

MANAGING DIGITAL ASSETS

The Challenge of Creating and Sustaining
Intangible Value in a Data-Driven Economy

David Bollier, Rapporteur



THE ASPEN INSTITUTE

Communications and Society Program

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Washington, D.C.

2015

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The Aspen Institute
One Dupont Circle, NW
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Washington, DC 20036

Published in the United States of America in 2015
by The Aspen Institute

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Printed in the United States of America

ISBN: 0-89843-616-8

15/001

2019CSP/15-BK

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Foreword

The digital age has fundamentally changed the way people conceptualize, create and capture value—moving away from traditional tangible assets like land to intangible digital assets or bits of information such as reputation scores, geo-location or medical status. As more of our lives happen online, data are accumulating at exponentially increasing rates. There are more than 100 hours of video uploaded to YouTube every minute and more than 400 million tweets generated on Twitter every day. Organizations, individuals and governments that effectively utilize and protect their digital assets—network, platform, brand, product designs and user data, for starters—will have distinct advantages over those who do not.

Adding to the growth of intangible digital assets is the proliferation of peer-to-peer platforms that empower consumers. This had led to the monetization of trust and interconnection among players in the market—a driver and a passenger or a homeowner and a guest—allowing users to bypass the central incumbent (a taxi service or hotel) and go through a new service provider (Airbnb or Lyft). These alternatives to traditional asset utilization offer businesses and consumers opportunities for extending their organizational and individual capital.

At the same time the implications of these trends and developments hold many perils for businesses, consumers and governments. Data both create and limit opportunities. With so much information tracked and stored online, the implications of data breaches are severe. What negative data is being collected about an individual and used? What happens when sensitive information gets leaked in a data breach? How do organizations quantify the value of harm when so much of their value is based on intangibles? Furthermore, the extended liabilities of mismanaging data assets remain unknown. What is the most effective way to use data assets to engender new insights, digital products and services?

These and other policy questions were addressed by the Aspen Institute Communications and Society Program during a three-day dialogue in Aspen, Colorado in July of 2014. A knowledgeable group of leaders, innovators and entrepreneurs assembled for the 23rd annual Aspen Institute Roundtable on Information Technology. Their task was

to develop a more sophisticated, timely understanding of digital assets and liabilities, as well as their economic effects.

Rapporteur David Bollier details the results of that wide-ranging dialogue in the following report. In describing the growing universe of digital assets and liabilities, Bollier explores new trends in a data driven economy. He offers an overview of organizational assets, as described by Thomas Malone of the Massachusetts Institute of Technology, and how they have changed from one economic era to another—from the labor economy to the information economy—where customer data is paramount. Bollier describes the data trails individuals create and their capacity to assert control over their own data. As individuals move about the digital world, the person can become the platform.

Bollier then examines the sharing economy's interdependence between individuals and platforms, as described by Robin Chase, Founder of Zipcar, Buzzcar and Veniam Works. Platforms such as Facebook or YouTube can provide access by aggregating lots of data in one place (e.g., unused open beds on Airbnb), "slicing up" assets to fully capture value in a more effective way (e.g., Uber) and opening up a resource to be used in new ways (e.g., YouTube music stars). These platforms unbundle existing assets and enable new value exchange out of those assets.

While digital assets offer many benefits, there are also serious risks associated, presenting on the liabilities side of the ledger. Myriad security breaches and unauthorized disclosures of personal information have shaken consumer confidence, calling attention to the need for more responsible stewardship of data.

Bollier concludes the report by investigating the proper role for government in the regulation of intangible digital assets. Government often struggles to keep up with technological innovation. The new and exciting realities of intangible digital assets are no exception. New public policies are needed to address concerns surrounding authentication, privacy, consumer protection and trust, without smothering important innovations.

Acknowledgments

I would like to thank our senior sponsor McKinsey & Company for its leadership in developing this Roundtable, as well as our other attending sponsors of the 2014 Aspen Institute Communications and Society Program for making this and our other conferences possible: The Markle Foundation, Deloitte Center for the Edge, The Walt Disney Company, Cisco Systems, PCIA, Reputation.com and John Kunzweiler.

I also want to acknowledge and thank David Bollier, our talented rapporteur, for his excellent synthesis of the discussions and debates that transpired during the Roundtable as well as our participants, listed in the Appendix, for their contributions to these important issues. Finally, I want to thank Rachel Pohl, Project Manager, and Liyuan Zhang, Program Associate, for their help in producing the Conference and this report, along with the Communications and Society Program's Assistant Director Patricia Kelly, who oversaw its editing and publication.

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Washington, D.C.
January 2015

*This report is written from the perspective of an informed observer at the
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 Roundtable.*

Managing Digital Assets
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David Bollier

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David Bollier

The Digital Assets on Open Platforms: A Different Kind of Economy

As the Internet matures, new types of technologies and interconnections suddenly arise and the importance of a new kind of social and commercial resource—“digital assets”—becomes more salient. These are intangible bits of information that have all sorts of personal, commercial, social and national value. They consist of data that may reveal our personal tastes in music, our movements around town or globally, our medical status, financial data about our creditworthiness and consumer preferences, and countless other types of information.

As more transactions and relationships of everyday life migrate to network platforms using digital technologies, the sheer amounts of data being produced are exploding. Much of this data, if properly analyzed and deployed, can yield important strategic advantages for companies, useful buying information for consumers, important knowledge for policymakers, and welcome conveniences for people’s social lives.

But the growing universe of digital assets also comes laden with serious liabilities. If disclosed in unauthorized ways, they can threaten our personal privacy, harm corporate reputations and revenues, limit one’s personal opportunities, and even undermine national security. Yet failing to use digital assets also comes with enormous opportunity costs in terms of economic vitality, product and service innovation, public health responses and the management of government programs.

While existing laws and regulatory systems address some of these issues, the unpleasant truth is that the proliferation of digital assets is producing new uncertainties and challenges that have no clear answers. The growth of networked devices such as sensors, remotely controlled

thermostats and military weapons—the so-called Internet of Things—makes it even more urgent to find ways to authenticate the identities of electronic devices to authorize their use. The challenges today extend far beyond private protection, to include such issues as the new business models, the macro-economic and social effects of peer production, control over digital identities and credentials, and the security of nearly every type of communication.

To probe these and related issues, the Aspen Institute Communications and Society Program convened twenty-two technology experts, business executives, privacy experts, policy advocates, venture capital investors, and others. The participants of the 23rd annual Roundtable on Information Technology shared their diverse perspectives on these issues in an attempt to develop some coherent frameworks for understanding the new technological and economic landscape. They also sought to gauge the social and civic implications and propose practical steps by which government, business and civil society might address the many challenges identified.

The conference took place from July 7-10, 2014, in Aspen, Colorado. Charles M. Firestone, Executive Director of the Communications and Society Program, moderated. This report is an interpretive synthesis of the highlights of those conversations.

A Framework for Understanding Organizational Digital Assets

How shall we begin to understand the very idea of “digital assets?” In an opening presentation, Thomas Malone, Professor of Management at the Massachusetts Institute of Technology (M.I.T.) Center for Collective Intelligence, offered a simplified framework for defining “organizational digital assets.”

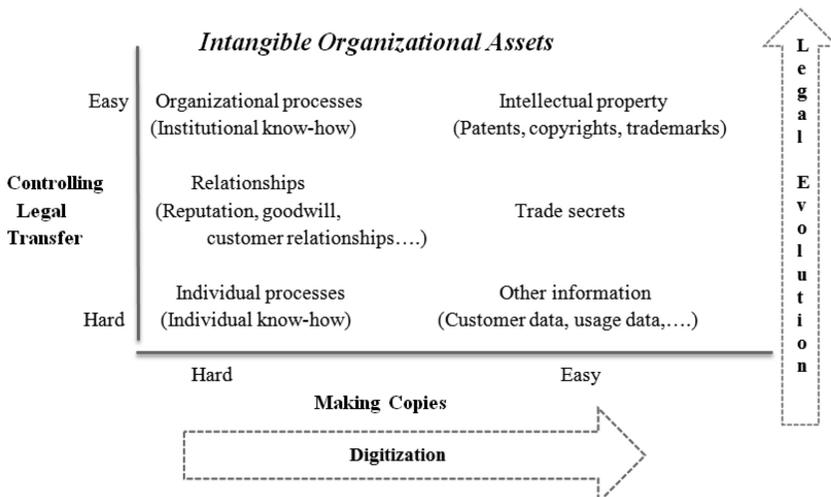
The most basic challenges for organizations, he said, are how to create and capture value. This requires three elemental factors: *labor* that can use *assets* and *productive skills*. Ultimately the value created must exceed the cost of these individual factors. In many instances, an organization may be quite successful in *creating* value but less successful in *capturing* value. Capturing value, said Malone, generally requires that an organization own productive assets or have productive capabilities that others cannot easily copy.

Throughout history, the assets considered most important have shifted. In hunting and gathering societies, for example, the chief productive asset was labor. Land was not really regarded as an asset because it was seen as an inalienable given for human life—something that could not be bought or sold, and that belonged to everyone.

The dawn of agriculture helped convert land into a valuable asset. As people invested resources to improve agricultural output, they began to treat land as an asset. With the rise of an industrial economy, physical factories and intangible production processes began to create more (monetizable) value than a farm on an identical plot of land.

“In the industrial economy, we have the first harbinger of the next economy,” said Malone, “in which certain kinds of ideas about the design and operation of machines became so valuable that they were treated as a kind of ‘intellectual property’—a kind of asset that people could buy and sell independent of the physical machines that embodied those ideas.” The rise of the “information economy” signaled the importance of yet another class of assets—informational processes—that could create even greater monetizable value.

“The key insight here is that what we consider an asset has changed significantly from one economic era to another,” said Malone. Now we stand at the beginning of a period in which *intangible organizational assets* constitute a significant new class of assets. These assets have two significant attributes—the ease or difficulty of copying them, and the ease or difficulty of controlling the legal transfer of them. Malone shared a chart that illustrates the nature of intangible organizational assets:



There is a shorthand way of thinking about how different sorts of economies rely upon different sorts of assets, said Malone: “In the hunting and gathering economy, it is how much work you do; in the agricultural economy, it is what assets you have; in the industrial economy, it is how productively you are able to use those assets; and in the information economy, I think it is how intelligently you are able to continue being productive in an ever changing environment.”

Based on economic history, Malone predicted that as more and more things are digitized, pressures will grow to devise new legal forms to protect intangible digital assets. However, social capital, civic capital and individual value will also be influential.

Robin Chase, an entrepreneur who founded Zipcar, Buzzcar and Veniam Works, took issue with Malone’s conclusion that the ownership of value through property rights was the next phase of the economy. “Today we see value-creation coming through openness because there is more value to be created by moving *away* from legal control of assets.” Malone agreed with this analysis as it applies to *creating* value, but disagreed in terms of the *capture* of value. “In order for organizations to be sustainable, they have to at least capture enough value to support their continuing operations.”

“...what we consider an asset has changed significantly from one economic era to another.”
Now we stand at the beginning of a period in which intangible organizational assets constitute a significant new class of assets. - Thomas Malone

Malone cited the immense amount of new value that Google has created, which is available to everyone for free. “Google has captured only a small fraction of that value through advertising,” he said, “but that small fraction has been a huge amount in absolute terms.” Kara Sprague, Principal at McKinsey & Company’s Business Technology Office, agreed, noting that Google’s chief economist, Hal Varian, has estimated that consumers reap about \$1.40 in economic value from the

Google search engine every day, for free. Facebook users reap an untold amount of value from that platform while Facebook, in monetary terms, earns only about \$1 per user annually. “There is clearly a lot more value that Facebook is creating than it is actually getting.” On the other hand, Malone pointed out that “in many cases trying to capture too much of the value created [through advertising, data-mining, etc.] can be counterproductive” if it irritates or angers users.

“Today we see value-creation coming through openness because there is more value to be created by moving away from legal control of assets.”

- Robin Chase

One of the big drivers of value in the Internet age, said Jerry Murdock, Co-Founder of Insight Venture Partners, is the “intangible value of the network itself. When Facebook bought WhatsApp [a cross-platform mobile messaging app], it was clearly buying a network of networks. A lot of the most important businesses today are all about the intangible value of the network.” What makes a network especially valuable, he added, is the personal and social engagement that may occur on a given platform.

Capturing Value through Open Platforms

But is it networks—or platforms—that are the biggest generators of value?

The big story of our time, said Kim Taipale, Founder and Executive Director of the Stilwell Center, a private research and advisory organization, is the role that platforms play in privatizing value. “Platform owners are capturing the bulk of the value right now, and may capture 100 percent of the value in the future unless there is a legal development that democratizes, or balances out somehow, the winner-take-all dynamic that now prevails by default on most platforms.”

As evidence of the proprietary ambitions of platforms, Taipale cited the use of cease-and-desist letters to developers who use the platform’s

APIs [application protocol interfaces] in unauthorized ways. “Right now platforms are controlling the creation and capture of value.” But platforms are not necessarily Web-based such as Facebook and Google, said Bill Coleman, Partner with Alsop Louie Partners, noting the rise of mobile telephony as a platform. “In this era of post-Internet connectivity, platforms are what you interact with,” he said. These platforms become invincible, at least for a period, for two reasons: Metcalfe’s Law of network effects (in which network value grows exponentially as more users join the network)¹ and the Long Tail of niche users who arise to build out the ecosystem.

“In eBay’s case, its dominance stems from everyone using eBay. In the case of Facebook, it is not only the numbers of users, but the subgroups who are adding many applications. These forces work in synergy to create a ‘winner takes most’ situation. That is why there is only one Facebook and only one Google, which represent 70 percent to 80 percent of the marketplace. Nobody else can get very big because you cannot break that network effect, especially once you start generating a Long Tail.” Coleman cited the example of Microsoft, which built Windows into a successful platform, without network effects, by capturing the leading applications that were built to interact with Windows.

In the Internet era with massive “free reach,” as Coleman put it, the power of network effects and the Long Tail are amplified by the growth of rich ecosystems of symbiotic players. This produces an even more powerful “network effect of network effects,” said Coleman, compounding growth. A “power law” of distribution effects comes into play, fortifying the dominant platforms.

“Now, the interesting thing about this dynamic is the low switching costs,” said Coleman. Google has a phenomenal central search engine, but there is almost no cost to switching to a rival. “All the other ecosystems that Google has created so far have not added value to the search platform, and the search platform is where they are vulnerable just like everybody else.” On the other hand, he conceded that the *social* switching costs—the user loyalty, habits and image associated with the Google brand—are more formidable than the technical or economic switching costs.

Cory Ondrejka, Vice President of Engineering in the Core Experience Group at Facebook, disagreed with Coleman’s analysis about Facebook,

arguing, “We are at the very beginning of understanding how people are using mobile phones as networks and platforms. I think that we have *layers* of platform owners, and the incumbent status of any of them is very much a dangerous assumption.”

There was certainly wide agreement on this proposition—that the rapid convergence of diverse networks and technologies, and their highly fluid, dynamic interactions, are scrambling old, familiar categories and forcing the invention of new business and organizational models.

“What we are seeing now is a complete rethinking of old business models and the creation of entirely new ones that mirror no previous circumstances,” said Tony Scott, Senior Vice President and Chief Information Officer at VMware, and a former CIO at Microsoft, The Walt Disney Company and General Motors Corporation. What is different today, he said, is the use of broadly available infrastructure, labor and intellectual property—i.e., “all the open stuff.... All the old institutional resources that we used to rely on are breaking down; the new model is the network.”

“What generates value is the unique idea on top of the broad, open use of [infrastructure, labor and intellectual property],” Scott said. “That is why it is all about ecosystems and the things that you can combine together easily and quickly to deliver value.”

“All the old institutional resources that we used to rely on are breaking down; the new model is the network.” - Tony Scott

Dorothy Attwood, Senior Vice President of Global Public Policy for The Walt Disney Company, sees platforms “as enablers” for tapping into the value of a social and technological ecosystem. She cited Disney’s recent purchase of Maker Studios, a company that enables 75,000 creators to make user-generated content on a large scale for YouTube. “It is kind of a heresy for traditional content companies to say, ‘Oh, wait a minute—I am going to try to maximize value for individuals who are not on my studio lot!’ And yet, because of network effects, that is the

way in which people are creating value and content. You have got to move into these worlds. It is clearly not a zero-sum game.”

One explanation for this shift is the role of social communities in generating value. “Our focus on value and value-capture has been focused on financial capital,” said John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge and Visiting Scholar at the University of Southern California and former Chief Scientist of the Xerox Corporation and Director of its Palo Alto Research Center. “The question is: Can we open up a new kind of orthogonal space that is built around the notion of identity and the social economy? We are entering a world in which people are making trade-offs between the construction of social capital—identity, reputation, social engagement—and financial capital.”

“We are entering a world in which people are making trade-offs between the construction of social capital—identity, reputation, social engagement—and financial capital.”

- John Seely Brown

While it is clear that the social and personal lives of users constitute an enormous store of intangible value, there are no consensus frameworks for talking about this fact yet. In their 2013 book, *The Ethical Economy*, sociologist Adam Arvidsson and Nicolai Peitersen make the fascinating observation that a huge amount of the market capitalization of companies these days—and of the economy as a whole—is based on intangibles. These intangibles include social allegiance to brands, a company’s organizational flexibility and culture, and its public reputation. An estimated 54 percent of the market value of the McDonald’s brand, for example, is said to be based on intangibles—as opposed to the physical asset needed to make hamburgers. A huge amount of the value of the Apple brand stems from the public’s loyalty to its image, product designs and social vibe.

This is a significant development because conventional economics is not well-equipped to assess the dynamics of intangible value. There are

no agreed-upon metrics, models or formulas for analyzing how intangible value is created or what it consists of. For Arvidsson and Peitersen, the emerging story is about the “socialization of production”—a subtle shifting of power over brands from managers to consumers:

It is thought that consumer-based advocacy now counts for much more than advertising, and that ‘earned media’ (what consumers freely say about brands) counts for more than ‘owned media’ (what companies can say about brands in their advertising). And there have been corresponding suggestions of a new ‘community based’ brand paradigm, in which brand managers are open not only to ‘conversation’ with consumers (that is to understanding and possibly profiting from their point of view) but also to ‘debate’ (that is, allowing consumers to have a say in the management of the brand and its core values).²

In short, businesses increasingly need to mobilize active, participatory publics if their brands are going to flourish. They must “initiate and support the formation of an interpretive community.” In this sense, a huge amount of value-creation is shifting to users, with all the loss of control that this implies. A company does not “own” its customers, much as it may try to do so. This is one reason that “brand is probably one of the most significant digital assets that a company can have,” as Jerry Murdock of Insight Venture Partners put it.

Much has been made of the blurring of boundaries between producers and consumers, resulting in “prosumers.” But it is also true that many users are organizing themselves into collectives seeking to maximize their own interests, not necessarily in monetary terms. David Bollier, an author and scholar of the commons, pointed to “a recent proposal by the Peer to Peer Foundation to create a new commons-based reciprocity license that would let a group retain the surplus value that its members create. If a company wanted to use the community’s resources, it might have to pay—or it may not even be allowed to use them at all.”

Alluding to John Seely Brown’s insights about identity and social agency, Bollier noted that “many self-styled commoners are starting to find the organizational and legal means to protect the social and eco-

conomic value that they create.” This trend builds on the examples set by the General Public License for software and Creative Commons licenses for creative works. “Many people are deliberately resisting attempts by proprietary market players to capture socially created value.”

There is a lesson in this for new business models, argued Shane Green, Co-Founder and CEO of Personal, Inc., a mobile and web data vault and network for important data and documents. “The best companies are going to be those who figure out how to align their interests with consumers to create a maximum amount of value for both. But I think it has to be transparent.”

Green added, “What is strange about this moment in time is that the capture and use of personal data is happening in ways that we do not understand.” Meanwhile, the bigger companies are already so awash in data and focused on proprietary advantage that they do not feel compelled to collaborate with users in deploying data in innovative ways. “I worry that because of the existing business models, there is a structural inability to take the next step [to use data to enhance the user experience].”

Two conference participants offered different visions for how empowered individuals (and self-organized groups of individuals) could use platforms to advance their interests. In one scenario, presented by John Henry Clippinger of ID3, every individual can in effect become a platform, meaning he or she would be capable of asserting his or her own digital identity and showing a high degree of self-sovereignty. In another scenario, presented by entrepreneur Robin Chase, groups of individuals acting as “peers” are engaged in an ongoing symbiotic, Yin/Yang struggle with platforms—a drama of interdependence that she will explore in her forthcoming book *Peers, Inc.*

Individuals as their Own Platforms

On the periphery of existing data-management practices, an ascendant paradigm aspires to change the very architecture of how digital assets are accessed and used. In a short presentation, John Henry Clippinger of ID3 described the “Cambrian explosion” of innovations in a “surreal new data ecosystem” now emerging. Its notable elements include the capacity of individuals to assert control over their own data;

the ability to aggregate personal data in fluid, real-time ways to yield new social and commercial benefits; and new sorts of algorithm-based institutions and governance systems.

In some ways, the workings of these systems require that we adopt a new ontological perspective about data itself, said Clippinger. “The key element in the new data ecology is *data immersion*. When we talk about collecting data, we usually see ourselves as independent observers *outside* of the data, as if we stand apart from them and can apply external tools such as government and law to manage them. But in fact, we are *on the inside*, looking out,” said Clippinger. “Data is a lens through which we see and do things these days. It is really like water that we are swimming in; there is no outside Archimedean perspective.”

Clippinger stressed that this has profound implications for how we try to manage data. Instead of assuming that external institutions such as government and law can adequately govern new data systems, he believes that governance must be *internalized* into the very design of new technological systems and use data to provide new sorts of “algorithmic governance.”

“Data is a lens through which we see and do things these days. It is really like water that we are swimming in; there is no outside Archimedean perspective.” - John Clippinger

Existing regulatory models are archaic and unworkable, said Clippinger, because they are based on old notions of data as something external and controllable. “They assume that the harms caused by data come simply from inappropriate access and circulation. And so you have regulatory policies like ‘do not collect this data’ and ‘notification and consent’ to individuals as conditions for the third-party use of data,” he said. “But such ‘opt-out’ policies are equivalent to forcing someone to become a digital pariah. They are not realistic for a society in which everything is digitized. These policies are actually destructive to the new digital ecology that is emerging, and so we have to think about new regulatory approaches.”

The imperative for a new regulatory regime is not just about personal privacy, he noted. “In the new Internet of Things, all sorts of devices are creating data. We are seeing self-driving cars and ‘smart dust’—very small processors with self-organizing sensors that transmit data back to satellites. The point of this data-rich environment is for things to be semi-autonomous. The question then is, how do you control these devices? Who are they sharing data with, and how do you verify that? In the next generation of smartphones, it is not clear if it is a ‘spy phone’ or ‘my phone.’”

As digital assets grow in value—whether they be data archives, financial assets or military drones and satellites—“devices, like people, are going to have to be authenticated, verified, permitted and governed,” said Clippinger. “The question is *how* they are going to be regulated. You have to be able to verify the chain of custody if you are going to know whom to trust.”

There is a certain urgency to this challenge, he added, because some former NSA analysts claim that RSA, a widely used system for secure data transmissions, will not be secure against hacking by quantum computers by the year 2015. “So every aspect of sovereign financial infrastructures will have to be rethought and redesigned to be made ‘quantum immune,’” he said.

In designing a new architecture for secure digital identity, Clippinger stressed that the question of who will control a person’s digital identity is pivotal: “‘He who enrolls, controls,’ as the saying goes,” he said. Identity has historically been something that larger institutions—the state, caste and lineage systems, kinship systems—provided. They asserted what your role would be and they conferred credentials (passports, drivers licenses, Social Security cards) authorizing access to certain privileges and resources. Identity-provisioning and credentials have thus been ways for institutions to assert and concentrate their power.

Today, many large players such as Google and Facebook are attempting to become identity gatekeepers for much of the Internet. This is a means by which they assert control over large quantities of personal data and expand their market power. But Clippinger believes that “the next value proposition is going to be opening up the identity level to everyone”—i.e., democratizing the technical means to authenticate a

person's digital identity and for communities to build trusted networks on their own terms.

Clippinger's nonprofit, ID3, has built a new open source software platform, Open Mustard Seed, which enables decentralized implementations of secure digital identity, authentication and individual control. He explains:

If you have a 360-degree view of who is using your data, and of your own data trail, that information can be updated on a dynamic basis and in context. It allows you to mitigate risks [of spoofing and fraud] and obtain better marketing offers tailored to your actual interests. Individuals can attach self-executing digital contracts to the data itself, and markets can build a virtual cycle around that system of identity-authentication. So you can forge a complete, secure link between the origination of the data and its later use. I think this is going to be very important because many institutions depend upon the reliability of digital assets.

If there is going to be trust in open networked systems, not to mention the possibility of an open, democratic polity, Clippinger stressed that individuals must have control over their own identity and data. "The person is the platform in this new world," he argued. This idea is currently being propagated by the technology at the heart of Bitcoin—the distributed ledger system—he said, and by people's growing interest in creating "decentralized autonomous organizations that are not captive to any particular network."

"The person is the platform in this new world."

- John Clippinger

If the individual and his personal data becomes the platform, Clippinger added, then open networks will build all sorts of different value-propositions around the individual in socially and commercially useful ways. "When your identity certification is not controlled by any

party, but is open, then your ability to host ‘enrollment’ becomes a lot easier. No one controls that chokepoint. You do not have to have face-to-face meetings; you can use biometric and other metrics embedded on a device, which then allows trustworthy interactions to occur easily and scale a lot faster. You can deploy what we call ‘trusted compute cells,’ which are self-deploying virtual machines that are capable of performing self-executing legal contracts in a distributed network environment.” This functionality would enable people to create their own Facebook-style networks of friends and colleagues without relying on centralized identity management by Facebook.

User-driven control of data also opens up the door for the creation of new sorts of automated digital asset exchanges and new types of business models. For example, it would be entirely possible to use new sorts of personal data collections to establish more reliable credit-scoring systems than, say, the standard FICO score. Groups of consumers with highly specialized interests would be capable of banding together to seek out customized or specialized products and services.

The Yin/Yang Symbiosis of Peers and Platforms

Robin Chase, an entrepreneur who has founded several startup ventures in different countries, presented her vision of the “sharing economy,” which she calls “Peers, Incorporated.” The essence of this concept is that disaggregated people are brought together by big companies who build digital platforms for participation to use under-leveraged “excess capacity.” This capacity consists of existing, already paid for resources such as an individual’s house or apartment, motor vehicle, videos, software code, expertise or social network. It is the artful conjoining of these three elements—people, platforms and excess capacity—that unleashes huge, new sources of value-creation, producing abundance.

Facebook, YouTube, eBay, Linux, Skype and Wikipedia are among the major platforms that are in the business of creating new sorts of abundance through peer collaboration and networking. Chase explained that these platforms unlock excess capacity by providing access to assets in three primary ways:

1. By “slicing up” peer assets so that they can be more readily used. An example is Zipcar’s ability to rent out a person’s car during the 95 percent of the time that it is not used.

2. *By aggregating lots of very small pieces.* An example is Airbnb's ability to let people select from thousands of dwellings in a city to rent overnight.
3. *By opening up a resource so that it can be remixed and used in new ways.* An example of this is LinkedIn, which provides an open platform for personal and professional data about people.

Platforms are able to organize people and resources in new ways, and facilitate access, by providing standardized APIs, data, rule sets and processes.

It is the artful conjoining of these three elements—people, platforms and excess capacity—that unleashes huge, new sources of value-creation, producing abundance.

The chief driver for this framework of “Peer, Inc.” is the ability of platforms to reduce the transaction costs of dealing with great multitudes of small, diverse, dispersed resources. The key is developing a friendly interface that can link the “industrial strength” capacities of companies, institutions and government, with the particular “individual strengths” of people, small non-governmental organizations and local companies.

“Companies, institutions and governments are uniquely good at certain things,” said Chase. “These include large investments, multi-year efforts, integration and aggregation of many parts and Deep Sector knowledge.” She also noted that large organizations can marshal diverse technical expertise, standard contracts and protocols, consistency and a trusted “brand promise,” all on a global scale.

By contrast, there are many things that individuals, small NGOs and local companies can provide more easily and inexpensively than companies. These include small investments, short-term sporadic efforts, the delivery of small services and local knowledge, said Chase. Individuals and small enterprises are also good at offering specific,

unique expertise, customization and specialization, creativity and access to trusted social networks.

Through this Peers, Inc. approach, then, the local and the global can be brought together in fruitful new symbiosis. All of it is made possible by “this sea of excess capacity” that results when global platforms are made available to local producers and when local producers can participate in huge global economies of scale. This produces a Yin/Yang of interdependency in which “peers” provide “diversity, innovation and resilience” to the ecosystem while the “incorporated” side provides “a platform for participation, scale economies and high growth.”

Chase finds this new paradigm of production “unbelievably compelling” because it makes possible “a world of very, very high-paced growth and transition. If you want to keep up, whether you are big or small, you will have to adopt this model because it provides the cheapest path, has the highest growth, and generates innovation quickly.”

Chase outlined three stages in the evolution of platforms in the Peer, Inc. framework. In the first stage, the founders seed the best cases and guide their early growth. In the second stage, peer participation on platforms is well established, but it also attracts “a lot of junk” that tends to be distracting, off-putting or inefficient. And in stage three, efforts are made to raise the quality of the experience on the platform, including filtering out the junk. This stage is also when the large “power players” attempt to capture the platform.

The interdependency of the “peers” with the “incorporated” platforms comes with built-in tensions because the large, market-driven players are eager to consolidate their control of peer participation and monetize it. Chase warned: “I think we need to move past that ‘capture.’ The platform needs to keep giving power back to the peers to retain their participation and retain innovation.”

“What is wrong with capture?” someone asked. Chase responded: “The small providers will say, ‘Why play?’” In New York City, for example, 70 percent of the units offered by Airbnb are offered by something like fourteen players in effect acting as small hotels. Small, individual participants are a minority. “People fail to understand that you are only empowered because of the platform. That platform is the structure that gives the power of the corporation and the power of government to the individual,” said Chase.

How Platforms Let Businesses Outsource Costs

Chase's presentation provoked a series of exchanges about the role of platforms in empowering individuals and small businesses. Allen Blue, Co-Founder and Vice President of Product Management at LinkedIn, noted that platforms enable "each individual to act like a small startup, taking advantage of the capacity that exists within that network." This theme was explored by Reid Hoffman, Co-Founder of LinkedIn, and Ben Casnocha in their 2012 book *The Startup of You*.

For M-Squared Consulting, a contract consulting business run by John Kunzweiler, former CEO of M-Squared Consulting and Chairman of Salesian High School, the ability to rely on the LinkedIn management of personal data has been "a game-changer" because "it is a massive cost-cutter. Our balance sheet was totally transformed. And the day we do not like LinkedIn, we can go somewhere else and not worry about the legacy of the database." Blue envisions LinkedIn enabling many other types of business-to-business transactions that would enable small players to access all the resources they need, whether they be lawyers, tax accountants, payroll managers or software services.

The basic point is that platforms can help businesses radically reduce the costs of all sorts of services and products. Perhaps the most significant of these are the ability of large companies to deliver customization and specialization in competitive, cost-efficient ways.

Anastasia Leng, Co-Founder of Hatch.co, cited her own experience in building a new business based on customization while reducing costly risks. Hatch.co is an online marketplace that allows consumers to buy made-to-order items from more than a thousand artisans and retailers around the world. In the conventional marketplace, small retailers usually end up shouldering enormous risks—and often failing as businesses—in trying to guess what consumers want. "In the apparel industry in the U.S. alone, about \$6 billion is wasted annually on warehouse costs and merchandise that does not get sold."

"The answer to this problem is customization," said Leng, who explained how Hatch.co sells customized apparel, accessories and objects without any inventory costs or risks: "The retailer creates products that they know will get sold, and there is no unused capacity or leftover inventory." The Hatch.co platform is key to this "just in time retail" model.

The growing role of platforms in routine business has serious implications for the structure and scope of corporations, too, because platforms allow the outsourcing of many functions at lower costs. “I think a big part of the value of a corporation is its distribution network,” said Leng. She cited the craft website Etsy, which despite some controversial policies over the years, remains the largest, most powerful distribution and marketing vehicle for small crafters, as well as a source for business-to-business tools.

The upshot, concluded Allen Blue, “is that a corporation shrinks to the point where its primary and only function is to act as a temporary platform.” It is a temporary function, he explained, because “platforms will end up competing with each other to be able to provide the right services.” He said that LinkedIn years ago anticipated that individuals would be empowered to choose from among many platforms, based on efficiency and convenience.

The Strategic and Competitive Implications of Open Platforms

Allen Blue of LinkedIn made an insightful comment about the novel ways that platforms are able to capture and privatize value: “Many platforms today basically rely on an entanglement between a platform and an application,” citing Facebook and LinkedIn as two examples. “If those layers become separated, then you end up with a very different situation.” Thus there is a lot of energy directed at *maintaining* the entanglement between a platform and its (proprietary) applications.

Kim Taipale of the Stilwell Center agreed: “These platforms that are emerging are really driven by the app. That is where the business of the platform lies and where the value is captured.” He noted that allowing openness on the edges helps enhance the viral capacities of the platform, but that openness is “deceptive.” As soon as public usage of the platform becomes large enough to threaten the app, he maintained, the platform owner is likely to begin issuing cease-and-desist letters and attempting to capture regulators, as the taxi service Uber has done in New York City.³

It is important to distinguish between *a platform* and *a market*, said Taipale: “A platform is something that enables interaction costs to be

lower than in a market, and an app is a market tool for capturing some of that lower transaction cost and allowing a service to be delivered.”

Shane Green of Personal.com asked whether the app/product or the platform was the primary focus when Facebook and LinkedIn were started. Participants associated with those enterprises said that Facebook was started as a product first and LinkedIn as a platform. Green believes that the most promising business models seem to be linked to the product, and not to a platform that can be used in a wholly open way. That is one axis. Another axis is whether the business model is based on advertising or paying customers. What appears to be critical, no matter which quadrant a business is in, is how it can cross-subsidize its long-term growth while maintaining its margins.

“This analysis becomes a lot easier if we release ourselves from the assumption that companies have to survive,” said Michael Fertik of Reputation.com. Certain functions tend to be commoditized as they become public goods that cannot be captured and privatized. And, Fertik maintained, certain companies that are able to retain their margins by creating unique products—citing Disney and Xerox—will survive in the end.

Robin Chase wondered, however, about the fairly novel reality of today that private companies, not governments, are creating public goods. Historically, government has either itself created or acted to protect public goods, she said. “But now that private entities like Google are creating platforms that are public goods; how does that play out?”

Fertik speculated that we may be seeing “the birth of the ‘instant trust.’” Referencing the thinking of Josh Kopelman, the Founder of First Round Capital, Fertik called attention to a new model of “buying” a market franchise. The taxi service Uber and the peer-to-peer lending marketplaces Prosper and Lending Club did just this: “At Uber, they went into cities and bought out all the inventory by paying drivers not to take rides from anyone else except Uber customers for a period of time. That seeded the market and allowed Uber to drive customer traffic to itself until the market bloomed. The same thing happened at Lending Club and Prosper, where the hedge funds are now buying up the best inventory.”

The basic lesson from these examples, Fertik said, is that “the switching costs have gotten so low and markets are so fragile, that you

can move liquidity to purchase and capture new markets. We are in a moment now where you do not ‘earn and capture,’ as LinkedIn did, but where you ‘buy and capture’—and succeed.”

Joseph Vardi, the noted Israeli venture capitalist, was skeptical: “It is a very risky strategy. A big portion of the venture capital money is going to fail to buy markets. When you buy markets, it means that the product itself does not stick—because you have to bribe the user to use it. Once you start bribing, then the whole effort is a failure. I have invested in 95 companies. If the company does not show viral stickiness after a few months, I give up on the investment.”

Kara Sprague of McKinsey & Company basically agreed: “If the business model has network effects, you are going to see customer acquisition costs go down over time—and so there is a model where you can invest upfront to build and seed the market. But if you are not seeing customer acquisition costs go down and you are not capturing network effects, it is ultimately going to be a money drain.” She added that this is not an entirely new phenomenon, citing Google’s practice of paying for distribution of its search services as early as 2005.

And yet even with significant venture capital and hedge fund money attempting to buy markets, the bottom-up creativity and energy of platform users cannot be so easily captured. Individuals and small businesses that use platforms are often eager to eliminate their dependency on a platform because it constitutes a vulnerability and risk.

Merchants who were dependent on the Visa system eventually began to accept a wider variety of credit cards to acquire some bargaining leverage with Visa over transaction fees. Banks began to issue their own Visa and MasterCard to enhance their autonomy and reduce costs. Similarly, many individual Facebook users are expressing their skittishness at being overly dependent on that platform, especially in being able to retain control of their photos, text and other data.

The power of individuals collaborating on open networks is introducing a whole new competitive force in innovation, said John Clippinger, Executive Director of ID3. “We are at a point now where software developers are using the principle of DRY—“Do not Repeat Yourself”—to have “self-assembly of standards and iterative infrastructures and services in the design of APIs. People are building different

kinds of open utilities that functionally reinforce each other. And so you are getting new sorts of ephemeral organizational structures that are pulled together at some instant to achieve some particular end, but which no one party controls.”

To Clippinger, DRY represents a shared vision and awareness of where the world is going. Bitcoin and other digital currencies represent types of “decentralized autonomous organizations,” or DAOs, which enable new types of value to be generated, discovered and exchanged without any single party controlling it. (While a small set of bitcoin speculators have for now acquired significant share of bitcoins, Clippinger stressed that there are many solutions to this problem.)

John Seely Brown of the Deloitte Center for the Edge agreed with Clippinger’s general vision: “Thousands of tiny, tiny working groups—small companies, peer production teams, a few platform companies—are restructuring the entire landscape of the corporate world. If firms in the 20th century were built to achieve scalable efficiency, the game in the 21st century is basically about scalable learning.”

An example offered by Robin Chase is the language company Duolingo, which after only two years has more than 12 million users who can learn a language for free, with extreme efficiency. College courses generally require 120 hours of learning (a semester) to learn a language, and Rosetta Stone, a highly popular set of language tapes, requires 54 hours for the same amount of learning. But Duolingo, said Chase, has got the learning time down to 34 hours by using its platform as an iterative feedback loop. It can conduct 100 experiments simultaneously with 150,000 participants, and in 48 hours it can identify the best ways to learn a language. The platform is not only a source of learning about people; the platform itself can be repeatedly modified to improve best practices and eliminate worst practices.

John Seely Brown believes such platforms are valuable because they are “a platform for reflective participation. The ‘excess capacity’ of such platforms may actually give you the latitude to build reflection—and this could become the foundation for a nation’s competitive advantage.” Brown added, “We have never succeeded in making organizational learning work—but we know a lot about how to make ecosystemic learning work. Basically, you learn from the broader ecosystem and its diversity, and you are not captured by organizational politics.”

This can be a great advantage for companies in other ways, said Joseph Vardi, most notably in enabling them to identify and recruit passionate and talented individuals: “The platform becomes a way to aggregate, cull and outsource work to passionate people, which are hard for big companies to assemble and maintain. Instead of trying to do that from within a company,” said Vardi, “you can draw upon the whole world.”

The Social Dynamics of Digital Assets

Digital Identity

If people can acquire greater control over their personal data and digital identity, they will not only become drivers for new sorts of business models keyed to “the person as platform,” they will enable new sorts of bottom-up social institutions to emerge.

John Seely Brown of the Deloitte Center for the Edge pointed out that so much of the attention paid to value and value capture has been focused on financial capital. But there is a real need to consider value that is based on social relationships and identity, and the role that those play in building new sorts of markets. Michael Fertik, Founder and CEO of Reputation.com, calls this phenomenon the “reputation economy.”

It is important for us to recognize social collectives and individuals as an integrated whole, not as bipolar and separate phenomena, said John Clippinger: “There is a field that studies this concept called ‘holonics,’” he said, an empirically based theory of living systems that blends multiple scientific and humanistic disciplines. In a recent essay on holonics, theorist Mihaela Ulieru writes:

A recurrent problem is our failure to understand that human endeavors are part of holistic, living systems, natural and constructed, whose constitutive elements are mutually defining, expressive and constantly evolving. In actual circumstances, the individual cannot be cast against, below or above the group; the individual is in fact nested *within* dynamic forms of social organization.⁴

By conceiving the new data environment as a holonic living system, we are more likely to do a better job of aligning individual and collective interests, and to design more value-enhancing network infrastructures, business models and software.

If and when individual data-portability becomes the norm, it could unleash innovative new types of value-creation.

One starting point is to engineer data as a resource that is portable throughout an open network, and not tethered to a particular proprietary platform. Portability of data is not the rule on most network platforms today. Companies are generally too intent on capturing the value of their users' personal data. But Shane Green of Personal.com argued that data portability will enable all sorts of time-saving conveniences and innovations for people, helping them make better, smarter decisions with their own data. This would be a vast improvement over the current default model, "advertising based monetization of data" —which he criticized as "probably one of the most inefficient sorts of economies there is, if you look at it on a per-transaction basis."

If and when individual data-portability becomes the norm, it could unleash innovative new types of value-creation. "We are still laboring under the assumption that the organizational assets are the ones that matter, instead of the digital assets," said Michael Fertik, Founder and CEO of Reputation.com. "This asset is moveable, and it is growing in value."

But do individuals really want to manage their own data, let alone profit from it? Kara Sprague, Principal of the Business Technology Office of McKinsey & Company, was not so sure: "Facebook is making a profit of maybe \$1 per user each year. I would gladly pay a dollar to have the services that Facebook provides. If I could become a broker of all of my own information, could I monetize directly what Google and Facebook do for me, by taking my eyeballs and matching them with advertisers? I do not know I would want to. What would that net me?"

This may be true, conceded Khaliah Barnes, Director of Student Privacy at the Electronic Privacy Information Center, the Washington, D.C. policy advocacy group for privacy. But individuals do have an

affirmative interest in shielding their personal information from potential employers, credit agencies and law enforcement. When third parties like these have access to personal information, it tends to have a “chilling effect on individuals,” she argued.

How Data Can Secretly Shape and Limit Opportunities

Still, many conference participants remained concerned about the special nature of data and its use in limiting opportunities or manipulating individuals. One then-timely example was Facebook’s manipulations of the news feeds of nearly 700,000 users in a study of “emotional contagion through social networks.”⁵ By manipulating positive and negative posts on news feeds, the researchers found: “When positive expressions were reduced, people produced fewer positive posts and more negative posts; when negative expressions were reduced, the opposite pattern occurred. These results indicate that emotions expressed by others on Facebook influence our own emotions, constituting experimental evidence for massive-scale contagion via social network.” The apparent conclusion, that user happiness and sadness could be artificially induced via undisclosed manipulations of news feeds, caused great concern among the public when it was made public in July 2014.

Michel Fertik of Reputation.com cited his 2013 essay in *Scientific American* describing how insurance, medical and other companies use data-mining of personal information to transmit differential advertising to different demographic groups, including no marketing at all to some groups.⁶ “Some laud this trend as ‘personalization’—which sounds innocuous and fun, evoking the notion that the ads we see might appear in our favorite color schemes,” he said. But this “behind-the-scenes curation” of Internet content has some serious consequences. Fertik wrote:

If you live on the wrong side of the digital tracks, you would not even see a credit offer from leading lending institutions, and you would not realize that loans are available to help with your current personal or professional priorities....Last September, Google received a patent on a technology that lets a company dynami-

cally price electronic content. For instance, it can push the base price of an e-book up if it determines you are more likely to buy that particular item than an average user; conversely, it can adjust the price down as an incentive if you are judged less likely to purchase. And you would not even know you are paying more than others for the exact same item.

There are other stories of data being used to shape the social and commercial environment:

- Airbnb not only allows tenants to rate landlords, but landlords to rate tenants.
- OpenTable, a restaurant reservations service, will kick people off its system if they cancel too many reservations.
- Uber allows drivers to rate passengers. Some social network data can now construct a more reliable, predictive metric of creditworthiness than conventional FICO scores.
- Reputation.com has scored over 100 million American professionals as to their current and future earning power, concluding with some degree of statistical certainty that the best proxy for reputation is your personal income.

Such stories prompted Shane Green of Personal.com to note, “What is scary about data compared to tanks or guns is that you do not necessarily see how it is being used, and it does shape your environment.” Robin Chase of Zipcar and other startup ventures said, “I am happy to have data be used to predict things that are of low consequence and of immediacy. But for things of large consequence and far into the future, I am really uncomfortable with that....We really need to preserve an ‘infrastructure of opportunity’ for people.”

A few conference participants were fatalistic about such uses of data. “All of the horses have run out of the stable—six, seven, eight years ago,” said Joseph Vardi, a leading Israeli venture capitalist and Chairman of International Technologies Ventures. “I think that to try to believe in 2014 that you can keep your privacy is very naïve....The whole system

is wide open. Most of us are safe, and only a small percentage is being compromised. If you want privacy, you have one way: Try to disconnect from your telephone, credit card and the Internet, and go ten feet underground. Then you will get complete privacy.” Vijay Sondhi, Senior Vice President of CyberSource, believes that “people are often choosing utility over privacy” in any case. “They want instant gratification...they are making a conscious tradeoff.”

But other conference participants disagreed with these perspectives. “I think privacy is a big issue,” said John Clippinger of ID3, citing the worldwide response to the Snowden revelations of NSA snooping and European attitudes toward privacy. “Luxembourg is flooded with companies looking for more secure cloud computing because no one wants secret NSA access through back doors.”

**“...people are often choosing utility over
privacy....” - Vijay Sandhi**

Khaliyah Barnes of the Electronic Privacy Information Center agreed that there is a great deal of personal concern about privacy for data. She cited the dismissal of the CEO of Target after the massive credit-card security breach in the company’s computers, and the U.S. Government’s new willingness to extend Privacy Act protections to EU citizens following the Snowden NSA disclosures. “We are seeing that privacy really matters, and that it is affecting our international relationships,” said Barnes. The other point to stress, she said, is that “there is such an ‘information asymmetry’ in what people know about the uses of data.” People just do not know whether law enforcement, the NSA, credit bureaus or others will be able to access one’s data, she noted.

Shane Green predicted that “there will become a tipping point in the future where people, on whatever platforms, will start to care about how their data is used.” In the meantime, he added, “information about how data is used will have to become more transparent so that people can know if their interests are truly aligned with the people using the data.”

One structural approach to this problem, noted John Clippinger of ID3, is not to look to conventional regulation or court rulings, but rather to look to “algorithmic systems” embedded in the technology

itself. He cited the distributed block-chain ledger used by Bitcoin as an example. Such secure digital structures are attractive alternatives to fallible, slow-moving regulatory and legal systems that can easily be gamed by wealthy, sophisticated players.

Thomas Malone of M.I.T. wondered “whether privacy is even the right framework for thinking about a lot of these issues.” The more appropriate frame might be “ownership” as secured through property rights, he said. “Rather than having all-or-nothing laws about what you can or cannot do with information, maybe data should be treated like many other assets. This would mean that you would have an ownership right to control how the information is treated. There may well be some legal frameworks, like the Uniform Commercial Code, that could formalize certain kinds of contracts about how information is managed.” Clippinger agreed that “looking at personal data as an asset class,” and not as something managed through a privacy legal framework, has merit.

Managing the Hidden Liabilities of Digital Assets

The Risks of Poorly Managed Data

While new types of digital assets offer many social and commercial benefits, they also come freighted with distinct liabilities. One session of the conference therefore focused on the responsibilities and trust associated with the management of personal data. A failure to meet either explicit legal responsibilities or implied social expectations can result in a serious loss of trust, harm to brand reputation and even lost revenues. Breaches in secure management of digital assets can also invite regulatory scrutiny and intervention, which may result in cumbersome and costly legal and government oversight.

The only way to overcome the challenge of poor stewardship of personal data, wrote tech commentator Om Malik on the day of the conference, is for “companies themselves [to] come up with a clear, coherent and transparent approach to data. Instead of an arcane Terms of Service, we need plain and simple Terms of Trust. To paraphrase Peter ‘Spiderman’ Parker’s Uncle Ben—with big data, comes big responsibility. The question is will the gatekeepers of the future rise to the challenge?”⁷

In approaching this topic, Jerry Murdock, Co-Founder of Insight Venture Partners, pointed out that “identity” is not really a unitary concept, but rather a complicated idea with multiple use cases, which he identified as follows:

Authentication: Is this really you?

Authorization: Do I have your permission?

Representation: Here is who I claim I am.

Communication: How do I connect?

Personalization: What do you prefer?

Reputation: How do others regard you?

Vijay Sondhi, Senior Vice President of CyberSource and Authorize.net, both of Visa, Inc., gave a brief overview of the many liabilities associated with digital assets, most of them associated with security breaches and unauthorized disclosures of personal information. Sondhi stressed that in addition to trying to prevent breaches, another challenge is figuring out “what to do when breaches occur—because systems do get hacked, especially with organizations like merchants who are not otherwise in the business of security. Cyberattacks are hard to prevent.” Sondhi reported that thousands of attempted hacks occur at businesses every day. The point is that any software and management system must be designed in advance for resiliency so that in addition to preventing breaches, companies can also recover quickly and minimize the impact of events when they occur.

In recent years there has been a parade of significant data breaches among major retailers and companies, including eBay, Neiman Marcus, Adobe, Target and Home Depot. The Target data breach, first reported in December 2013, consisted of 40 million credit card numbers and addresses, phone numbers and other personal information.⁸ The episode was the largest hack of a retailer’s data up to that point. Following the breach, which was also during a very cold winter, and losses at Canadian stores, Target experienced a 16 percent decline in profit driven by slower in-store traffic.⁹ This in turn led to major upheavals within the company, including the departure of the CEO and CIO.

The odd thing about security breaches of data is that the repercussions for sales volume and company reputation can vary greatly, said

Bill Coleman. Another significant hack of personal data—an 18-month attack on the retailer T.J. Maxx that ended in May 2007—had little lasting impact on either the reputation or sales of the company, he noted. Yet the Target hack six years later became a veritable landmark in the history of security breaches because of the significant public reaction.

All of this suggests that the ways in which retailers access people's personal data—the social context and expectations of data collection—matter a great deal. It is common for website retailers such as Amazon to collect all sorts of data about a person's browsing and shopping habits, and then to issue personalized recommendations about what to buy. The public may or may not realize such data collection is going on, but even when discovered, it is mostly accepted.

But the reaction was quite different when the retailer Nordstrom decided that it would like to try to collect similar data about in-store shoppers. In a pilot experiment, it tracked customer identities and movements within the store using low-powered Bluetooth technology. It even required people to log into fitting rooms and tracked what apparel items were tried on. The experiment provoked such outrage among shoppers that it was quickly shut down.

Sondhi concluded that such an episode shows how the notion of “brand permission” can be a very unpredictable thing. What is acceptable online may not be acceptable in physical stores. “People had no problem when online retailers told them, ‘You bought these ten things. Would you like these others?’ In fact, some consumers liked that.”

Leaving aside the social variables that define a perceived breach of personal trust, there is general agreement that the technologies for preventing breaches can and must improve, if only because the scale and intensity of hacker attacks is so great. Sondhi reported that “the number of attacks and instances of malware have increased hundreds of fold over the last ten years.”

The Target breach has catalyzed the adoption of a more secure “chip” technology for credit and debit cards in the U.S. Each card contains a small computer chip with a little operating system on it that generates a unique one-time code for each transaction. “When the system went into effect in the UK,” said Sondhi, “counterfeit fraud dropped significantly. This chip is extremely secure so if card data is compromised in a breach, it cannot be used for counterfeit fraud.”

Yet card fraud was not eliminated; it simply moved to other arenas. In the UK, it simply moved online, at about the same percentage as previously occurred in retail stores. A similar dynamic occurred in Canada and Australia when the chip card was introduced there.

The U.S. continued to rely on a magnetic strip, rather than move to a chip card, because card-issuing banks did not want to pay the \$10 needed to put the chip on each card. Retailers, for their part, were not eager to pay for the additional cost of new terminal readers to process chip-based cards. In the aftermath of the Target breach, such misgivings were swept away. Target will begin using chip cards in 2015. In October 2014, President Obama ordered its use for U.S. Government payments by credit cards by 2015 as well.

Innovative Technologies to Stop Data Fraud

Participants mentioned a number of technological innovations that are making it harder to hack into data systems, but they conceded that the problem amounts to an ongoing arms race. Each side is constantly trying to out-manuever the innovations developed by its adversaries.

One new approach that is now being rolled out involves “tokenization.” Rather than allowing banks to retain all customer data, the Visa affiliate CyberSource will issue “network tokens,” employing a public/private key security system. By separating transaction data from a customer’s personal information, via tokenization, retailers can be protected from having to be the stewards of “too much information.”

Michael Fertik of Reputation.com reported that a variety of online businesses are offering “ephemeral communications,” that use encrypted communications, such as TigerText and Whisper. These communications are designed to self-destruct after a given period of time on the theory that personal information not stored anywhere is far less vulnerable to unauthorized capture. There are also new forms of “homomorphic encryption” that allow computers to perform operations on data without looking at the actual data, said Fertik.

A variety of sophisticated new authentication and cryptographic methods have also emerged in recent years, said John Clippinger of ID3. The more notable systems include OpenID Connect, OAuth 2, zero knowledge proofs, Byzantine Fault Tolerance and Merkel Trees.

Such systems can allow a user to authenticate his or her identity without revealing a legal name or other attributes to the identity provider.

An interesting discovery is that the algorithms used by social networks are much richer and more reliable as predictors of a person's identity than the more conventional fraud algorithms used by payment systems. So attempts are being made to incorporate some of these social data-points into security systems—even as hackers try to reverse-engineer the new approaches. The arms race continues.

...algorithms used by social networks are much richer and more reliable as predictors of a person's identity than the more conventional fraud algorithms used by payment systems.

Bill Coleman, Partner with Alsop Louie Partners, agreed that we need to find new mechanisms to separate authentication from authorization. "We have to enable the verification of someone's identity without having to actually pass along personal information. Until we do that," he said, "things are going to get worse, especially as we move into the Internet of Things," where the identities of a vastly larger universe of devices will need to be securely established.

Another strategic shift in improving data security: the use of rapid and constant feedback loops from the network ecosystem so that a security method can self-improve itself through peer learning. Cory Ondrejka of Facebook noted that distributed groups of hackers often develop near-perfect communication links among themselves so that they can search for the weakest points in a computer system, and share that knowledge. This approach was also used by guerrilla fighters in Iraq, who made rapid damage assessments of their roadside IED [improvised explosive devices] attacks so that they could learn from the success and failure of each one.

Hacker groups that are networked may pose more of a threat than isolated groups, but they are also more vulnerable precisely because their multiple interconnections provide more points of detection.

Ondrejka reported that Facebook had recently shut down a bot network consisting of 250,000 computers.

Can Law, Technology and Social Practice Be Blended?

John Clippinger agreed with Ondrejka that the architecture for secure authentication and identity must become more dynamic and evolutionary. He cited a famous 1881 essay by Oliver Wendell Holmes, Jr., “The Common Law,” which “brilliantly describes a biological model for how the law should evolve—moving from custom to social norm to common law and statutes, and then back again. That is a vital, creative process that the technology should embrace.” One lesson that we can take from “The Common Law,” Clippinger said, is that statutes should focus on a very high, meta-level of public need so that social practice and custom can experiment and evolve and, in time, generate the most stable consensual forms of law.

He cited the core principles of documents like the Consumer Data Bill of Rights promulgated by the European Union. Such a document can be the structure for a range of specific implementations that conform to the principles, with dynamic social practices actually enacting and enforcing the principles. “Safe harbor” provisions in statutes can be used to sanction open-ended experimentation and innovation, in effect providing “meta-rules” for social and technology-based enforcement. In turn, companies that devise effective implementations can reap branding advantages from their systems, and groups of users can use contract law to validate social agreements among themselves in the use of digital assets.

Clippinger envisions the rise of “smart contracts” that are digitally encoded and enacted using computer scripting language. He reported that software algorithms can be technically designed to “negotiate” mutual understandings and self-execute them in virtual spaces, without resort to conventional paper contracts, lawyers and courts.

A persistent undercurrent in so many debates about privacy and security is that nothing can be done about it and people do not really care. Another participant noted that despite publicity about data security breaches, people rarely take steps to improve or change their passwords.

Fertik strenuously disputed the idea that people do not care. “People

believe they can reasonably rely on institutions and infrastructure after a data breach occurs. They may not be fully justified in their feeling. But the costs of breaches do get absorbed into the system and create change. The Target breach resulted in their adoption of the chip and PIN system. And there is always, always liability following a breach. If someone does not handle a breach well, the liability grows very quickly.”

“If there is any industry that is just pregnant with opportunity, it is digital cyber-insurance risk. An intelligent insurance platform would allow everyone to socialize the risk.” - Michael Fertik

Fertik cited how the costs of dealing with security and privacy threats in earlier generations of the Internet and computing technology “have been ingested” by leading tech companies and institutions, which have made needed changes in the infrastructure. Similarly, in earlier generations of payment systems, the merchant banks, retailers, credit card companies, and others have taken steps to prevent or diminish security harm.

While it may be difficult to roll back the open availability of personal data that now exists, Fertik emphasized that the real struggle is over the “next 9,000 data points. What should be required of the Visas and Facebooks and Googles to develop a new set of norms for the next 9,000 pieces of data?”

“What is missing from today’s discussion is the idea of insurance,” said Fertik. “If there is any industry that is just pregnant with opportunity, it is digital cyber-insurance risk. An intelligent insurance platform would allow everyone to socialize the risk.”

The problem with this idea, said Bill Coleman, is that “it is backward-looking and presumes a steady-state world.” In addition, he said, it is exceedingly difficult to quantify the value of harm to organizations when so much of their capitalization value is based on intangibles—intellectual property, brand, consumer goodwill, social trust and other non-physical assets.

Another participant pointed out that there are no reliable accounting protocols for putting a price on a company's intangible values. The larger macro-economic liabilities of mismanaging data assets are not really known, either. It may be that we simply need a "black swan" catastrophe or significant loss experience in order to get a provisional grip on how to set prices for such damage, and how to set suitable insurance premium rates.

Perhaps some incentives to responsible stewardship of data could arise by assigning property rights to intangible digital assets, said Professor Thomas Malone.

There is an opportunity to do something analogous to what Creative Commons did for copyrighted works. We could establish different classes of data, and provide different classes of contracts for each one, specifying the rights and responsibilities that belong to each one. For example, you could say that certain data requires the consent of all participants in its creation if the asset is to be sold or transferred in some way. For other kinds of data, you might require only one-party consent. Another licensing term might be mandatory licensing. The contracts could include various kinds of penalties for breaches and exceptions for law enforcement. There could even be a whole library of these digital assets and transaction types, with different contract terms for each one.

Michael Fertik warned that similar "badging systems" to simplify websites' terms of service have failed because they have been created by lawyers, who tend to be focused on static categories of behavior and complicated exceptions. There are also jurisdictional issues that complicate enforcement, and companies often legitimately need certain flexibility beyond the standard "badges."

What Role for Government in Overseeing Digital Assets?

In light of the ferocious pace of technological innovation, an unavoidable question is what role government should play, and how policymaking at different levels—national, state and international—might be coordinated.

Bill Coleman, the long-time entrepreneur and Partner of Alsop Louie Partners, envisions government as “a platform for the digital economy” whose first principle ought to be “Do no harm!” By that, he means that government should not be in the business of choosing winners and losers in the marketplace.

In effect, Coleman regards ARPANET—the Defense Department agency that incubated the Internet in the late 1960s and early 1970s—as the model for how government should behave in developing new systems for managing digital assets. Government should seed, nurture and facilitate the new system in all its dimensions. Other possible models of “government as platform,” said Coleman, include the government’s role in developing and spinning off G.P.S.; in collecting and disseminating weather information; and arguably its role in building the interstate highway system and the Federal Aviation Administration network.

Coleman believes that government should adhere to the following basic principles: Build open infrastructures that allow others to add value; do not constrain innovation; allow social norms to emerge before codifying them through regulatory regimes; do not charge fees to raise transaction revenue except in rare cases necessary to enable the platform and then only when a government agency is the only logical mechanism (as the Obama administration did in proposing that the Federal Aviation Administration charge a \$100 per-flight fee on every takeoff and landing by general aviation aircraft.)

The key issue for government to address, said Coleman, is how to unlock the value of digital assets. This requires that mechanisms be found to enable the protection of digital assets, whether through technological, legal, regulatory or social means. Coleman believes that securing personal information and intangible assets requires some means to tie them to one’s personal identity, and then to ensure that the owner of that digital identity be able to assert effective control over the asset (e.g. using crypto currency).

So the question may devolve in the first place to *how* to secure a person’s digital identity. For this, Coleman believes that parties to transactions involving intangible assets must be able to authenticate identity and claims *without* having to disclose personal identifying information (PII). The privacy of the owner/authorizer must be protected throughout all counterparty transactions. Privacy cannot really

be achieved, Coleman argued, without cleanly separating *authentication* of a person's identity from *authorization* to engage in a transaction. When the two are integrated, he said, there is a much greater risk of mass disclosures of PII.

Privacy cannot really be achieved without cleanly separating authentication of a person's identity from authorization to engage in a transaction.

The best and perhaps only solution, he suggested, is to avoid centralized control of authorization and to empower individual owners of digital assets to control identity-authorization themselves. "The problem today is that every time I want to do business with someone, the authorizer is also the authenticator, which means that I am giving everybody my personal identifying information. So the more things you do on the Internet, the weaker your security is. This is the paradigm that we have to break."

Centralized storage of identity credentials has not worked, said Coleman, because the data is never truly up-to-date; because it is seen as the most attractive place for hackers to attack; and because "not every party can ever agree who is going to be the neutral disintermediator for all of my transactions."

To help build out the digital economy, therefore, government must show leadership in building "a platform service to enable trust based on the vast amounts of identifying information on citizens, organizations and businesses which it maintains across all departments and agencies. This platform must be open and extensible to include other trust authorities and services," said Coleman.

Coleman recommended that the government platform should be an extension of the program run by the government's NSTIC Program—the National Strategy for Trusted Identities in Cyberspace—and ultimately governed by a neutral, non-governmental organization. The platform should provide "authentication services and secure protocols which provide privacy-enhancing authentication in accordance with

the NSTIC principles, thus separating authentication from the authorization.” Coleman envisions a system in which the storage of personal identifying information for authentication would be decentralized, and which would use open APIs and protocols to allow third-party authenticating services to join the network.

Besides assuring privacy and fostering digital commerce, a government trust platform is needed to help manage the identity credentials for the emerging Internet of Things. The proliferation of sensors and devices with Universal Resource Identifiers (URIs) means that the growing universe of networked computing tools must also be subject to reliable authentication and authorization protocols.

Here, too, it makes the most sense for individual owners and transactors to set the appropriate credentialing policies for access, use and exchange. They should be able to choose from any combination of authentication services that they deem trustworthy in order to gain the confidence of the counterparties to authorize a transaction.

Fortunately, there are now many sorts of authentication systems (such as homomorphic encryption, tokens, crypto-hashtags, etc.) that can achieve reliable identity and claims authentications without requiring the sharing of actual personal identifying information. John Clippinger added that software systems such as OAuth (an open standard for authentication), the decentralized block chain ledger technology at the heart of Bitcoin, and ID3’s Open Mustard Seed software all offer authentication without PII disclosures. These systems also move beyond password-based systems of authentication, introducing combinations of biometric and behavioral metrics that are not easily spoofed by third parties.

Trust in transactions of digital assets can be further enhanced, said Coleman, by the routine creation of a secure, encrypted audit trail, which is accessible only to the owner of the resources or by duly authorized authorities acting under due process (e.g., court order). This scenario would allow individuals to engage in anonymous transactions and yet, with sufficient probable cause for suspecting illegal activity, authorities could identify individual suspects.

Moving Forward on an Alternative Regime for Managing Digital Assets

A new regulatory and legal regime is essential, said John Clippinger of ID3, because the existing apparatus of law and regulation presumes that it can adequately control the data from unauthorized parties, which is manifestly untrue. “We have to start to recognize that data has got to flow. You cannot just say, ‘Do not collect PII,’ as if data can be quarantined. The presumption that you can cordon off certain kinds of data and control them by limiting the flow is just not credible. Our lives are immersed in data. We require data.” A more realistic, effective legal and regulatory system would recognize that “with the use of data comes obligations. With potential harms come duties.”

“With the use of data comes obligations. With potential harms come duties.” - John Clippinger

If such a system were in place, it could help make available all sorts of valuable datasets held by private corporations that could help inform public policy. Allen Blue of LinkedIn pointed out that its user data could be of immense help to the U.S. Department of Labor in developing policies to “close the skills gap.” But of course, LinkedIn users currently have no way to authorize government use of PII that they give to LinkedIn, nor much confidence that the government would in fact respect their privacy.

This problem prompted Michael Fertik of Reputation.com to suggest that new systems be established for “the provenancing of data” so that one might establish responsibility for data as it was shared over time. “If you know from whence the data come, you can know whom to blame for a violation and whom to credit for creativity or innovation.”

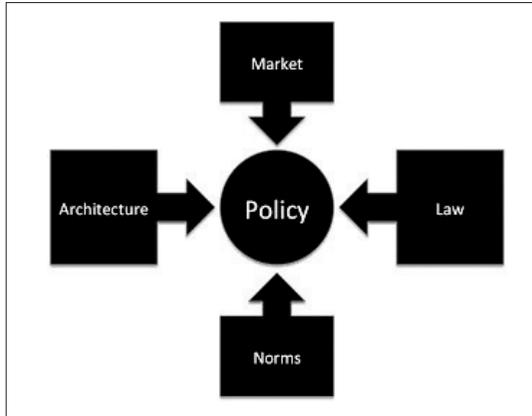
Perhaps a more basic meta-problem is how any new initiative for a government trust platform would be initiated. Fertik noted that the problem with the government trust framework idea is that “it more or less relies upon everyone in the room to hold hands at the same time and leap together to a future that is uncertain and undefined. That is

not going to happen.” Based on his experience, Fertik said that “these issues are normally solved from the edges in, and very incrementally,” usually after private business has taken the first steps or after a social norm has started to crystallize.

So what may instigate a new approach? There may be some seeds germinating right now. A company in Estonia has supposedly established a “keyless signature infrastructure” using a time-stamp that has attracted the interest of telecom carriers. The U.S. Department of Health and Human Services is reportedly building a new system premised on data having provenance as it moves through the system. Government’s role as a major purchaser of new technology gives it the capacity to drive adoption of new standards and protocols. Another constructive step: leadership among government and business leaders to stir the civic imagination about the actual societal benefits of using data in creative ways to serve public health and civic needs.

In a short presentation, Kim Taipale of the Stilwell Center offered a conceptual framework for thinking about *where* strategic interventions might be made to achieve new policy approaches for digital assets. He referenced four *de facto* types of “law” that Professor Lawrence Lessig invokes in his 1999 book *Code and Other Laws of Cyberspace*: conventional law, technological architectures, markets and social norms. Each in its own way constitutes a kind of “law” that regulates people’s behaviors.

Taipale noted the limitations and failures of these different forms of law, as now constituted, in managing digital assets. For *conventional law*, there is a distinct sense that legal and regulatory systems are too cumbersome, slow and antiquated to deal with the pace of technological innovation. For *network architecture*, there is a problem with its propensity to produce a “power law distribution” of highly unequal outcomes—a “winner takes most” scenario that aggravates inequality and hollows out the middle class. For *markets*, the routine production of hidden externalities is a major problem. And for *social norms*, it is clear that general social awareness and support for different ways of managing digital assets have not yet emerged, which makes it difficult to imagine how new legal regimes could be formulated or enforced via social norms.



Model from *Code and Other Laws of Cyberspace*, adapted by Cybertelecom Federal Internet Law & Policy, An Educational Project.¹⁰

What might be the points of intervention in these different types of law? Taipale identified the following possibilities:

Conventional law: One could legislate certain minimal standards for technological or social performance using a command-and-control approach. The Consumer Privacy Bill of Rights, currently a set of guidelines, could be enacted into law, for example. It might also be attractive for legislators to consider creating an entirely new class of property rights called “data rights,” which might borrow elements of intellectual property law (which is ill-suited for managing data) while adding new twists that take account of prevailing use-cases of data. Because of its immense versatility, contract law may also be a fruitful body of law that could be adapted to deal with digital assets.

Technological architecture: One could “build in” certain discontinuities and friction back into the system as a way to advance certain values and social goals. For example, the problems caused by high-speed stock trading could be addressed by building in a uniform time delay for all transactions. Or platforms could be regulated to ensure that they provide open APIs. The Open Mustard Seed software proposed by ID3 is another way that the technology design itself could embody certain policy priorities.

Markets: The power of markets can be leveraged if we were to assign liability to key actors in the digital asset ecosystem, and expose the actual costs of certain behaviors. For example, the Securities and Exchange Commission has been moving to force corporations to disclose their exposure to cyberattack risks. Perhaps the benefits and liabilities of digital assets more generally ought to be made visible on corporate balance sheets or in the Generally Accepted Accounting Principles (GAAP). Another market-based intervention could be the development of new types of insurance for the stewardship (and misuse of) digital assets.

Social norms: Ways must be found for people's behaviors to be expressible and made consequential in self-regulating the behavior of others. The idea is that in today's world, social interactions are highly distributed and self-organizing, and routinely give rise to new kinds of social norms. Why not use technologies to help make these social norms more visible as a kind of "digital common law," in the spirit of Oliver Wendell Holmes, and even codify the more powerful, consensual norms? This is one goal of the Open Mustard Seed platform. One could also leverage social norms as a kind of law by empowering people to make their own choices about levels of identity-authentication and privacy protection.

Whatever new regime for managing digital assets may be initiated, John Clippinger stressed that "policy must be informed by technology." Right now, he complained, the two realms are often treated as quasi-independent realms. Bringing the two together means that the law must formally sanction experiments and dynamic innovation as part of the search for solutions. It cannot simply look to familiar principles of law and try to impose them (futilely) on the boisterous, unpredictable and globally distributed world of tech innovation.

Conclusion

Developing effective new ways to manage digital assets—to neutralize their threats and liabilities while unleashing their enormous latent potential—is a formidable challenge because it is a *systemic* challenge. Piecemeal, incremental approaches that deal with only one or another facet of the problem—technology design, law, regulation, economics, individual rights—are not likely to be successful. That is because the free flow of digital assets on which open electronic networks now

thrive is an unprecedented, inescapable reality that requires new ways of thinking and inventive new infrastructures and institutions. We may need to reconceive structures of law and governance. The old, familiar systems for thinking about this new reality and regulating it seem almost destined to be inadequate.

...the free flow of digital assets on which open electronic networks now thrive is an unprecedented, inescapable reality that requires new ways of thinking and inventive new infrastructures and institutions.

That is why it is so important to start a larger discussion about this urgent topic. The need to find better, more responsible and cost-efficient ways of managing digital assets will only intensify as new technologies and networking opportunities expand. A new path forward will either begin in the conventional venues of government, business, law and social communities—or the inadequacies of existing systems will eventually result in a crisis that produces catastrophic harms and a loss of social trust.

The point is that a new, more focused and ecumenical discussion about digital assets is urgently needed. It is most likely to yield results if it consists of cross-cutting conversations that bring technologists into dialogue with policymakers, and both of them into deeper conversation with businesses, peer communities, leading nonprofit institutions and the public. Such dialogues will be important not only to devise workable, holistic solutions, but to establish the legitimacy of any envisioned new framework for managing digital assets. That will require a greater convergence and consensus among constituencies than now exists. Fortunately, as this conference demonstrated, the rudiments of constructive solutions are already at hand as well as the enthusiasm to explore them further.

Endnotes

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APPENDIX

The Twenty-Third Annual Aspen Institute
Roundtable on Information Technology

Digital Assets and Liabilities: Valuing the Intangible Economy

July 7 - 10, 2014
Aspen, Colorado

Roundtable Participants

Dorothy Attwood

Senior Vice President, Global
Public Policy
The Walt Disney Company

Khaliah Barnes

Director, EPIC Student Privacy
EPIC Administrative Law
Counsel
Electronic Privacy Information
Center

Allen Blue

Co-Founder and Vice President,
Product Management
LinkedIn

David Bollier (rapporteur)

Author, Activist, Blogger &
Independent Scholar

John Seely Brown

Independent Co-Chairman
Deloitte Center for the Edge
Visiting Scholar
University of Southern California

Zoë Baird Budinger

President
Markle Foundation

Robin Chase

Founder
Zipcar, Buzzcar, Veniam Works

John Henry Clippinger

Chief Executive Officer/Research
Scientist
ID3/MIT

Bill Coleman

Partner
Alsop Louie Partners

Michael Fertik

Founder and Chief Executive
Officer
Reputation.com

Charles M. Firestone

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

Shane Green

Co-Founder and Chief Executive
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Personal, Inc.

John Kunzweiler

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Salesian High School
Former Chief Executive Officer
M-Squared Consulting

Anastasia Leng

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Thomas Malone

Professor of Management
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Founder and Executive Director
The Stilwell Center

Joseph Vardi

Chairman
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Ventures

*Staff:***Rachel Pohl**

Project Manager
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Program
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About the Author

David Bollier is an author, activist, blogger and independent scholar with a primary focus on the commons as a new paradigm of economics, politics and culture. He pursues this work primarily as co-founder of the Commons Strategies Group, a consulting project that assists the international commons movement.

Bollier has written or edited fourteen books, including *Think Like a Commoner: A Short Introduction to the Life of the Commons* (2014); the anthology *From Bitcoin to Burning Man and Beyond* (2014), co-edited with John H. Clippinger; *Green Governance: Ecological Survival, Human Rights and the Commons* (2013), co-authored with Burns Weston; and the anthology *The Wealth of the Commons: A World Beyond Market and State* (2012), co-edited with Silke Helfrich.

Bollier spent many years in various policy advocacy jobs in Washington, D.C. in the 1970s and 1980s—Congress, a regulatory agency, public-interest advocacy—before joining television producer/writer Norman Lear in 1985 to work with him on a range of non-television public affairs and political projects until 2010. In 2001 Bollier co-founded Public Knowledge, an advocacy organization for the public's stake in the Internet, telecom and copyright policy.

Bollier blogs at Bollier.org, and lives in Amherst, Massachusetts.

About the 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.

Select Publications from the Aspen Institute Roundtable on Information Technology

The Weightless Marketplace: Coming to Terms with Innovative Payment Systems, Digital Currencies and Online Labor Markets (2013)

David Bollier, rapporteur

This report examines a rapidly changing global marketplace. Due to the proliferation of the World Wide Web and mobile devices, as well as changing relationships between producers and consumers, friction is being drastically reduced in commerce. There is more direct contact between buyer and seller, geographical barriers are being broken down, competition is improving and the cost of doing business is decreasing. Commerce not only has the ability to be targeted and instantaneous, it has essentially become “weightless.” “The Weightless Marketplace” is the Report of the Twenty-Second Annual Roundtable on Information Technology, a dialogue convened by the Communications and Society Program by the Communications and Society Program. 2014, 43 pages, ISBN Paper 0-89843-600-1; \$12 per copy, free download at www.aspeninstitute.org.

Power-Curve Society: The Future of Innovation, Opportunity and Social Equity in the Emerging Networked Economy (2012)

David Bollier, rapporteur

Power-Curve Society, written by David Bollier, examines how technological innovation is restructuring productivity and the social and economic impact resulting from these changes. It addresses the growing concern about the technological displacement of jobs, stagnant middle class income, and wealth disparities in an emerging “winner-take-all” economy. It also examines cutting-edge innovations in personal data ecosystems that could potentially unlock a revolutionary wave of individual economic empowerment. *Power-Curve Society* is the Report of the Twenty-First Annual Roundtable on Information Technology, a dialogue convened by the Communications and Society Program. 2013, 61 pages, ISBN Paper 0-89843-582-X, \$12 per copy, free download at www.aspeninstitute.org.

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.

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