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A FUTURE OF FAILURE?

The Flow of Technology Talent into
Government and Civil Society—A Report

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About This Report

This report was written by Freedman Consulting, LLC, and was commissioned by the Ford Foundation and the John D. and Catherine T. MacArthur Foundation.

FREEDMAN **CONSULTING, LLC**

Freedman Consulting, LLC, a consulting firm located in Washington, D.C., provides high-level strategic consulting, communications planning and policy development. Building upon diverse experience in politics, policy, communications, high-level marketing and philanthropy, we advise a broad range of clients, including major foundations, elected officials, nonprofit organizations, political campaigns and Fortune 500 companies.



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The John D. and Catherine T. MacArthur Foundation supports creative people and effective institutions committed to building a more just, verdant, and peaceful world. In addition to selecting the MacArthur Fellows, the Foundation works to defend human rights, advance global conservation and security, make cities better places, and understand how technology is affecting children and society.

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Glossary of Common Acronyms in this Report

CDT – *Center for Democracy and Technology*

EFF – *Electronic Frontier Foundation*

IT – *Information Technology*

FCC – *Federal Communications Commission*

FTC – *Federal Trade Commission*

OTI – *The Open Technology Institute at the New America Foundation*

PIPA – *PROTECT IP Act*

SOPA – *Stop Online Piracy Act*

VC – *Venture Capitalist*

EXECUTIVE SUMMARY

The rapid pace of technology innovation and development has had a profound and undeniable impact on all corners of contemporary society. It has changed many of the day-to-day transactions that characterize personal and home life; it has radically reshaped and influenced domestic and global markets; and it has offered the potential to revolutionize how government works at the same time that it challenges the ways in which government protects consumers. A few well-worn statistics only confirm these trends: Facebook has over one billion users; each minute, YouTube adds 100 hours of video; as of last year, there were over 400 million “tweets” per day on Twitter.¹

Technology now mediates a vast set of relationships, but the number of individuals who can understand, build, and work with these evolving technology tools and platforms remains relatively small. This collection of technically skilled and creative people – including programmers, designers, engineers, and innovative thinkers with crucial skills in computer science, data science, and the Internet – represents just a fraction of the human capital across the many sectors of our society and economy.

As information technology further suffuses every aspect of our lives, government will inevitably have a role to play in ensuring that technology serves the public interest. The ability for government to improve operations and provide services to citizens more efficiently

through the effective use of technology is among the greatest contemporary opportunities for the public sector.

Civil society faces a similar set of challenges and opportunities. Technology has emerged as a transformative tool for how non-governmental organizations are able to build movements, raise money, disseminate information, provide services, and generate conversation.

In addition, both government and civil society will play a crucial role in making decisions about how technology should be used across all sectors of contemporary society. This includes identifying opportunities to utilize technology as a solution, but it also involves a sophisticated and challenging set of conversations about limitations on the use of technology, whether by private or public institutions.

Recent examples illustrate in vivid detail both the complexity of these issues and their growing relevance. The launch of President Barack Obama’s signature domestic policy initiative – health care reform – has been stymied by significant malfunctioning of HealthCare.Gov, the online portal intended to provide health insurance to millions of Americans. The system’s failures have incited a highly visible debate about how the government develops and acquires technology and whether adequate expertise exists within government to pursue such large-scale technology systems. In particular, because HealthCare.Gov was built largely by private

¹ “Number of active users at Facebook over the years,” The Associated Press, Yahoo News, May 1, 2013, <http://news.yahoo.com/number-active-users-facebook-over-230449748.html>; “Statistics,” Youtube, <http://www.youtube.com/yt/press/statistics.html>;

“Twitter Now Seeing 400 Million Tweets Per Day, Increased Mobile Ad Revenue, Says CEO,” Shea Bennett, All Twitter, June 7, 2012, http://www.mediabistro.com/alltwitter/twitter-400-million-tweets_b23744

contractors, questions have emerged about whether government agencies employ enough individuals with the skills to knowledgeably manage outside vendors for extensive technology projects.

Over the past several months, revelations that the U.S. National Security Agency has been at the center of a massive telecommunications surveillance program – in some cases in cooperation with technology and telephone companies – have put questions about technology firmly in center of the national conversation and raise thorny questions regarding the flow of technology talent into government and civil society. Some government agencies such as the NSA employ legion technologists to engage in surveillance while, at the same time, other government agencies – such as those involved in social problems – are relatively starved for such talent. Despite this comparatively better technology human capital, other difficult questions have been raised. For example, the NSA’s vast technology needs require giving private parties access to highly sensitive material.

In addition, President Barack Obama was reelected in 2012 in part on the strength of one of the most successful data-driven, analytical political operations in history. As has been widely reported, his campaign employed cutting-edge tools to understand voters at the individual level, and to precisely deploy television advertisements, fundraising emails, and other campaign techniques. After the campaign, however, many of these individuals – most of them young, driven, and passionate innovators – did not enter the public sector to deploy their skills in the service of the presidential administration. “[A]fter Election

Day in November, huge political success met financial opportunity,” according to *The New York Times*, “The people in their 20s and 30s from the Obama tech team had seen others just like them get incredibly rich on innovations (Facebook, Twitter, etc.) that were as transformational as anything they could hope to achieve in government. Now they started to think about what innovations they could bring to the market.”²

While these examples showcase the need, the opportunity, and the challenges associated with building robust information technology human capital in government and civil society, the story is not entirely a bleak one. Local, state, and federal governments all have success stories to share about the incipient role of transformational innovators and technologists. The U.S. federal government today has a Chief Technology Officer and Chief Information Officer. Cities such as Boston and Philadelphia have offices of “New Urban Mechanics,” designed to inject a spirit of innovation into municipal government. The pace of change is accelerating, and awareness of the stakes is growing.

Despite these gains, deep questions remain about the ability for many areas of government and civil society to identify, cultivate, and retain individuals with the necessary skills for success in a world increasingly driven by information technology.

In response to the importance of these questions, the Ford Foundation and the John D. and Catherine T. MacArthur Foundation asked Freedman Consulting, LLC, to investigate broadly the health of the talent pipeline that connects individuals studying or working in information technology-related disciplines to

² “Data You Can Believe In,” Jim Rutenberg, *New York Times*, June 30, 2013
<http://www.nytimes.com/2013/06/23/magazine/th>

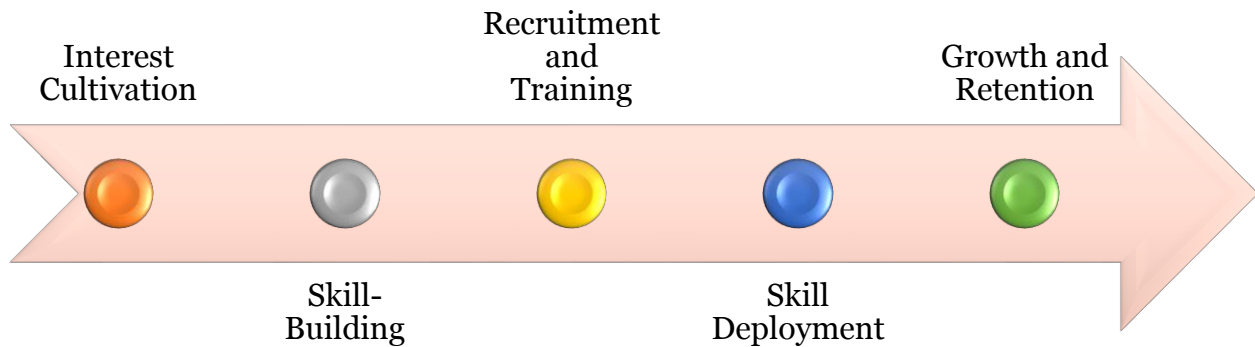
e-obama-campaigns-digital-masterminds-cash-in.html?pagewanted=all

careers in public sector and civil society institutions. The following report, based on dozens of interviews with key stakeholders as well as secondary research, assesses the current state of the pipeline, key challenges and barriers to the development of technology-oriented human capital in government and civil society, models of successful interventions, and recommendations for a more robust pipeline.

Key Findings

Among the key findings of this report:

- ✓ **The Current Pipeline Is Insufficient:** the vast majority of interviewees indicated that there is a severe paucity of individuals with technical skills in computer science, data science, and the Internet or other information technology expertise in civil society and government. In particular, many of those interviewed noted that existing talent levels fail to meet current needs to develop, leverage, or understand technology.
- ✓ **Barriers to Recruitment and Retention Are Acute:** many of those interviewed said that substantial barriers thwart the effective recruitment and retention of individuals with the requisite skills in government and civil society. Among the most common barriers mentioned were those of compensation, an inability to pursue groundbreaking work, and a culture that is averse to hiring and utilizing potentially disruptive innovators.
- ✓ **A Major Gap between the Public-Interest and For-Profit Sectors Persists:** as a related matter, interviewees discussed superior for-profit recruitment and retention models. Specifically, the for-profit sector was perceived as providing both more attractive compensation (especially to young talent) and fostering a culture of innovation, openness, and creativity that was seen as more appealing to technologists and innovators.
- ✓ **A Need to Examine Models from Other Fields:** interviewees noted significant space to develop new models to improve the robustness of the talent pipeline; in part, many existing models were regarded as unsustainable or incomplete. Interviewees did, however, highlight approaches from other fields that could provide relevant lessons to help guide investments in improving this pipeline.
- ✓ **Significant Opportunity for Connection and Training:** despite consonance among those interviewed that the pipeline was incomplete, many individuals indicated the possibility for improved and more systematic efforts to expose young technologists to public interest issues and connect them to government and civil society careers through internships, fellowships, and other training and recruitment tools.
- ✓ **Culture Change Necessary:** the culture of government and civil society – and its effects on recruitment and other bureaucratic processes – was seen as a vital challenge that would need to be addressed to improve the pipeline. This view manifested through comments that government and civil society organizations needed to become more open to utilizing technology and adopting a mindset of experimentation and disruption.



Understanding the Scope of the Pipeline

Based on conversations with stakeholders, the basic character of the pipeline to facilitate the flow of the technology talent is not altogether distinct from other comparable skill sets and fields. The diagram above provides the nodes that emerged in interviews.

There are, however, some unique elements to this pipeline that emerged through interviews. First, the point of entry at the “interest cultivation” and “skill-building” phases may be a traditional training institution, such as a university. Technology talent, however, is also cultivated on the job or, in many cases, outside of an institutional environment. Second, due to the growth in “Chief Technology Officer” and “Chief Innovation Officer” positions in government especially, some especially high-skill and senior technologists in civil society and government may be leaping from existing careers, rather than entering from a training setting. Third, some of those interviewed noted that one way to envision a successful pipeline

may be the periodic rotation of individuals both into and out of civil society and government.

Due to the content of comments in the interviews, this report largely condenses the first and second points in the pipeline (“interest cultivation” and “skill-building”) and the fourth and fifth (“skill deployment” and “growth and retention”).

Who Are Technologists?

The range of skills associated with individuals who understand, use, and deploy technology in government and civil society settings is diffuse. This report defines technologists according to the various categories of expertise that surfaced organically through interviews. These include:

- *Computer Scientists and Engineers:* these are “traditional” technologists including those who can understand and build technology solutions. This includes computer scientists, some of whom have served in “chief technologist” roles in local, state, and national government.

- *“Lay” Technology Experts:* this category includes, for example, researchers who may not be able to build technology solutions, but understand deeply how technology works and intersects with other domains and practices. This category encompasses scholars who study the implications of technology or private sector technology executives who emerge from a business background but work in a technology-related field.
- *Technology and Communications Policy Lawyers:* these attorneys specialize in technology-related law topics, including intellectual property, privacy, telecommunications policy, and other similar topics. Many of the attorneys at the Federal Communications Commission, or staffing the relevant congressional committees, feature this type of technology expertise.
- *Data Scientists:* these mathematicians, statisticians, engineers, and others utilize “big data” tools and techniques. These individuals would be represented by scholars in data-heavy fields, private sector analysts and, lately, data analysts in government.
- *Designers:* the field of design has increasingly become linked to advanced engineering and technology domains, and designers participate in a range of technology-oriented disciplines. This includes many private sector consultants with a design background or scholars who work on technology-related projects in design schools.
- *Serial Organizational Innovators:* this category includes those who may not themselves be technologists, but understand the role and aims of

innovation and have deep experience building organizations and projects that leverage technology and technologists. A less defined category, these individuals are often represented in the “Chief Innovation Officer” ranks, featuring a facility in technology project management but not necessarily direct training in technology skills.

Methodology

Freedman Consulting, LLC, conducted interviews with dozens of thought-leaders including:

- Current and former federal, state, and local policymakers
- Civil society leaders
- Scholars
- Private sector executives and technologists
- Foundation leaders

Interviewees were provided anonymity to encourage candor, and have been quoted in this report by domain only. A list of interviewees is provided in Appendix A.

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THE STAKES: WHY A HEALTHY PIPELINE MATTERS

Interviewees articulated a wide range of reasons for why having technical talent, knowledge of technology, and individuals with technology-aware mindsets in government and civil society is imperative.

Government

Advantages to including technical expertise and an understanding of technology in government spanned three categories: (1) enabling more effective governance, (2) improving policymaking, and (3) enhancing public institutions.

1. Enabling More Effective Governance

A key attribute of technology raised by those interviewed was its capacity to improve the effectiveness and efficiency of legacy processes. Technology was therefore seen as a vital tool in improving government operations, such as the delivery of services to citizens. According to one former policymaker, “The first thing government needs is a service delivery execution strategy. It needs to be able to think about how to do what it traditionally does with a smarter technology strategy.” This individual noted that a “near-term cost” to a deficit of technology expertise in government “is you don’t get done what you need to get done as efficiently as you could.”

Some compared technology expertise to other kinds of technical knowledge more commonly deployed in policymaking institutions, arguing that the need for technology expertise was equally crucial. A former policymaker noted that, for example, “Governments have to decide how to set tax rates and that’s based on a lot of pretty sophisticated economic analysis,” adding, “You have this whole cadre of people [across government] who have a lot of technical expertise in economics.”

Several of those interviewed indicated that, as a result of a shortage of technology expertise, even where government deploys technology to improve performance, it does so in inefficient ways. Said a nonprofit technology expert, “The lack of talent means that we’re mired into an older model and fundamentally, if no one is building products for you because they don’t see a market for you, you get the mom-and-pop solutions that dominate government.” Added a private sector voice:

I think it’s a huge problem, a huge cost in terms of effectively and efficiently delivering government services. It is not only an issue with what is done today, but the reality is that the pace of technology investment is increasing and not decreasing, and the government broadly defined in most places is ten to twenty years behind the private sector.

A former policymaker endorsed unequivocally the value to public services of this expertise, noting, “Yes, I think it would be beneficial to the agencies and really to the public we serve to have a more intelligent [approach], to have more tech savviness in house. We’d just be able to do our job better, quicker, more efficiently.”

A distinct subset of this issue is the use of technology, not to more effectively deliver government services, but as a means to achieve specific policy goals. A policymaker highlighted “the potential of the use of information technology to help achieve a national policy goal.” Citing data on the declining real wages of individuals who lack a college education, this individual noted, “The government is funding some work that is reducing the time required for new military veterans to acquire certain technical skills from years to months.” As a result of this project, which involves a digital training tool, veterans “are getting jobs with six

to eight months of using this digital tutor at salaries of \$40,000 to \$80,000.” In this case, the policymaker said, “The government is using IT not to directly provide a government service, but to solve a policy problem.” The individual suggested that other ways information technology could be deployed to achieve a national policy goal could include developing engaging educational games and creating mobile services to help the unbanked.

2. Improving Policymaking

The presence of technology expertise and knowledge was also regarded as a necessity within government due to the increasing pace of technology policy being made at all levels. As one advocate stated, “You can’t make technology policy in the absence of experts, and to do so is a fool’s errand that will do more harm than good.” Added a scholar, “If a regulator doesn’t understand how the technology works, doesn’t know the difference between an Android operating system and a Windows mobile operating system, they’re not going to know where they can have impact.” Said a former policymaker, “If you’re a regulator, you’re an enforcement agency and you are charged with perpetuating various laws and developing public policy—you really have to understand the industry that you have oversight around.” A funder noted that this is an especially acute problem with regard to technology because “the facts are changing so quickly because technology is changing so quickly,” continuing, “You want people who are able to assess whether information we thought of five months ago is applicable today.” Added a former policymaker, “Particularly in the tech sector where there is an incredible amount of

“You can’t make technology policy in the absence of experts, and to do so is a fool’s errand that will do more harm than good.”

dynamism, it is important that you have people on your staff who understand your technology issues.”

Few had confidence that such appropriate expertise currently suffused government. According to a scholar, “Very few jurists, officials [and] their staffers and so forth at the state and federal level [have technical knowledge].” “They just don’t always understand technology very well,” the scholar added, “They don’t necessarily have what I like to call an accurate mental model of the technology they are governing.” Those interviewed frequently pointed to recent examples of what they considered poor policymaking, most notably the Stop Online Piracy Act (SOPA), an effort in the House of Representatives to regulate intellectual

property online that was ultimately derailed by a massive backlash from Internet users and companies. Said a former policymaker, “SOPA was kind of a leading example of this where the decision, the policy assessment required to make a decision about

whether something like SOPA was a good idea or was not a good idea depended on a very, very sophisticated understanding and analysis of how the Internet works.”

In addition, several of those interviewed noted that the absence of technical and technology expertise within the government tilted the policymaking balance in favor of industry voices. As a scholar said, “The basic problem is that the ignorance of technology makes it very easy for technology companies to snow policymakers.” Another scholar added that “today everyone who explains technology to a

“If the public sector can’t be as smart and agile with new technologies, it will really atrophy.”

staffer has a dog in the race.” According to a private sector expert, the challenge with this information asymmetry is that “If you don’t have somebody who can assess the conflicting voices you’re actually hearing, you make policies about technologies that are extraordinarily naïve.” A funder said that it is not in the public interest to have major tech companies setting public policy, noting: “They have a role to play, but we need a landscape of people that have different perspectives and interests – personal financial interests – in the outcome.”

3. Enhancing Public Institutions

Though stated less frequently, an additional concern centered on the fear that a failure to incorporate technology expertise into government risked allowing government and governing institutions to grow moribund and obsolete. As a former policymaker indicated, “There’s a really important long-term cost” to the lack of technical talent and technology expertise in government,” explaining, “If the public sector can’t be as smart and agile with new technologies, it will really atrophy.” As a private sector leader warned, “In the near term it’s a problem in [that] consumers’ or citizens’ expectation of what they should be getting is not driven by their experience with what they have been getting [from government] but their experience in life.” A nonprofit leader agreed, “If nothing else, government is the way in which we come together and interact with each other and, if the Internet and technology is how we

do that in every other sphere of our lives,” then “it’s impossible to imagine a government that isn’t [interacting that way].” This person explained further:

The costs [of an inadequate pipeline] are two-fold. It’s an increasingly poorly functioning government, a government that isn’t serving its citizens’ needs well. And it’s a heightened disconnect between citizens and their government.

Civil Society

Perceived advantages associated with the presence of technologists and those with a deep understanding of technology in civil society organizations ran parallel to those in government. In particular, those interviewed identified three overall benefits: (1) improving nonprofit techniques, (2) bolstering credibility, and (3) enhancing organizational effectiveness.

1. Improving Nonprofit Techniques

Interviewees described a principal advantage to civil society organizations from the employment of technology expertise as a more modern toolkit for the kind of work that civil society organizations undertake. As a private sector policy expert said, “There is this need [because] there is a newer dynamic that the tools of doing

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what we do,” stating, “The tools of advocacy, of effective social change are also rooted in technology and technical capabilities.” Added a nonprofit leader, “Technology opens an entire new community of people who are not a member of Common Cause or not a member of the Red Cross,” rather, “They’re just people who are looking to be connected.” An advocate noted, “It makes you more knowledgeable, more effective to have that broad set of tools.” Said a funder, “I can’t think of a nonprofit that couldn’t benefit in some way [and] on some level from some more sophisticated tech.”

There were also comments about the potential for technology to enhance civil society. A policymaker said that technology could help civil society organizations dramatically extend their reach in the same way that businesses have. The individual noted, “In the business world they’re talking about these micro-multinationals. The notion is that access to this information technology gives you this kind of scale and scope that used to be reserved exclusively for large multinationals, and now you have these firms that can start going after global markets right away.” In the civil society sector, the policymaker explained, “there are some examples, not as many as there are in the private sector, but there are examples of organizations that start off as like one person or a small group just having an outsized impact. I would point to Wikipedia, Khan Academy, and Ushahidi.” The policymaker declared that, today, “with a really good idea and with the ability to mobilize the talent and the financial resources to support it, civil society can have this impact in a way that was very difficult to have in the past.”

“I can’t think of a nonprofit that couldn’t benefit in some way [and] on some level from some more sophisticated tech.”

A particular challenge that some interviewees described was a disjunction that now prevails between how civil society organizations and technologists perceive the utility of technology to address social problems. A nonprofit technology expert explained, “What if the user is a teacher, a domestic violence counselor, a human rights advocate?” Right now, “there’s a gap between what those people want from technology and what technologists think they’d want,” the expert said. Added a policymaker, “Having people with the right skills that can translate between the technology needs and the human-scale needs is definitely important.

There aren’t many people with those skills. And that applies just as much in government as in civil society.” A nonprofit executive agreed, “When we’re talking about working with states, working with cities, working with coalitions, when we’re placing fellows, there’s

an interesting demand for people who understand technology and have the executive experience and presence to roll out technology in a way that engages people.”

2. Bolstering Policy Credibility

Analogous to the regulatory necessity for government to employ technologists in order to credibly undertake technology-related policymaking, those interviewed noted that civil society would be unable to advance the public interest around technology issues without tantamount technical expertise. As a skillset, this was defined as a broad competence in both technical issues and public policy knowledge and experience. Said a private sector policy expert, “We need a diversity of people who are in the policy world, and that includes people

“Those engineers show us how policy plays out in a real life. You don’t want to be in a place when you’re proposing a policy that’s out of line with the technology. That’s what Congress did with SOPA/PIPA.”

who have real technical competence.” This individual added, “There has been and still is a very strong need for more people who good technical intuitions, who are technically competent or even better have a dual competency in understanding policy.” An advocate said, “It’s tremendously important. A huge amount of what we do now is mediated by technology and that includes our speech, our privacy, innovation, our economy.”

Interviewees asserted that this diverse knowledge and skill set played a vital role in informing public policy advocacy around technology issues. One advocate put it bluntly: “I need a technologist in my organization...and so do all other organizations in my field.” Another advocate explained that “having people with those skills, backgrounds, [and] experiences enhances how you understand where markets are working, whether there’s a need for government intervention,” and as a result equips civil society organizations to “translate [that expertise] into policy proposals that make sense.” This individual warned that, “On the outside, you’re being evaluated by a whole slew of extremely well-paid analysts,”

³ PIPA, or the PROTECT IP Act, was the Senate companion – and precursor – to the House SOPA bill.

making it necessary to ensure proposals are developed by a commensurately talented staff. Another advocate agreed, “What industry says to us when we propose policies – like on net neutrality or spectrum allocation – they say, ‘You don’t have any technologists or engineers. You don’t know what you’re talking about.’” This individual continued, “Those engineers show us how policy plays out in a real life. You don’t want to be in a place when you’re proposing a policy that’s out of line with the technology. That’s what Congress did with SOPA/PIPA.”³ Another advocate pointed to the recent controversy around National Security Agency monitoring of telephonic and Internet communications as an example of how civil society credibility is essential to productive discussion: “Right now we’re in the midst of a very public debate where frankly there’s a lot of obfuscation going on about how our privacy might be at risk because they can get away with it frankly.” Another advocate was clear: “I think 10 years from now it will be utterly unacceptable to be doing policy work in this area without technology expertise in your organization.”

3. Enhancing Organizational Effectiveness

Beyond the specific and concrete deployment of technology in the service of programmatic objectives, many spoke to the underlying power of technology as a mindset and framework to improve the robustness of civil society organizations generally. As a private sector technology expert said, the Internet is “the platform for everything.” A former policymaker agreed, noting, “It’s hard to overstate how important it is to have people who understand how technology works, either in your nonprofit organization or your government agency.” A private sector leader spoke to the broad trends

in the economy and society that are dominated by technology:

I think the stakes are very high. I think that we're in the midst of a profound transformation of the entire global economy and that people who understand the way in which the mechanisms are affecting that transformation are very valuable. And they're valuable in the commercial sector and they're valuable in the public sector.

Others spoke in greater detail with regard to the specific ways that technical skills and technology expertise enrich organizational practice. Explained a former policymaker and current scholar:

The benefit of this is to be able to almost visualize what's possible for an organization or a government agency using digital technology. Advances in efficiency and organization and those sorts of things. And also as a facilitator and generator of increasing returns.

With real feedback loops set up, and real ability to quickly gather the best ideas, and real ability to have people look together to visualize a shared problem, you can actually just be more thoughtful and productive about the problems facing society while using fewer resources.

Said an academic administrator, "Some of the most importance affordances are not that I can send an email to 1,000 people at once," rather, "what you can learn from technology. Openness, the value of experimentation, collaboration." This person added, "If you get geekier folks into the broad public interest space, you might introduce more transparency, more openness, more collaborative practices." Another scholar and former policymaker described these skills and their impacts across organizational practice:

In short, technologists are trained with an agile and design-oriented mindset to think about systems as being capable of being changed. We need to move away from the

legal mindset that places the emphasis on certainty and stability toward cultures which embrace experimentation. On a more specific level, technologists can think about how to use tech as a tool in the toolkit to solve problems in the way that we think today about law and regulation.

A DEFICIT: CURRENT STATE OF THE PIPELINE

Overall, those interviewed reported that the pipeline of technology-related talent into government, civil society, and the public interest sector generally was inadequate to the meet needs in those fields, either in terms of sheer numbers or in the alignment of taught skills with sector needs.

Government

Although not unanimous, those interviewed tended to be straightforward in their assessments of the quality of the talent pipeline flowing into government: (1) the absolute number of individuals with the right skill set is too low, and (2) current skills do not match government needs.

1. Too Few

Interviewees were largely consonant in the view that there were too few individuals with technical skills and technology expertise in government, especially those who combined such knowledge with a sensitivity to policy and governance questions. Said a scholar, “There’s just a handful. The range of skills one needs is so broad. They’re unique people.” A nonprofit leader concurred, “There are 52,000 cities in the country and 50 states, and I’ll bet you \$5 that at least 20 percent of people who work in state government do not know how to effectively use technology themselves.” Said a scholar, “The for-profit sector gets to these students before the nonprofit and government [sectors].” A policymaker added, “I think there’s a paucity of them. I’m in New York City, so it’s a lot easier for me to find what few there are.” One policymaker was more reserved, saying: “It’s not rare but it’s not abundant either.” A nonprofit leader echoed this sentiment, stating, “I think there are a lot of people in the public sector who understand technology and more and more every day. But I think there’s not

enough.” A private sector expert said, “That talent, especially the best, is scarce and expensive. They’re less generally attracted to the career path within the public sector and a lot of it is handled through contracting, either directly outsourcing or, at a minimum, tasking others, and that’s a huge problem. A lot of projects are done over budget or late.”

There was discussion in the interviews about the inconsistency of talent across government, with some interviewees indicating that certain government agencies had access to a more robust talent pool than others. Said one advocate, “Everything in the spook world probably has some pretty good techies, at the high levels in terms of defense, CIA. Not clear to me that it’s consistent across any particular government agency. Certainly not Capitol Hill.” A scholar noted, “The FTC has had a chief technologist who they’ve brought in from academia. The FCC has done something similar over the last few years. I think that’s an important recognition of trying to bring in that kind of expertise and providing a model [for others].”

Several interviewees noted that the issue may not solely be quantity, but how such individuals are used. A former policymaker explained, “What I’ve found in [a municipal government] as well as in the federal government [is that] there are a lot of people in government already who are just being underutilized.” A nonprofit leader agreed: “More often than not, government and the public sector isn’t set up to take advantage of their skills.” This person

“That talent, especially the best, is scarce and expensive.”

Case Study: Making Cities Safer and Smarter with Predictive Analytics

Data scientists and technologists help solve regulatory challenges in New York City

Today, governments at all levels have access to more kinds and a greater volume of data than ever before. Creative analysis of that data combined with careful application can increase safety, save money, and improve life for citizens.

In the wake of a deadly fire, New York City broke down silos among data and combined several sources to produce an analysis of what kinds of buildings were most likely to have high rates of illegal conversions and were at elevated risk of catching fire. The analysis identified four factors that strongly predicted a fire risk, such as whether the building was in foreclosure or if it was built before 1938. It then used those factors to prioritize inspections, which led to the issuance of vacate orders at a rate thirteen times higher than normal.

The city has also successfully used this kind of data modeling – called predictive analytics – to improve the rate at which it finds stores selling bootleg cigarettes, crack down on pharmacies committing Medicaid fraud and contributing to the black market for prescription painkillers, and identify people flipping business licenses.¹

1. “Predictive data analytics is saving lives and taxpayer dollars in New York City,” Alex Howard, O’Reilly Strata, June 26, 2012, <http://strata.oreilly.com/2012/06/predictive-data-analytics-big-data-nyc.html>.

explained further that, “First and foremost, governments in general are IT management shops, not IT development shops. They’re usually not writing and building code themselves.” Added a funder: “Another way of framing the problem is that there is a real organizational gap in the dev[elopment] side of that, that technology is fundamentally cast as operations.” The individual continued, “There’s something really important in this issue, which is less about the staffing pipeline and more

about culture change. It doesn’t negate the role of the operations folks, and it is important to accept the yin-yang nature of both operations and development.” This individual suggested that this misperception constituted a deep challenge for the sector: “I believe strongly that the perception of technology only as an operational question, rather than developmental one, as much as just general pay issues is one of the deep cultural divides that is really hindering a healthy pipeline.”

Employment by Sector for All Degree-Holders in Computer and Mathematical Sciences, 2008

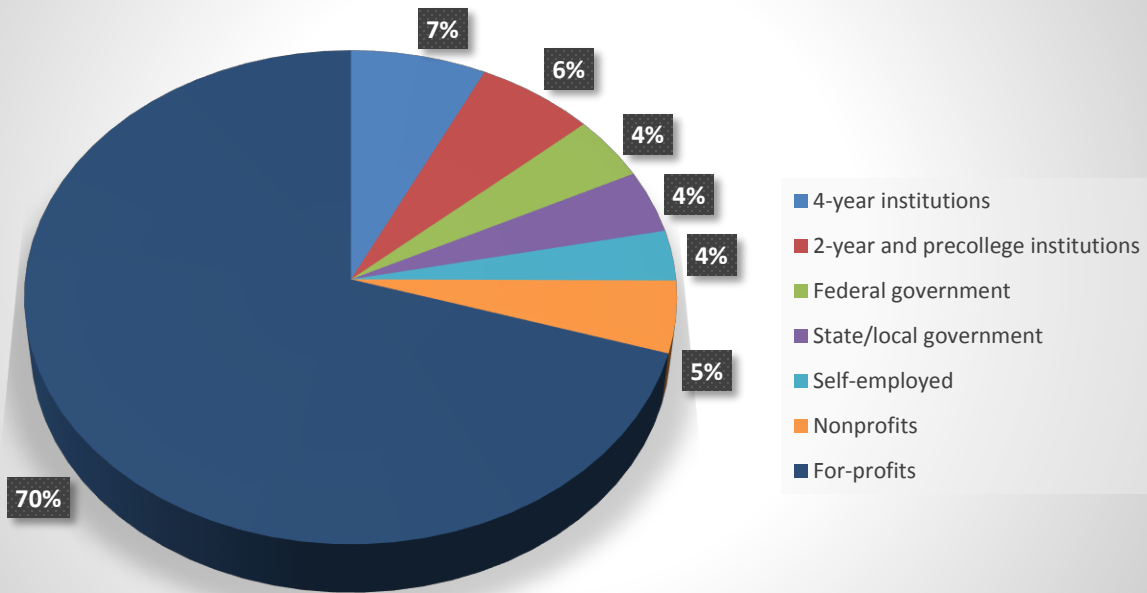


Figure 1. National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), <http://sestat.nsf.gov>.

Interviewees pointed to differences in the kind of technology talent and expertise most available to government. A local policymaker explained, “That innovation layer at the top—we’re really starving.” This individual described this “extra layer on top” as the place where “innovation in government really does require increasingly the full embracing of technologies that make new service delivery possible, new policy possible. This is what we’re really missing.” A scholar, however, indicated a

broader deficit: “My sense is that there is somewhat of a shortage of policy-oriented technology people in a lot of areas. My sense from talking to policymakers and the staffs of policymakers is that they’re actually pretty hungry for expertise that is not coming from groups that are trying to lobby them.” Finally, several interviewees noted that individuals who blend various kinds of expertise are scarce across sectors, with the shortage in government simply the most acute extension of a wider

Employment by Sector for All Doctoral Degree-Holders in Mathematical and Computer Sciences, 2008

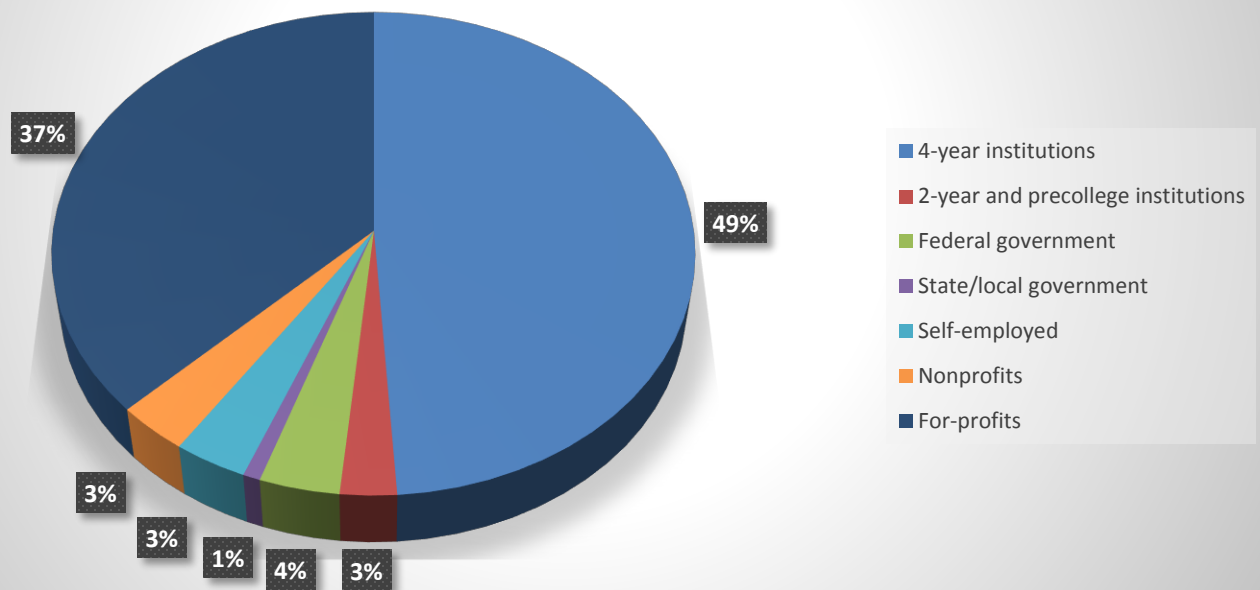


Figure 2. National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), <http://sestat.nsf.gov>.

supply challenge. Said a policymaker, “We don’t have enough period, not just in government. In the same ways we now talk about data scientists as people who need training in at least three different types of domains, they need to have backgrounds in places like math and AI [artificial intelligence] and statistics; they need to be facile with using a new set of tools; and, they need to understand enough about the domain so they can intelligently use these tools in this domain.” A private sector expert said, “I don’t think we have an adequate number working in any sector,” but added, “I think it’s most acute in public sector and civil society in part because we’re in a ridiculous financial climate.”

2. Skills Not Aligned with Needs

Interviewees also discussed the ways in which current talent flows were not properly aligned with government needs. For example, several interviewees noted that available technical and technology talent often lacked an appropriate understanding of policy processes and institutions. Said a scholar, “There’s something about the personalities of people who are attracted to technology that make them not so good on policy,” continuing, “Some of the technologists I know are a little fast and loose, and I don’t think they always know the value of procedure.” Another scholar agreed, “What these students [with technology training] don’t understand is your starting points,” explaining, “They don’t understand that you don’t have the background or the context [on technology]. I think it has to do with training people that other people don’t have the background or assumptions that they have.” Summarized one scholar:

⁴ The impact of this phenomenon on recruiting to public sector agencies will be discussed at greater length in subsequent sections of this paper.

The pipeline of skilled technologists who can translate effectively to the public sector and public policy process, there’s a great need for that. It’s a real tough skill to put together, and I don’t think there are many people who are there just now. I think we’re starting to see that happen.

Another type of need misalignment cited by interviewees is the heavy emphasis on government technology as traditional information technology (IT) infrastructure.⁴ As a former policymaker said, “Historically technical knowledge in government has been shunted into IT support and procurement.” Noted a local policymaker, “By the time you get to state, city, county government, disproportionately [it] is made up of older people. Because they’re the prevailing group, they set the tone for sophistication, technology adoption, these kinds of things. It’s a challenge for us to make room for a generation of professionals who think differently, work differently.” Said another local policymaker, “We know it’s possible to get talented people to come to city hall. But we see far less of that through the rest of the organization. On the IT group, they basically do very, very little of that sort of thing.” This individual explained further:

Increasingly in the public sector, local governments are being asked to produce tools and technologies for residents to use. But one of the issues is that there is no skill in local government to do that. The skills that are hired into to city hall to do that are enterprise skills. What this has resulted in is us essentially us asking the IT group to double as the engineer group.

An experienced policymaker noted that this phenomenon can result from internal “silos” within agencies:

Remember, we're an agency of mostly lawyers and economists. We have an IT group, and they're more running the system as opposed to thinking about policy. And it's kind of interesting, too. Government bureaucracies can be a little bit siloed from time to time, even internally.

Another policymaker noted that different government agencies have varying capacities to deploy technological solutions to policy problems. The policymaker noted, "One of the barriers to doing more of this is that the capacity to identify and promote these types of opportunities is very unevenly distributed across the federal government." The individual continued, "Some parts of the government, like DARPA [Defense Advanced Research Projects Agency], absolutely have the ability to do this. If they have a problem, in weeks they can get the smartest people in academia, government, and industry working on the problem." In contrast, the policymaker said, "The same capacity does not exist in the Department of Energy, the Department of Labor, or the Department of Housing and Urban Development—the parts of government responsible for helping low-income families."

In addition, some interviewees noted that the skill misalignment is not a challenge merely limited to technologists who could work in government, but is also prevalent among individuals with policy expertise who are already on track to work in government but lack technology knowledge. Said a scholar and former policymaker, "We need to do much more to recruit those with a technology background into government. More importantly, we need to teach technology to those studying law and public policy. It isn't tech that's needed so much as a blended skill set." This person said further, "The problem is that students who train to go into government don't get a skills-based, multi-disciplinary education that includes training in technology,

innovation, data science, and the tools that today's problem solvers need."

Civil Society

Interviewees provided a similar diagnosis of the health of the pipeline feeding technical talent and technology expertise into civil society organizations. Principally, interviewees suggested two major features of the civil society talent pipeline: (1) too few individuals within the sector and (2) civil society organizations have inconsistent success in incorporating this type of talent into their organizations.

1. Too Few

Those interviewed were largely in agreement that civil society organizations employed too few individuals with a technology skill set. Said a private sector expert with knowledge of civil society organizations, "It's definitely better than it was, but the numbers are still too small." A scholar agreed, "I don't think we have enough. The pipeline is getting bigger, but I don't think we have enough people doing that yet." A former policymaker stated, "Most organizations are understaffed when it comes to technology and technology policy," adding, "Because they're understaffed, they don't articulate to their funders what their strategic technical vision [is]." An advocate noted, "We don't have a dedicated engineer. We'd love to, but we can't afford it. We have some people who are steeped in technology, but they're not engineers." This person noted that this experience was typical of the field: "In civil society, there are far more policy experts and far fewer technology experts." In a similar vein, a funder noted that demand for big data skills was substantial outside of government. The individual declared, "Take out 'government' and put in 'research lab,' and take out 'technologist'

and put in ‘data scientist,’ and the same kind of people with the same kind of quantitative skills are desperately in need to advance any kind of research.” Even an advocate whose organization has a strong technology staff said, “We probably have the deepest stable of access to people with technical knowledge” but “we still struggle sometimes to have the right people at the right time for what we need.”

Similar to the state of technology talent and government, interviewees remarked that civil society organizations do not merely lack technologists, but technologists who can grapple with the kinds of issues addressed in the nonprofit sector. Said a funder, “Civic technologists are rare in a lot of ways.” This person explained further, “On one hand you have technologists, and they obviously have the sophisticated skills of technologists. But then to understand and be effective at civic tech, you really have to be able to push in to understand what the community is about, to have some sense of the socioeconomic environment.” One private sector expert provided a similar statement regarding past experience in civil society: “It was hard to find people who had a combination of technical competence and were good policy advocates, which is what we were looking for. Inevitably, you’d wind up with one or the other and then try to train them up on the other part, which is fine, but harder.”

The failure of civil society organizations to best deploy technologists was also raised in interviews as one aspect of the skill deficit. One nonprofit leader said, “The two problems I see are, one, we don’t have enough technologists; two, and when people become technologists they’re pretty siloed off.” Another nonprofit technology expert added that, in civil society organizations, “There’s a lack of appreciation for what technology can do for your work.” This person later elaborated this as a “lack of understanding [about] why technology is a

strategic investment rather than part of the plumbing.”

2. *Inconsistent Success*

Some organizations were raised in interviews as signal examples of effective efforts to identify and recruit technology talent, but they were frequently discussed as exceptions. For example, a scholar said, “I see something I didn’t see five years ago, which is job announcements for, literally ‘staff technologist,’ and I’m seeing that out of EFF [the Electronic Frontier Foundation] and CDT [Center for Democracy and Technology].” Another scholar pointed to the same two organizations: “On the organizational side, the nonprofit sector, there aren’t many organizations out there doing this work.” Said a third scholar, “Anecdotally I’ve heard that it can be difficult for these organizations to find the right kind of people for these positions. I know they’re out there and some of the groups that I’ve been involved with like EFF and CDT [that], when they do advertise for these positions, they do get a lot of applications.” The Open Technology Institute (OTI) at the New America Foundation was also mentioned. According to a former policymaker, “You have OTI which essentially was designed to try to solve this problem.”

One individual did note that this phenomenon may be a function of the size of the field. According to this scholar and former policymaker, “A lot of that, though, is organizational capacity. The organizations that I think of working on technology policy, you can put them in one hand. We don’t have a particularly dense rich civil society framework in the U.S. for information policy.”

Universities

Often a starting point for the training and development of technical experts and

technologists, the efforts of universities to promote an effectively pipeline were discussed across the majority of interviews as, at best, confined to relatively few institutions. Interviewees noted three factors in particular: (1) a paucity of targeted programs; (2) siloing within universities; (3) growing demand among students.

1. Paucity of Targeted Programs

A range of interviewees said that universities and academic institutions currently failed to provide an adequate number of programs that blend technical and technology training with policy-oriented training. Said a private sector expert, “So where I think the real gap right now is in the programs aimed at technologists or those programs that want to build this dual competency [in technology and policy].” Another private sector expert said, “There’s a huge talent gap. There’s no pipeline.” A scholar added, “I think the public policy schools have done very little on this.” Another individual

familiar with academic research explained, “On universities and technology, a lot of it is what the incentives are. And if you’re asking the question of technology and public interest, universities aren’t always good on the public interest part.”

Some university efforts were celebrated in the interviews, though in some cases as evident exceptions to current practice. Summarized an academic administrator with deep knowledge of university centers: “Uneven is the most fair way to describe it. There are probably individual programs at [specific university] and around the country, and individual faculty members that do good work.”

2. Siloing within Universities

In tandem with the observation that few universities offered multi-skill training, interviewees also indicated that universities often failed to create potential connections

Historic and Projected Computer and Mathematical Science Occupations

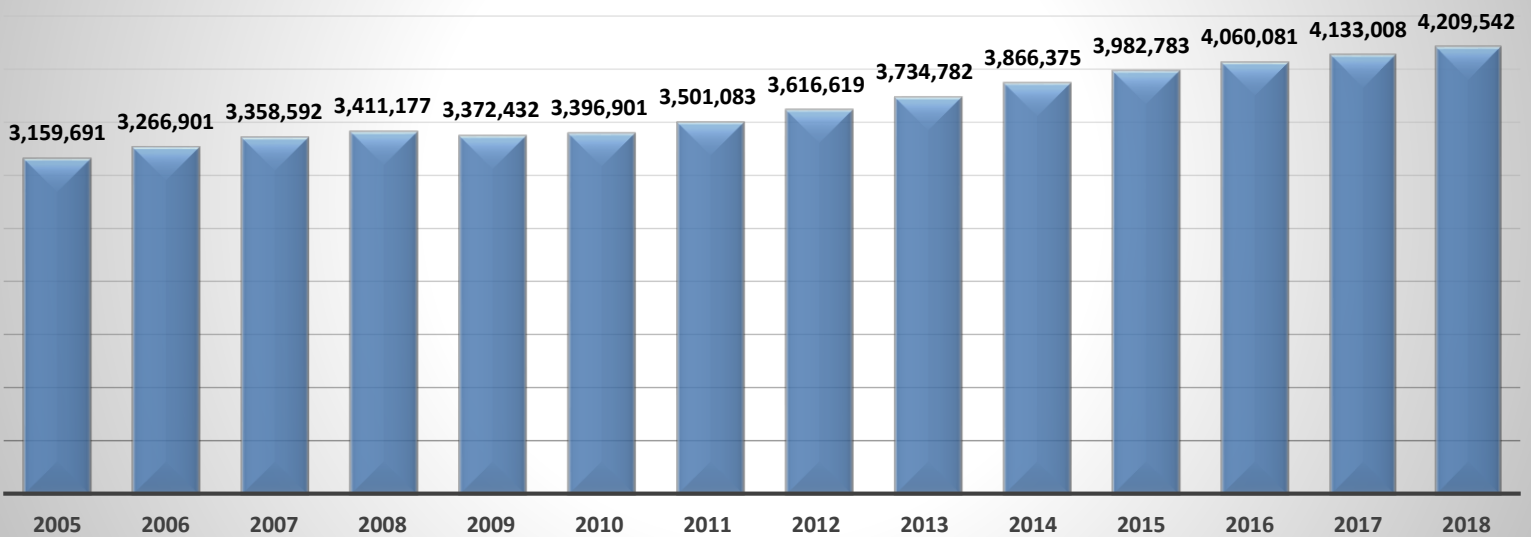


Figure 3. Carnevale, Anthony P., Nicole Smith and Jeff Strohl. "Help wanted: Projections of jobs and education requirements through 2018." Georgetown University Center on Education and the Workforce. 2010.

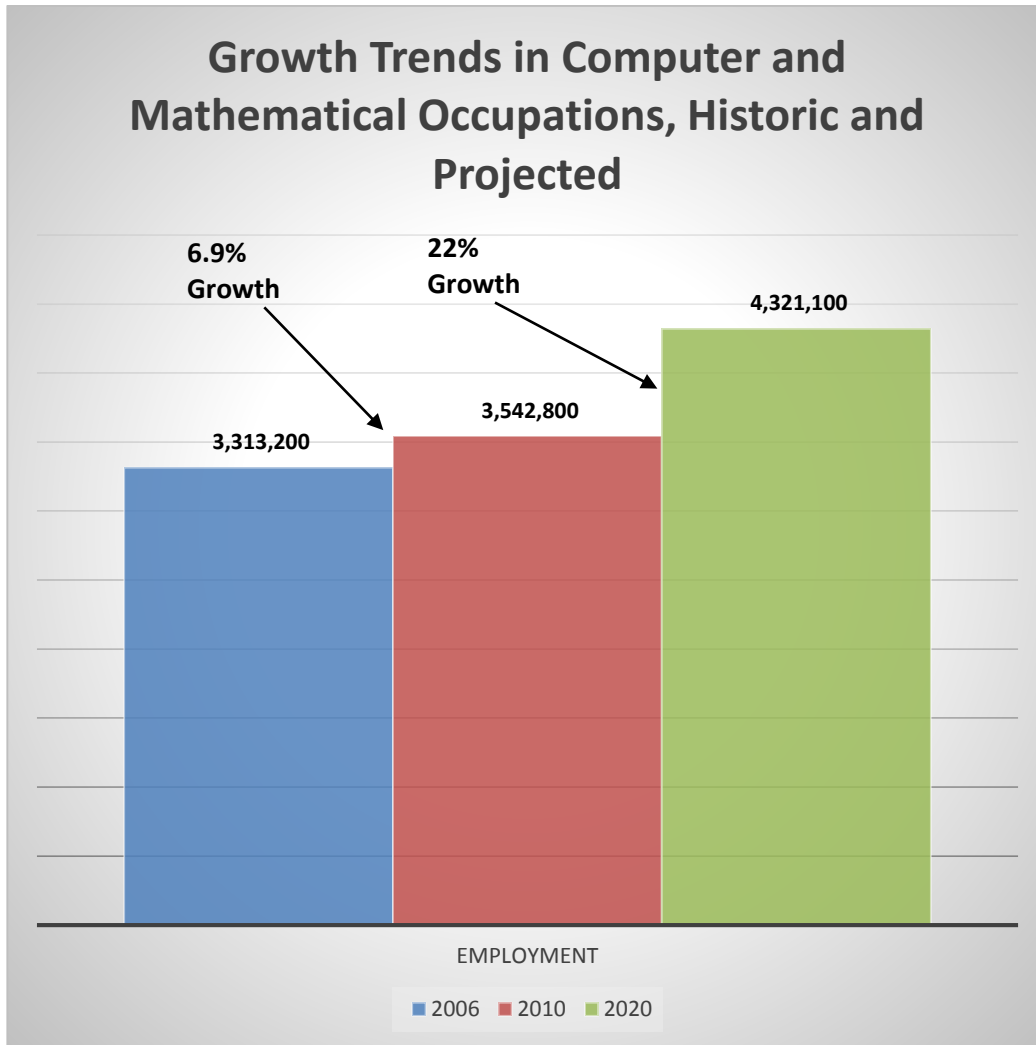


Figure 4. Lockard, C. Brett and Michael Wolf. "Occupational employment projections to 2020." *Monthly Labor Review Online*. 135:1 (2012).

between relevant departments. A scholar explained, "It's in part having the training in the technology alongside a training in the social and policy dimensions of the technology. We see very few places where it's consciously coordinated." A nonprofit leader concurred,

"I don't think our academic institutions connect those things. Historically, universities have been siloed. You're an engineer, you're working in this shop. You're a liberal arts person, so you're over here." Said a former policymaker, "I would

say there is no supply part of the equation. Right now the education system is not designed to take people from a technical track to a policy and politics track. It is unusual for people to jump across." A scholar said that silos present strong barriers to building integrated education programs that address the interrelated challenges of technology and public policy. This person explained that, "On each side you've got silos. At public policy schools, the existing

Undergraduate computer science enrollment increased 29.2% from 2011 to 2012.⁴

faculty who would decide strategically to add these skills—they haven't got the background" and "The concern for incumbent faculty will be that this may divert resources from my pet area," adding "The same thing will crop up in the engineering school."

Some interviewees noted that this siloing both influenced and reinforced student preferences. A scholar described, "Folks are not going into these areas that they should be. They're not trying to talk across disciplines. They're not trying to solve human riddles—they're trying to solve technical problems." Another said, "One of the problems is most technical people don't talk to policy people and aren't that interested in policy. And most polisci [political science] majors aren't that technical. So you need to get those people to talk to each other which isn't always easy."

3. Growing Demand

Despite the relative paucity of programs, several interviewees pointed to growing

student demand for training and opportunities at the intersection of technology, civil society, and governance. A former policymaker said, "There's really huge demand from undergraduates. That's not to say that all of those students are going to go into government or the nonprofit sector. Some of them will probably want to go work in the commercial world and that's fine. But there's big demand there." A nonprofit leader and technology expert agreed, "The current generation of students I interact with are the most socially engaged generation since the 60s." An academic administrator said further, "The students are ready and dying for that kind of stuff, but I think the faculty and the administration typically are a bit more of a barrier." Added a scholar, "I'm especially hopeful, though, for younger people. My experience has been that students have been interested in this and are really looking for sign posts, are looking for a path to apply their skills to public service."

⁵ Stuart Zweben. "Computing Degree and Enrollment Trends: From the 2011-2012 Computing Research

Association Taulbee Survey." Computing Research Association.

DISCONNECT: GAPS IN THE PIPELINE

Those interviewed provided a range of explanations for the shortage of technical talent and technology expertise in government and civil society. Comments canvassed initial training, recruitment into the public sector and civil society, and efforts to retain existing talent.

Training and Cultivating Interest

Chronologically, an initial point of entry into the pipeline occurs when individuals either receive technical training or develop an interest in public sector issues. This commonly, but not exclusively, occurs in academic settings, and some of those interviewed delineated between students and mid-career professionals. At this stage in the pipeline, interviewees discussed three challenges: (1) culture, (2) aspirations, and (3) exposure.

1. Culture

Several interviewees noted that the culture within technology disciplines, among both students and faculty, does not emphasize public sector and civil society careers. A private sector expert explained:

One thing is cultural. At the major science and engineering schools, public policy work or thinking tends not to be highly valued. You get tenure...for being a great scientist, for publishing in great technical journals. You're not getting tenure as an engineering professor for testifying in Congress. Honestly, nobody cares.

This person also said that "a lot of that has to do with the biases of the educational institutions, of the schools, and of the people who go into this space. They're going to solve problems technically, not do social science." An advocate agreed, "There's not a culture of public service necessarily when it comes to engineering. It's true of economics, too." One scholar mentioned that the culture of legal

education may also discourage law students from pursuing interdisciplinary work, such as around technology regulation:

There are a certain number of law students who are very risk averse or traditional-minded. I think in a changing environment, that is no longer viable, but telling law students they need to be interdisciplinary? Some law students are less open to that message than others.

Some also voiced concerns about the culture of professors and other potential mentors. An advocate said, "I think the other problem – and I think this is very true of the legal scholars and technologists – is that everyone wants to write a book and go on [The Daily Show with] Jon Stewart or Colbert [Report]. There is this culture of individualism." What is missing, the advocate said, is "the star professor who cares more about mentoring students and building a pipeline than he does about promoting his books."

One nonprofit technology expert did note that cultural barriers to public service did not always prevail in technical disciplines: "I'd say 40 years ago people went into engineering because they wanted to contribute to society."

There were also some comments around potential ideological perceptions of government and civil society. A scholar explained:

Here in San Francisco, my experience is that people who are really technologically astute want to work for companies. And there's this feeling – this real libertarian feeling that really runs through the engineering community – that you can do more by being in a company than in academia, or government, or a nonprofit.

A scholar pointed out that a sense of disdain may sometimes be expressed mutually, from

the technology community and from the public interest sectors:

Also there is a culture gap I think between the tech world and government and the sort of D.C. policy world generally which operates in both directions and I think too often manifests as each community disrespecting the other one and not listening and learning when there's an opportunity.

2. Aspirations

A distinct subset of cultural barriers that arose in interviews was the issue of the existing goals that young engineers, technologists, and others tend to pursue. Said a private sector expert who attended MIT, "When I was an undergrad...the heroes were all Nobel Prize winners and people who built big things in engineering. That's who people were taught to want to grow up to be," continuing, "The heroes have changed, the role models have changed. They're more in the entrepreneurial space. Mark Zuckerberg is a hero, Sergey Brin is a hero." A nonprofit technology expert echoed this sentiment, "In the tech field, we have this shift in culture where your dream is to work for Facebook or Google or to start your own Facebook or Google." As a result, said an advocate, "There are very few people who go into computer science or engineering [who are] at the get-go desiring to have a career that is about public policy."

In addition to private sector aspirations, some interviewees described how academic aspirations also shaped interests among technologists. A funder noted, "In academia you generally get success by being a deep, deep,

deep domain expert, doing the kinds of things deep, deep, deep domain experts value, which is a very specific thing and publishing that in a top tier academic journal." A private sector expert added, "If you're a postdoc or junior faculty" then, "in order to get tenure, you have to fit squarely within one discipline, which is the department that has hired you. To get tenure, you have to be publishing in the top journals in that discipline."

3. Exposure

In part as a consequence of the siloing of university training for technical experts and technologists, many students who might have considered careers in government or civil society are not adequately exposed to opportunities in those sectors, according to those interviewed. An advocate said, "I don't think it occurs to many engineers that they could even do public policy." A scholar noted, "If you were someone in a technical program and you wanted to do public policy, it's not like there's a curriculum that's widely taught across schools." A nonprofit technology expert said, "Engineers are starting to do some of this stuff, but it's not pervasive in the profession as it is in other professions like medicine and law." Added an advocate, "The lack of popularizing the opportunities is a huge problem."

This analysis was applied not just to technologists, but to students training for policy careers as well. A policymaker explained, "At the grad school level, you can in many places get a public policy degree or a public affairs degree without exposure to technology of any real sort. I think that's something that should

"The heroes have changed, the role models have changed. They're more in the entrepreneurial space. Mark Zuckerberg is a hero, Sergey Brin is a hero."

Case Study: Using Tech Skills to Save Money by Improving Procurement

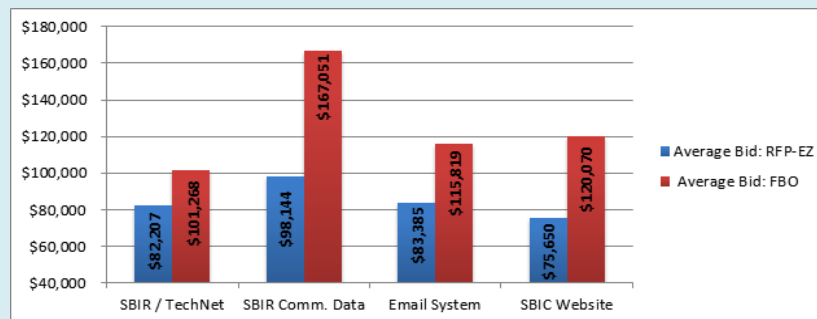
Federal government technologists create procurement tool that cuts costs and expands access

Government procurement can be an extraordinarily complex process that both increases costs for taxpayers and sets high barriers that may prohibit small businesses from competing to provide services. A Presidential Innovation Fellows project set out to improve federal government procurement, working to cut costs and make federal projects more accessible to businesses. The Presidential Innovation Fellows program brings innovators from the private sector, universities, and nonprofits to work in the executive branch on specific projects.

Working with Small Business Administration (SBA) staff, the fellows developed a system called RFP-EZ. RFP-EZ cuts down on many of the registration burdens endemic to traditional acquisitions channels such as FedBizOpps.gov, making it easier for small or new businesses to sell goods or services to the government.

In an initial pilot involving five information technology projects, the SBA found that bids submitted through RFP-EZ were on average approximately 30 percent lower than bids submitted through FedBizOpps.gov. The agency also reported that “RFP-EZ attracted more than 270 businesses that until now had never approached the world of Federal contracting.”¹

Impact of RFP-EZ on Federal Bidding



Source: Small Business Administration

Taking a new approach to procurement clearly helped save money. While RFP-EZ’s use is limited to projects that fall below the threshold for simplified procurement rules – \$150,000 – the SBA estimates that around \$700 million worth of IT procurement in fiscal year 2014 would likely fall below the threshold, offering big opportunities for savings.

A new round of fellows is working to improve and scale RFP-EZ. The project was also developed open source with the code publicly available on GitHub, so cities or state government can also potentially adapt the initial work to their own procurement needs.

1. “RFP-EZ Delivers Savings for Taxpayers, New Opportunities for Small Business,” Karen Mills, U.S. Small Business Administration, May 15, 2013, <http://www.sba.gov/community/blogs/rfp-ez-delivers-savings-taxpayers-new-opportunities-small-business>

“I don’t think it occurs to many engineers that they could even do public policy.”

change.” A scholar agreed, “I think there’s a huge opportunity to communicate the potential for impact and the role of technology in that sector [civil society and government]. It’s kind of missing.”

Beyond exposure to the potential work in government and civil society, some interviewees also noted that, even for students with a nascent interest in public-minded careers, there is poor awareness of the long-term career paths available. Asked a nonprofit leader, “Do people who are studying to be technologists understand what their career options are?” A private sector technology expert said, “Part of the problem is there isn’t a clear career path,” explaining, “If you say, ‘I want to be somebody who does technology policy advocacy or I want to be a technologist for advocacy groups,’ nobody knows what that looks like.” Said a scholar, “Some of it is that especially students who have interest in this in a lot of places don’t have good access to advice on how to do it, or ways to get started in understanding government and policy.” A former policymaker agreed, “It is very hard to know for students what the career path is. They’re not sure first of all what kind of training they should be getting.” A scholar and former policymaker stated this affirmatively, “There are all sorts of different possible career paths and I do think there is a premium on helping people be more imaginative, flexible, and creative about their possible career paths.” A funder added, “Industry is driving the pipeline. Industry demands these people, therefore the pipeline

will produce these people,” warning, “The question is where they’ll pour out to.”

Recruitment

In between training or careers outside the public sector and civil society is the process of identifying and recruiting individuals with technical expertise and knowledge of technology into government or civil society. Interviewees described a range of challenges to successful recruitment, including: (1) compensation, (2) career path, (3) external perceptions, (4) classification, and (5) institutional culture.

1. Compensation

The level of compensation, particularly in relation to private sector opportunities for individuals with technical skills and technology expertise, was by far the most commonly cited barrier to effective recruitment by government and civil society. As a scholar said, “Pay is definitely a huge problem.” A private sector expert explained, “For the most part, it’s a financial exercise. You’re not going to get the smartest people because they’re going to make video games, because that’s where the money is and what they grew up wanting to do.” An advocate was blunt, “You can make a hell of a lot more money in the private sector than you can in the public sector or in civil society.” A scholar used nearly the same terms: “Anyone who can code can get paid a hell of a lot more in the private sector than they can in Washington.” An experienced policymaker summarized this point of view:

The people who think great thoughts on technology, they’re often in business and if they wanted to come to government, it would mean a substantial salary cut. Even professors at institutions make considerably more than the \$155,000 we can probably pay them, probably as a salary and then they do consulting [as well].

Current Salaries for Technology Occupations by Field

Occupation	Number Employed	Annual Mean Wage
COMPUTER OCCUPATIONS	3,456,500	\$80,020
Computer and Information Research Scientists	24,880	\$103,670
Computer and Information Analysts	554,710	\$84,520
Computer Systems Analysts	482,040	\$83,800
Information Security Analysts	72,670	\$89,290
Software Developers and Programmers	1,397,780	\$90,470
Computer Programmers	316,790	\$78,260
Software Developers, Applications	586,340	\$93,280
Software Developers, Systems Software	391,700	\$102,550
Web Developers	102,940	\$66,100
Database and Systems Administrators and Network Architects	599,800	\$80,910
Database Administrators	111,590	\$79,120
Network and Computer Systems Administrators	350,320	\$76,320
Computer Network Architects	137,890	\$94,000
Computer Support Specialists	693,610	\$53,230
Computer User Support Specialists	525,630	\$50,130
Computer Network Support Specialists	167,980	\$62,960
Computer Occupations, All Other	185,730	\$81,860

Figure 5. US Department of Labor, Bureau of Labor Statistics. Occupational Employment Statistics, May 2012. http://www.bls.gov/oes/current/oes_nat.htm#15-0000.

Cost of Education for Top 10 Undergraduate Computer Science and Engineering Schools

University	Tuition
Massachusetts Institute of Technology	\$42,050
Stanford University	\$42,690
Carnegie Mellon University	\$46,670
University of California at Berkeley	\$12,834 (Out of State: \$22,878)
Harvard University	\$37,576
Princeton University	\$40,170
University of California at Los Angeles	\$11,220 (Out of State: \$34,098)
Cornell University	\$45,130
Columbia University	\$45,028
University of Washington	\$11,307 (Out of State \$28,860)

Figure 6. This chart describes tuition costs for the top 10 American undergraduate computer science programs as listed in the U.S. News and World Report's list of "World's Best Universities: Computer Science." Data collected in May and June, 2013.

While the absolute financial gap between private sector and government or nonprofit employment was discussed frequently in the interviews, some also provided more extensive explanations. A nonprofit leader noted that the issue was not just a gap between the private and public sectors, but an intense private sector market for these in-demand skills: “The problem is that technologists are expensive because the markets are extremely competitive.” A policymaker also pointed out that private sector financial opportunities also extend beyond base compensation: “Where else do you get high-quality talent at reduced costs? That tends to be at startups. But what do you get at startups? An equity position.” Another policymaker described compensation in the broader context of the private sector working environment: “Hiring, pay scales, not having a cafeteria and a foosball table. And generally it’s not as sexy as working for a startup that’s going to IPO or flip to Google or Facebook for a ridiculous amount of money.”

Some said these compensation disparities could reinforce existing cultural challenges to increasing adoption of technology-influenced thinking, particularly in the sciences. According to a philanthropic leader, data scientists are “highly valued outside in industry, so what we’re seeing is as data science becomes more and more valued in industry, and science gets less and less funding, science gets more entrenched in traditional ways of assessing impact,” the individual said, adding, “In other words, the elite stay elite and the new guard have a hard time getting established.”

Interviewees also discussed the financial gulf between the private and public sectors as influenced by such issues as student debt. As a scholar said, the issue is “tuition costs, because the nonprofit sector doesn’t pay the kind of dollars a computer science expert or a lawyer can command.” This person added that “the

cost of tuition versus earnings capacity in the public sector is going to be an obstacle.”

The symmetrical challenge that interviewees described was the reality of relatively constrained resources in government and civil society to compete in this labor market. A nonprofit leader who has had success recruiting technologists said, “We have to pay a lot more than nonprofits in general because we have to pay a competitive wage,” but, in general, “The people who are interested don’t have the capacity or the financial resources to hire what they would like to hire.” This person referred to resources as the most significant challenge for recruitment: “Our biggest problem in hiring people is the money. Can we pay them enough?” Explained a private sector technology expert:

There’s kind of a different technologist pay scale. If you’re [major nonprofit] and you’re going to hire a really talented web designer or programmer or whatever, you’re competing in a labor market that probably isn’t as accustomed to the nonprofit wage.

Some interviewees said the same is true of government. According to a scholar, a government agency “mentioned they’d be happy to host students there for the summer as interns, but they don’t really have any budget for it, so it would be for the most part unpaid internships,” continuing, “My students are in principle very interested,” but “these same students have offers from Microsoft or Google for ridiculous salaries.” A nonprofit technology expert described the factors that can impact decision-making in many nonprofits: “If you’re a nonprofit person and you’re not making a lot of money or you’re a government person, are you willing to pay a top wage for a tech person to come in?”

Some interviewees noted that the financial considerations in part explain why it is more

senior technology talent that has started to enter the public sector. Said a private sector expert, “In terms of public sector, it’s something people do once they have money. It’s really true in the tech sector: ‘I made a ton of money at Google, and now I’ll give it back.’”

2. Career Path

As previously described, lack of knowledge or concerns about potential career paths was also discussed by several interviewees as a potential barrier to recruitment. A former policymaker said, “There are a lot of people ready to make the jump [to government or civil society] but you have to find them and convince them that there is a career track available.” Said a scholar, “There’s always a chicken and an egg problem. As an institution, you don’t want to be churning out people when there aren’t job possibilities.” Added a funder, “It’s just basic opportunity. Where do you go if you’re a civic technologist, if you’re really interested in this?” A scholar agreed, “I think for the very top, point 1 percent of people who come in thinking they have a path, they continue to have a path, I just think the numbers are very small.” An advocate put it succinctly, “There’s plenty of technologists who want to make the world a better place. That’s not a problem. The problem is making a path for them and giving them the skills to do it well.”

Those interviewed noted the effect of limited or constricted career paths and options on how technical experts and technologists approach potential opportunities. Said a policymaker, “The kind of people we’re talking about are the people who want to have an impact. They might not plan on staying here forever. They’ll spend a chunk of their professional lives here and then move on. Even that’s a model of working that’s not really supported in local government.” A funder noted the challenge that exists “if you’re not respected, and there’s no career path, or there’s no way to develop yourself and become

excellent and be recognized as that in these sectors unless you fit a particular model.” An advocate provided the private sector as a clear contrast: “Your career path in Silicon Valley is pretty clear. The examples of what success are – not just gauged in money but also vis-a-vis prestige and where you go – it’s pretty laid out for you.”

3. External Perceptions

Another factor cited in interviews concerned perceptions (and potential misperceptions) by technologists and those with technical expertise regarding work in government and civil society. A scholar noted, “I think there’s a little bit of a prestige issue. I think in some cases public interest is not seen as prestigious as other areas.” Said a policymaker and technologist, “It is completely counterintuitive that someone like me would take a job in government, and I think that’s part of the problem,” continuing, “I sit down and have to invest a huge amount of effort for every hire.” A scholar explained:

Clearly, there are both monetary and prestige incentives to enter the private sector. A lot of our graduates with the right set of technical skills who could address public sector problems are going to places like Google, IBM, Microsoft, LinkedIn, Facebook, all of these tech firms that are considered very prestigious places to work.

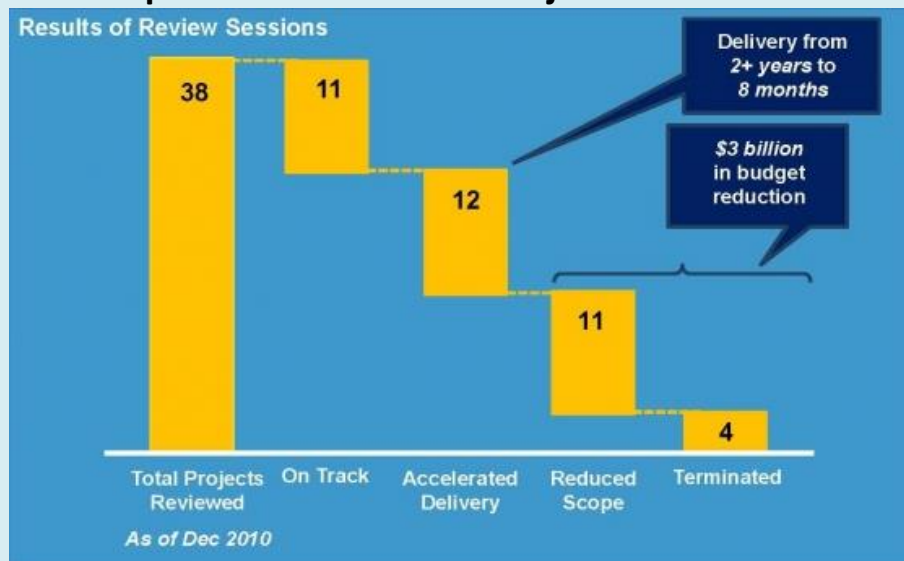
A policymaker also noted, “I think there are perception issues. Most people who have a tech or engineering background might think working in the federal government would be a major bummer.” Said a funder, “If I’m a young technologist and I want to be the next Tumblr or eBay or whatever, there’s no value proposition that gets me there [into government or civil society].”

Case Study: Improving IT Project Management

Emulating private-sector technology management practices lowers costs and supports innovation

Project management styles more common to tech-sector businesses can pay significant dividends when applied to government operations. To cut costs, improve efficiency, and increase effectiveness, Peter Orszag, then director of the Office of Management and Budget (OMB), ordered a review of high-risk IT projects in July 2010, declaring that “agencies will be required to present improvement plans to the CIO for projects that are behind schedule or over budget.”¹ These reviews examined 38 projects through the end of 2010. Four were terminated, 11 had their scope reduced, and 12 had their delivery of meaningful functions accelerated. In total, OMB estimated that these reviews produced \$3 billion in lifecycle budget reductions.²

Impact of IT Review on Project Performance



Source: Office of Management and Budget

Then-Chief Information Officer Vivek Kundra, who conducted the reviews, also developed a 25-point implementation plan for improving federal IT management practices. Key recommendations, many of which are in the process of being implemented, included “shift to a ‘cloud first’ policy,” “develop a strategy for shared services,” “launch a technology fellows program,” and “reduce barriers to entry for small innovative technology companies.”³

1. “Cutting Waste by Reforming IT,” Peter Orszag, Office of Management and Budget, June 28, 2010, <http://www.whitehouse.gov/omb/blog/10/06/28/Cutting-Waste-by-Reforming-IT/>

2. “Saving Money on Government IT,” Vivek Kundra, The White House Blog, December 10, 2010, <http://www.whitehouse.gov/blog/2010/12/10/saving-money-government-it;>

In a government accounting dispute, the Government Accountability Office has challenged the precise magnitude of the savings. “Information Technology: Additional Executive Review Sessions Needed to Address Troubled Projects,” Government Accountability Office, June 2013, <http://gao.gov/assets/660/655214.pdf>

3. “25 Point Implementation Plan to Reform Federal Information Technology Management,” Vivek Kundra, The White House, December 9, 2010, <http://www.dhs.gov/sites/default/files/publications/digital-strategy/25-point-implementation-plan-to-reform-federal-it.pdf>

Some of those interviewed suggested that such perceptions may stem from negative associations with public-minded institutions. For example, a private sector expert said, “It has to do with the general sense that if you want to do something more exciting and leading edge, you do it with innovators, not with people at the back of the train. And that’s unfortunately what the reputation of the public sector is.” An advocate echoed this assessment: “Often the technical issues aren’t that interesting [in civil society]. If you’re someone who is bright and sharp on technical issues, you want to be working on the cutting edge. Where we are in law and policy is very far behind.” A former policymaker discussed a different association: “In civil society people with those sorts of skills just don’t think of themselves as policy advocates because that has the taint of lobbying.” This individual continued:

People I know who have those skills, they don’t like doing the kinds of things that you do as a political advocate. Public speaking, performance, talking about things that you don’t know that well. Persuasion and compromise and the irrationalities of the political system. Those things I have seen trouble the technically minded.

Perceptions about geography were also raised in some conversations. Said a scholar, “Another factor is geographic location. Most of the public sector stuff is in the D.C. area and I have a couple of students that, for various reasons, really wanted to be on the West Coast and

there are limited opportunities on the West Coast [in these sectors].”

Some did note that these perceptions did not always prevail among technologists or technical experts more advanced in their careers, especially with regard to government service at

an adequately high level. A nonprofit leader deeply familiar with efforts to draw private sector talent into the public sector noted that some adopt the following perspective: “I need to move from salary to significance.” An advocate also noted that “you can either draw people in because they can come out and market it better or because you can take people mid-career

because they can come in, take a pay cut” for a high-profile government position. This individual did caution that “there’s nothing like that in the public interest sector.”

4. Classification

One problem with both abstract and concrete manifestations raised in the interviews was the failure of government and civil society to properly identify and conceptualize the right role for technical experts and those with technology knowledge in their institutions. A private sector technology expert was blunt, “People don’t even know that they need these folks.” Said another private sector voice, “They think of technology as a slice of the pie, but it’s actually the pan that supports everything they do.” As a result of this misperception, this person said, “Their funding streams don’t allow them to hire technologists, their programmatic approach doesn’t allow them to hire technologists.”

“If you want to do something more exciting and leading edge, you do it with innovators, not with people at the back of the train. And that’s unfortunately what the reputation of the public sector is.”

This was perceived as impacting how those with technology training seek out and apply for jobs. A former policymaker explained, “Those people don’t apply for those kinds of jobs [in government and civil society] because the job description that goes out with the position – the call for the hire, says, ‘We want a degree in political science and three years of law and public policy’ – it doesn’t say a master’s degree in electrical engineering.”

With regard to government specifically, those interviewed described both a lack of planning and vision for how to prioritize technology expertise and an inability to develop civil service hiring processes that would yield candidates with these skills. A policymaker said with regard to federal government, “The agencies that are involved in domestic and social policy programs tend not to recruit these people because they don’t necessarily view it as being core to their mission.” A scholar and former policymaker agreed, “Understanding technology is not a basic skill for people coming into government, so it’s not a hiring criteria except for these specialized roles in government.” Said another scholar and former policymaker, the challenge is “a failure to create policy positions where tech is a criterion sought,” explaining:

Right now, only the IT folks who sit deep in the bureaucracy doing tech support need to have an engineering background. We need to recruit – from Cabinet Secretaries on down – positions for which IT experience and interest are prerequisites. We need to create innovation roles like CTO [Chief Technology Officer] that sit at the right hand of the Secretary.

This vision gap was seen by interviewees as directly thwarting effective hiring processes. A policymaker said, “If they’re coming in with this startup ethos, we don’t have policies and procedures that make it easy to bring them into government.” Another said, “The job categories

don’t exist in most governments for these kinds of people. I’m trying to hire a data analyst, and we didn’t have the personnel classification for it.” Still another policymaker added, “Government needs to figure out the descriptions on the budget lines such that they have the flexibility to hire somebody who may not have years and years and years of experience.” A private sector expert said a problem is the “civil service requirement. In New York State, for example, if you want to hire a data architect,” a challenge is that “you can’t actually hire that person because civil service union contracts describe an IT professional.”

5. Institutional Culture

In addition to a failure in many public sector and civil society institutions to make technology expertise a human resources priority, several interviewees described an institutional culture – primarily in government – that discouraged effective recruitment of technical experts and technologists. This was generally attributed to risk aversion. Said a private sector expert, “Government is generally reticent to innovate because it’s a highly risk-averse environment. It’s atrophied over decades of bureaucracy and, because it’s generally administered through a political process, it operates in a culture of fear—fear of innovation, fear of risk.” A nonprofit leader described a similar phenomenon, “One world [the private technology sector] is focused on breaking things and failing forward fast,” but “the other world [government] is focused on not breaking anything ever.”

“Government is generally reticent to innovate because it’s a highly risk-averse environment.”

Retention

The final stage in the talent pipeline includes how skills are deployed in government and civil society settings, and the structures in place to help individuals stay in the sector and grow. Interviewees pointed to three problems around current retention structures: (1) institutional constraints, (2) an inability to pursue groundbreaking work and to innovate, (3) the lack of opportunities for career development, and (4) a paucity of ongoing, prestigious research opportunities valuable to individuals with research backgrounds.

1. Institutional Constraints

Several interviewees commented that technologists and technical experts can find public sector and civil society organizations constraining and bureaucratic, particularly when compared to private sector companies. A private sector expert said, “Most of them have left [government] out of frustration. There’s no sustainability.” Explained a policymaker, “You’re not necessarily working on cool things that are going to IPO—instead you’re working on big bureaucratic systems.” According to a scholar, “I think everyone who has worked in a private firm is frustrated by the restrictions that government puts on you.” Another private sector expert indicated that “If they can’t get basic things to function and use the basic systems they know, they ask themselves, ‘Why am I constantly banging my head into a wall when I’m underpaid and over-scrutinized when I can’t even work on the things I care about?’” A private sector expert explained how these considerations figure into decision-making:

It has all to do with what’s the value proposition to do that for the person. It is not only but partly related to compensation; it’s partly related to career paths; it’s partly related to the structure in what the job is and the flexibility and freedom.

2. Inability to Innovate

Those interviewed explained that many technical experts actively seek out environments that foster innovative thinking and creativity, but that government and civil society institutions may not be fertile terrain for such pursuits. An advocate said, “A lot of it is resources and the ability to have impact. To the extent that you’re looking for cutting-edge uses of technology, it’s not like you’re going to find many opportunities for development in the public sphere.” When asked about barriers to retention in the sector, a scholar and former policymaker referred to “anecdotally, the inability to do creative work and to try new things.” This individual also said that people with technical and technological expertise tend to be less effective within public sector organizations due to those institutions’ “lack of willingness to experiment, to try new platforms, to quickly and easily procure new technology, to work with leaders who are interested in or even understand the power of tech to solve problems.” A nonprofit leader largely echoed this view, stating that many technologists “just have a perception in their head that you can’t make change happen in government,” specifically noting that “the way in which government roles are positioned, they aren’t [asking individuals to] build great modern open source apps.” Instead, this person explained, technologists are asked to “manage the IT infrastructure that we have.” A June 2013 *New York Times* article about the flight to the private sector of individuals who had been members of the innovative data analytics team for President Obama’s 2012 reelection campaign underscored this perception. The article described the perspective of one such individual, who:

[T]reated his shift from selling Obama to selling Caesars [Palace Casino] as a small discomfort that was necessary if he wanted

to keep working on the technological advancements he and his colleagues developed on the campaign. In a nonpresidential year, no political effort would have the money to finance what he described as the “huge R.&D. project” that the Obama campaign effectively became. The resources for that kind of project could now be found only in corporate America. If companies with big budgets wanted members of Obama’s team to do for them whatever it was that they did for the president, [he] couldn’t see why they shouldn’t answer the call.⁶

3. Limited Career Development

Interviewees confirmed that previously mentioned anxieties about the lack of career development in government and civil society reflect the reality. An acute aspect of this problem raised by several individuals was the general paucity of mentors to help develop and train younger technologists and technical experts. Asked an advocate, “The problem is a vicious cycle—who is going to mentor this person?” This individual also noted that “We’ve got plenty of mentors for lawyers and government affairs people and communications people, but we don’t have anyone to mentor an engineer who is involved in public policy.” A policymaker concurred, “If you’re an entrepreneurial person who’s working here – if you’re lucky enough to wind up in a group with other like-minded people – there are opportunities for mentorship, but otherwise you’re pretty much on your own.” A scholar and former policymaker said, “I think there’s an oversupply, frankly, of students coming out who would like to be in the mix and can’t find places for themselves,” in part because “the

framework of existing civil society organizations can’t afford to train anybody. They have to come fully formed.”

Advancement challenges were also mentioned in some interviews. Said a scholar, “One of the problems people have is, ‘Where do I go from here? And I think that’s true even in very storied groups.’” A scholar added, “The question is, ‘What is the career path for an ambitious and really skilled person who is young and wants to make a career in this space?’”

Longer-term professional development was also mentioned. One academic administrator said that “another part of it is intellectual perks – creating community – so people get the professional growth they would get at another organization.”

4. Lack of Research Opportunities

Some suggested that lack of funding and opportunities to conduct and publish research diminished the appeal of staying in public sector or civil society careers for individuals with strong technology research backgrounds. One scholar said, “My students for the most part are being educated with PhDs, research-oriented PhDs. If my students go and work for a civil society organization, there’s going to be very limited opportunities for them to keep doing research.” This individual added that “there are some organizations that bring in some grant money and have folks who do some research, but I think it’s very different than having an academic research position.” This person continued by highlighting the importance of providing ongoing research opportunities, noting, “I feel like these folks got a PhD because they want to do research and to maintain their

⁶ “Data You Can Believe In,” Jim Rutenberg, *New York Times*, June 30, 2013
<http://www.nytimes.com/2013/06/23/magazine/th>

e-obama-campaigns-digital-masterminds-cash-in.html?pagewanted=all

expertise they need to keep doing the research.”

Case Study: Creating Reusable Components

In-house technology capacity saves money and provides flexibility in California

Not all high-quality technology projects involve creating something from scratch—in many cases, the best application of tech-savvy thinking is developing something that can be reused many times.

California provides one example of the impact of deploying this kind of thinking.¹ In 2006, the state embarked on a redesign of its state websites, which were largely relying upon templates developed in 2001. Working collaboratively with state webmasters and other staff technology experts, new templates were developed that met modern needs and standards. The work was done in-house, aided in part by webmasters doing voluntary work to contribute to the project.²

Once complete, the templates were hosted on a public website and webmasters could easily implement the templates across state websites. Ultimately, about 80 percent of agencies were able to update their websites using the new templates and in-house resources, which the state estimates saved \$56 million. Previously, the state reported, “No state agency was available to provide assistance to other agencies as they updated their websites, essentially leaving them with no other option but to hire vendors.” The new templates, which have been updated several times since, filled that need, and the state’s web presence placed in the Best of the Web competition in 2008, 2009, 2010, and 2012.

1. “How open government can help states save money,” John F Moore, *CNN Money*, December 10, 2010, <http://tech.fortune.cnn.com/2010/12/10/how-open-government-can-help-states-save-money/>

2. “Web Refresh,” California eServices, <http://www.eservices.ca.gov/webrefresh.htm>; “The role of the volunteer workforce in California’s Best of The Web victory,” John F. Moore, *Government in the Lab*, November 28, 2010, <http://web.archive.org/web/20110108123350/http://govinthelab.com/the-role-of-the-volunteer-workforce-in-californias-best-of-the-web-victory/>

A Problem that Will Not Solve Itself

Despite acknowledgements of progress on several fronts, interviewees were clear that gaps in the talent pipeline that carries technologists into government and civil society would likely not be addressed – at least with meaningful alacrity – in the absence of intervention. An advocate said, “I really believe it will not solve itself. I think you have to actively create the vehicles for this fertilization to happen.” One nonprofit leader felt the problem might solve itself in 20 years, but declared, “I don’t want a painful 20 years. I don’t want the next 20 years to suck while we hope for it to get better.” This person added, “The longer and longer we wait, the longer and longer we’re going to have to wait – exponentially – for better results.” A scholar agreed, “It may solve itself, but if you’re thinking in academic years, you’re probably talking 20-30 years down the road, because the time it takes to have a time shift in an academic universe.” A former policymaker acknowledged that the problem “would solve itself in 30 years, but that’s not going to be good enough.” This individual explained that technical knowledge “will gradually become part of common knowledge at a higher level than it is today, but that will just raise the bar of what it means to be a specialist.” A private sector technology expert said that “we’ve still got some holes out there,” continuing, “It surprises me because, if you asked me 20 years ago, I’d think this would definitely be a solved problem by now.”

SOLUTIONS: APPROACHES TO BUILDING THE PIPELINE

Those interviewed suggested potential methods to improve the robustness of the pipeline at all stages, from training, to recruitment, to retention. Contributions sometimes focused on particular institutional entities, while others spanned the range of stakeholders involved in the pipeline.

Training

There were many comments across the interviews with regard to how universities and centers of training could better foster interest in the public sector and civil society in addition to more effectively endowing students with the necessary skills to operate in these environments. Contributions largely reflected three categories: (1) providing greater opportunities for interdisciplinary training; (2) improving exposure to public sector and civil society careers; and (3) developing institutional partnerships.

1. Interdisciplinary Training

The importance of interdisciplinary teaching was repeatedly cited as an imperative. As a scholar said, “Real-world problems do not have disciplinary boundaries. In order to address those problems, you need an environment that encourages thinking across boundaries and ideally removes those boundaries.” This individual noted that:

The traditional policy curriculum and the traditional curriculum in disciplines like

computer science or statistics are pretty separate. I think there is a big need for the creation of academic programs and course curricula that start bridging the gaps between these fields.

Said a former policymaker, “There’s a need to develop a more policy-oriented set of sub-disciplines in computer science first so that we can have high-quality research being done and, second of all, so that the idea of doing this sort of work is legitimized.” Another former policymaker and current scholar was blunt: “You really need to encourage interdisciplinary connections to be effective.” An additional scholar added, “I think what you want is you want to have a place that is thoroughly interdisciplinary, that looks at issues around technology from 360 degrees.” One scholar phrased this conclusion in terms of outcomes: “How do you produce people who are comfortable sitting at the intersection of technology and people interested in public service?”

Some noted that the need for interdisciplinary teaching and courses not only creates the space for more appropriate training, but also provides a home for scholars who sit at the interstices between technology expertise and policy expertise. A former policymaker and scholar said:

Here’s the problem or the opportunity. I personally don’t fit into any school and yet I think that the tenor of these questions is creating more people like me, but we don’t fit anywhere. So what are you going to do? Is there any program or any way to test centers or nodes of learning that would generate this interdisciplinary, lifelong learner?

A private sector expert affirmed this perspective, noting, “The thing is that most of the interesting questions that would be relevant

“You really need to encourage interdisciplinary connections to be effective.”

to this domain don't fit squarely in one discipline—there's computer science, law, informatics." A funder involved in a similar effort to encourage the development of new kinds of expertise spoke to the issue of legitimizing interdisciplinary and practical research: "What we discovered is what we really need to do is essentially establish the value that these teams and these people are to academic research."

Interviewees highlighted the important role real-world interdisciplinary training opportunities could play for young technologists. Said an advocate and former policymaker, "It was sort of the end of the era when Media Access Project (MAP) went out of business because MAP was the training center for a lot of young lawyers who became important people in the community," noting, "There is no such thing as MAP for building technical skills into the community [now.]" The individual suggested that in a new approach to training "you could do it in one institution, you could provide a kind of Rockwoods-style thing where you send people to Berkman for six weeks."

Those interviewed discussed other kinds of skills or experiences that should figure into a more broad-based approach to training. As a private sector expert said, "Part of that is a broader educational mission of sensitizing engineers to the issues, like the social context of what they do."

Some said that it was also important to expose civic-minded students seeking non-technical degrees to technology issues. Noted a local policymaker, "The people most willing to go into government are the thousands in our public policy and public administration grad schools. Those university programs should be more heavily recruiting faculty that can teach classes that ensure that all graduates have some command of technology." This person

continued, "That way, any interested graduate can have a meaningful understanding of how technology works and intersects with other domains and practices," adding, "This will not fully meet the skill needs, but it will be an important component."

Others suggested that technology training could also be extended to non-technical experts. A former policymaker explained, "Many ideas for training solutions focus on helping budding technologists become policy people," the individual said, "But what if you took seasoned policy people and taught them about technology?"

2. *Exposure*

Ensuring that students were made aware of career opportunities in the public sector and civil society was also raised during the interviews. A private sector expert reflected on his own experience: "Part of what was incredibly meaningful to me as an engineering student was just hearing people come and speak who had done some of this work." This individual continued, "The gap is in finding or creating programs that bring technologists into this space, that help learn about the possibilities and train them in this. It's not something you just pick up." An advocate pointed to the Princeton University Center for Information Technology Policy as an example of this: "My understanding is that [Ed Felten's] students do a lot of this hands on work. He incorporates public policy in his teaching." A scholar suggested "requiring students in technical tracks to take political science courses, to take courses that expose students to how policies are made. Getting them involved in their professional societies, and helping them be aware of the opportunities."

Some also spoke to the inculcation of the right ethos or set of values around opportunities in the public sector and civil society. A

policymaker said to “view it as community service in the digital age” and spoke to the “need to harness the civic engineering, community hacker type.” A version of this analysis was also applied to institutions themselves. As a scholar asked, “I think there’s partially a programmatic perspective, which is how do you get academic departments to reflect the fact that there may be a career path?” One academic administrator was optimistic about the change in values and culture in academic settings:

In academia, in particular, but I would also argue in the nonprofit world, I think things are generally getting better. What we see with the young academics, what we see with the young fellows getting academic appointments is they are geekier, they are just getting better.

As this individual said, “Part of that is age.”

Not all interviewees equated success with moving technical experts and technologists out of academic settings. Said one scholar, “I don’t know that necessarily you have to have a career in government or civil society in order to play this role. As an academic I’m able to play this role. I think you shouldn’t overlook that.” A policymaker noted, “A lot of it really does get done by graduate students. The reason that’s important is that if we want to make sure that research gets done that addresses public sector social questions and priorities,” adding, “There has to be a professional rewards structure that says to graduate students, ‘You can have a good career working on these kinds of issues.’”

Those interviewed also commented on the significance of practical training to expose students to additional opportunities.⁷ One scholar said that training should be “combined

with some sort of practical opportunity to do research that has some connection, some hook with public policy.” A scholar and former policymaker explained, “In school, we need to treat the whole thing much more like community college—more trade-oriented externships, that kind of thing more practical than theoretical. And there’s much more than could be done there.” This person continued, “Just getting rid of the idea of the four-year degree would help, and the limited master’s degrees that are now provided.” A former policymaker said, “The way that I’ve watched people develop is that there’s a certain amount of academic preparation that is required,” but that “you also have to have the experience of in some sense of really being engaged in the policy process.”

Some perceived the training years as a crucial time to have an impact. An advocate urged “finding ways to intervene when people are still in school. I think that first job is tremendously important. Once you get on a path with your first job or second job, I think people have a hard time stepping off it.”

3. Partnerships

Various kinds of partnerships between academic institutions and with public sector and civil society organizations were also suggested. An academic administrator said, “Having interaction among the different centers whether they’re at the academy or other bodies of activity is key to sharing some of those lessons and figuring out how do we work on the pipeline, how do we work on substantive issues together.” An advocate said, “Maybe some of our more experienced advocates need to be in universities. We need advocates-in-residence.” A scholar added, “I also think there are probably

⁷ The role of civil society and government in implementing this recommendation is discussed at greater length in subsequent sections of this report.

untapped opportunities to sort of network and connect and organize the folks who are doing this stuff.” A funder working with universities noted that “you’ll have organizations, particularly those who are the nodes of affinity groups and conferences and trade groups that can get the message out there [about a new or different approach].” Another funder said:

There is a lot of interesting activity happening in academia, and how do you think about not just taking individual people and putting them into a pipeline, but how do you build relationships with academia in order to help, just to serve as laboratories or research support for public policy in this area? Is there also a need to create some sort of institutional networks of academic institutions that can also help serve the function of helping ensure the public policy is informed by good information because that’s sort of what they do? That would be helpful.

A policymaker agreed, “I think we will see more innovation through partners with academia than with partnerships in the private sector.” It is worth noting, however, that academic institutions are already partnering with private organizations. As a scholar said, “You’re seeing a partnership where larger organizations like Google and Microsoft are funding academic research.”

Recent new accounts show the potential for non-traditional partnerships to fill in gaps in internal capacity. In an interview with *The Wall*

“There is clearly a need in this space to have more people with the right skills for doing this cross-sector translation, understanding how to connect social and civil challenges to technology tools.”

Street Journal about cities working with hackers, Brenna Berman of the City of Chicago’s Department of Innovation and Technology said, “As a city IT department, we’re never going to be able to build all the apps the people of [city] could want” and suggested that making data sets accessible to the public can help spark public action.⁸

Interviewees did raise key considerations to ensure that such partnerships would be successful. A policymaker cautioned that, in order to make cross-sector partnerships work, it is important to have people with cross-disciplinary skill sets: “Much of the work in applying technology to address social and/or civil issues involves collaboration across sectors. However, during these sorts of collaborative projects – say, if a university is working with a community organization or a government unit is working with a tech company – there is often enough of a difference in culture and language that the various partners quickly fall out of sync in terms of what needs to get

done and how to do it.” This person added, “Needless to say, this results in significant communications problems and thus complicates actually completing the work.” As a result, the policymaker noted:

There is clearly a need in this space to have more people with the right skills for doing this cross-sector translation, understanding how to connect social and civil challenges to technology tools. People with these skills are often generalists with a varied work history

⁸ “Hackers Called Into Civic Duty,” Ben Kesling, *Wall Street Journal*, August 12, 2013,

online.wsj.com/article/SB10001424127887324263404578613850076916028.html

and generally have a background in some or all of design or design thinking, community outreach, tech strategy, and so on.

Creating Connections

Those interviewed identified a range of opportunities to build more robust connections between training opportunities and public sector and civil society institutions. The principal recommendations included:

(1) establishing a greater number of internship and fellowship opportunities, and (2) establishing collaborative spaces.

1. Internships and Fellowships

Structured internship and fellowship opportunities were frequently cited in the interviews as a way to both expose and train technical experts and those with technology expertise for careers in the public sector and civil society. As an advocate explained, “In order to really get people aware of what the opportunities are, you kind of have to a recruitment structure and an outreach structure to popularize what you can do.” Said a scholar, “It’s always surprising to me that there’s not more advocacy and recruitment for students who are particularly skilled in this area at an earlier stage.” A former policymaker and scholar added, “The only model I really believe in is apprenticeship, mentorship. Working very closely with someone who is inspirational and bright.”

One approach, recommended for both government and civil society, was to facilitate structured internships. One nonprofit leader said, “One way we’ve actually been quite successful in hiring people is through internships. This is one of the things I thought before because what we’ve done is when schools like RPI [Rensselaer Polytechnic Institute] and schools like that that produce a

lot of people interested in technology.” This person noted that “there are at least five technologists in our office now who came to us and worked part-time for us in one way or another.” This individual further added that “the requiring of internships is something that could be instituted so they’d get real experience,” explaining, “There could be a curated list of ‘hungry’ NGOs and these groups could put out the word that interns were available.”

Another model discussed was that of funded fellowships. An advocate was enthusiastic: “A two-year engineering fellowship—that would be great.” This suggestion was offered most commonly in relation to government. A policymaker said in the context of city government:

I think there can always be more fellowship programs. They’re a way you invest in talent. It can be both a safe way for the person you’re trying to recruit and the host city to bring someone on who has a less traditional background. I think there’s a lot of opportunities to bring in talent that way.

A former policymaker and scholar said that “if you just label it a fellowship program,” then “it’s going to help create talented public servants.” This person continued, “Create some fellowships that could be open to entry-level applicants on a competitive basis.” The same individual urged a bolder vision:

In a dream world for me, the federal government would create a technology policy fellowship and they’d have 10 agencies come together and try to create the fellowship and reduce the friction between student interest and finding the opportunity. We need, in other words, something like Teach for America that makes these opportunities easier to access.

A scholar spoke in favor of “having a couple scholarships that are very visible, the way big

companies try to get buzz around their products by giving them to influencers.”

The idea of fellowships was not restricted to graduating students. A former policymaker recommended experimenting with current academics rotating into agencies: “You couldn’t have smart engineers or tech people from a company come and do a rotation at the FTC, [but] you could do it through academia.” An advocate suggested a different approach to engage current students:

[The] component parts are a faculty that both educates and is plugged into the policy environment, classes that can be clinical in structure and that might be expansive to include practitioners who want a policy practicum...[Students] could get a fellowship or something to come to the university of X in D.C. and work on whatever the policy issues are of that semester, that year.

Another former policymaker suggested that the government could work to better align existing fellowship programs with needs for technologists. The individual suggested, “You might also explore how existing government fellowship programs could be leveraged.” Two examples offered by the former policymaker were the AAAS Science & Technology Policy Fellowship, which places scientists with doctoral degrees in congressional and executive branch positions, and the Franklin Fellows Program at the State Department, which brings mid-career and senior professionals to work for the department and the United States Agency for International Development in a variety of roles.

Others suggested the importance of multi-sector partnerships. A private sector expert said, “I think it’s a public sector problem, but I do think the private sector, and philanthropy, and the not-for-profit sector can really accelerate [improvements in the pipeline] if they give attention to that.”

Rotations in and out of various sectors also emerged as a training methodology in select interviews. A scholar suggested such an approach for law students, providing training-oriented rotations, explaining it would be “somewhat akin to the medical school model, which is we looked at doing something in the third year that would pair a cohort of students with—initially I’m thinking a law firm, a company, a government agency, all organized around a particular theme” The individual continued, describing that “what would happen is that a student does an academic and sector-supervised activity for a couple of months. Think of it as a clerkship rotation.” The ultimate impact of this approach, the individual said, is that, “At the end of the day, these students then have a combination of academic training and a skill set of what is needed in the private sector.”

While there was significant endorsement and praise for fellowships, they were not seen as a panacea. One nonprofit leader noted that “fellowships are catching on for cities” because they don’t “come across as a threat to unions because they’re short term” and they tend to be “specially financed, just as a mayor’s innovation thing.” This person lauded such approaches, but noted that “The problem is that, if you want to invest in a top notch innovation team, you have to make it full time and you have to pay them well.”

2. Establishing Collaborative Spaces

A set of interviewees noted that, beyond or instead of boosting the sheer numbers of technologists working government and civil society, there was a need to create more collaborative spaces. Said a private sector expert working on developing such a space, “There’s a need to actually create something,” describing, “A physical center where we can offer technology professionals one-week, two-week, three-week boot camps on public policy

regulation so when they're thinking about their start up – call it Uber, AirBnB – so they can have some kind of understanding how government works.” This person’s vision included “a civic incubator and the teachers would be people like Beth Noveck or Susan Crawford or Clay Shirky.” A former policymaker said:

It’s also part of what will encourage all students – undergraduates but especially graduate students – to be able to focus on these issues. There are variety of ways that could happen, [such as] partnerships between the social justice oriented philanthropies and government agencies.

A nonprofit leader added that the strongest need is not for “an increased number of technologists [in government and civil society] per se, but it’s a need for spaces for that collaboration.”

This concept was extended to cooperation between policymakers and scholars. A policymaker who was also supportive of building capacity within government highlighted the value of developing processes that could help government collaborate with scholars. The policymaker explained, “A lot of times, academics find it difficult to provide concrete policy recommendations, so there are a set of things that could be done to increase the interaction between academics and policymakers.” The problem, the individual continued, is “policymakers don’t have time to read the literature” and “on the university side, government is a black box to academics.” To address this disconnect, the policymaker suggested:

There is a useful role for intermediary organizations that can help mediate the relations between government policymakers and academics. That would include interviewing policymakers on ‘What kind of questions would you like advance?’ and, on the academic side, give them some training

and at least provide online materials so they know what are the tools policymakers use to advance a particular policy objective.

Enhancing Existing Institutions

Many interviewees indicated that capacity-building in civil society and governmental institutions would have a role to play in improving the pipeline. Recommendations were divided into several categories: (1) shifting the culture, (2) considering activity outside of institutions (particularly government), (3) building rotations, (4) crafting public-private partnerships, (5) building internal capacity, and (6) leading the charge.

1. *Shifting the Culture*

As discussed previously in this report, cultural barriers in public sector and civil society organizations were considered significant impediments to effective recruiting of individuals with technical skills and technology expertise, as well as substantial deterrents to potential job seekers. To address this, some of those interviewed focused on improving the culture of government and civil society institutions to help them cultivate a more friendly internal and external orientation toward technology. A scholar and former policymaker urged a “larger civil society [presence], greater capacity, [and] more awareness in government offices that they need this kind of person, and more mid-level managers to mentor these people.” A private sector expert elaborated:

On the demand side, there’s a lot to be done to educate the community on what it’s missing. I think a lot of it is just exposing people to best practices, showing them good examples of what their peers are doing. Some of it is some measure of capacity-building within the community, giving organizations the ability to go out and hire a technologist

that they couldn't have before it isn't some program-tied position they can easily fund.

Several interviewees felt that a more hospitable culture could trump other considerations, such as the financial desserts of private sector work. One scholar said, "I really think it's about incentives and motivation," noting that individuals with these skills "need to have tasted what it feels like to make impact and impact other people lives." This individual ultimately argued, "I think money will always lose out—if people can make a major impact, they will choose to do that over making money." Another scholar agreed, "I think if you make the environment attractive enough," then "basically the word will spread." A nonprofit leader who has had success building such a practice agreed:

Our labs team are really young, just out of school, [but they] want to work in the public interest sector. And we have a bunch of people who worked for consulting firms, and didn't like that pay-for-hire business and really wanted to get into the social sector.

According to an academic administrator, "I think the way that you compensate for the career track and the financial benefits," is through asking, "How do you create a great technology practice within your organization?"

Others urged efforts to address the endemic disconnect in policymaking institutions between policy and information technology. A former policymaker declared, "We need to popularize the idea in Washington that code is policy. Or at least, it can be." The individual continued, "One of [the Open Technology Institute's] innovations is to demonstrate that building software to support Internet freedom in practice is just as powerful in Washington as writing policy papers explaining why this is a human rights issue that should be prioritized in government." The policymaker noted, "Code as a form of public policy development should be a booming

industry in think tanks and start transforming the culture of organizations—but it isn't. It's a sideshow at the moment." The individual said that "if some of the major think tanks had big programs of full of technologists building software alongside the usual packs of lawyers and political scientists writing policy briefs," they would create "an attractive frontier for coders with an itch for politics." If there were "a group of interested funders with this perspective," the former policymaker suggested, it "will quickly entice savvy executive directors to propose new organizational structures and programs to accommodate this interest."

2. Building Capacity Outside of Government

There was a debate among interviewees about whether to create technology capacity within public institutions, or outside of them. Comments on this issue were generally applied specifically to government. Those who argued that such capacity should not be built in government – at least not exclusively – offered a range of justifications. Among the strongest admonitions came from a private sector expert, "If the challenge is to bring more people into government, I think that's a fool's errand...I think people should be building stuff out of government." This individual suggested, "If you create a civic startup that is for-profit, then you've got somebody who's making money, has an incentive to make money from a capitalistic perspective." Another private sector voice agreed, "I think the incentive to do it is that there is a significant potential for private sector financial return using public sector data."

Even some of those who advocated enhanced government capacity recognized the need for more robust cross-sector collaboration outside of government. A policymaker declared that identifying effective ways to deploy outside capacity was crucial, "given that you're always going to have a lot more talent in the private

sector than you are in government.” This person noted:

There are a couple different models. You now have a number of open innovation marketplaces where you have seekers and solvers, where a seeker identifies a problem they have and a solver solves it. It exists in big data with Kaggle. It exists with the development of software – Top Coder – and it exists for a much broader range of technical problems, which is InnoCentive. We’re encouraging the government to start using these innovative approaches. Government doesn’t need to be able to do everything in house, but it does need to articulate the problems it has.

The policymaker highlighted one method through which the government can employ this sort of approach to support and attract outside capacity. The individual said it is “something like a pull mechanism, so instead of grants and contracts where I gave X a grant, and I hope it’s in his statement of work, you say, ‘I want a piece of software which significantly increases the performance of poor kids in math.’” This policymaker continued, “I always say in advance what I am willing to do if someone can deliver something like that.” The individual added that, in this way, “The government can also help create markets for IT-enabled solutions that help address some societal problem.”

3. Building Rotations

Similar to the rotation-based training model discussed earlier, some suggested that technologists should move back and forth between government and other institutions. Said a policymaker, “I’ve sort of adhered to the philosophy of we need to move to a model of technologists bouncing in and out of government.” A scholar added:

That is part of the issue in getting these people, that you almost really want to think more of a model of people rotating into these

kinds of positions, or in spending a fraction of their time in these positions, or as a place where someone lands where they’re fairly senior in their career.

This approach was perceived by some as addressing key gaps in the ability for the public sector to provide meaningful enticement to private sector experts. As a nonprofit leader said, one problem is recruiting the right leadership, such as Chief Technology Officers or Chief Information Officers because “the people you’d want for those jobs could probably be making seven figures plus stock at a company.” This person suggested a fellowship model for executive talent, asking “Is there some way you can attract those C-level people to give a year or two to public service?” A private sector expert agreed:

A lot of [efforts at improving the pipeline] are built around fellowship programs and people going back and forth so they’ve got the range of experiences rather than you’ve spent a lot of your career in one place. I think there’s a lot of promise in that. It helps encourage cross-sectoral understanding and experience in ways that are extremely helpful to bring and share learnings. Most people in the generation of people joining the workforce are not going to be people looking to join one institution in their career.

4. Crafting Public-Private Partnerships

Another approach was to consider public-private partnerships. A policymaker explained:

I’ve not had a very good track record bringing these people into government. I would say the prevailing strategy that works are these public-private partnerships where I sit in my role in my team doing the work of official government and we encourage the creation of some kind of mechanism sitting just outside government that can more flexibly employ [and] create more flexible working conditions [and] pay scales.

Science and Technology Talent in Federal Agencies

Federal Agency	Total Employees	Number of STEMM Employees	Percentage STEMM Employees
National Aeronautics and Space Administration	17,386	11,904	68%
Nuclear Regulatory Commission	3,696	2,317	63%
Veterans Affairs Administration	280,183	157,883	56%
Department of Health and Human Services	60,209	30,030	50%
Department of Agriculture	77,056	36,997	48%
Environmental Protection Agency	16,498	7,235	44%
Department of Commerce	34,236	14,256	42%
Department of the Interior	52,886	19,305	37%
Department of the Navy	190,752	65,850	35%
Department of Energy	15,168	4,883	32%

Figure 7. "The Biggest Bang Theory: How to get the most out of the competitive search for STEMM talent." Partnership for Public Service and Booz Allen Hamilton. 2013.

5. Developing Internal Capacity

Others felt that organizations should develop some core technology and technical capacity. Said a policymaker, "The best scenario is that you have at least some core capability within the organization." Another policymaker offered, "You do need people on the inside of the organization that have full access that are able to work," continuing, "The way I look at it is, how do we have alternative rewards to get people to come into government to work on interesting projects?" A former policymaker posed a similar question: "How do you develop a cohort of technology thinkers and 'understanders' who could not be lawyers but would be part of a group?" Another former policymaker suggested that "you have to integrate technical training into the training and career advancement and skill development processes" and "it has to be part of the promotion criteria. It's a signal to the talented people in your institution that this is a way to rise fast." A nonprofit leader agreed, "You have

to set up an incentive structure that's competitive and sustainable. That requires reform to [human resources] policies and the budget."

Some expressed this view in the context of providing a viable career path. Said a former policymaker, "I would identify this challenge of growth and retention as one of developing a new specialty in information policy/strategy within a variety of fields—computer science, law, business, management, sociology, and economics, to name just a few." The individual added, "I regard this as the hardest and most important long-run focus." The policymaker elaborated:

The long-run need is for creation of a robust set of professional values, skills, and educational standards that are necessary to define more mature points in a career path that answer the question, 'Where should students committed to these issues be heading?' Getting people early in their careers onto this path is one set of questions,

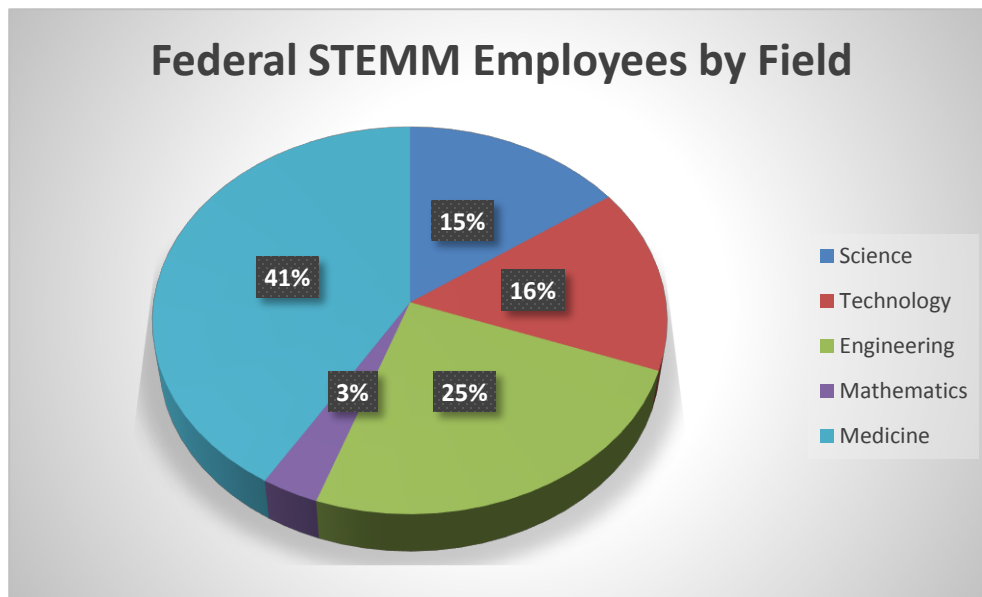


Figure 8. "The Biggest Bang Theory: How to get the most out of the competitive search for STEM talent." Partnership for Public Service and Booz Allen Hamilton. 2013.

but the longer-run challenge is to establish a trajectory to aspire to if they actually stick with it for 10, 20, or 30 years.

Others noted that internal capacity could be developed through technology training for non-technologist leaders. Said a former policymaker, "I think you should look beyond training and recruiting students in new ways. Training doesn't have to focus on students." The former policymaker continued, "I think there is a case to be made that the most effective 'lay technologists' in the policy advocacy space are people who learned it on the job. What you need are policy people who are very good at being policy people but who also understand the technical dimension." This person explained that such expertise could be developed systematically: "You should take the best policy people you have at the organizations you want to succeed and have them take training courses in technical issues. This would be far more efficient than the current system, which essentially relies on individual initiative."

6. Leading the Charge

Several interviewees noted the significance of leadership to spearhead and experiment with potential approaches. A former policymaker said, "While it's important to have leadership at the top, you need leadership in the middle, and that's oftentimes harder." This individual continued, "You need a willingness to invest, not necessarily money, but someone who is saying this is important and I am willing to invest my time at the very least."

A public sector role mentioned by interviewees was that of setting the norms for the education of technologists. A former policymaker said, "A key aspect of defining this new field is to create a set of academic disciplines that give intellectual and public legitimacy to this work. The public sector ought to be forward-leaning about defining this new field, recognizing that academic sub-disciplines can emerge over time." This individual cited a historical

precedent for the government playing such a role in the birth of a new field of study:

The prime example of this is computer science, a field that was developed in the mid-1960s through concerted action by the Defense Department in order to stimulate the development of new computing technologies seen as necessary for the military in particular and the overall competitiveness of the U.S. economy in general. Computer science, now seen as a discipline unto itself, was constructed as a hybrid of mathematics, physics, electrical engineering, and materials sciences. Before the early 1960s there were no computer science departments in any universities. Today, they are a major field of study and have given rise to a whole profession.

This person also suggested, “The public sector can also decide to devote resources to developing information policy studies as a sub-discipline of computer science, economics, sociology, law, and other fields.” The individual said these public sector investments would be valuable because, “It is important to set that out as a goal in order to create a direction for a new generation of social justice workers to have a clear path to pursue the scholarship and training needed to advance vital public interests in the information economy.”

Part of this process, said some interviewees, could include garnering support from political leaders. Another former policymaker suggested such an approach, stating that an important piece “is working to educate the political parties about the importance of tech know-how in government.” Doing so would be valuable, the individual said, because:

The way these agencies work, you will have a hard time changing institutional culture or recruiting good technologists to become civil servants. But you can bring techies into government via political appointments, contractors, and fellows. Administrations

come into office and staff hundreds if not thousands of senior positions across the government. They should plan to have techies on their lists as a part of effective government.

CONCLUSION

This report sought to provide an analysis of the health of the talent pipeline that connects individuals studying or working in technology-related disciplines to careers in public sector and civil society institutions. Based on dozens of interviews with key stakeholders as well as secondary research, this report analyzed the current state of the pipeline, key challenges and barriers to the development of technology-oriented human capital in government and civil society, models of successful interventions, and recommendations for a more robust pipeline.

Based on this research, the findings of the report are clear: technology talent is a key need in government and civil society, but the current state of the pipeline is inadequate to meet that need. The bad news is that existing institutions and approaches are insufficient to build and sustain this pipeline, particularly in the face of sharp for-profit competition. The good news is that stakeholders interviewed identified a range of organizations and practices that, at scale, have the potential to make an enormous difference.

While the problem is daunting, the stakes are high. It will be critical for civil society and government to develop sustainable and effective pathways for the panoply of technologists and experts who have the skills to create truly 21st century institutions. A private sector expert offered an optimistic summation of the challenge:

In terms of the needs and interests, you've got a whole generation of people retiring and there's not a pipeline behind them and that's most acute in the technical work. This problem is urgent and going to be more urgent in the next few years.

[But] it's solvable. We've done this to ourselves. It's not as if there's some immutable law about how government is organized. It's having the energy and focus and discipline to take a real run at it. And I think both from things you see at a small scale that are working and when you go across those and understand what is learned and what would make those the norm rather than the exception this is really solvable.

Improving the talent pipeline will likely require a multifaceted approach and sustained investment. The challenges are numerous, but so are the opportunities to improve governance and transform civil society.

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APPENDIX A: List of Interviewees

This appendix lists many of the dozens of individuals who graciously provided their insights to support the development of this report. We are deeply grateful for their time and perspectives. Titles and positions are current as of August 2013, except where noted.

- **Jennifer Anastasoff**, Founding CEO, Fuse Corps
- **Danah Boyd**, Senior Researcher, Microsoft Research; Research Assistant Professor in Media, Culture, and Communication, New York University; Visiting Researcher, Harvard Law School; Fellow, Harvard Berkman Center for Internet & Society; Adjunct Associate Professor, University of New South Wales
- **Brad Burnham**, Managing Partner, Union Square Ventures
- **Ryan Calo**, Assistant Professor of Law, University of Washington Law School
- **Cindy Cohn**, Legal Director and General Counsel, Electronic Frontier Foundation
- **Lorrie Cranor**, Associate Professor of Computer Science and of Engineering and Public Policy and Director, CyLab Usable Privacy and Security Laboratory and Co-Director, MSIT-Privacy Engineering Master's Program, Carnegie Mellon University; Chief Scientist, Wombat Security Technologies
- **Susan Crawford**, Professor of Law, Benjamin N. Cardozo School of Law; Fellow, Roosevelt Institute; Co-Director, Berkman Center for Internet and Society at Harvard University; Special Assistant to the President for Science, Technology, and Innovation Policy (former)
- **Alan Davidson**, Visiting Scholar, Massachusetts Institute of Technology; Director of Public Policy for the Americas, Google (former)
- **Robert Faris**, Research Director, Berkman Center for Internet and Society at Harvard University
- **Michael Flowers**, Analytics Director, Office of Policy and Strategic Planning, City of New York
- **Jim Fruchterman**, President and CEO and Chairman of the Board, Benetech
- **Liz Gerber**, Assistant Professor and Allen K. and Johnnie Cordell Breed Junior Professor of Design, Northwestern University; Faculty Founder, Design for America; Fellow, OpEd Project
- **Stephen Goldsmith**, Daniel Paul Professor of the Practice of Government and Director of the Innovations in American Government Program, Harvard Kennedy School of Government; Deputy Mayor, City of New York (former); Mayor, City of Indianapolis (former)
- **Brett Goldstein**, Fellow in Urban Science, University of Chicago Harris School of Public Policy; Chief Data Officer and Chief Information Officer, City of Chicago (former)
- **Jennifer Granick**, Director of Civil Liberties, Stanford Center for Internet and Society
- **Joshua Greenberg**, Director, Digital Information Technology Program, Alfred P. Sloan Foundation

- **Leslie Harris**, President and CEO, Center for Democracy & Technology; Senior Adjunct Fellow at the Silicon Flatirons Center for Law, Technology and Entrepreneurship, University of Colorado
- **Chris Hoofnagle**, Lecturer in Residence, Berkeley Law; Director of Information Privacy Programs, Berkeley Center for Law and Technology ; Senior Fellow, Samuelson Law, Technology & Public Policy Clinic
- **Nigel Jacob**, Co-Chair, City of Boston Mayor's Office of New Urban Mechanics
- **Thomas Kalil**, Deputy Director for Policy, White House Office of Science and Technology Policy; Senior Advisor for Science, Technology and Innovation, National Economic Council, White House
- **Gene Kimmelman**, Director, Internet Freedom and Human Rights Project, New America Foundation; Senior Associate, Global Partners Digital; Chief Counsel for Competition Policy and Intergovernmental Relations, Justice Department (former)
- **Jon Leibowitz**, Partner, Davis Polk & Wardwell LLP; Chairman, Federal Trade Commission (former)
- **Jane Lowe**, Senior Adviser for Program Development, Robert Wood Johnson Foundation
- **Geoff MacDougall**, Head of Development, Mozilla Foundation
- **Colin Maclay**, Managing Director, Berkman Center for Internet and Society at Harvard University
- **Lori McGlinchey**, Senior Program Officer, Democracy Fund, Open Society Foundations
- **Lenny Mendonca**, Director, McKinsey and Company; Co-Founder, Public Sector Practice, McKinsey and Company
- **Chris Mentzel**, Program Officer, Science Program, Gordon and Betty Moore Foundation
- **Ellen Miller**, Co-Founder and Executive Director, Sunlight Foundation
- **Deirdre Mulligan**, Assistant Professor, School of Information, University of California Berkeley; Faculty Director, Berkeley Center for Law and Technology
- **Daniel Neill**, Associate Professor of Information Systems and H.J. Heinz III College Dean's Career Development Professorship, Carnegie Mellon University; Director, Event and Pattern Detection Laboratory , Carnegie Mellon University
- **Abhi Nemani**, Co-Executive Director (Interim), Code for America
- **Beth Noveck**, Visiting Professor, New York University's Robert F. Wagner Graduate School of Public Service; Visiting Professor, MIT Media Lab; Founder and Director of The Governance Lab at New York University; Deputy Chief Technology Officer, White House (former)
- **Chris Osgood**, Co-Chair, City of Boston Mayor's Office of New Urban Mechanics
- **Scott Peppet**, Professor of Law, University of Colorado Law School
- **Andrew Rasiej**, Co-Founder, Personal Democracy Media
- **Joel Reidenberg**, Stanley D. and Nikki Waxberg Chair and Professor of Law and Founding Academic Director, Center on Law and Information Policy, Fordham University

- **Michael Rocco**, Executive Director, City Hall Fellows
- **Ben Scott**, Senior Advisor to the Open Technology Institute, New America Foundation; Co-Founder and Partner, Stoake; Visiting Fellow, Stiftung Neue Verantwortung; Non-Residential Fellow, Stanford Center for Internet and Society; Policy Advisor for Innovation, State Department (former)
- **Ted Smith**, Director of Economic Growth and Innovation, Louisville Metropolitan Government
- **Gigi Sohn**, President and CEO and Co-Founder, Public Knowledge; Senior Adjunct Fellow at the Silicon Flatirons Center for Law, Technology and Entrepreneurship, University of Colorado
- **Paul Tarini**, Senior Program Officer, Pioneer Portfolio, Robert Wood Johnson Foundation
- **Yvette Thijm**, Executive Director, WITNESS
- **Damian Thorman**, National Program Director, Knight Foundation
- **Chris Vein**, Chief Innovation Officer for Global Information and Communications Technology Development, World Bank; Deputy Chief Technology Officer for Government Innovation, White House (former)
- **Phil Weiser**, Dean of the Law School and Thomson Professor of Law and Executive Director and Founder of the Silicon Flatirons Center for Law, Technology, and Entrepreneurship, University of Colorado; Senior Advisor for Technology and Innovation to the National Economic Council, White House (former)
- **Daniel Weitzner**, Director, MIT CSAIL Decentralized Information Group, Massachusetts Institute of Technology; Deputy Chief Technology Officer for Internet Policy, White House (former)

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