many structures, including those in education, government, business and the economy, often remain rooted in the past. The report captures the insights of the Nineteenth Annual Aspen Institute Roundtable on Information Technology, where business leaders, technologists, international politicians, academics and innovators explored how global structures and institutions are being confronted by the 21st century realities of distributed knowledge, crowdsourcing, open platforms and networked environments. The report shares the solutions these leaders proposed for preserving individual well-being and defining a future world of work that benefits everyone involved. 2011, 60 pages, ISBN Paper 0-89843-543-9, $12 per copy, free download at www.aspeninstitute.org.

The Promise and Peril of Big Data (2009)

David Bollier, rapporteur

Ever-rising floods of data are being generated by mobile networking, cloud computing and other new technologies. At the same time, continued innovations use advanced correlation techniques to analyze them, and the process and payoff can be both encouraging and alarming. The Eighteenth Annual Roundtable on Information Technology sought to understand the implications of the emergence of "Big Data" and new techniques of inferential analysis. Roundtable participants explored ways these inferential technologies can positively affect medicine, business and government, and they examined the social perils they pose. The report of the 2009 Roundtable, written by David Bollier,

summarizes the insights of the Roundtable and concludes with its analysis of the financial sector from the perspective of Big Data, particularly how massive transparency, common reporting languages and open source analytics might greatly relieve the problems of systemic risk. 2010, 56 pages, ISBN Paper 0-89843-516-1, $12 per copy, Free download at www.aspeninstitute.org.

Identity in the Age of Cloud Computing: The next-generation Internet's impact on business, governance and social-interaction (2008)

J.D. Lasica, rapporteur

The Seventeenth Annual Roundtable on Information Technology brought together 28 leaders and experts from the ICT, financial, government, academic, and public policy sectors to better understand the implications of cloud computing and, where appropriate, to suggest policies for the betterment of society. Participants discussed the migration of information, software and identity into the Cloud and explored the transformative possibilities of this new computing paradigm for culture, business and personal interaction. The report of the roundtable, written by J.D. Lasica, offers insights from the roundtable and includes a set of policy recommendations and advice for the new presidential administration. 2009, 98 pages, ISBN Paper 0-89843-505-6, $12 per copy.

Beyond the Edge: Decentralized Co-creation of Value (2007)

David Bollier, rapporteur

The 2007 Roundtable convened 27 leaders to analyze the current and future social and economic impacts the co-creation of knowledge across networks made possible with new communications and information technologies. While collaborative engagement encourages increased productivity and creativity, it can also lead to mass chaos from the co-creation process. The roundtable participants discussed what separates successes from failures in the new collaborative era by reviewing business and organizational models and the implications of new models. 2007, 64 pages, ISBN Paper 0-89843-481-5, $12.00 per copy.

The Mobile Generation: Global Transformations at the Cellular Level (2006)
J.D. Lasica, rapporteur

The 2006 Roundtable examined the profound changes ahead as a result of the convergence of wireless technologies and the Internet. The Roundtable addressed the technological and behavioral changes already taking place in the United States and other parts of the world as a result of widespread and innovative uses of wireless devices; the trends in these behaviors, especially with the younger generation; and what this could mean for life values in the coming decade. The Roundtable tackled new economic and business models for communications entities, social and political ramifications, and the implications for leaders in all parts of the world. 66 pages, ISBN Paper 0-89843-466-1, $12.00 per copy.

When Push Comes to Pull: The New Economy and Culture of Networking Technology (2005)
David Bollier, rapporteur

The author considers how communications, economics, business, cultural, and social institutions are changing from mass production to an individualized "pull" model. *When Push Comes to Pull* describes the coexistence of both push (top down or hierarchical) and pull (bottom up or networked) models—how they interact, evolve, and overlay each other in the networked information economy. The report explores the application of "pull" to the worlds of business and economics; the content and intellectual property industries; the emergence of an economy of the commons; and personal and social dynamics, including leadership in a pull world. It also touches on the application of the pull model to learning systems; the military, in the form of network-centric warfare; and the provision of government services. 78 pages, ISBN Paper 0-89843-443-2, $12.00 per copy.

Information Technology and the New Global Economy: Tensions, Opportunities, and the Role of Public Policy (2004)
David Bollier, rapporteur

This report provides context and insight into the unfolding of new economic realities arising from the information revolution—how the world's players will live, learn, innovate, offer, consume, thrive, and die in the new global economic landscape. *Information Technology and the*

New Global Economy draws a portrait of a changing global economy by describing new business models for the networked environment, exploring topics of innovation and specialization. Among the more creative concepts propounded at the Roundtable was an analysis of the world's economy in terms of video game theory that suggests that if developing countries are not incorporated into the world economic community in some acceptable way—if they cannot make economic progress—they could become disrupters to the entire economic or communications system. The report also explores issues of outsourcing and insourcing in the context of digital technologies moving work to the worker instead of vice versa. Participants concentrated on developments in India and China, taking note of some of the vulnerabilities in each of those countries as well as the likely impact of their rapid development on the broader global economy. 57 pages, ISBN Paper: 0-89843-427-0, $12.00 per copy.

People / Networks / Power: Communications Technologies and the New International Politics (2003)

David Bollier, rapporteur

This report explores the sweeping implications of information technology for national sovereignty, formal and informal diplomacy, and international politics. Bollier describes the special challenges and new rules facing governments and nongovernmental organizations in projecting their messages globally. The author further explores the relationships between the soft power of persuasion and the more traditional hard power of the military and discusses how governments will have to pay close attention to newly burgeoning social communities in order to prosper. 68 pages, ISBN Paper: 0-89843-396-7, $12.00 per copy.

The Rise of Netpolitik: How the Internet Is Changing International Politics and Diplomacy (2002)

David Bollier, rapporteur

How are the Internet and other digital technologies changing the conduct of world affairs? What do these changes mean for our understanding of power in international relations and how political interests are and will be pursued? *The Rise of Netpolitik* explores the sweeping implications of

information technology for national sovereignty, formal and informal international diplomacy, politics, commerce, and cultural identity. The report begins with a look at how the velocity of information and the diversification of information sources are complicating international diplomacy. It further addresses geopolitical and military implications, as well as how the Internet is affecting cross-cultural and political relationships. It also emphasizes the role of storytelling in a world in which the Internet and other technologies bring our competing stories into closer proximity with each other and stories will be interpreted in different ways by different cultures. 69 pages, ISBN Paper: 0-89843-368-1, $12.00 per copy.

The Internet Time Lag: Anticipating the Long-Term Consequences of the Information Revolution (2001)

Evan Schwartz, rapporteur

Some of the unintended consequences of the Internet and the freedoms it symbolizes are now rushing to the fore. We now know that the network of terrorists who attacked the World Trade Center and the Pentagon made full use of communication technologies, including email, Travelocity.com, automatic teller machines (ATMs), data encryption, international money transfers, cell phones, credit cards, and the like. Is the Internet an epochal invention, a major driver of the economy for many years to come, or just a passing fad? Will the new phenomena of recent years—such as the contraction of hierarchies, instant communication, and lightning-fast times to market—last beyond the funding bubble? What is the next new economy? What are the broader social consequences of the answers to those earlier questions? This report takes a wide-ranging look at the economic, business, social, and political consequences of the Internet, as well as its ramifications for the process of globalization. 58 pages, ISBN Paper: 0-89843-331-2, $12.00 per copy.

Uncharted Territory: New Frontiers of Digital Innovation (2001)

David Bollier, rapporteur

This report looks critically at key insights on the new economy and its implications in light of the digital revolution. The report begins with an examination of the interplay between the current economy and the

capital economy and then probes the emerging world of mobile commerce and its potential for driving the next great boom in the economy. It further explores new business models resulting from the combination of mobile communications and the new economy. 68 pages, ISBN Paper: 0-89843-307-X, 12.00 per copy.

Ecologies of Innovation: The Role of Information and Communications Technologies (2000)

David Bollier, rapporteur

This report explores the nature of innovation and the role of the information and communications sectors in fostering ecologies of innovation. In this context, the report examines the ways in which the creation of new ecologies is affecting significant societal institutions and policies, including foreign policies, industry and business structures, and power relationships. 44 pages, ISBN Paper: 0-89843-288-X, $12.00 per copy.

Reports can be ordered online at *www.aspeninstitute.org* or by sending an email request to *publications@aspeninstitute.org.*

The Aspen Institute Communications and Society Program

www.aspeninstitute.org/c&s

The Communications and Society Program is an active venue for framing policies and developing recommendations in the information and communications fields. We provide a multi-disciplinary space where veteran and emerging decision-makers can develop new approaches and suggestions for communications policy. The Program enables global leaders and experts to explore new concepts, exchange insights, develop meaningful networks, and find personal growth, all for the betterment of society.

The Program's projects range across many areas of information, communications and media policy. Our activities focus on issues of open and innovative governance, public diplomacy, institutional innovation, broadband and spectrum management, as well as the future of content, issues of race and diversity, and the free flow of digital goods, services and ideas across borders.

Most conferences employ the signature Aspen Institute seminar format: approximately 25 leaders from diverse disciplines and perspectives engaged in roundtable dialogue, moderated with the goal of driving the agenda to specific conclusions and recommendations. The program distributes our conference reports and other materials to key policymakers, opinion leaders and the public in the United States and around the world. We also use the Internet and social media to inform and ignite broader conversations that foster greater participation in the democratic process.

The Program's Executive Director is Charles M. Firestone. He has served in this capacity since 1989 and also as Executive Vice President of the Aspen Institute. Prior to joining the Aspen Institute, Mr. Firestone was a communications attorney and law professor who has argued cases before the United States Supreme Court. He is a former director of the UCLA Communications Law Program, first president of the Los Angeles Board of Telecommunications Commissioners, and an appellate attorney for the U.S. Federal Communications Commission.

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