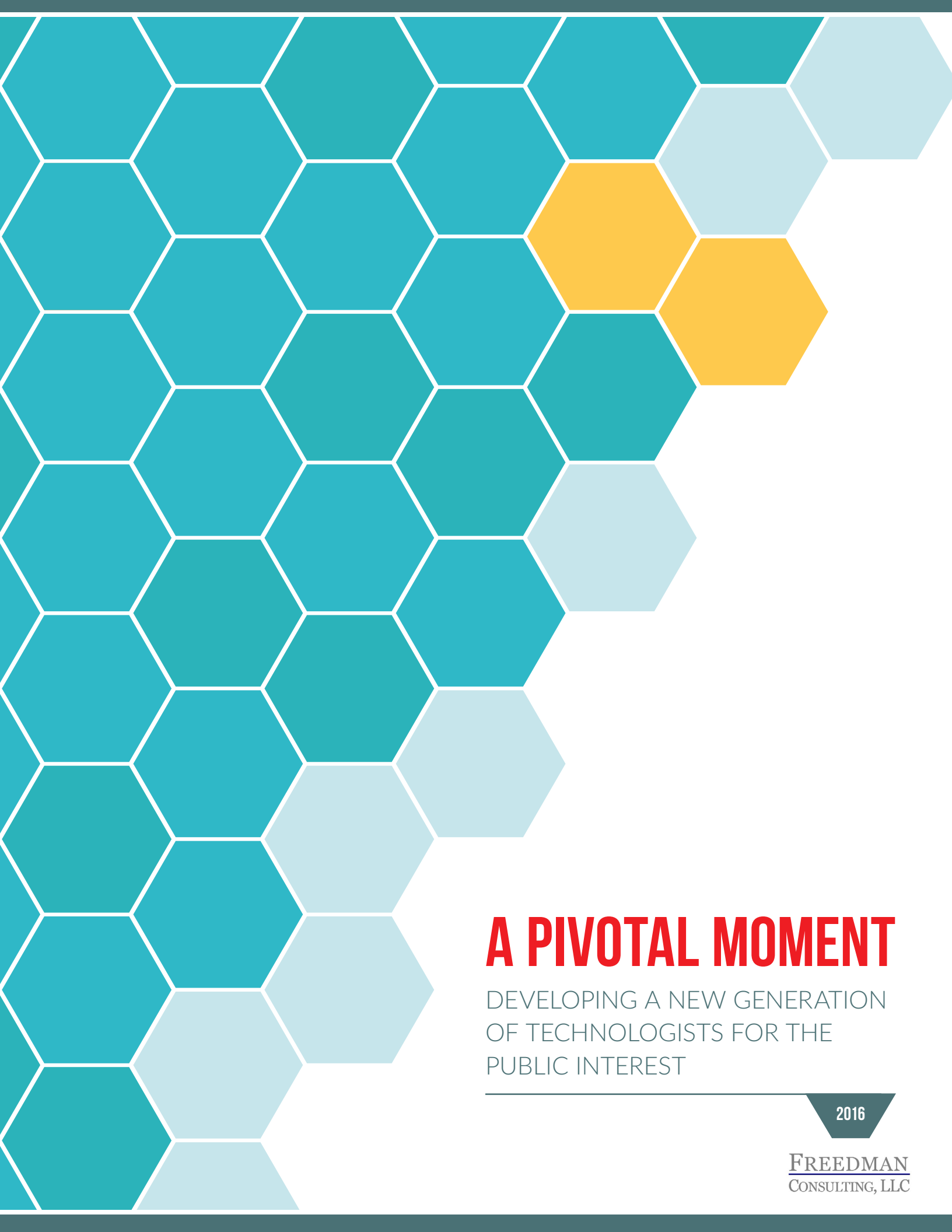


A PIVOTAL MOMENT

DEVELOPING A NEW GENERATION OF TECHNOLOGISTS FOR THE PUBLIC INTEREST

2016

FREEDMAN
CONSULTING, LLC

ACKNOWLEDGEMENTS

The authors wish to acknowledge the 60 interviewees whose input and reflection made this report possible. Additionally, program staff from several foundations, including the Ford Foundation, the John D. and Catherine T. MacArthur Foundation, the John S. and James L. Knight Foundation, the Open Society Foundations, the Mozilla Foundation, the Media Democracy Fund, the Omidyar Network, and the William and Flora Hewlett Foundation, informed the shape and direction of this research.

ABOUT 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, non-profit organizations, political campaigns and Fortune 500 companies.

Freedman Consulting, LLC, plans and implements strategies that achieve client objectives and have a major impact. Our approach focuses on helping clients conceptualize their goals and then developing comprehensive approaches that flexibly respond to client needs.

A BRIEF LETTER TO READERS: THOUGHTS ON USING THIS REPORT

We are excited and grateful for the chance to offer this report. This study lays out specific ideas and strategic options that philanthropy could undertake to improve the technology talent pipeline. It builds on a previous report, *A Future of Failure*, that outlined the magnitude of the problem in getting non-profits and governments to have a sufficient supply of technologists. This study is the optimistic companion to that survey, laying out ideas from 60 thought leaders in the field for how to better confront this important problem.

The report's title, *A Pivotal Moment: Developing a New Generation of Technologists for the Public Interest*, summarizes some of the energy we found during our study. Again and again, we were told that public interest organizations and government will not succeed if they do not quickly figure out how to better harness the wave of innovation sweeping the world, and that one key element of that challenge will be to implement more effective strategies for developing and integrating technologists into relevant organizations and projects.

One aim of this report is to be a useful tool to policymakers and those interested in solving this problem. To do that, we made a number of choices, including how to define relevant terms such as "pipeline" and "technologists" as well as the possible scope of interventions. In every case, we have attempted within the report to explain our reasoning, whether it be in terminology or in policy framing.

No choice was likely more important than thinking through what actual tools leaders would want from a report like this. While the primary emphasis of this report is philanthropy, it is our hope that it is valuable to all who are interested in strengthening the public interest technology talent pipeline.

This report serves as a compendium of specific ideas from the 60 experts we interviewed. While we edited some of these ideas for length and clarity, the bulk of the report is our attempt to faithfully lay out what amounted to 26 specific ideas from interviewees for future work in this field. We were fortunate to receive a great range of feedback—some said the report misses arguments and interventions, and others said it is too long and should focus on fewer thematic categories. We think both views are right. There are many more possible interventions, and final decisions will ultimately require a narrowing down of choices and focus.

As the report makes clear from title to appendix, this is a quickly evolving, complex, and important subject. It is a moving target, with changes so pervasive and rapid that the "Information Age" may well be the moniker historians will use to define our time and innovation one of its chief hallmarks. There can be no doubt these challenges will be with us for some time, and that the magnitude of the problem is one fitting of philanthropy's interest and effort. The report is a snapshot, but it is both necessarily a limited one given the scope of change, and one that will need updating. The steady stream of transformations will not stop, though that must not be an excuse for inaction.

Finally, this report is particularly indebted to the interviewees who participated in it, and the many foundation staff and others who read and suggested changes to it. It is not a typical rote acknowledgment to say any omissions or lapses are our fault alone, and the strengths flow from the many who gave their time and thoughts to supporting the document. We thank you all for both your ideas and the chance to contribute to the conversation about this crucial issue.

THIS PAGE IS INTENTIONALLY LEFT BLANK

A PIVOTAL MOMENT

DEVELOPING A NEW GENERATION OF TECHNOLOGISTS FOR THE PUBLIC INTEREST

2016

CONTENTS

THIS PAGE IS INTENTIONALLY LEFT BLANK

I. OVERVIEW AND SUMMARY

We stand at a moment of tremendous change. In only a few short decades, the Internet has grown to touch every issue in our society, from health, employment, and education to economic development, political engagement, civic life, and more. For philanthropy, deeply invested in these issues, the implications are massive.

> Foundations and allies are working "to fulfill the promise of this digital age, ensure all benefit, and defend the public interest from new threats." —Philanthropic Leader

Today, four out of five Fortune 500 companies only offer their job applications online,[1] and a number of companies are deploying algorithms to automate their hiring processes, sparking concerns about equity and potential bias.[2] Our political debates increasingly transpire in a networked public sphere of privately owned platforms like Facebook and Twitter, and non-profits and social movements rely on the Internet to organize for social change and use the Internet itself to advance their missions.

Traditional education models have also deeply integrated digital approaches—according to a 2013 Pew Research Center study, 79 percent of Advanced Placement and National Writing Project teachers surveyed reported requiring students to access assignments online.[3] These examples of technology's reach into modern life only scratch the surface of its impact and import.[4]

Recognizing these fundamental transformations and the need for action in the public interest community, the Ford Foundation, John S. and James L. Knight Foundation, John D. and Catherine T. MacArthur Foundation, Mozilla Foundation, and Open Society Foundations came together in February 2015 to launch NetGain, a partnership "to spark the next generation of innovation for social change and progress."[5] The foundations made a declaration of principles in recognition of the fact that, "This change is enormous in scale and touches virtually every area of concern to philanthropy."[6] As one philanthropic leader put it in an interview, foundations and allies are working "to fulfill the promise of this digital age, ensure all benefit, and defend the public interest from new threats."

Helping philanthropy meet this technology transformation is the focus of this report. Through interviews with a diverse set of 60 practicing public interest technologists and experts in academia, advocacy, philanthropy, and government, as well as supplemental research, we have identified more than two dozen sets of interventions philanthropy could undertake to help meet this public interest challenge. While significantly more details on each potential intervention are provided later in this report, this overview serves as a summary of our top take-aways and this report's key insights. We hope it is a valuable resource for all working with the public interest community as it adapts.

The report itself is divided into the following sections:

I. ***Overview and Summary:*** an outline of the report, key arguments to consider, methodologies, and some recommendations for options for investment.

II. ***The Challenge:*** discussion of the barriers that face the field of public interest technology.

1 "Broadband Adoption Key to Jobs and Education," Federal Communications Commission, https://apps.fcc.gov/edocs_public/attachmatch/DOC-310346A1.pdf

2 "For More Workplace Diversity, Should Algorithms Make Hiring Decisions?," Bourree Lam, The Atlantic, June 22 2015, http://www.theatlantic.com/business/archive/2015/06/algorithm-hiring-diversity-HR/396374/

3 "Teacher Survey- Methodology and Survey Questions," Pew Research Center, December 13, 2011, http://www.pewinternet.org/files/old-media/Files/Questionnaire/2012/Teacher%20survey%20-%20Methodology%20and%20survey%20questions.pdf

4 A famous current challenge, of course, is secure communications technologies, which were instrumental in allowing Edward Snowden and journalists to remain anonymous while revealing and documenting the unprecedented scale of government surveillance (which was itself enabled by unimagined advances in technology). Additionally, human and environmental rights advocates are using satellite imagery, video forensics, drones, and social media to document abuses in countries ranging from Syria and North Korea to Burma and the Central African Republic.

5 "The Internet, Philanthropy, and Progress: Principles for Future Work," The Ford Foundation, http://www.fordfoundation.org/pdfs/news/NetGain_Principles.pdf

6 Ibid.

III. ***Potential Interventions:*** some specifics on each intervention, including opportunities for investment, best practices and design considerations, and example models.

IV. ***Conclusion:*** final thoughts on the need for action.

V. ***Appendices:*** a list of interviewees, summary tables of interventions, and a background and methodology for the research.

Our hope is that, taken as a whole, the report offers a relatively complete sense of ideas we heard in the interview process. At the same time, we hope that the large number of thoughts and ideas are usefully organized into themes and may help suggest opportunities for extension of ongoing work by foundations.

Five Key Themes

The remainder of this summary highlights some of the key insights from the report, and then offers one possible approach to consider. We chose five themes that we felt were either pervasive throughout the interviews or were identified as more crucial than others by those interviewed.

The themes are:

First, many of those interviewed described this as a "pivotal moment." While we cite individual instances of visionary leadership and successful deployment of technology skills for the public interest, there was a consensus that a stubborn cycle of inadequate supply, misarticulated demand, and an inefficient marketplace stymie progress.

Second, the issue of talent was seen as key to a host of other challenges faced by those fighting for the public interest in the digital age. What many called a "talent pipeline" crisis was not an abstraction or a small sliver of an issue. As one philanthropic leader put it bluntly, "If you work with non-profits or governments in this century, it is going to matter whether they have the talent to tap into technology challenges. If they don't, it is game over." We heard from those who work in social justice, education, economic fairness, and a host of other issues that there is a need to make sure institutions are effective in a rapidly evolving technological environment. Too often, they were not.[7]

Third, a commitment to increasing diversity within public interest technology was repeatedly described as vital to both creating shared prosperity and ensuring that the landscape and Internet structures will be representative of the populations who will ultimately use them.

Fourth, many experts pointed to the need for a deep cultural shift. If we are to solve these challenges, the public sector and government generally need to create work environments that are more supportive of innovation, the use of technology, and those who work with these tools.

Fifth, the need for leadership was emphasized. A government practitioner said about the government space, "Top-down leadership takes a big role. None of what's happening right now would be happening if Obama wasn't embracing tech and innovation—not even buy-in, but unabashed championing really matters. Then you fill in good people around you to sell it." Many interviewees in the non-profit arena were enthusiastic about the leadership already shown via the NetGain collaboration and its potential for dramatic impact.

While the challenges were significant, there was a sense of optimism underlying many of our conversations. Observers pointed out that the attention given to the struggling launch of HealthCare.gov was a pivot point in public awareness, alerting many to the need for deep change. Developments such as 18F, discussed in Section III of this report, exemplify the opportunities for real progress.

A word about terminology may be useful. Discussing the limitations of terminology was a frequent subject in interviews. For the purposes of this paper, the phrase "public

7 These challenges are outlined in significant detail in a 2013 report developed by Freedman Consulting, LLC and supported by the Ford Foundation and the MacArthur Foundation, which noted, "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."

Freedman Consulting, LLC. "A Future of Failure? The Flow of Technology Talent into Government and Civil Society—A Report." *Freedman Consulting, LLC. 2013.* http://www.fordfoundation.org/pdfs/news/afutureoffailure.pdf.

interest technologist" is used to include everyone from computer programmers to data scientists and tech-policy experts to organizational leaders. A full working definition is provided later in this report (Section III). Given that interviewees for this report spoke about a wide variety of people as technologists, we chose to apply this broader conception of "technologists" to fully encompass their ideas. However, some interviewees found even this definition too narrow, while others said it was too broad to be meaningful. They were concerned that it does not provide a narrow enough guidance for what type of skill-building or pathways philanthropy should support.

The term "talent pipeline" also was the subject of much interest in interviews. Some experts thought the term fails to encapsulate the diverse ways and times in their careers that people become public interest technologists. While this paper does explore alternative pathways and different entryways into the talent pipeline, it may be worthwhile contemplating what image could be better suited to the nonlinear realities of individuals' careers.

Conclusion

This report is intended as a platform for refinement and discussion. A recurring theme in many of the interviews conducted was the need for philanthropic leaders to use their expertise in investing, shaping, and evaluating work in choosing how to proceed. Different investors look to different areas for maximizing impact. For instance, some look to early education, others to the social justice or the legal system, and others to making sure economic opportunity is available to all. It seems likely, based on our interviews, that useful interventions could be made in each area that would strengthen the public interest technology talent pipeline and help expand digital human capital. A key choice for leaders will be to determine whether to continue to focus on this problem through the lenses of their own work, or to consider a more tightly coordinated strategy. Our interviews found support for both potential approaches.

There are significant areas for further thought, study, and debate. The research for the report also showed another powerful theme: participants noted that while the challenges are real and numerous, they are surpassed by the tremendous opportunities for action.

A final thought. No one we interviewed for this report thought the talent pipeline was working well, or that the problem would soon take care of itself. Every interview included powerful ideas on what philanthropy could do. The most consistent theme was the critical role of leadership. Experts noted repeatedly in our interviews that in the private sector, technology succeeds or fails because of the commitment and quality of leadership. We hope this document will catalyze immediate action, and with strong leadership from philanthropy, government, and civil society, we will meet the challenge of this pivotal moment.

> "If you work with non-profits or governments in this century, it is going to matter whether they have the talent to tap into technology challenges. If they don't, it is game over."
> —Philanthropic Leader

II. THE CHALLENGE

Improving the health of the public interest technology talent pipeline is a difficult undertaking that requires surmounting numerous barriers. A full discussion of the challenges facing the pipeline can be found in: *A Future of Failure? The Flow of Technology Talent into Government and Civil Society*, which was developed in 2013.[8] This section briefly resurfaces several of those challenges within a qualitative and quantitative context, and it is divided into the following subsections:

» What We Heard: A Multi-Faceted Challenge
» By the Numbers: Pressures Facing Public Interest Technology

What We Heard: A Multi-Faceted Challenge

For both this report and the *A Future of Failure?* report, interviewees identified several barriers to a healthy public interest technology talent pipeline. "We haven't built any type of comprehensive pipeline," said a scholar, adding, "There are now maybe three or four programs that aim to do this, but the pipeline is almost non-existent." A public interest technologist cited opportunities and training as areas of need. The technologist explained, "We have a serious pipeline crisis. It boils down to a lack of internship opportunities and a lack of professors creating students with these skillsets."

Many specific barriers mentioned by interviewees fall into a larger narrative described below.

The Current Pipeline Is Insufficient

Inadequate Educational Opportunities

- ***Limited Grade School Exposure:*** interviewees noted a lack of exposure to technology classes for many children throughout the country. "The smartest kids by the time they reach college haven't done computer science," said a government practitioner. "We are really failing a lot of kids who didn't already show up at schools having some background in computer science," the practitioner continued.
- ***Insufficient University Offerings:*** this dearth of relevant technology coursework and collaboration is also present – if to a lesser degree – in higher education, interviewees said. A scholar mused, "There's probably a dozen senior faculty who have a shared interest here at [my university], but there isn't an institutionalized way for us to work together." One benefit of working together could be the development of novel coursework for students.

Too Few Job Opportunities

- ***Small Field Lacks Cohesion:*** some interviewees indicated that there are not enough jobs to form a cohesive field for public interest technology. Said a scholar, "I have a background in sociology and I have enough technical literacy to engage in conversation, and I'm at [a university]. But there aren't a lot of jobs for people like me who have in-depth tech experience and a social sciences background."
- ***Low in Budget Prioritization:*** interviewees noted that a lack of resources and resource prioritization contributes to a lack of available positions. "Some cities need to make a choice," said a government practitioner. "In a system of finite resources, [investment in technology like open data is not] going to be a priority—if you have a short number of resources, that makes it super hard," the practitioner continued.
- ***Lack of Understanding in Leadership of Potential Impact:*** the indirect nature of technologists' role in achieving an organization's mission may be contributing to a lack of understanding and resulting lack of push for these positions. As one government practitioner remarked, "On the city or government side, there's still a barely growing market for the talent. In other words, I've seen significant growth in terms of people who could do the work, at least 'technocratically,' though maybe not a growth in positions." The practitioner added, "I blame not the government workers—I blame the leadership involved in these efforts. They don't understand. Nobody is focusing on outcomes."

8 Freedman Consulting, LLC. "A Future of Failure? The Flow of Technology Talent into Government and Civil Society—A Report." *Freedman Consulting, LLC*. 2013. http://www.fordfoundation.org/pdfs/news/afutureoffailure.pdf.

Public Interest Technology Is Not Diverse

Diversity Pressures in Technology Generally

- ***Diversity Barriers and Bias:*** interviewees discussed the lack of diversity in technology generally as a barrier for public interest organizations. "Yes, it's a pipeline problem," commented a field expert. "Still, in 2014, there were two states where no girls took the AP computer science test," the expert continued. While the percent of female, black, and Hispanic students taking the AP computer science test increased by over 30 percent nationally from 2013 to 2014, there are also 12 states where no black students and six states where no Hispanic students took the test in 2014.[9] The field expert continued, "It has everything to do with systemic barriers and hidden or implicit unconscious bias."

Diversity Pressures for Public Interest Technology Specifically

- ***Communities Not Represented:*** a particular need for civil society and government to be representative of the population it is serving was discussed. Said an advocate, "I would love to think more about diversity and localization elements. I think that's critical for public interest technology for its mission. I don't think that's solved at all."

- ***Heightened Need in Public Interest Technology:*** interviewees also noted that public interest technology may have a heightened need for diversification. A government practitioner remarked, "As a field, we do horribly in all those groups – for women, we're notorious in science due to enormous drop off in the field. In terms of minorities or disabilities, we're about at the same level as other sciences, but we should be better, especially with computer science."

- ***Limitations in Programming Reach:*** despite the needs, interventions that could help boost public interest technology often do not reach a diverse audience. "Opportunities for young people don't reach every community," said an advocate, continuing, "Great stay-away programs do exist, but they are very expensive. And not enough programs have culturally relevant curriculum or are accessible."

Connection and Training Can Be Improved

Technologists Don't Have Appropriate Training

- ***Mismatched Skillsets:*** due to a real or perceived lack of talented technologists, some interviewees said that not enough relevant training has been conducted. This training is in preparation for work at public interest organizations—while specific elements of relevant training programs may differ, interviewees noted that the common theme is overall training inadequacies. A public interest technologist commented, "I've spoken to other people at other public interest groups, and everyone is having a hard time hiring good technologists." The technologist elaborated, "The pipeline is empty. It's dry. We don't have a budget line item for an internship and it's hard to get them experience. Realistically, the only Ph.D. or master's students we have are the ones that we give funding." Said a government practitioner, "Many people are brought in with a mismatched skillset for the task at hand." Part of the problem stems from higher education curricula, some indicated. A technologist said, "Universities at their core are used to putting out computer scientists. There's no program that exists that I can recommend for public interest technologists." Additionally, an advocate noted the problem extends beyond higher education. "I don't think there are good pathways for continuous learning," the individual said.

- ***Searching for Unicorns:*** interviewees indicated that the combination of skills necessary to form a successful public interest technologist is difficult to find. "The skills that we're looking for are really rare," said a public interest technologist. The technologist noted that even organizations that may otherwise have their choice of talented staff members "are having a tough time locating the right people" for their technology positions.

9 Yettick, Holly. "More Students—But Few Girls, Minorities—Took AP Computer Science Exams." *Education Week*. 19 December 2014. http://www.edweek.org/ew/articles/2014/12/19/more-students-but-few-girls-minorities-took-ap-computer.html.

Issues and Work Remain Unconnected

- ***Nuance and Specialization Needed:*** where skillsets may be able to be specialized within public interest technology, some interviewees said the field lacks a nuanced understanding of different ways to engage. "One thing that we haven't solved for yet is that for public interest lawyers you can specialize," said an advocate, continuing, "We haven't figured out how to become public interest technologists and shift from organization to organization."

- ***Translation Problems:*** interviewees commented that it can be difficult for those working in social justice to translate their ideas to technologists, and vice versa. A researcher outlined the difficulty:

  > *Where I see the biggest gap is about translation. How do you get the folks that are working on mass incarceration issues to understand that technology is about to disrupt everything that they're doing? How do you get folks that are in the tech industry to understand that tech is no longer just a [separate] sector? How you get them to understand that what they are working on will disrupt other industries?*

Barriers to Recruitment and Retention Are Acute

Matching Private Sector Compensation and Amenities

- ***Competitive Compensation:*** a prime challenge for public interest organizations is being able to offer competitive compensation, and particularly for technologists, reported interviewees. "Decades ago a good public service job was the same pay as a job in the private sector, but that simply isn't true today," said a scholar. "There are intangible benefits that will keep people [in the public interest], but sometimes those intangible benefits aren't enough in the face of a salary increase," the individual continued.

- ***Uneven Office Benefits:*** public interest organizations face an obstacle in matching labor market expectations for workplace amenities, many interviewees said. "Our competition is tech companies—they have figured out the quality of life thing pretty well: they offer massages and smoothies; they do your laundry for you," said a public interest technologist. Similarly, a philanthropic leader commented, "Most organizations, even large organizations and certainly medium and small – and probably in government though I know it's less than civil society – they're working currently in a dreadful situation. Bad systems, bad processes, bad information."

- ***Celebrated Silicon Valley Culture:*** a scholar commented that the popularity of Silicon Valley in modern culture poses challenges to recruitment. "I think part of the problem is that the whole Silicon Valley thing has been so celebrated, and it's such an attractive culture," the scholar said, adding, "I don't know if we've done a good job making some of the public sector stuff similarly attractive."

Making People Aware of Opportunities

- ***Interests Do Not Match Pursuits:*** interviewees noted that many public interest organizations face recruitment and retention pressures despite a general desire to participate. "When you go around the room and ask coders what they would like to do, public interest is what's coming out—some category of social good," said an advocate, continuing, "You never hear people say 'I want people to click on more ads.' There's a gap there."

- ***Ineffective Hiring:*** additionally, recruitment may be hampered by existing hiring practices. "In the federal government in particular, the civil service hiring rules are clunky; you have to demonstrate your abilities in ways that are nonstandard," said a scholar. A public interest technologist remarked, "A lot of people would say that there are all kinds of disincentives for people to work in government because of the way that government hires. It's difficult to hire anybody good."

Leadership toward Culture Change Is Necessary

Culture Shift

- ***Rigid Structure:*** the culture and structure of public interest organizations, and government particularly, stood out as an obstacle to many interviewees. Said a scholar, "Government is at a big disadvantage in terms of money, but also in terms of fun. It

tends to be more rigid and not grant as much freedom." A government practitioner agreed, speaking specifically to local government:

> *For local government, there's a lot to be done to create good work environments—we have old buildings with dated layouts that are dreary to come into. [Local government should be] putting up idea paint, encouraging people to collaborate, that kind of thing, so the space reflects the manner that we want people to work. The logistics in the autocracy – signing in and signing out – those can be really counterproductive. Having them punch in and out are antithetical to what we want to do.*

- ***Perception of Redundant Bureaucracy:*** interviewees indicated that government personnel structures and bureaucracy could influence how technologists perceive job opportunities. Said the practitioner, "It's designed to be redundant! Redundancies in 911 and other things exist because if they fail, people really get hurt. Why would I work with you if that's your game?" "People get into it because they want to change things, and they just find a lot of red tape," commented a public interest technologist.

- ***Inertia of Legacy Attitudes:*** additionally, many public interest organizations have a general difficulty adapting to change, including impacts of technology and the Internet. Said a philanthropic leader, "It's harder, although there are exceptions, to get organizations that are more than a decade old to move to a digital context. That's because of entrenched interests. It's easier with younger organizations that were born digital." Moreover, referencing an Oldsmobile rebranding campaign, an interviewee said that there is little room for error when trying to shift legacy attitudes:

> *Although the ad campaign was very successful, when people discovered that the cars were the same, it failed. The same is true of technologists in government. We can get them excited, but the reality of the environment can be very bad. If you make one person disillusioned, it can make all disillusioned through social media.*

Leadership

- ***Core Technology Competencies Still Developing in Leadership:*** interviewees indicated an acute need to develop technology competency exists for public interest staff members in both executive level and midlevel leadership positions. A philanthropic leader commented, "It isn't just the technology specialist, but also the literacy of other positions that's needed. It's not just building awareness it's about building skills." The philanthropic leader continued, noting that technically sophisticated leaders will be able to help recruit and retain technology specialists: "Leaders need those skills, and those are actually the success factors in recruiting technical people."

Taken as a whole, the barriers discussed in this section form a system in which supply obstacles within traditional education and alternative pathways to technology exist in an early portion of a pipeline, while barriers to recruitment and retention inhabit a later portion. Overarching

themes of necessary culture shifts and an improvement in diversity underpin every stage within the pipeline, as well. This system is illustrated below:

By the Numbers: Pressures Facing Public Interest Technology

Given the rapidly changing role of technology in the workforce, quantifying the number of people who work as "technologists" – and if a deficit exists in any given sector – is difficult. When taken in aggregate, however, several studies paint a picture of substantive pressures facing public interest organizations. This picture largely supports the comments from interviewees detailed earlier in this section.

60 Percent of Non-profits, Charities, and NGOs Claim Lack of Knowledge of New Technology as Primary Barrier to Technology Adoption

There is data that supports the premise that non-profits and the government have not achieved the same level of integration of technological capacity into their work as the private sector. During a 2012 survey of 10,500 non-profits, charities, and NGOs, 60 percent stated that "a lack of knowledge is the single greatest barrier to technological advancement adoption," referring specifically to new technology like cloud computing.[10] This implies that there is a lack of people with technological knowledge in the NGO field, and points to the need for more technologists within the non-profit sector.

32 Percent of Organizations Say Competitive Pay Is Their Greatest Retention Challenge

Part of the deficit of technologists in the non-profit sector may be due to an inability to offer competitive salaries. Over half of the non-profit organizations in a 2013 employment survey said that competing with other sectors based on salary offerings is a staff retention challenge, and 32 percent said that the inability to pay competitively was their greatest retention challenge.[11] Since technologists have highly marketable skills, it may be particularly difficult for non-profits to offer these individuals competitive salaries. In 2014, technology industry workers earned an average wage of $100,400, which is 102 percent more than the U.S. average private sector wage across industries.[12]

Government and Non-profit Spending on Development Far Behind Private Industry

Regarding the development component of R&D, private industry spends approximately $233.9 billion, while the federal government and non-profits spend about $25 billion and $2.6 billion, respectively.[13] The people working on development are often the ones who take the knowledge gained through basic research and transform it into useful systems and processes. These types of individuals may also excel at the type of innovative and practical thinking that would make a good public interest technologist, and given the disparities in the amount spent by each group, private industry is likely supporting the work of far more of these people than the government or non-profit sector.

Non-profits Spend Only 4.2 Percent of Annual Budgets on Technology

Part of the deficit of technologists in the non-profit sector may be related to an overall investment shortfall in technology itself by non-profits. That non-profit survey participants reported spending a small proportion of their budgets on technology, only 4.2 percent, implies that non-profits are not creating the type of tech-savvy environments that would attract technologists and enable their work.[14]

Government Spending on Business Technology Is Less Than For-profit

The private sector is accelerating its spending on customer-facing, non-IT technologies ("Business Technology," or BT) in the coming years, and BT spending is forecasted to

10 Technology's Role in the Non-profit Sector: Increasing Organizational Effectiveness and Efficiency through Technology Innovations. 2012. http://cswr.columbia.edu/wp-content/uploads/2013/04/Boles.-Technologys-role-in-the-non-profit-sector-Increasing-organizational-effectiveness-and-efficiency-through-technology-innovations.pdf

11 Non-profit Employment Trends Survey. 2013. http://www.non-profithr.com/wp-content/uploads/2013/03/2013-Employment-Trends-Survey-Report.pdf

12 CompTIA Releases Cyberstates. 2015. http://www.comptia.org/resources/2015-cyberstates?tracking=resources/cyberstates-2015

13 National Science Board Science & Engineering Indicators. 2014. http://www.nsf.gov/statistics/seind14/content/etc/nsb1401.pdf; 'Development' is the portion of R&D which is "the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes."

14 The State of Non-profit Data. 2012. http://www.nten.org/sites/default/files/data_report.pdf

grow more than three times as fast as IT spending through 2017.[15] In order to create these new BT products, both private industry and the government will be competing for the same talent.

In sum, the government and non-profit sectors likely lag behind the private sector regarding integration of technologists into their work. Non-profits reportedly lack sufficient knowledge to adopt new technology. Moreover, the non-profit and government sectors are outspent on innovative technology by the private industry, both in terms of a percentage of their budgets and in total amounts. Given the increasing importance of technology in our world and its revolutionary capacities, it is worthwhile to continue to investigate the role that technologists should play in the public sphere and determine through both quantitative and qualitative research where there is a deficit of public interest technologists.

15 Business Technology "Spending In The US Will Grow Faster Three To Four Times Faster Than Classic "Information Technology. 2014. http://blogs.forrester.com/andrew_bartels/14-10-14-business_technology_spending_in_the_us_will_grow_faster_three_to_four_times_faster_than_classic_inf

III. POTENTIAL INTERVENTIONS

Interviewees expressed optimism about the ability to drive change in the health of the public interest technology talent pipeline. Accordingly, this section details the heart of our research: specific interventions that philanthropy could invest in. These interventions were identified by interviewees and may be combined or otherwise paired to form a cohesive strategy. While the primary focus of this report is philanthropy, many of the potential interventions outlined here may be appropriate for others working to strengthen the pipeline to consider investing in.

The section is divided into areas of the technology talent pipeline described in Appendix C, aiming to capture both a traditional path in the pipeline as well as the multiple ways individuals may enter the pipeline:

A. Interest Cultivation Interventions

B. Skill-Building Interventions

C. Recruitment and Training Interventions

D. Skill Deployment Interventions

E. Growth and Retention Interventions

The tables on the next few pages summarize the different specific interventions. Full details on each are found later in this section.

Interest Cultivation Interventions

Intervention	Description
Digital Inclusion	Philanthropy could help to grow the supply of technologists and diversify the pipeline in the long term by ensuring everyone has access to the Internet and at least a basic understanding of and literacy in technology. Investment in this intervention could take the form of continued support to organizations as well as a call for additional government programs.
Student Incentives	Opportunities to sponsor financial incentives for university students to pursue public interest technology careers through scholarships, loan forgiveness, and competitions exist. These programs could expand the supply of technologists and enhance opportunities for individuals from low-income backgrounds.
Internships	Philanthropy could provide funding for internships, potentially with a formalized structure that allows interns to rotate among public interest organizations, to provide early exposure to public interest work for students and create opportunities for individuals from a variety of backgrounds.
Conferences and Alliances	Philanthropy could support conferences and alliances for public interest technologists to help bring in new individuals and to build communities and a professional identity. This intervention would likely have a corollary benefit of improving dissemination of public interest technology job opportunities.
Highlight Success	This intervention involves assisting public interest organizations in efforts to broadcast successful case studies to raise visibility of the need for public interest technologists, highlight the projects where they are succeeding, and potentially reach new, diverse communities. This effort to elevate public interest technology success could take the form of producing documents for city leaders, a speaker series, and general communications assistance.

Skill Building Interventions

Intervention	Description
K-12: Computer Science Curricula	Philanthropy could support the development of computer science and web literacy curricula that are appealing, useful, and culturally relevant. Upon completion of successful pilot programs, the curricula could later be taken to scale and taught at schools around the country. Investment in this intervention could entail funding original curriculum development or supporting the expansion and refinement of existing programs.
Higher Learning: Interdisciplinary Curricula at Universities	Philanthropy could work to improve the environment for interdisciplinary studies at universities through a number of methods, including: supporting hybrid coursework, creating accelerated programs, encouraging technical core requirements and capstone projects that aid public interest organizations, and broadening the definition of "interdisciplinary."
Online Learning Opportunities	Philanthropy could increase diverse communities' access to existing programs by bringing them online and adapting content to make it resonate with different learning styles and realities. Online learning opportunities can coexist with traditional education models or be used independently of formal education settings for continuing education.
Teacher Training	By strengthening professional development opportunities, philanthropy could help ensure that those teaching computer science curricula have adequate training and all teachers have basic computer literacy.
Improve Faculty Incentives	Philanthropy could improve incentives for faculty by developing and socializing interdisciplinary journals, recruiting senior field advocates to form a community, and creating endowed chair positions.

Recruitment and Training Interventions

Intervention	Description
Better Job Descriptions	Philanthropy could create appealing, accurate templates that organizations can use to help attract technologists to public interest work and facilitate hiring in bureaucratic structures.
Online Job Board/ Clearinghouse	Philanthropy could develop a sophisticated and user-friendly job board and email listserv, potentially including a clearinghouse, for public interest technology opportunities.
Recruitment via Networking and Partnerships	Philanthropy could sponsor networking opportunities, potentially including volunteer positions or initiatives, to identify potential public interest technologists, leverage city officials to make asks, and reach diverse communities.

Intervention	Description
Placement Agency	Philanthropy might build an agency or intermediary with knowledge of both the supply and demand side that can help place talented technologists in public interest opportunities.
Credentialing	Philanthropy could create effective, widely recognized systems that signal the skills technologists have developed and facilitate easier evaluation and hiring decisions for public interest organizations, potentially enhancing diverse individuals' opportunities to obtain relevant jobs.
Boot Camps	Philanthropy could offer short-term intensive training for technologists to bring them up to speed on how to be effective across the breadth of technology projects in the public interest and give them a better understanding of how government and civil society operate. Similarly, boot camps can train existing public interest leaders in core facets of technology.
Management and Communications Training	Philanthropy could support programs to enhance management and communications skills of public interest technologists through professional development with a public interest lens.

Skill Deployment Interventions

Intervention	Description
Fellowship Programs	Given a variety of existing fellowship programs, philanthropy could build and strengthen thoughtful and strategic fellowship programs in government, civil society, and academia, emphasizing where possible the recruitment from a diverse set of backgrounds.
Enable a Tour of Service	Philanthropy could enable technologists' short- to mid-term tours of service in public interest organizations by making it easier procedurally to onboard new employees and deploy their skills on a time-limited basis.
Innovation Teams	Philanthropy could support successful examples of innovation teams at a given locus in public interest organizations by expanding or augmenting existing efforts, developing new innovation teams, or conducting an efficacy study.
Contracting Reform	To streamline government procurement and contracting, philanthropy can help ensure that officials have the expertise and ability to hire innovative technology contractors by developing best practice and procedural studies, supporting the hiring of experts, and creating a state-based competition.

Intervention	Description
Technology Consulting (as a Stopgap)	Philanthropy could help organizations fill an immediate need for technologists working in the public interest by supporting technology consulting as a stopgap measure.

Growth and Retention Interventions

Intervention	Description
Mentorships	Philanthropy could establish or support programs that partner existing and potential public interest technologists, potentially from the same community. Mentorships serve to onboard new talent, support career development, and grow the field.
Software and Hardware Infrastructure Development	Philanthropy could help ensure that public interest organizations have the physical technology infrastructure necessary to develop and execute technology-dependent projects.
Reform Grantmaking Processes	Philanthropy could reform grantmaking processes by providing support for core funding and offering long-term funding commitments to help organizations make investments in organizational infrastructure needs, as well as strengthen programming by ensuring that measurement and evaluation is sophisticated, outcome-based, and consistent.
Promote Best Practices	Philanthropy could help build public interest workplace environments that are attractive for technologists by identifying and fostering best practices among grantees and particularly leaders in grantee organizations.

Frequently Heard Ideas

During interviews, each person was not presented with every idea. However, there were several intervention ideas that were commonly raised by interviewees, including:

- Fellowship Programs
- Higher Learning: Interdisciplinary Curricula at Universities
- Highlight Success
- Software and Hardware Infrastructure Development
- Innovation Teams
- K-12: Computer Science Curricula
- Management and Communications Training
- Recruitment via Networking and Partnerships

These commonly mentioned ideas may indicate areas where broad support can be obtained. Additional description of each intervention follows later in this section.

Icons in this Report

Throughout each intervention's description, a number of icons are used to depict the intervention's potential timeframe and level of maturity; these icons are described below.

Timeframe

Timeframe icons indicate when the intervention might be able to be implemented—in the short, mid, or long term. These are defined below:

- *Short-Term Interventions:* these interventions may be engaged within approximately the next year, and often have attributes such as a need for relatively fewer resources or infrastructure. Short-term interventions are marked with an hourglass icon.
- *Mid-Term Interventions:* these interventions could likely be implemented within the next two to five years, as they often require more resources, infrastructure, or planning than their short-term counterparts. Mid-term interventions are marked with a watch icon.
- *Long-Term Interventions:* those with the long-term distinction would likely need enough planning, resources, or infrastructure to be most feasible after approximately five years. Long-term interventions are marked with a calendar icon.

These icons are intended to provide a general sense of when the intervention could be implemented. However, in many cases the work of long term interventions could be broken down into smaller short-term goals, such as a demonstration pilot, before they would be fully implemented.

Level of Maturity

Level of maturity icons help to signify the amount of planning and implementation that have already been conducted for the intervention in question, primarily within the field of public interest technology. Interventions are distinguished by those that are existing ideas, ideas that are in process, or new ideas on a scale of program maturity.

- *Existing Idea:* existing ideas are interventions that have been implemented and fully planned.
- *In Process:* ideas that are in process may either have only a pilot project or small number of proofs of concept, or otherwise are in a current state of advanced planning without implementation.
- *New Idea:* new ideas are not currently being implemented and have basic or moderate levels of planning only.

While some ideas are not new, in many cases there is still opportunity and need to shape and support the activity to reach the goal of strengthening the talent pipeline.

Archetypes of Public Interest Technologists

Some interviewees conceptualized public interest technology as a long-term commitment at the career level, while others saw more of a possibility for rotation among sectors. Apart from this distinction, other themes or archetypes of public interest technologists emerged that are used to anchor discussion throughout this report. These

archetypes are described below and are not necessarily mutually exclusive, as some technologists may have elements of each archetype in their roles:

- ***Computer Scientists, Designers, Engineers, and Data Scientists:*** this archetype includes individuals designing and building technology projects firsthand for the public interest. These individuals may create civic technology apps or help governments at all levels analyze and rationalize large amounts of data—some may call these individuals "civic hackers."

- ***Public Interest and Technology Leaders:*** those who manage public interest projects with some relation to technology, including those who are charged with coordinating procurement, form this category. Technology leaders may also be organizational innovators sometimes defined as "Chief Innovation Officers" or may otherwise be midlevel leaders. Critically, leaders across public interest organizations should have a fundamental understanding of the applications of technology – as well as how to manage and implement them – in order to foster effective projects. Interviewees indicated that having a core of capable leaders who understand technology is vital to public interest organizations.

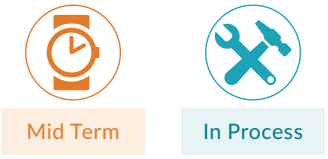
- ***Policy Influencers and Field Experts:*** a third group of individuals are motivated primarily by public policy changes. These technologists may be technology and communications policy lawyers or "lay" technology experts, and may also have a deep understanding of programming, data, or design, but are not tasked with these activities in their day-to-day work. Instead, they drive changes in the field through research, by drafting legislation, or mobilizing policy campaigns.

- ***Advocates and Activists:*** those who seek to improve the number and quality of public interest technologists as well as encourage the use of technology in public policy form the last category. Many technologists within different archetypes may also be called on to serve in this role and act as evangelists for the field and to communicate, tell stories, and help build public interest technology.

A. Interest Cultivation Interventions

The interventions in this subsection aim to spur initial interest in public interest technology to broaden overall participation in the talent pipeline. The interventions identified from the interviews to most directly contribute to this stage include: (1) Digital Inclusion; (2) Student Incentives; (3) Internships; (4) Conferences and Alliances; and (5) Highlight Success.

1. Digital Inclusion



Philanthropy could help to grow the supply of technologists and diversify the pipeline in the long term by ensuring everyone has access to the Internet and at least a basic understanding of and literacy in technology. Investment in this intervention could take the form of continued support to organizations as well as a call for additional government programs.

Interviewees described a need to establish a foundation of digital knowledge and inclusion in order to strengthen the pipeline and its multiple entry points. "I don't think you need a Ph.D. to be good at this at this point in civic development," a government practitioner said, continuing, "That would be a Ferrari when you're trying to ride a bike. We need to allocate resources accordingly to have more and more of these people." Said an advocate, "We need to improve broadband access to make the pipeline more inclusive. It's hard to learn how to code if you don't have Internet at home."

An advocate echoed this sentiment, noting an acute need to broaden access to civic technology. "In order to build tools that are relevant for everyone, we need to have everyone at the table to create the technology," the advocate said. "It's about everyone, not anyone, and we need to figure out how to get everyone at the table," the person continued.

According to the Federal Communications Commission, 48 percent of Americans earning less than $25,000 per year

lack access to broadband Internet service at home.[16] Being unable to use high-quality Internet service at home can have significant impact on the lives of adults and children, as well as impede efforts to learn technological skills.

One government practitioner cited the importance of digital inclusion initiatives in this individual's own career path: "I went to [my university] and majored in computer science in large part due to a program I participated in," the practitioner said, continuing, "It was my first exposure and set the path for how I ended up at [my university] studying engineering."

Opportunity for Investment

Current efforts to engage in general digital inclusion programming are being undertaken, though room for additional investment exists. Digital inclusion grantmaking could provide training to boost skillsets related to computers and the Internet, in addition to improving access to the Internet:

- ***Building Skills:*** basic computer and Internet literacy skills were noted as being important building blocks for participation in the digital world. Skill building involves everything from computer education and familiarization to awareness of the tools enabled by the Internet and how to use them in everyday life.

- ***Improving Access:*** another area described by interviewees involved improving access for individuals. For example, a field expert cited a program recently started at the Seattle Public Library that enables library patrons to check out a Wi-Fi hotspot.[17] "It was great that so many people were using the public library to access the Internet," the expert said, and added, "Why not let people take it home?" An extension to this program could involve "access to a library card, being offered an Android phone, and competing with Verizon and AT&T," the field expert continued.

Best Practices and Design Considerations

- ***Target a Broad Audience, Including Children:*** one advocate identified a particular opportunity for digital inclusion grantmaking related to children. "By and large we have a generation of kids who grow up with a facility for technology, but they're not always sophisticated with using it," the advocate said, continuing, "We have to educate kids and give them opportunities."

- ***Digital Inclusion Leaders May Be New to the Field:*** a field expert noted that programming related to digital inclusion may be novel for many non-profit leaders. This person advised searching creatively for new leaders in digital inclusion programming and foregoing a litmus test of advanced technical knowledge. "Digital inclusion isn't well understood and is not discussed—if we required people to know about this, we wouldn't get any applicants," the field expert said, referring to the expert's own digital inclusion program. "Understanding the importance and basics of technology are important, but most of this knowledge we'll train on," the expert continued.

> "We need to improve broadband access to make the pipeline more inclusive. It's hard to learn how to code if you don't have Internet at home." —Advocate

16 Flynn, Kerry. "Living Without Broadband In 2015: How 55 Million Americans Find Jobs, Study, Watch YouTube." *International Business Times*. 02 June 2015. http://www.ibtimes.com/living-without-broadband-2015-how-55-million-americans-find-jobs-study-watch-youtube-1943615.

17 Soper, Taylor. "Google Funds New Lendable WiFi Hotspot Devices for Seattle Public Library." *GeekWire*. 18 May 2015. http://www.geekwire.com/2015/google-funds-new-lendable-wifi-hotspot-devices-for-the-seattle-library/.

Digital Inclusion Example: Tech Goes Home

Program: Tech Goes Home (TGH) in Boston is a digital inclusion program that focuses on improving skills and access to the Internet. The TGH School program helps caregivers and their children access 21st century technology through tutorials on web-based academic and family resources, as well as highlights the technology options that are available to participants.

Target Participants: while TGH School focuses on impacting underserved families in the Boston public school community, TGH has additional programs focused on the community, small businesses, and early childhood.

Impact: in partnership with 53 public schools, TGH School offered 89 courses in nine languages, and in 2013, the program served over 1,200 families. TGH programs are also currently under implementation by local organizations in Chattanooga, TN, Las Cruces, NM, and Litchfield, CT.

Source: http://www.techgoeshome.org/

2. Student Incentives

Mid Term

In Process

Opportunities to sponsor financial incentives for university students to pursue public interest technology careers through scholarships, loan forgiveness, and competitions exist. These programs could expand the supply of technologists and enhance opportunities for individuals from low-income backgrounds.

Financial obstacles and incentives were mentioned by interviewees as forming a significant barrier for students to enter into public interest technology due to existing and perceived pay disparities between the private sector and public interest opportunities. "Pay in the public sector is unattractive," said a philanthropic leader. Imagining the thought process of a recent graduate from a prestigious computer science program, a scholar said, "I could go to Google or Facebook and make a lot of money, or I could go to the ACLU, and I won't get paid as much." This problem could be mitigated if "they'll forgive my debt," the scholar said. Given the high price of university tuition – the average cost of attending a private, four-year non-profit college in 2014 was $42,419 – students are more in need than ever of financial assistance.[18]

Opportunity for Investment

As discussed below, some incentive programs exist for students wishing to enter public interest technology. Because incentive programs might require substantial planning and application processes, this intervention is likely best conducted in the mid-term. Specific elements of this intervention could include:

- ***Support Scholarship for Service Models:*** building on the success of CyberCorps (profiled as an example in this subsection), opportunities may exist to expand or develop new scholarship for service models. Said a government practitioner, "The reason why I'm pulling from this program is that I get them at a discount. These graduates could go to Google or Facebook but they come to government for half that, and they are required to because of the structure of the program." A scholar indicated that some service models should be shortened. "Two years would be better than the churn we're experiencing right now," the scholar said, "Ten years seems unrealistic for my students."

- ***Competitions:*** philanthropy can invest in competitions that encourage individuals to participate in public interest technology. A scholar said, "You could do a DARPA challenge. It would be a lot of money, but it could do things at a level that are pretty big, too." Moreover, such competitions could "give people opportunities or incentives to come forward and participate, and when that happens it's a great opportunity to scout for talent, assess, and give that person the next opportunity," the scholar said.

- ***Diversity Scholarships:*** covering the cost of secondary education or other technology curricula could help bring diversity to public interest tech-

18 Associated Press. "Stock Up On Ramen: Average Cost Of College Rises Again." *USA Today*. 13 November 2014. http://college.usatoday.com/2014/11/13/stock-up-on-ramen-average-cost-of-college-rises-again/

nology, interviewees said. One method mentioned by a public interest technologist "provides loans to women to go to a programming academy." The technologist said, "I suppose that philanthropy could be using some of its money to be doing things like that."

Student Incentive Example: CyberCorps: Scholarship for Service

Program: by providing scholarships and financial incentives for college students, Scholarship for Service (SFS) fortifies the federal information assurance workforce that is assigned with safeguarding the government's critical information infrastructure. SFS provides scholarships and financial incentives, which typically include full coverage of costs associated with attending participating institutions.

Target Participants: Scholarship for Service is available for students across all levels of higher education. The National Science Foundation alongside the Department of Homeland Security partner with select government and academic institutions to award grants to students that they attract to the information assurance field.

Impact: Scholarship for Service alleviates financial constraints by providing monetary and educational incentives to serve in the public sector. This allows students to actively cultivate interest in public service.

Source: https://www.sfs.opm.gov/

Best Practices and Design Considerations

- *Foster Partnerships:* partnering with existing organizations can help a financial incentive programs start quickly, interviewees said. Speaking to competitions, a government practitioner said:

  > *As to the competition space, you can pitch it to 4H, the Girl Scouts, the Afterschool Alliance—all these organizations have technology components. Citizen Schools does three hours of after school activities at the middle school level, and that's a project that reaches a lot of kids, and there are lots of people that want to work with the kids.*

- *Build the Case—Invest Adequately in Marketing:* an interviewee indicated that determining a rollout strategy is critical to the success of an incentive program. "Part of what gets people thinking about the public interest is leaving law school with lots of debt or no debt," said a scholar, continuing, "From a marketing point of view, getting people to show up to learn about what debt forgiveness looks like is important."

- *Consider Downsides of Incentives:* one interviewee conveyed the importance of carefully structuring incentive programs. "You have to be careful with incentives," the government practitioner said. "Practice pragmatic innovation—I don't just want people who can talk about new ideas, I want people who can execute new ideas," the practitioner continued.

Student Incentive Example: *Stokes Educational Scholarship Program*

Program: the Stokes Educational Scholarship Program seeks to recruit individuals with skills useful to the NSA. Its scholarship targets minority high school students interested in computer science and engineering, providing them a $30,000 annual stipend for tuition. These students work as employees of the NSA during the summer in fields tailored to their course of study.

Target Participants: the Stokes Educational Scholarship Program partners the NSA with minority high school seniors intending to major in computer science or computer/electrical engineering.

Impact: the Stokes Educational Scholarship Program offers minority students the opportunity to pursue their area of study within the context of the NSA, fostering an interdisciplinary approach. This scholarship connects students who have demonstrated interests that are useful to the NSA with the agency so that they can pursue the necessary education.

Source: https://www.nsa.gov/careers/opportunities_4_u/students/stokes.shtml

3. Internships

Mid Term

In Process

Philanthropy could provide funding for internships, potentially with a formalized structure that allows interns to rotate among public interest organizations, to provide early exposure to public interest work for students and create opportunities for individuals from a variety of backgrounds.

Opportunities to create new internship programs and expand the ones that exist are ample, said interviewees. One scholar said that internships and experiential education "need experiments" in grantmaking. An advocate noted that entering the public interest field, including through internships, can be a substantial financial burden. "A lot of public interest work that exists requires that you learn your skill sets on your own—pipeline work requires financial commitment," the advocate said.

Space remains to formalize the internships that do exist, according to interviewees. "The bright light in the space are people who have done this organically," a public interest technologist said, citing one individual with whom the technologist was familiar. "The few people and places that exist—it's mostly people figuring things out for themselves," the technologist continued.

Interviewees noted that interns, much like with public interest technologists more generally, are not always deployed effectively. "Sometimes agencies don't know what they need—I've had students who had a perfectly fun time, but their agencies could have gotten much more interesting stuff from the students," a scholar said.

Despite the challenges, interviewees suggested that internships are worth supporting. "Simply creating opportunities for engagement for students working in the public interest would be very good. Short-term engagements can be really exciting and enlivening, and I've seen them get students on whole different career paths," remarked a scholar, "the more engagement the better."

Internship Example: Office of Science and Technology Policy Internship Policy Program

Program: the OSTP Policy Internship Program includes a variety of divisions through which interns collaborate with senior White House officials and science and technology (S&T) policy analysts. These divisions include the departments of Communications, Environment and Energy, and National Security and International Affairs.

Target Participants: the OSTP Policy Internship Program facilitates close collaboration between students, White House officials, and S&T analysts. The policy internship is open to all undergraduate or graduate students.

Impact: the OSTP Policy Internship Program is a rare opportunity for students to interact with officials and analysts who have combined careers in technology and policy. This program shows students an array of potential career paths.

Source: https://www.whitehouse.gov/administration/eop/ostp/about/student

Opportunity for Investment

Internship programs already exist, though programs related specifically to public interest technology can benefit from additional sophistication, according to some interviewees. Due to the administrative work that must be done in order for an internship program to succeed, philanthropic funding of new internship programs in some form may best be considered a mid-term intervention. Specific routes to investment identified by interviewees include:

- ***Support Paid Internships:*** interviewees indicated that the ability to do internships and not take a financial hit is important for students. "We need paid internships, and we don't have the money to do it ourselves," a public interest technologist said. "If there were a foundation funding program for us

> "We need paid internships, and we don't have the money to do it ourselves." —Public Interest Technologist

to hire two or three students a summer, that would be huge," the individual advised.

- *Formalize a Rotation System:* a public interest technologist suggested developing a system in which students can experience internships with a variety of different public interest organizations. "Having some formalized system where students can do internships with different groups would be helpful," the individual said, continuing, "That means we're not fighting over candidates and we'd know that we'd get them next year if we don't have them this year. Right now that formalized internship rotation system doesn't exist."
- *Advise Government on Public Interest Technology Internships:* one interviewee identified government internships specifically as needing consultation. "There's some need to help parts of the government identify what sorts of the summer programs, externships, and internships might be useful and which sorts of students might be the appropriate ones to participate," the scholar said. She cautioned that an element of such consultation would likely be communicating that government "will likely get more student applicants than they will have use for."

Internship Example: ITWorks

Program: ITWorks aims to provide qualified youth with the opportunity to obtain two professional IT certifications over four months and relevant professional experience through five-week internships at top corporations and non-profits.

Target Participants: ITWorks is designed for young adults between the ages of 18 and 26 who are high school graduates but have yet to complete college. It places these individuals in internships partnered with corporations and non-profits.

Impact: ITWorks enables youth to gain practical, hands-on IT knowledge and experience in the public sector, a combination that increases understanding of potential future career paths and opportunities.

Source: http://itworks.org/

Best Practices and Design Considerations

- *Facilitate Communication between Academia and Public Interest Organizations:* some misunderstanding may arise, a scholar said, due to a lack of mutual knowledge in academics and public interest leaders about each other's calendars. "Part of it is that it requires people in the academic community and public interest community to understand the life cycles," the scholar said. The individual noted, "The academic schedule – and the cyclical nature of it and how it might to hook up with the needs of the public interest community – isn't always clear."
- *Form Partnerships with Industry and Government:* some interviewees indicated that partnerships with organizations outside of the public interest could help an internship program gain traction. 55,000 Degrees, a Louisville partnership, was offered as an example of such a partnership. In Louisville, "Mayor Fisher and UPS and some of the big companies there did an analysis of the workforce they needed in the region. Then they began allocating out responsibility for hitting those specific targets, for example by providing X number of internships and opportunities for young people," a government practitioner said.

4. Conferences and Alliances

Mid Term

Existing Idea

Philanthropy could support conferences and alliances for public interest technologists to help bring in new individuals and to build communities and a professional identity. This intervention would likely have a corollary benefit of improving dissemination of public interest technology job opportunities.

Interviewees indicated that public interest technologists stand to gain from sharing experiences and best practices with one another in a structured fashion. One researcher said, "People need raw skills and networks they can learn from," signaling that these networks could be developed in a more robust fashion. An advocate cited the ability of

conferences to make the field more sophisticated. "Conferences help with socializing concepts and improving the understanding people have about broader issues," the individual said.

The same researcher noted the difficulty of finding talent in different organizations, forming the rationale for the development of a professional association or alliance or organizations. The researcher said:

> *You're going to have a lot of talent being pulled into a series of different election campaigns. What's going to happen to them? Where will they go? We certainly saw a lot of people in technology make their names in campaigns. How do you find the leader who wants to support them? Just like you have Palantir embedded in organizations, you should have social-justice-minded tech people embedded.*

Opportunity for Investment

Conferences and alliances relevant to public interest technologists already exist, but many interviewees noted that space remains for a distinct version of conference or alliance. Conferences that do exist in this field seem to point to a large demand for information and networking opportunities around technology and policy. At this year's Code for America Summit, for example, organizers anticipate over 1,300 "government leaders, technologists, and community members" to attend.[19] While conferences likely would not be able to be staged within a short timeframe due to logistical and infrastructure needs, a successful event could happen in the mid term. Alliances may also take some time to develop, depending on the development of principles and agreement about shared actions. Interviewees offered the following opportunities for investment in this intervention:

- ***Convene Technologists:*** conferences were listed by many as being a potential positive contaminant for the field. "Conferences can draw people—you hang out, see friends, catch up, have a drink," a scholar said, continuing, "I can't tell you how many times people are brought into the fold; that could use a lot more support." A field expert reflected on experiences from another conference: "We saw that people wanted a place for a diverse set of individuals to come together on a regular basis, be surrounded by resources, and not only demonstrate the value of their projects but also take them to scale," the individual said.
- ***Conferences for Human Resources Managers:*** similarly, human resources managers could be aided by a conference or series of conferences that helps identify best practices in the recruitment of public interest technologists. "You could have a meeting every year or a conference to talk about early identification of technologists where people who have experimented report back to the group," a scholar suggested.
- ***Sponsor Attendance at Existing Public Interest Conferences:*** supporting the presence of technologists at existing public interest gatherings may fulfill the need to share experiences and best practices. As one philanthropic leader remarked, philanthropy should be "more focused on bringing technologists into existing events and alliances where non-profit and public sector leaders are gathered."

"We saw that people wanted a place for a diverse set of individuals to come together on a regular basis, be surrounded by resources, and not only demonstrate the value of their projects but also take them to scale."—Field Expert

- ***Sponsor Attendance at Conferences outside the Public Interest:*** one advocate said that there could be a role for public interest technologists at conferences that are not directly related to the public interest. Some technologists "are actually going out to start-up conferences and presenting [public interest technology] as a viable alternative that allows people to work on challenging problems at scale," the advocate said. Philanthropy may be able to sponsor attendance for individuals at these conferences.

19 Code For America 2015 Summit Announcement. https://www.codeforamerica.org/summit/.

- *Form a Public Interest Technologist Association:* an advocate called for the formation of an association for public interest technologists. "It would be great to create an association that was dedicated to human rights," the advocate said, continuing, "You could be a member of it, and it would just mean that you made that public statement of values while continuing in your current work."

Conference and Alliance Example: Personal Democracy Forum

Program: the Personal Democracy Forum (PDF) is an annual two-day conference. It unites over 1,000 people with disparate backgrounds – from politicians to journalists to technologists – who meet to discuss how technology is shaping a new face of politics and government.

Target Participants: the PDF conference facilitates discussion between leaders in a variety of fields.

Impact: the PDF conference builds community and provides a forum for people to share their innovations that foster a more inclusive democracy.

Source: https://personaldemocracy.com/conference

Best Practices and Design Considerations

- *Consider Unconventional Conference Formats:* one interviewee said that integrating multiple untraditional components in a conference could be helpful. A conference could be "part hackathon, part training workshops," the advocate said.
- *Ensure Participation from Diverse Groups:* interviewees discussed ensuring participation in conferences and alliances by groups of people diverse both demographically and professionally. A field expert cited the example of the New York Tech Meetup as a group that includes multiple professions. "Members of the Tech Meetup aren't all technologists," the expert said. They are "academics, journalists, accountants who are all trying to understand how technology will influence their jobs and livelihoods," the expert continued.
- *Practice "Intentional Curation":* in developing an association, one interviewee noted the importance of strategically inviting new members. "We use intentional curation," said the field expert. "There are entrepreneurs and advocacy groups that are all members," and recruitment of new participants is enabled because "we designed a space that's so inviting that people want to be a part of it," the individual said.

Conference and Alliance Example: National Center for Women and Information Technology

Program: the National Center for Women and Information Technology (NCWIT) is a partnership of over 600 organizations. All of these partners have the common goal of preparing, placing, and keeping more women in technology-oriented careers.

Target Participants: NCWIT targets women at all stages of education and career. Its 600 alliances consist of groups that work in K-12 settings, the university environment, and several corporate spheres.

Impact: NCWIT believes that the presence of women in technology will bring several benefits. Female talent is currently underutilized in the IT sector, and diverse teams have increased problem-solving capacities when compared to more uniform groups. NCWIT provides a research-based approach to its pursuit of reform and greater access to key populations.

Source: https://www.ncwit.org/

5. Highlight Success

Short Term

Existing Idea

This intervention involves assisting public interest organizations in efforts to broadcast successful case studies to raise visibility of the need for public interest technologists, highlight the projects where they are succeeding, and potentially reach new, diverse communities. This effort to elevate public interest technology success could take the form of produc-

ing documents for city leaders, a speaker series, and general communications assistance.

A substantial and recurring difficulty for public interest organizations, and particularly civil society, is ensuring that success is adequately celebrated, according to interviewees. "I think we're missing a narrative and a compelling pitch to get people going into civil society," said a philanthropic leader. An advocate expanded on the problem, "The reason why I believe that is the case is that we are in the middle of the most competitive industry in the world—we're not doing a good enough of a job telling people about our mission and what it is that we do. A better articulation of that value proposition would be helpful in our recruiting." Another advocate agreed, specifically referencing online campaigns. "There's just not much publicity about effective online campaigns," the advocate said, "and as a result, we're not sparking the imaginations of young people to be heroes by using technology."

> "We're not sparking the imaginations of young people to be heroes by using technology."—Researcher

> "Foundations could help conduct PR and outreach. Philanthropy has relationships because of their size and stature, and they could be using that stature to drive stories with the press."
> —Government Practitioner

Some of this problem may come from a lack of successes to highlight, according to one interviewee. While technology may enable public interest organizations to revolutionize how they serve their communities, tangible examples of this impact may be limited. The scholar said, "I don't say this unkindly, but there's been a lot of hype around these ideas – for example, data science – but there aren't very many actual successes." The scholar continued:

The hype exceeds the reality, but there are those of us in the movement who are believers and see the potential for huge impact, and a few big hits would go a long way. When I'm teaching my students [about civic technology], we quickly get to things like rodent inspections. Unfortunately, that's the leading example [of a successful, impactful deployment of technology in the public interest]. But there's not a big glamourous success, and we could use a few.

Several interviewees mentioned the HealthCare.gov crisis as the most prominent example of technology for the public interest lifted up by press—this negative press coverage coincided with public opposition to the healthcare law rising to 57 percent.[20]

Moreover, some interviewees indicated that the culture of information sharing in public interest organizations is not healthy. "One of the problems in the non-profit sector is everybody trying to not share with anybody else," said a researcher.

Opportunity for Investment

Interviewees said that investment in improving communication surrounding successful instances of public interest technology could be done relatively quickly, potentially in the short term. Investment would likely build on existing efforts and existing infrastructure that highlight success throughout civil society and government. Potential opportunities for investment include:

- ***Lend Out Foundation Communications Resources:*** an interviewee noted that foundations often have more capacity than grantees to highlight success in the media. A government practitioner said: "Foundations could help conduct PR and outreach. Philanthropy has relationships because of their size and stature, and they could be using that stature to drive stories with the press." An advocate agreed, commenting "At [my organization] for instance, we did a lot of incredible work with technology. It wasn't recognized in any way by the sector. Philan-

20 Balz, Dan and Craighill, Peyton M. "Obama's Ratings Tumble After Health-Care Flaws." *Washington Post*. 19 November 2013. http://www.washingtonpost.com/politics/obamas-ratings-tumble-after-health-care-flaws/2013/11/18/c9cdbc2c-507c-11e3-9fe0-fd2ca728e67c_story.html

thropy could be devoting some of their communications resources to getting those stories out in the media." Some interviewees said the need for exposure to success stories is particularly acute in cities. "Most cities of the same size deal with similar issues," said an advocate. "If we can point to other successful examples, this can be very motivating—we can then scale by spreading learnings across cities," the person continued.

Highlighting Success Example: Data & Society

Program: Data & Society is a think/do tank that focuses on social, cultural, and ethical issues that have surfaced due to technological advances. Through discussions and debates, Data & Society engages individuals from a wide array of fields to address these pressing issues. It furthers society's understanding of these issues by hosting events and discussions, conducting research, and devising policy structures.

Target Participants: Data & Society brings together individuals from a variety of backgrounds, such as researchers, entrepreneurs, activists, policy creators, journalists, and academics.

Impact: since its establishment in 2013, Data & Society has launched six research initiatives alongside corresponding events and projects that increase awareness and consideration of the specific initiatives. Additionally, some of the themes and proposals made by Data & Society have been featured in White House reports, further elevating these issues in the public consciousness.

Source: http://www.datasociety.net/

Best Practices and Design Considerations

- *Profile Individuals:* some interviewees said that individuals may provide a useful angle for lifting up successes, particularly in the context of examples of successful technology efforts. Said an advocate, "In all successful places, it's possible to point to the person who caused the change by giving budget and resources and space to make this happen."
- *Pressure Elected Officials to Be Innovative:* resulting from publicizing technology efforts, some noted an ability to foster competition within elected officials as a way to take ideas to scale. "Elected officials don't want to be the last on the boat," said an advocate. The advocate observed, "One thing that it's been most striking to me is that although governments don't like to go first, they love to go second—there is great willingness to copy others and jump in."
- *Balance the Negative with the Positive:* one philanthropic leader recommended coupling information about the underdeveloped talent pipeline with images of what success looks like. "Do both: first aggregate how many positions are out there and what the gap in pay is, and then when you close it, show how much better things get as well as cases and examples of things that are working," the leader said.

B. Skill-Building Interventions

This subsection details interventions related to building skills relevant to public interest technology in existing and potential technologists as well as their instructors. Interventions in this subsection include: (1) K-12: Computer Science Curricula; (2) Higher Learning: Interdisciplinary Curricula at Universities; (3) Online Learning Opportunities; (4) Teacher Training; and (5) Improve Faculty Incentives.

1. K-12: Computer Science Curricula

Mid Term

In Process

Philanthropy could support the development of computer science and web literacy curricula that are appealing, useful, and culturally relevant. Upon completion of successful pilot programs, the curricula could later be taken to scale and taught at schools around the country. Investment in this intervention could entail funding original curriculum development or supporting the expansion and refinement of existing programs.

Interviewees indicated that K-12 education is an important component of widening and diversifying public interest technology. Speaking to the lack of diversity in the field, one philanthropic leader said, "It's almost like you

want to start in elementary school." The leader continued, "I don't see how you can hold industries or organizations responsible for a computer science graduation rate that's as skewed as it is." Said another researcher, "When I look at weaknesses in the pipeline, I would want to look at the surprising fall off of women interested in computer science at age 14." A government practitioner agreed: "All our work in underrepresentation must have a component of education and how to put them on path [toward a computer science degree]."

Some interviewees emphasized that K-12 curricula should also focus on broadly applicable web literacy skills over a narrower scope of coding alone. As one philanthropic leader remarked, "The idea of universal web literacy is key. We define that as read, write, and participate. Employers want to hire tech-savvy people for non-technical jobs."

For example, although the Advanced Placement (AP) Computer Science test was first administered in 1984, as of 2014, in California alone only 13 percent of high schools offer AP Computer Science.[21] Exploring Computer Science, an innovative K-12 computer science curriculum and teacher training program based in Los Angeles, "was such a success that it's been scaled across the country – it's required in Chicago, and is being scaled by Code.org," a government practitioner said.

K-12 Example: Level Playing Field Institute

Program: the Level Playing Field Institute (LPFI) aims to increase participation in STEM fields by eliminating the barriers to education that underrepresented communities often face. LPFI offers five-week summer programs, a year-long Saturday enrichment program, and mentoring for high school freshmen.

Target Participants: LPFI targets African American, Latino/a, Native American, Southeast Asian or Pacific Islander, and low-income or first generation college-bound high school students with demonstrated ability in science and math.

Impact: LPFI bolsters educational opportunities for high school students so they can attend and graduate from top colleges and universities. The educational success of these students will ultimately allow them to become leaders in STEM fields, and these fields will benefit from the broad perspectives these underrepresented communities offer.

Source: http://www.lpfi.org/

Opportunity for Investment

Current efforts to develop K-12 computer science curricula are still in process, and the curricula that do exist have not been fully implemented, interviewees indicated. Investments in K-12 could take the form of supporting the advancement of current programs or creating new ones:

- ***Scaling Up Success:*** philanthropy could provide additional support and guidance for successful duplication efforts. Philanthropy may also consider providing funding to research organizations for investigating the effectiveness of existing programs and pilot programs to determine which curricula should receive additional support. As one field expert cautioned, "You're never going to get education reform through charter schools. How can you use these examples in a large-scale effort to reform public school education?"
- ***Compelling Program Development:*** philanthropy may consider providing funding to researchers and educators to create new pilot models of computer science curricula. As a government expert explained,

21 Braswell, James. "Advanced Placement Computer Science." *National Council of Teachers of Mathematics*. 77.5 May 1984. 372-379. http://www.jstor.org/stable/27964073?seq=1#page_scan_tab_contents; and Hayden, Sara. "Pushing the Start Button On A Computer Science Curriculum for K-12 Schools." *LA Times*. September 1, 2014. http://www.latimes.com/local/education/la-me-computer-science-20140902-story.html

Exploring Computer Science was developed by "a social science researcher, so it took time to get it into the national picture. But it took off because there was such a huge need." Further funding could allow other researchers to develop other computer science curricula.

K-12 Curricula Example: Exploring Computer Science

Program: Exploring Computer Science aims to increase students' opportunities to learn computer science within the Los Angeles Unified School District as well as increase encourage minority and female participation in computer science.

Target Participants: Exploring Computer Science targets academic institutions in the Los Angeles Unified School District. In particular, it focuses on igniting the interest of African American, Latino/a, and female students in computer science. It has partnerships in K-12 schools and university systems. Participating students should have previously completed an algebra course.

Impact: the Exploring Computer Science program recruits diverse high school students. The program addresses the racial inequalities in computer science education, which are representative of inequalities in the educational system at large. Exploring Computer Science is currently being scaled across the country

Source: http://www.exploringcs.org/

Best Practices and Design Considerations

- *Create Interesting Curricula:* interviewees said that new curricula should be well-designed to pique student interest. One advocate said, "Certainly we want kids to have motivation to do things because they are interested in it [but] how do you identify these kernels of interest and support them?" One suggestion this advocate had was connected learning models, which have "an approach to student-lead learning that causes intrinsic motivation in children."
- *Focus on Algorithmic Thinking:* one researcher said that it may be more important to focus on improving algorithmic thinking in children than to focus on teaching how to code. "We want students to approach things as algorithms—whether it's software or hardware, they're building a recipe to solve something," the researcher said.
- *Start before High School:* one advocate who works with communities of color emphasized the need for computer science education before high school. The advocate spoke about how particularly for the underrepresented minorities and women in the person's program, "Age 10, 12, 13 is the peak of the participation curve—if you wait until high school, you have waited too late." The advocate continued, "The quickest return for investment is in high school or college, but this leaves out communities of color."
- *Transcend School Programs Alone:* government practitioner cautioned against relying on supplemental education programs alone. "This change has to happen in schools, not just after school programs the practitioner said, continuing, "Minorities say that they are interested in computer careers, but they don't have access to classes." An advocate who works on supplemental education programs agreed about the importance of classroom education. "We need low-cost computers and ways for students to access technology once they leave the workshop, and one of these may be incorporating computer science into school curriculum," the advocate said.

2. Higher Learning: Interdisciplinary Curricula at Universities

Mid Term

In Process

Philanthropy could work to improve the environment for interdisciplinary studies at universities through a number of methods, including: supporting hybrid coursework, creating accelerated programs, encouraging technical core requirements and capstone projects that aid public interest organizations, and broadening the definition of "interdisciplinary."

Improving interdisciplinary curricula at universities may be one way to create more public interest technologists—including both leaders who understand technology and those who implement technology projects. Many interviewees expressed a desire for public interest technologists who are able to grasp both the fundamentals of computer science and policy development. "We keep learning that technology cannot be applied like a wrench at the end of a policy process," one scholar remarked, continuing, "It has to be at the table at all times. The people with this mix of expertise could be serving in all areas of government."

At the same time, some interviewees felt like there were not many programs that successfully address both technology and policy. "It's a fascinating mix, but it's one that I don't see that often," one government practitioner stated. Another government practitioner agreed: "You can count the number of programs on one hand." Even when there are professors working in in this field, interviewees felt that this does not necessarily result in students with the same skills. "The professors who are the most tech-policy savvy have been very inconsistent about putting out people like them," remarked a public interest technologist.

Interviewees repeatedly discussed how combining technology and policy in a traditional academic setting is challenging. "To be honest, there are a lot of obstacles to having true interdisciplinary programs," a scholar said, adding, "A lot of it has to do with money. If we were to do a program with [another college on campus], we would have to share the revenue with those programs. Given the choice to do something in house or share it with another college on campus, there's a lot of motivation to do it yourself. This doesn't make sense in a lot of cases, so you end up with a lot of redundancy." Another scholar agreed, saying, "It's much easier to stay within your discipline, both inside and outside academia. It's challenging to build a new community around a new set of problems. It's very hard to find the right people, both the right faculty and the right students. Some university programs have found that they weren't able to bridge the divides."

> "To be honest, there are a lot of obstacles to having true interdisciplinary programs." —Scholar

Interdisciplinary University Curriculum Example: Berkman Center for Internet and Society at Harvard

Program: the Berkman Center for Internet & Society at Harvard University is a research center built on interdisciplinary collaboration between faculty, students, and outside affiliates. It seeks to understand the evolution and norms of the Internet through active research.

Target Participants: the Berkman Center engages with a wide audience through free online lectures and events such as conferences that bring participants together and invite debate. The Center collaborates with innovative thinkers in fields ranging from law to technology. The Center promotes partnerships amongst faculty, students, fellows, entrepreneurs, lawyers, and online architects.

Impact: by studying the constellation of issues connected to Internet use, the Berkman Center has established itself as a leading authority on the intricacies of cyberspace. Their research extends to the community through online lectures, discussions, and gatherings.

Source: https://cyber.law.harvard.edu/

Opportunity for Investment

Establishing interdisciplinary curricula at universities is in process. Although according to interviewees there may not be many programs that bridge technology and policy, some programs have been developed. It will likely take time for this area to become accepted within mainstream academia, but the barriers do not seem insurmountable, according to interviewees. Philanthropic leaders could encourage the adoption of interdisciplinary curricula through grants and liaising with university leadership:

- *Establish Interdisciplinary Grants:* philanthropy may consider creating small grants that would promote interdisciplinary partnerships that both expose tech-

nology implementers to policy and policy leaders to technology. Interviewees felt that there would be enthusiasm for interdisciplinary work, but incentives are needed to jumpstart teamwork. As one philanthropic leader explained, "One of the things I'm thinking about is how to reboot those programs and incentivize them to draw upon the expertise at the [information studies schools] and computer science programs. I think there will be interest and excitement, but there hasn't been a lot of group thinking by funders about how to catalyze this. Philanthropy doesn't always have to build from the ground up." One scholar gave an example of how philanthropy can encourage interdisciplinary coursework, saying there is "a joint course between Georgetown Law and MIT. It was a totally new effort, and the foundational support was vital in helping develop it."

- *Motivate Leadership:* philanthropy could also promote support among university leadership for interdisciplinary programs, perhaps through training programs or seminars. Support from senior leadership was one common feature of the few successful interdisciplinary programs mentioned. A scholar said, "It takes a strong commitment from upper-level administrators. Every university in the nation talks about the value of interdisciplinary work, but it doesn't actually happen. This change has to come from the top."

Interdisciplinary University Curriculum Example: Department of Engineering and Public Policy at Carnegie Mellon

Program: the Department of Engineering and Public Policy (EPP) at Carnegie Mellon University provides interdisciplinary programs with courses in engineering and public policy. The program recognizes that, while technology allows us to solve many of today's most pressing problems, it also has created its own set of issues.

Target Participants: the Department of Engineering and Public Policy (EPP) offers several programs to undergraduates in engineering or computer science programs. It also has programs for Master's and PhD students.

Impact: the multidisciplinary program provides students with the technical expertise and social science background necessary for them to solve societal problems.

Source: https://www.cmu.edu/epp/

Best Practices and Design Considerations

- *Public Interest Projects:* group projects are a common feature of curricula for many universities and a unique opportunity to expose students to public interest work. One public interest technologist remarked that by integrating public interest organizations into these projects, "It would not only help with visibility and pipeline side, but also influence the kind of skills that people are gaining coming out of college." A government practitioner agreed, praising an institution which has "a multi-disciplinary course where students work in teams to solve problems in the community. For example, they built a wetland so that the river that came through it would be cleansed." A scholar also emphasized the importance of these types of projects as an important element of their interdisciplinary program, remarking "We not only want our students to have classes in economics and computer science, but to also have experiential learning elements to help them apply these concepts." The scholar continued, "It's not just a capstone at the end; we have experiential learning

built throughout the program. It forces you to apply concepts in a holistic manner."

- *Build Policy Coursework:* interviewees suggested that technologists working in the public interest may benefit from policy coursework. "I think anybody who wants to work in a public sector environment would benefit from our program and learn policy analysis, communication, and management skills. Even if you're working in the technology field, those are important skills to have," one scholar said. Some institutions already have professors creating these curricula: "I'm trying to build classes where students are solving problems and creating startups that have a social justice bent," explained a researcher.

- *Introduce Ethics and Social Justice Coursework:* several interviewees found value in providing ethics classes to technologists. One advocate remarked, "I think it's fascinating that most people go into computer science, and very rarely do they take ethics classes." The individual continued, "This could be an interesting way to create best practices and expose people to some of the opportunities that may exist outside of working at a large technology community." Another scholar agreed, describing their ideal curriculum as containing "technical components to the education, as well as legal, ethics and policy studies." A researcher echoed these ideas, explaining, "I'm really interested in this question of how we teach social justice in context of teaching technology. Never would I call it ethics, but I'm teaching classes on Internet history from the perspective of what are ideologies and paradigms we bring to bear in our work."

- *Reinforce Data Coursework:* interviewees agreed that public interest technologists should learn how to understand and manipulate data and technology. "I don't think you can start teaching that kind of mind frame early enough," said a government practitioner. "If you're a government major at a college, there absolutely should be a requirement that you start learning to manage data," the individual continued. Another government practitioner agreed: "You need the ability to analyze data and be thoughtful about data."

Interdisciplinary University Curriculum Example: Georgetown Law and MIT Joint Privacy Practicum Course

Program: the Georgetown Law Center on Privacy & Technology, in partnership with the Massachusetts Institute of Technology, offers a semester-long class to facilitate collaboration between lawyers and technologists. The course, called a Joint Privacy Practicum, teaches students the technical and legal dimensions of privacy issues, and they apply this knowledge by creating working models of state privacy legislation.

Target Participants: the course targets engineering and computer science students at MIT and law students at the Georgetown Law Center. The course began in the spring of 2015, with the first class held at MIT and the subsequent sessions held via teleconferencing between the two universities.

Impact: in the long term, the program aims to cultivate a generation of lawyers and technologists capable of approaching privacy issues from both legal and technical standpoints.

Source: https://www.law.georgetown.edu/news/press-releases/georgetown-law-and-mit-offer-joint-privacy-practicum-course.cfm

3. Online Learning Opportunities

Mid Term

In Process

Philanthropy could increase diverse communities' access to existing programs by bringing them online and adapting content to make it resonate with different learning styles and realities. Online learning opportunities can coexist with traditional education models or be used independently of formal education settings for continuing education.

Online opportunities are a potentially valuable avenue to supplementing education programs and helping people gain technology skills that may otherwise be inaccessible. "My hunch is that if you have the skills, there will

be opportunities to get jobs without a college degree," said one researcher. However, the researcher continued, while some people can afford to take time off and afford to enroll in courses, "Only certain people are going to be able to pause their lives and learn the skills to get hired as web developers."

While the effectiveness of online learning is still under debate, there is some recent evidence in favor of online classes as a learning method. A 2014 study from the Massachusetts Institute of Technology found that online courses may be superior to classroom lectures in terms of the amount learned by students.[22]

Opportunity for Investment

Several attempts have been made to develop online learning opportunities for computer science. Philanthropic leaders could engage with online opportunities by supporting free online coursework or integrative online/offline educational programs:

- ***Support Online Coursework:*** massive open online classes, known as MOOCs, are a well-known possible avenue for investment. "There are few examples in education that have managed to hybridize education and tech," said one scholar. "One option that I've wanted to do is to try MOOCs," mentioned another scholar. Another option for philanthropic leaders could be supporting the development of online coursework that could supplement classroom teaching.

Best Practices and Design Considerations

- ***Support Online Learners:*** philanthropic leaders may wish to support online opportunities to help diversify the technology talent pipeline, but an interviewee warned that online learners still need support. One scholar remarked that even though "people might be less self-selecting" when enrolling in online classes, "the entire field needs to be cognizant and encourage these people as they go along their path."

- ***Enable Integrative Online/Offline Educational Programs:*** philanthropy may consider supporting program development of courses that combine online and offline learning. "I can imagine degree programs that combine online programming with real-life internship programs," said one scholar. An advocate mentioned, "Online tools could help scale their resource-intensive classwork."

Online Opportunities Example: Khan Academy

Program: Khan Academy is a website that provides free video tutorials to users with or without an account. Khan Academy offers courses across disciplines, from art history to computer programming. The material covers a wider range of levels; the math courses span kindergarten to calculus.

Target Participants: Khan Academy is flexible, and anyone can access the videos and supplemental materials to learn at their own pace. Khan Academy also provides resources for teachers to see where their students are struggling and need extra practice.

Impact: millions of students use Khan Academy every day from across the globe. The videos are offered in nearly 40 languages.

Source: https://www.khanacademy.org/

4. Teacher Training

Mid Term

In Process

By strengthening professional development opportunities, philanthropy could help ensure that those teaching computer science curricula have adequate training and all teachers have basic computer literacy.

Interviewees emphasized the importance of teacher training for improving the technology talent pipeline and ensuring the successful implementation of K-12 computer science curricula. "We have often thought about professional development and how to engage teacher's colleges," said one government practitioner. Even so, as one field expert remarked, "The next bottleneck that's coming up is teachers." A researcher agreed: "Part of the solution is creating a new generation of educators."

22 Chandler, David. "Study: Online Classes Really Do Work." *MIT News Office*. 24 September 2014. http://newsoffice.mit.edu/2014/study-shows-online-courses-effective-0924

Opportunity for Investment

Several programs have already begun to address teacher training, although interviewees indicated no technology program has achieved full adoption across the United States. While achieving widespread teacher training will take time, as efforts are underway this intervention is feasible in the mid term. Interviewees noted that philanthropic leaders could support teacher training in a number of ways:

> "My hunch is that if you have the skills, there will be opportunities to get jobs without a college degree." —Researcher

- *Computer Science Teachers' Organizations:* interviewees advocated for strong computer science teacher organizations. "Teachers turn over fast in public schools," warned one government practitioner, continuing, "Will [organizations] be pumping money into these programs in five years? They'll be moving on to other things. We need a strong computer science teachers' organization. We need to bring back building a community of teachers." A substantive teachers' organization could also support "more and better conferences," as desired by another government practitioner.
- *Teacher Training Programs:* interviewees suggested the formation of a robust education infrastructure that could train teachers. A government practitioner hoped that philanthropic leaders would support "a formal education infrastructure" that "teaches the basics of [computer science] and grows the number of people who are able to operate effectively in that subfield."

Best Practices and Design Considerations

- *Teach the Teachers, Not the Technologists:* some interviewees supported training teachers in computer science rather than training computer science professionals to teach. As a field expert remarked, "A good teacher can teach anything, but taking your most talented geeky engineer and making them into a teacher? It's not saleable." Current STEM teachers might be a good source to draw from, and this practice is already underway: "We've been working on professional development programs to take science and math teachers and help them teach computer science," one government practitioner said. Additionally, a philanthropic leader advocated for instructing teachers on technical skills more broadly, saying, "We're giving tech skills to non-computer science teachers. There's a much bigger need for this, and it's a big area of investment for us."
- *Look Beyond Skill Building:* interviewees hope that teachers will learn to teach coding from an intersectional perspective. "You should stay away from the idea that this is just coding or writing programs," advised a government practitioner. Rather, this government practitioner hoped that teachers will "look at societal impact," and their coursework will involve "collaborative teamwork and a broad picture," and "focus on programming as a creative field."

Teacher Training Example: Code.org

Program: Code.org is a non-profit that works to increase the scope of computer science education, particularly for underrepresented groups. Code.org's initiatives are international in reach and include the design of curricula as well as collaboration with large school districts. They also campaign for policy changes that would incorporate CS classes into the traditional curriculum.

Target Participants: Code.org's initiatives are geared towards women and underrepresented students of color.

Impact: Code.org has several metrics attesting to its scope. Over 121 million students have participated in Code.org's Hour of Code tutorial, of which 48 percent were female. Code.org has also helped change policy in favor of an expanded computer science curriculum in 16 states. Additionally, it has motivated over 141,000 teachers to teach at least an introductory CS course, which will reach more than 5.9 million students.

Source: https://code.org/

5. Improve Faculty Incentives

Philanthropy could improve incentives for faculty by developing and socializing interdisciplinary journals, recruiting senior field advocates to form a community, and creating endowed chair positions.

Interviewees perceived many opportunities for philanthropy to foster interdisciplinary and innovative work by supporting technology and policy faculty. As one scholar depicted the environment, "There's not a lot of faculty themselves who are working at this intersection of technology and policy. Few people can bring these two together."

This deficit may be due in part to a lack of broader recognition of the intersections between technology and policy within academia. "It's way too early to think about a journal in this field," a scholar explained. Some of the faculty working in this area have found it challenging as well: "My university hasn't stood in the way, but they haven't been supportive," a scholar commented.

> "The short-term thing to do is make a community of professors interested in this space where they can share objectives, conduct annual workshops, and promote education and student work."
> —Government Practitioner

Opportunity for Investment

While the concept of interdisciplinary work is not new, the ideas discussed below suggest that uniting the technology and policy fields will result in a thus far undeveloped area of expertise. Establishing the legitimacy of a new academic field that brings these areas together is likely a long-term undertaking.

Interviewees raised several ways that philanthropic leaders could improve faculty incentives, including by establishing a faculty community and legitimizing the technology and policy field by creating Ph.D. programs:

- ***Build a Faculty Community:*** interviewees expressed a desire for more colleagues and community that work at the intersection of technology and policy. A government practitioner proposed, "The short-term thing to do is make a community of professors interested in this space where they can share objectives, conduct annual workshops, and promote education and student work." There was also a desire for more faculty working in this field in general. "If I was faced with bottomless resources," said one scholar, "I would certainly double our faculty."
- ***Legitimize the Field through Ph.D. Programs:*** one suggested method of creating legitimacy within academy for technology policy issues is establishing Ph.D.-granting programs. One scholar explained this idea in depth:

  We have tossed around the idea of a Ph.D. program to create people from the get-go who do this kind of work. Part of the problem is that when there's only one program, there isn't a market. However, seeding five to ten Ph.D.-granting programs would create the next generation of faculty and grow the field. They would then teach the next generation of people who go out into the real world as public interest technologists.

Best Practices and Design Considerations

- ***Adjust Tenure Requirements:*** interviewees praised flexbile tenure requirements as a key factor in encouraging faculty to undertake interdisciplinary work. As one scholar explained, "At some schools, when you're an assistant professor and they are deciding on your promotion, they have a certain list of journals where you should publish." This is in contrast to the scholar's own institution, where "of course they want you to publish at the top, but they don't discriminate if it's marketing or economics. This gives you a degree of freedom to truly practice interdisciplinary work." The scholar also lauded their institution for not counting paper co-authorship against faculty: "There's an effort to look at your contribution to your field, and this

encourages you to find co-authors in other fields. I know if I publish with them, I won't be penalized. These little things do matter." Another scholar agreed, concluding "Here this bean-counting is never taken into account, and that's critical. This culture attracts scholars who are interested in interdisciplinary work."

- *Fund Experimental Research and Innovation:* cross-department experimental research and innovation were suggested as helpful components of faculty incentives. As one scholar mentioned, "You can do experiments like the ones I'm talking about with only a little money. They help bring people together and let them know that they're not doing this on their own." Echoing the importance of financial support, another researcher commented, "There's not a lot of native support faculty who have innovations in the social good space to help bring them out into the universe." This funding could also go toward fostering practical skills. Some interviewees were concerned that universities do not provide students with technical training relevant to the workplace, a phenomenon which some trace to the culture of academia. As one researcher cautioned:

> *Academia is about basic research. The problems that people are trying to solve in doing research are not about implementation. Academics may use Python, but they don't know how to choose between vendors or manage large teams of implementers; professors know how to train graduate students, but they don't necessarily know how to train developers and product managers.*

C. Recruitment and Training Interventions

The interventions in this subsection detail those close to the marketplace of public interest technologists and relate primarily to recruitment and training. The interventions include: (1) Better Job Descriptions; (2) Online Job Board/Clearinghouse; (3) Recruitment via Networking and Partnerships; (4) Placement Agency; (5) Credentialing; (6) Boot Camps; and (7) Management and Communications Training.

1. Better Job Descriptions

Mid Term

In Process

> *Philanthropy could create appealing, accurate templates that organizations can use to help attract technologists to public interest work and facilitate hiring in bureaucratic structures.*

In examining both the demand side and the supply side of public interest technology, many interviewees highlighted improving job descriptions as a key potential intervention point to make it easier for public interest organizations to hire high-quality talent and for technologists to find jobs best suited to deploying their skills. They suggested philanthropy could potentially support efforts to standardize and improve job descriptions.

> "It takes so long to get a job description. They're pages and pages long, and they're written in a language technologists don't understand—I don't understand them." —Advocate

One advocate put the challenge simply: "There is a lot of unbelievably tactical stuff about how civil service jobs are constructed that is incredibly slow and constrained." A public interest technologist argued, "At this point, a lot of hiring is speculative." The individual added, "What the person is going to do, what their actual job will be, is very vague in a way that is not convincing or engaging for a person who is high-skilled and that is considering a job at a public agency." The public interest technologist said, "A public agency will have to work extra hard to make it clear that the job is a really good job. They aren't doing that." Or as the advocate put it, "It takes so long to get a job description. They're pages and pages long, and they're written in a language technologists don't understand—I don't understand them."

Interviewees with direct experience in government agreed with these perspectives, and highlighted how lackluster job descriptions could be off-putting to potential talent and stand in the way of effective recruiting. Said one individual, "These are people that want to work on the hard problems that our society faces. In our experience, there are no limit to the people that actually want to do this." The practitioner added, "The problem is when they look at those jobs, they sound really boring and uninteresting. People want to do this kind of work."

> "Academia is about basic research. The problems that people are trying to solve in doing research are not about implementation."
> —Researcher

Some interviewees highlighted the disconnect between the non-technical human resources or administrative staff often charged with writing job descriptions and the nature of the jobs public interest technologists are recruited to perform. The public interest technologist said, "I think that there is a high-level problem, which is that you have people writing job descriptions in government that they don't know anything about. It would be like asking me to write a job description for an underwater welder." Another government practitioner agreed: "I used to joke that some of our job descriptions included horse-shoeing and buggy-making. They take the job description, dust it off, and put it on USA Jobs." Noted an advocate, "What people do is take the old [job descriptions] and reuse them, so the job descriptions don't match what you're hiring for. So the criteria are wrong. The selection process is highly, highly constrained for rank and file jobs." Others suggested the problem was more fundamental—said a scholar, "Part of it is how do we define the profession? What is a technologist? Conceptually, we need a sense of what it is."

> "Part of it is how do we define the profession? What is a technologist? Conceptually, we need a sense of what it is."
> —Scholar

Opportunity for Investment

While some organizations and individuals are attempting to reform the way that job descriptions are written, as interviewees' frustrations attest, better job descriptions are far from attaining widespread adoption. Interviewees highlighted several potential key roles for philanthropy:

- ***Standardized Basic Templates:*** philanthropy could support efforts to develop and disseminate core job descriptions for common public interest technologist jobs in civil society and government, reducing the need for these organizations to develop their own. A scholar noted that among CIOs and CTOs, "not even their own titles are standardized. Each one is fleshing out their position and job description." The scholar contrasted this situation to the well-defined roles of a CFO and his or her staff that tend to be consistent across communities, declaring, "You'd never have a CFO ask another CFO for a job description of the person they are hiring."
- ***Best Practices Guides for Public Interest Technology Leaders:*** interviewees highlighted the impact of compelling job descriptions, and suggested philanthropy could play an important role in helping to develop standard or replicable templates that could be deployed by multiple communities or organizations. Said a government practitioner with significant success in hiring public interest technologists, "Our hiring process is also different. Everything starting from the language we use when writing up the job descriptions really helps us. We try to make ours as interesting-sounding as possible and stay away from the jargon." Recognizing the likely needs of government entities and civil society organizations to create their own job descriptions for certain technologist positions in addition to the templates envisioned above, philanthropy could invest in the creation of best practices guides. These guides could codify recommendations on crafting effective job descriptions, such as focusing on relevant competencies, using

appealing language, highlighting cultural factors and opportunities for impact, and keeping position descriptions to a manageable length.

- ***Support Stop-Gap Measures:*** one interviewee suggested a stop-gap measure that translates unappealing job descriptions into accessible and attractive language for public interest technologists. "We are re-writing job descriptions to make them more appealing to people in the tech industry. We call it a 'Job-board Hack.' We're building an interim-job board that takes an official job description and adds to it, giving it an accurate title, the real impact of the job, and what are the most important skills needed. This will 'hack' the system," remarked the advocate. While encouraging public interest organizations to reform their methods of writing job descriptions, such stop-gap measures as this one might fill the immediate need for better job descriptions.

> "We are re-writing job descriptions to make them more appealing to people in the tech industry. We call it a 'Job-board Hack.'
> —Advocate

Best Practices and Design Consideration

- ***Consider Needs Assessments and Scoping:*** a number of interviewees identified a lack of understanding even within organizations of their fundamental needs and goals for hiring a technologist as a barrier. Said one public interest technologist about a fellowship program, "The organizations don't have a solid idea of what they want." The individual continued, "Ultimately many of them want someone who can bridge technology and policy [and is] less like a computer programmer." In developing templates and other replicable hiring materials, developing a solid understanding within organizations and externally of what skills they actually need may be critical.

- ***Emphasize Respect:*** some interviewees suggested that optimal job descriptions would highlight a supportive environment and how public interest technologists would work within the hiring organization. Said a former government practitioner, "Everyone wants to be needed and loved. If you're in an environment where the organization is still having issues with what the value is you're bringing to the table, it's not good."

- ***Offer a Value Proposition:*** some interviewees argued that a key element of increasing the adoption of public interest technologist jobs in public interest organizations is developing job descriptions that reflect to employees of the organization the value technologists could deliver and having leadership that prioritizes those values. Said a former government practitioner, "I believe strongly it's not the price that's the problem—it's a matter of crafting [technologist] roles in a way that they're set up to deliver ROI for agencies who are paying their salary. It requires a manager who understands the value of analytics."

2. Online Job Board/Clearinghouse

Mid Term

New Idea

Philanthropy could develop a sophisticated and user-friendly job board and email listserv, potentially including a clearinghouse, for public interest technology opportunities.

A number of interviewees highlighted the difficulty of connecting would-be public interest technologists with opportunities to deploy their skills, suggesting this marketplace failure significantly impaired the recruiting process both for technologists and for public interest organizations. One technologist said, "This pipeline is not, as far I've seen, a well-functioning market where there's some marketplace people know to go to and evaluate jobs." "People are definitely coming with this feeling of wanting to work in public interest careers," the individual said, "but it's not a category on Monster.com. Something that makes that part of the talent pipeline more concrete would be a big help." An advocate called for a "strategy of getting

information coordinated and anchored by an existing network of people for the public service, with a strategy around the communications."

Others agreed that currently, formal centralization and aggregation of opportunities for public interest technologists is limited for civil society and government. Said a former policymaker, "The marketplace isn't organized. If I am hiring for the private sector, there are recruiting firms, head hunters, LinkedIn, and incentivized systems. Right now there isn't a system in government." One scholar said there is "not a formal mechanism. It would be great to have some support for this." A field expert noted a fundamental challenge, saying, "Part of the problem is that all of these companies are in competition for highly talented people."

> "People are definitely coming with this feeling of wanting to work in public interest careers, but it's not a category on Monster.com."
> —Technologist

Job Board Example: Idealist

Program: Idealist connects individuals who wish to take action and drive impact with organizations and resources. Idealist compiles and posts an extensive list all of the jobs, internships, and volunteer opportunities that individuals can get involved in, making it easier for individuals to be connected to the array of available opportunities to engage and pursue change.

Target Participants: Idealist is a resource for individuals and organizations motivated by the public good.

Impact: Idealist has held over 500 community outreach events and currently has over 12,500 ongoing volunteer opportunities alone. It has reached over 108,800 organizations.

Source: http://www.idealist.org/

Opportunity for Investment

Establishing or creating online job board or clearinghouse for public interest technologists is a new idea. In order to successfully implement this idea, sufficient organizations would have to participate and enough people would have to know about it to use it as a resource. However, using online job boards or clearinghouses may provide a significant boon for public interest organizations. A recent study calculated that adopting online talent platforms for recruitment could raise employee output by 9 percent and reduce hiring costs by 7 percent. [23]

Some interviewees suggested that while the potential benefit of aggregating opportunities for public interest technology work could be significant, it is an initiative that would be unlikely to occur in the absence of intervention from philanthropy:

- *Essential Role for Philanthropy:* one interviewee suggested that as there is no compelling interest to the private sector in aggregating opportunities for public interest technologists, such a resource would be developed only with the support of philanthropy. "There needs to be a digital clearinghouse," a former policymaker said. The individual added, "That's not something the market should drive, it's something philanthropy should drive. The incentives aren't there [for the private sector]."

Best Practices and Design Considerations

- *Meet Technologists Where They Are:* interviewees suggested tailoring a potential job board and other career resources to the preferences and interests of technologists. "You've got to meet people where they are," a technologist said. "Technologists are hanging out on Reddit, for example" and the "strategy of getting these messages out" is an important consideration, this individual said.

- *Consider Iterative Approaches:* interviews revealed a need for this infrastructure, and these discussions as well as supplemental research revealed a number of potential approaches. While the most formal approaches could require more significant investments of resources, basic efforts to aggregate and disseminate public interest technologist

23 Manyika, James, Susan Lund, Kelsey Robinson, John Valentino, Richard Dobbs. "A Labor Market That Works: Connecting Talent With Opportunity In The Digital Age." McKinsey & Company. June 2015.

career opportunities—such as starting a listserv—could be undertaken at a lower cost. These initial approaches could be deepened and expanded in response to demand.

3. Recruitment via Networking and Partnerships

Short Term | Existing Idea

Philanthropy could sponsor networking opportunities, potentially including volunteer positions or initiatives, to identify potential public interest technologists, leverage city officials to make asks, and reach diverse communities.

Interviewees highlighted providing networking opportunities through volunteering as a key activity that could help expose additional technologists to public interest problems and provide an on-ramp for them to work on these challenges in more formal capacities. A scholar suggested, "Give people opportunities for incentives to come forward to engage and participate. When that happens, it's a great time to do scouting for talent." The scholar said that these basic engagements could be used to move individuals up a ladder of engagement and suggested that sponsors should then "assess and give that person the next opportunity." Another scholar emphasized the value of looking particularly to engage individuals who had already achieved prosperity in the private sector. "Your first job isn't necessarily your last job," this individual said, adding, "You should look at people who are also interested in doing something for the public good after working in the private industry and making lots of money."

> "If you want great talent, you have to get out there."
> —Government Practitioner

One government practitioner discussed how weaknesses in recruitment practices place public interest organizations at a disadvantage when trying to hire top quality employees. "When you run a [for-profit] organization, you have a recruitment budget and HR. If you want great talent, you have to get out there. Traditionally government doesn't do that. But look at what Todd Park is doing—he's recruiting. He's engaging and energetic, and he gets people involved. Government needs more of that."

Opportunity for Investment

Recruitment via volunteer opportunities was already mentioned as a common way that technologists become involved in public interest work. This is consistent with existing research, which holds that 60 to 80 percent of employment roles are discovered through personal relationships.[24] Further financial support for organizations already involved in recruitment via volunteer opportunities might quickly result in more technologists engaged in public interest opportunities. Interviewees discussed the following opportunity for investment:

- ***Technology Meet-Ups:*** volunteer technology meet-ups already exist in a variety of forms, and interviewees suggested that they are an excellent place for technologists to meet other technologists and learn about volunteer opportunities. A former policymaker discussed how these networks often provided fertile recruiting ground for their work. The individual described successful recruiting pitches in these contexts often consisted of saying first "that I grew up in the startup world. Then I talk about 'Hey, I want you to come and make a difference, and I talk about some of the projects I've been working on." These kinds of pitches, while often more targeted to recruiting for permanent positions, were suggested as potential tools for recruiting established technologists for volunteer projects as well.

Some interviewees discussed how volunteer opportunities could serve as a way to build partnerships with public interest organizations, engage diverse communities, and offer on-ramps to public service careers. "Our [program] is

24 Driscoll, Emily. "It's All About Who You Know: Networking To Get A Job." Fox Business. 25 April 2011. http://www.foxbusiness.com/personal-finance/2011/04/25/know-networking-job/

a call for all citizens to build digital solutions to challenges in collaboration with local government. We've started to see people coming through the [program] to get full-time jobs. This is a great entry point for us," an advocate said. The individual added, "We're going to focus on bringing in diverse communities. It's like a gateway drug—you can do it on a volunteer, part-time basis." Philanthropy could provide financial support to the organic volunteer tech meet-ups already in place to allow them to expand their efforts, or investigate ways to connect tech-meets with public interest organizations seeking technologists.

Best Practices and Design Considerations

- *Conduct Meaningful Outreach:* some interviewees suggested that in order for these interventions to succeed, reaching out to technologists, rather than expecting them to independently discover these opportunities on their own, was essential. Said one field expert, "Years ago, I was asked to speak at [public interest technology organization]. I had never heard of them, but then I got involved." The individual continued, "Even just inviting people to speak or help out in some small way, you could really get people excited for whom it never crossed their minds," adding, "[and] when the White House calls you, you feel honored to be asked."

- *Offer Compelling Challenges:* many interviewees emphasized an important ingredient in the success of networking and volunteer opportunities was the extent to which target projects are substantive, challenging, and socially useful. Said one field expert, "If I were to write a note to 350 members saying, 'Would you like to be part of a project to help libraries bring Internet to the underserved of New York?' I think 50 people would raise their hands right away." The individual continued, "You don't really have problems getting people to help. What you need are opportunities to make people feel like they are using their skills." Argued another field expert, "Working to solve a real problem and creating real deliverables is the best way to learn."

Recruitment through Networking Example: Code for America Brigades

Program: Code for America Brigades are comprised of local groups of civic hackers and other community volunteers who support their community through leading and organizing, opening civic data, and advocating for local government.

Target Participants: Code for America Brigades partner with local civic hackers and volunteer with local governments and the community.

Impact: there are official Brigades in over 40 cities in the United States, as well as unofficial Brigades across five continents. Code for America Brigades have over 2,000 members and are expanding quickly.

Source: https://www.codeforamerica.org/brigade/

4. Placement Agency

Mid Term

Existing Idea

Philanthropy might build an agency or intermediary with knowledge of both the supply and demand side that can help place talented technologists in public interest opportunities.

As noted in numerous places within this report, difficulties connecting would-be public interest technologists to opportunities in civil society and government were raised frequently as barriers to the development of a healthier pipeline. An experienced government practitioner succinctly articulated the underlying challenge for public interest technologists to identify opportunities:

> *You can go onto USAJobs[.gov], which is a system which almost seems designed to deter technical people. I have no idea where you'd find jobs in non-profits. I personally might call up people I know, but that's only because I know them. It would be an odd phone call to make.*

A number of interviewees suggested that dedicated matchmaking efforts or organizations could make a meaningful impact on smoothing search frictions and making it

easier to place people in public interest technology jobs. Argued one field expert, "This isn't a supply problem. It's not even really a demand problem. It's more of a talent intermediation problem—it's a market failure."

Opportunity for Investment

While models of placement agencies do exist, further support might allow the ones that do exist to expand their efforts more greatly into technology roles. It may take some time before these placement agencies gain more traction among professionals and organizations. Potential opportunities for philanthropy to invest in the development and refinement of placement agencies could include:

- *Support Placement Agency Expansion:* interviewees lauded existing placement agencies that work to match individuals with organizations. One government practitioner highlighted one potentially useful approach, declaring, "I'm a big fan of the Education Pioneers model. They're good at identifying organizations that deliver for them over time." This individual added, "Having something like a placement agency that knows its clients on both sides is very, very helpful." By supporting placement agencies like Education Pioneers, or encouraging fellowship programs that already work to bridge the gap between organizations and individuals to expand into permanent placements, philanthropy could help with one element of the aforementioned 'market failure.'

Placement Agency Example: Education Pioneers

Program: Education Pioneers, which was founded in 2003, provides a prestigious Graduate School Fellowship to leaders who want to work in education leadership. The yearlong program provides a stipend for both the summer and the school year as well as placements for both terms. Program participants come from a range of backgrounds, such as law or business, which they use to provide counsel to an education organization.

Target Participants: candidates must have graduate-level training in a field and demonstrate excellent leadership capabilities.

Impact: the Fellowship has cultivated over 2,500 education leaders since its inception. 70 percent of fellows continue in educational careers following the end of the program.

Source: http://www.educationpioneers.org/

Best Practices and Design Considerations

- *Support Organizational Preparation:* interviewees emphasized the need for organizational understanding about the work that technologists do. As one public interest technologist remarked, "The organizations don't have a solid idea of what they want. Ultimately, many of them want someone who can bridge technology and policy [and is] less like a computer programmer." The technologist continued, "If you look at the list of requirements for the job, you don't necessarily need computer programming skills." By working with organizations to ensure they know what skills they are really looking for in a technologist, public interest technologists may be aided in a successful placement.
- *Leverage Relationships:* a successful placement agency or initiative would likely have strong relationships with key organizations on both the supply and demand sides of public interest technology.
- *Embed Evaluation:* while some elements of the placement initiative would likely be established in the near or medium term, over the long run, a key

"This isn't a supply problem. It's not even really a demand problem. It's more of a talent intermediation problem—it's a market failure." —Field Expert

component of maximally effective placement may be an ongoing effort to assess the efficacy of placement strategies, the extent to which target talent recipient organizations deploy the skills of technologists effectively, and the volume of demand for the placement services and the nature of the services required.

5. Credentialing

Mid Term

In Process

Philanthropy could create effective, widely recognized systems that signal the skills technologists have developed and facilitate easier evaluation and hiring decisions for public interest organizations, potentially enhancing diverse individuals' opportunities to obtain relevant jobs.

Credentialing is an opportunity for technologists to signal that they have expertise beyond the university setting, and may also provide opportunities for technologists to grow their skills. One advocate spoke about the current struggle to find these opportunities for public interest technologists: "Professional development is a huge piece. It's something we as an organization talk about and think through. Where do I send them? What's the next certificate? How do they become a certified civic technology developer? I think those things are important to demonstrate [public interest technology] as a career path."

Credentialing Example: Udacity

Program: Udacity is a web-based educational platform. It has partnered with tech giants such as Google and Facebook to offer online classes in subjects like introductory programming and data analysis. Participants receive a "Nanodegree" upon completion of a particular course. This educational model allows working professionals to continually hone their skills and increase their job prospects.

Target Participants: Udacity courses are designed for people looking to work in technology who wish to learn or update their technical programming skills.

Impact: Udacity allows users to return to school without quitting their jobs and gain skills at a low financial cost. The courses, taught by industry giants, teach skills closely tailored to the current needs of the job market.

Source: https://www.udacity.com/

Opportunity for Investment

Several credentialing programs are already in place. Developing standardization and further public interest technology credentials will take time to gain widespread acceptance, but these items are likely feasible in the mid term. Possible opportunities for investment include:

- *Credential Clearinghouse:* in addition to the perceived lack of credentials for public interest technology, there is currently a lack of credential standardization for technology skills in general, as multiple programs exist on different platforms.[25] This ambiguity may lead organizations to be confused about the meaning of an individual's credentials, and in turn might cause individuals to question if obtaining credentials has real value at all. One possible method for achieving standardization would be establishing a clearinghouse that would certify the legitimacy of different programs

25 Soares, Louis. "A 'Disruptive' Look at Competency-Based Education." *Center for American Progress*. 7 June 2012. https://www.americanprogress.org/issues/higher-education/report/2012/06/07/11680/a-disruptive-look-at-competency-based-education/.

and provide a clear outline of the skills obtained in each program.

- *Public Interest Technology Credentials:* one method to build public interest technologist skills and provide a clear pathway for people interested in the field could be to establish public interest technologist credentials. Philanthropy might draw upon existing platforms and credentialing systems to create these new programs.

Credentialing Example: Mozilla Open Badges

Program: the Mozilla Open Badges program allows individuals to gain recognition for various skills and accomplishments they have through earning digital or open badges. Digital badges represent this distinction of skill online, whereas open badges involve the verification of the badge via credible organizations. The Mozilla Open Badges program also encourages individuals to gain badges of recognition for the skills they have taught to others. These badges can then be displayed across a variety of platforms, including social networking and job sites.

Target Participants: the Mozilla Open Badges program targets individuals who seek to effectively share their skills and accomplishments with potential employers or other interested parties. The Open Badges program is particularly useful to individuals are pursuing continuous, lifelong learning and new job opportunities.

Impact: the Mozilla Open Badges provides users with an accessible and coherent framework to share their skills and accomplishments with interested parties. Consequently, this program allows individuals to showcase their expertise to future employers.

Source: http://openbadges.org/

Best Practices and Design Considerations

- *Experiential Learning:* interviewees emphasized the importance of experiential learning to prove skills. A government practitioner suggested that this learning could take place within a certificate program, as with the teaching hospital model: "That's a way to cultivate talent for the medical field. [These programs] are about immersing professionals in a career in a practical perspective." The government practitioner continued, "What if we thought about the city government as giving people hands-on experience?" Integrating real-world experience into credentialing programs might not only give people skills and work experience, it could also expose them to prospective employers.

6. Boot Camps

Short Term

New Idea

Philanthropy could offer short-term intensive training for technologists to bring them up to speed on how to be effective across the breadth of technology projects in the public interest and give them a better understanding of how government and civil society operate. Similarly, boot camps can train existing public interest leaders in core facets of technology.

Experts consulted for this report emphasized that technologists' success in government and civil society would not be driven by technical expertise alone, but in the marriage of that knowledge with a savvy about public policy processes. While interdisciplinary curricula in universities were cited as a primary way of inculcating this policy expertise, interviewees also highlighted potential approaches to helping mid-career technologists rapidly develop the people and process skills needed to succeed in public interest organizations. Interviewees also discussed the need to train existing leaders in public interest organizations on core elements of technology.

A number of advocates and other experts described the current challenge. Said one advocate, "Public interest is a thing to people who know public interest is a thing. But people coming in don't have that sense." This individual continued, "I think coming in, people have a sense of 'I want to fix problem X' but not of the wider ecosystem. People don't know what it is, and maybe we can tell them." This advocate suggested that to solve "public interest problems, you have to think about who the stakeholders are and what will address the problems stakeholders actu-

ally have." Noted a policymaker, "The entire intent of these programs is to get good work done and recruit people who will have long-term careers, people that can understand the political context without being political themselves."

> "We need to help people who believe in the causes to become successful technologists." —Philathropic Leader

While many indicated it would be most effective to teach policy skills to technologists, some also suggested a complementary approach of deploying boot camps to teach technology skills to people with stronger policy backgrounds but limited technical expertise. Said one scholar involved with a civic technology program at a university, a challenging question is, "How do I boot-camp computer science to get enough policy to get into a program? I think programs like this need to have a strong quantitative research component." "We need to help people who believe in the causes to become successful technologists," remarked a philanthropic leader. A public interest technologist disagreed, arguing, "The [organization's] philosophy is take a good lawyer and teach them the technology afterwards, but I think the best is to take a technology person and teach them the policy."

Opportunity for Investment

Establishing boot camps for technologists is a new idea, but components of what might go into such a boot camp have been developed. For example, one might emulate elements of fellowship training programs and adjust for a different audience.

Interviewees highlighted several potential key roles for philanthropy in facilitating the development and execution of boot camps designed to arm technologists for success within public interest organizations:

- *Existing Technologists—Sponsor Curriculum Development and Supporting Materials:* some interviewees suggested foundations could sponsor the development of the curricula and other relevant materials that could be shared among multiple boot camps. "I think there's an opportunity for the philanthropic community to create reusable materials to teach civic technologist education courses. That right there would be something that everyone would use," an advocate said. The individual suggested content could be as simple as information such as, "Here's what to do, here's what not to wear. Knowing what to wear when showing up for a meeting with a government official. Something as simple as that would be not only a stamp of legitimacy, but also really useful so we wouldn't have to use it on a one-off basis."

- *Existing Public Interest Leaders—Sponsor Curriculum Development and Supporting Materials:* similarly, some interviewees called for curriculum development for public interest leaders. A scholar affiliated with an interdisciplinary engineering and public policy graduate program agreed, pointing out that people who are "passionate about bringing change to civil society often don't have the kind of analytical background they need to navigate our program." In response, the scholar continued, "We have developed a quantitative social science program and invest in students to bring them up to speed on technology." The use of technology in the public interest – from coding to data science to IT needs – could be reviewed in such boot camps as well as resources for effective contracting.

Best Practices and Design Considerations

- *Identify Core Elements of a Curriculum:* interviewees identified a host of possible issues to explore in boot camps, but many suggested there is not yet a consensus in the field around which skills are most critical. "It's not only that these classes don't exist, but also a lack of agreement on what skills need to be taught. Maybe that needs to be done first," an advocate said. The individual suggested one core element could be "how governance works—what does a democracy mean, how is power organized, what happens when you add transparency, and how does power work?"

- *Include Soft Skills, Project Management, and Vendor Management:* interviewees emphasized the importance of soft skills and project management for technologists going into the public interest. As

one advocate declared, "There's very little understanding in the world at large on how to design a good project. It's a lot of listening, and it's talking to stakeholders when you have problems and solutions." A boot camp that also provides this practical hands-on background for technologists may be helpful as they navigate the public interest sphere.

7. Management and Communications Training


Mid Term | In Process

Philanthropy could support programs to enhance management and communications skills of public interest technologists through professional development with a public interest lens.

A need to couple *bona fide* technology skills with other skills that will help technologists succeed in the public interest, including management and communications, was identified by many interviewees. Said one public interest technologist, "If you want to be an impactful advocate, you have to know how to use the media to your advantage." A scholar echoed this sentiment: "You have to know something about how policymaking works. You have to have very good communication skills in general—you have to know how to write and how to speak."

An advocate indicated that the path of least resistance for training may lie with teaching technologists. "It's always easier to take a trained technologist and teach them the civic side," said the advocate, warning, "Of course, teaching how technology works in the civic space is different from a Google environment and open source—it does take a while to really ramp them up."

> "If you want to be an impactful advocate, you have to know how to use the media to your advantage."
> —Public Interest Technologist

Some said that many public interest technologists do not have a concept of what skills they could still stand to develop. An advocate commented, "Nobody knows how to do media outreach or brand development, and they might not even know that these are things that they need. There may be a 'I don't know what I don't know' problem in some of the space."

Training is not the only path to improving management and communications skills in technologists, some interviewees said. "You need so many skills to be effective in the world—you need to be able to manage a project and run a meeting," said a scholar, continuing, "Those skills are hard to teach, and they're learned from experienced mentors out in the world. There's no substitute for outside experience to help you develop project management."

Opportunity for Investment

Interviewees said that some training on management and communications is already occurring, but it could be further systematized and coordinated. Additionally, bringing this training to civil society and government alike may be an undertaking best done in the mid term. Specific opportunities to invest in this undertaking include:

- ***Media and Communications Training:*** technologists indicated that media and communications training could produce dividends for the field. One public interest technologist recounted an experience with communications training: "That two-day training program made me a better guest on TV. Maybe a training program for managers would help us create better future technologists." An advocate expanded on what may be helpful for the field, saying, "Communications and sensitivity to how media relations are handled—the fact that they're operating in a [Freedom of Information Act] world with transparency" would be useful to teach technologists.
- ***Training from the Private Sector:*** some said that certain practices from the private sector, including especially management, may be particularly useful to teach public interest technologists. "Create opportunities and scholarships for people who are in the public sector to keep their skills up and also learn how differently things get done in private sector," a government practitioner advised. "My an-

ecdotal experience was that it really opened their eyes and what they believed is possible and how they contracted and hired," the individual added.

Management and Communications Training Example: Own the Room

Program: Own the Room aims to increase the presentation abilities of participants by holding interactive sessions and utilizing cutting edge technology. Whether speaking to a large audience or a small boardroom, Own the Room holds online or in-person training sessions to provide participants with the skills necessary to thrive in public speaking.

Target Participants: Own the Room targets individuals from any career path who seek to expand and polish their presenting skills.

Impact: Own the Room transforms and enhances the communication skills of its participants. This program allows participants to gain a competitive advantage by sharpening their ability to engage and communicate effectively with whomever their target audience is.

Source: http://www.owntheroom.com/

Best Practices and Design Considerations

- ***Design with Empathy:*** an interviewee cited Stanford's "Design for Extreme Affordability" course as an example of an entity that aims to integrate these management and communications efforts into technology, with a focus on empathy. "They get put with non-profits that serve severely underserved communities—part of what they learn is how to develop empathy and meet the needs of those users," said the researcher.[26]

- ***Shared Training Services:*** an interviewee discussed the possibility of foundations sponsoring a training service that could be shared across grantees on a wide scale. Said the advocate, "I know some of the foundations are doing some really interesting work around shared services models to allow organizations get access to skills they don't have internally."

- ***Target All Technologists, Including Those Entering the Field:*** it is important to offer training to technologists at all stages of their careers, interviewees said, and focusing on those newly entering the field may hold particular benefits. Said an advocate:

> *One of my biggest gripes about my field is that we don't have better onboarding for people who are entering the field. It's part product design. For public interest problems you have to think about who the stakeholders are and what will address the problems stakeholders actually have. There's very little understanding in the world at large on how to design a good project. It's a lot of listening, and it's talking to stakeholders when you have problems and solutions.*

D. Skill Deployment Interventions

This subsection outlines interventions that focus on technologists' deployment of their skills. Interventions include: (1) Fellowship Programs; (2) Enable a Tour of Service; (3) Innovation Teams; (4) Contracting Reform; and (5) Technology Consulting (as a Stopgap).

1. Fellowship Programs

Short Term

Existing Idea

Given a variety of existing fellowship programs, philanthropy could build and strengthen thoughtful and strategic fellowship programs in government, civil society, and academia, emphasizing where possible the recruitment from a diverse set of backgrounds.

Interviewees noted the ability of fellowship programs to bring novel perspectives in to existing organizations. Fellows allow for "intellectual diversification," said a researcher, adding, "We will also have provocateurs in residence to help us constantly refresh our thinking."

Demand exists for fellowship programs, interviewees said. "Technologists are much more interested in public service than anyone would have thought," said an advocate, continuing, "I would posit that there is a pretty large number of people in the technology industry who as long as the

26 For more information on "Design for Extreme Affordability," please see http://extreme.stanford.edu/.

salary isn't $35,000 – if you can live on the salary you're making – more people are interested in impact than we expect."

In order to arrive at a sustainable and reputable fellowship program, a government practitioner suggested that organizations in this space need to coalesce as a field. "The field would have to be deliberate about saying we as a field have this problem," the practitioner said. According to this individual, players in the space would need to have an ethic of, "Let's get together—we're going to give you professional development opportunities and hope you stay, and this next generation of public interest technologists will be possible."

> "Technologists are much more interested in public service than anyone would have thought." —Advocate

Fellowship Example: Ford-Mozilla Open Web Fellowships

Program: building on the experience of the Knight-Mozilla OpenNews Fellowships, the Ford-Mozilla Open Web Fellows program is a partnership between the Ford Foundation and Mozilla that places fellows at select civil society organizations. The partnership provides young technology activists an avenue for effective change early in their careers, and the participating organizations benefit from the technical expertise that fellows bring. The aim of the program is to safeguard the open web.

Target Participants: the Open Web fellows are chosen from emerging talented technologists. Selected fellows spend 10 months working at leading global advocacy groups, such as the American Civil Liberties Union and Amnesty International.

Impact: the program facilitates the training of the next generation of leaders advocating for digital freedom. The projects that the fellows work on provide education about Internet policy issues to policy makers and the general public.

Source: https://advocacy.mozilla.org/open-web-fellows/

Opportunity for Investment

Interviewees cited a number of existing programs as examples of what could be expanded or learned from in the development of a new fellowship program. One government practitioner said, "I think what's going on is there are a large number of smaller scale experiments—we have a large number of fellowship programs with radically different types." These models include Presidential Innovation Fellows, White House Fellows, Knight-Mozilla OpenNews Fellows, Fuse Corps, AAAS Fellows, the Rodel Foundation of Delaware's Strategic Data Project fellow program, CODE2040, Code for America, and others.

Demand for these programs is high—the Knight-Mozilla OpenNews fellowship for example, which works at the intersection of journalism and technology, received 417 applications to fill six slots this year alone.[27]

Because of these programs, there may be a short-term opportunity to scale an existing program. In any case, interviewees indicated that the role for philanthropy in fellowship programs is substantial. One advocate said, "Philanthropy has been extremely important in getting the first fellow in place and extremely important in places where they don't have the fiscal resources or expertise to do it internally." Specific, potential areas for investment include:

- *Academic Fellowships and Professorships:* as it has with professorships in other areas, philanthropy could establish public interest technology opportunities at universities across the country. "Having worked in an advocacy organization, I think the opportunity for a mini-sabbatical would be great," suggested one scholar. Another scholar pointed to the broader influence of philanthropy on academia: "The philanthropic community gets listened to by academics," said the scholar, adding that such professorships would be more palatable "if this was a program that would exist for the next decade."
- *Fellowships for Current Students:* a scholar identified existing student projects as creating an opportu-

27 Sinker, Dan. "OpenNews Announces Its 2015 Knight-Mozilla Fellows." Idea Lab. 29 October 2014.

nity for developing a public interest technology fellowship program. "Pipelines, fellowship programs, and ways for the public interest and government to interact with Master's and Ph.D. students so you get not quite free work," would help advance the field, the scholar said, adding, "There are a lot of students who are doing projects anyway—they might as well be projects for good. Some can be done with coordination and incubation, and out of that you might get a few folks who can fill and have a desire to fill the public interest."

"There are a lot of students who are doing projects anyway—they might as well be projects for good." —Scholar

- ***Facilitation of Government Fellowships:*** interviewees noted a potential role for philanthropy in sponsoring or otherwise facilitating fellowships in government, both to increase technology implementation capacity and to increase the capacity for technology leadership. A scholar said, "If you look at the government there are programs where people come to [the Department of Justice] straight out of law school in some honors fellowship. The public sector, they do have much more infrastructure to do training, but I think the fellowship programs are an important part of the legal pipeline that the clinical programs feed into."

- ***Facilitation of Public Interest Fellowships Broadly Defined:*** fellowships do not necessarily need to be limited to one level of government or civil society, some interviewees indicated. Fellows would "have to be black-belt technologists and have a chance to spend a week schmoozing with each other every month," in order to make it attractive, a scholar said, adding, "I wouldn't restrict it to the federal government." One interviewee suggested broadening fellowships to potentially include private sector opportunities for existing public interest technologists.

- ***Training Programs or Templates:*** sophisticated training programs for fellows were emphasized as a critical element of a successful fellowship program, creating a potential role for philanthropy in supporting a larger training program or developing templates and best practices for training. Training tactics include pre-, mid-, and post-fellowship convenings, host organization coaches and advisors, and external coaches and advisors. Said an advocate, "There's a whole series of advisors, the training, the network of advisers and supporters" that help the advocate's program achieve success. Another advocate indicated it is important to train host organizations on shifting their internal culture: "I think the curriculum is focused not just around fitting in and how to be a change agent" as a fellow, the advocate said, emphasizing "not just meeting their expectations but changing their expectations."

- ***Evaluation of Fellowship Projects:*** one interviewee identified evaluation as a potential need for projects completed by fellows and, by extension, fellowship programs themselves. "I don't know how successful projects are," the government practitioner said, continuing, "It would be interesting data to look at—what happens with those projects? Does that actually make a change?"

Fellowship Example: CODE2040

Program: the CODE2040 Residency encourages African American and Latino/a entrepreneurs to grow their businesses and communities. The Residency partners with tech hubs in Austin, Chicago, and Durham. The chosen Entrepreneur in Residence for each city then receives resources from CODE2040 and Google for entrepreneurs to build their businesses. CODE2040 seeks to fuel the construction of diverse entrepreneurial ecosystems in these pilot cities.

Target Participants: the CODE2040 Residency supports minority entrepreneurs from designated cities. These entrepreneurs must be dedicated to driving racial, ethnic, and gender change in their city.

Impact: the Code2040 Residency seeks to diversify start-up talent, a route that has not been substantively addressed previously. The platform for CODE2040 will facilitate a greater diversity of individuals in tech entrepreneurship. It aims to provide the chosen resident with the necessary tools to allow their innovative business to succeed and drive change.

Source: http://www.code2040.org/

Best Practices and Design Considerations

- *Recruit Diverse Cohorts:* interviewees indicated that fellowship programs will likely be most successful if they attract a diverse cohort of fellows.
- *Carefully Consider Timeframe:* interviewees warned that fellowship timeframes can support or scuttle potential impact and the ability to shift the culture of the host organization. "I think six months is far too short of time to realize the potential of a role, but I think that's going on the right track in terms of being able to add in new skills," said a philanthropic leader. A government practitioner urged a longer timeframe: "I think a grant-funded position that lasts two years is ideal because a year is not long enough."
- *Balance External and Internal Opportunities:* a fellowship's draw should include a number of external opportunities, including attending conferences and meeting leaders in the field, many interviewees said. Remarked a scholar:

> *It could be a one-year post-college fellowship—you'd get your salary topped off by a foundation. Part of the bait would be prestige, part of it would be hanging out with your talented colleagues. Your sponsors would send you to Silicon Valley twice a year to build relationships. You'd have a senior version for people that would bring the CIOs of mid-sized companies to spend two years in government.*

An advocate noted that other opportunities made possible by the fellowship program should be viewed as secondary to the fellowship itself. "Every program we have is designed to supplement what the fellowship does," the advocate said.

Fellowship Example: Code for America Fellowship Program

Program: the Code for America fellowship program brings technologists into government to drive impact in four critical areas: health, economic development, safety and justice, and citizen-government interaction. By integrating innovative technology and design, Code for America aims to transform government practices through simplicity and efficiency.

Target Participants: Code for America brings together teams of technologists, including developers, designers, and product managers, and applies their talents to work on pressing issues facing local governments. The Code for America fellowship program takes 24-30 technologists annually.

Impact: Code for America works with 8-10 local governments annually to find innovative technological solutions across a broad range of issues. For example, in San Francisco, Code for America partnered with the Human Services Agency to devise a text system called Promptly. This program ensures that food stamp recipients are not dis-enrolled from the program without their knowing.

Source: https://www.codeforamerica.org/

- ***Fund People, Not Projects:*** creating a fellowship that is not tied to a specific project may help instill confidence and stability in a given program. "By funding the project, at the outset you're saying your funds are revoked—by being successful, you are creating your destruction," said an advocate. "That's not good for solving any of the problems that we've surfaced here today," he continued. Instead, the advocate suggested funding people, which may give "an incredible sense of stability as I know that I can try stuff and feel as comfortable as possible because I know they have my back for the next three years."

  A government practitioner highlighted the experience of the Rodel Foundation of Delaware's Strategic Data Project fellow program, which is conducted in partnership with the Delaware Department of Education, Harvard University, and the Longwood Foundation.[28] "Their model was that they are going to change the culture and transform things using private dollars for public purpose," the practitioner said, continuing, "They want to go in and not just execute a task for the agency, but also be strategic about helping develop greater capacity to prioritize and tackle the next task. A lot more of that kind of work could happen."

- ***Benefit Both Individuals and the Field:*** the mutual benefit of fellowship programs – for individuals and for the field generally – was raised by a number of interviewees. "There's both the tangible impact of the particular project – the work in the moment – and for the researchers and designers themselves, it provides them the opportunity to do public sector work," said a public interest technologist.

  One interviewee acknowledged the importance of a program's influence on an individual while also suggesting that focusing on how the fellowship will impact the field can have a watershed effect. "If you optimize for field impact, and primarily focus on partners and communities, and your whole program is focused on that, then the impact on the individual will come as well," the field expert said.

Fellowship Example: Presidential Innovation Fellows

Program: the Presidential Innovation Fellowship is a year-long program that encourages technologists and innovators to engage in governmental work. PIF is a component of 18F, the federal in-house consulting group. Throughout the program, the selected fellows work in conjunction with a federal agency to devise creative solutions to difficult problems that are national priorities.

Target Participants: fellowship participants are individuals who are top innovators or technologists.

Impact: since its inception, fellows have solved an array of national issues and enacted changes in over 20 federal agencies. Their innovative solutions have been applied to a variety of issues, such as job creation and disaster response.

Source: https://www.whitehouse.gov/innovationfellows

- ***Build Robust Partnerships:*** interviewees emphasized the importance of partnerships in building support, ensuring sophisticated program design, and also making fellowship programs sustainable. Said a field expert with experience in fellowship design, "It's really important to think about those partnerships, they are the key to everything. Thinking about their community from their world has really helped us develop this program."

  An advocate noted that host organizations could be asked to help support the fellowships financially. The advocate said to consider "a fee-for-service model in which the [host organization] is the payer and sometimes philanthropy assists." In this case,

"Fellows programs are a workaround. They're putting in place a mechanism by which people can enter. From there that creates more options—it's the front end of a recruiting process."
—Advocate

28 Herdman, Paul. "Looking Ahead to 2014." *Rodel Foundation of Delaware*. 8 January 2014. http://www.rodelfoundationde.org/looking-ahead-to-2014/

"the value proposition has to be clear, as [host organizations] don't have a lot of spare resources," the advocate added, noting that "when you first start talking to them, the price tag seems high, but once they have a fellow they see value."

- *Cultivate Prestige:* prestige was cited by a number of interviewees as a central factor to attracting talented technologists to fellowship programs. The Presidential Innovation Fellows, for example, are "the type of model that appeals to people as it has a certain level of prestige," said a researcher. Citing CODE2040, another researcher remarked, "Here's this strict, structured program where people get high prestige." A scholar said that the White House Fellows program is "very small and elite" and that foundations could generate "something comparable to that, where you'd have a public service technology fellowship and you'd name it after somebody who was instrumental in some application of technology to government or public service."

Fellowship Example: Knight-Mozilla OpenNews Fellowships

Program: the OpenNews Fellowships integrate technologists into partner newsrooms of Knight-Mozilla. The fellows' technical skills and expertise in data analysis are employed to streamline the technical aspects of the newsroom.

Target Participants: the fellowship recruits top technologists and collaborates with key news outlets, such as NPR and the LA Times. The program runs in seven U.S. newsrooms as well as in Berlin.

Impact: fellows are a part of strengthening the technology decisions that news outlets make. The publication of the open technology in journalism project, Source, and the content that fellows share about their experiences aim to improve how the public interacts with news outlets via the Internet. In addition to the fellowship, Knight-Mozilla hosts two annual conferences that bring together data experts who work in news.

Source: https://opennews.org/what/fellowships/

- *View Other Fellowship Programs as Complementary:* a public interest technologist with fellowship program experience described a tendency of program staff in any field to become defensive if a program that appears to be similar to their own is in formation. This individual indicated that direct competition would not be desirable and programs should strive to collaborate. "Our own reaction was to subsume what we were doing well and compete—that was a stupid instinct that came from a low-level fear of capability rather than a perspective of 'How can we help these people who I care about?'" the technologist said. "We sent the folks information about our fellowship program and they sent everything back, at which point we realized that we were not supporting just the same things in different projects," the individual continued, noting that each organization's investment "does better in collaboration."

- *Show Early Results to Host Organizations:* for some fellowships, it may make sense to communicate early progress to hosts in order to ensure fellows are adequately used throughout the duration of the fellowship. An advocate with an existing program advised, "Ship technology very early—it can be half-baked, early, or just a prototype." With results that they can see, the advocate said, "People get excited and engage with you more because they can see possibilities in their work."

- *Foster Community through Advisors and Alumni:* an advocate with fellowship experience indicated that programs can involve more than just the current fellows. "It is important to us to form a community of alumni and a network of advisors," the advocate said.

- *Use Fellowships to Help Build a Professional Class:* fellowships may help form the basis for a professional class of public interest technologists, an interviewee said. "We need to signal we are there," said a government practitioner. "We need to create a professional class or entity for folks—you're part of a cohort now, an *esprit de corps*."

- *Recognize Fellowships as a Mid-Term Tactic:* in the long-term public interest technology talent pipeline, interviewees said fellowship programs would ideally not be necessary, as public interest organizations would have ample interest in technologists

and ability to effectively host technologists. It is important, these interviewees said, to consider this ideal state in program design. "Fellows programs are a workaround," said an advocate, "They're putting in place a mechanism by which people can enter … it's the front end of a recruiting process."

2. Enable a Tour of Service

Long Term

In Process

Philanthropy could enable technologists' short- to mid-term tours of service in public interest organizations by making it easier procedurally to onboard new employees and deploy their skills on a time-limited basis.

While a point of some contention, many interviewees viewed tours of service as potentially effective vehicles to increase public interest technology capacity by recruiting technologists working in the for-profit sector. Said one advocate, "I think as much as shallow perforation as anything—allowing that talent to flow more easily between sectors." The advocate added, "Personally, I think that cross-sector careers is the way we are moving societally. As we have more and more companies that are trying to look like social sector companies, people are having much more mobile careers."

"There has to be a better way to reach out to this community of technologists and bring them in, and there also has to be a way for them to get back." —Scholar

A scholar mentioned that there are tangible benefits of tours of service and that paths between sectors should be better worn. "There has to be a better way to reach out to this community of technologists and bring them in, and there also has to be a way for them to get back," the scholar said. "They have to know that they can do this for two years or four years and be welcomed going back," the individual added.

One interviewee described private sector training as a fundamental issue facing public interest technology. A researcher said:

> *The problem in the public sector is that you need people that are already trained. It's a very different ask from, 'Oh, we need to find the people.' It's more that you are dependent on Silicon Valley to do the training, and then convincing them, at the height of their career, to walk away and take a bet to be helpful in another sector.*

Opportunity for Investment

Some tour of service models currently exist in public interest organizations, such as the Department of Health and Human Services' Innovator-in-Residence Program (described in more detail in this section). Because this intervention calls for shifting mindsets, the intervention could be best engaged with in the long term. Specific elements of this intervention could include:

- *Tours of Service:* interviewees suggested supporting for-profit technologists' tours of service in public interest organizations, potentially by helping to streamline onboarding processes. One advocate remarked, "I think keeping people in the public sector is obviously good for us, but having people in the private sector with a background and understanding of the public sector is just as much of a win." A scholar agreed: "People can come in and out of these jobs or roles in many places in their careers." Another advocate noted that the best talent may prefer this model. The individual said, "It's more of a free-flowing mechanism going back and forth. I don't mean

"I think keeping people in the public sector is obviously good for us, but having people in the private sector with a background and understanding of the public sector is just as much of a win." —Advocate

a revolving door. Honestly, it's very much that the best talent would like to operate." These suggestions require a fluid onboarding process in public interest organizations in order to enable a fluid movement of technologists.

- *Efficacy Studies:* studies that illustrate when might be the best time for technologists to begin working in the public interest were called for. "In terms of staying power, I'd be interested to know if there are studies on who stays and who goes—if there is a specific moment in time that they want to be involved in," said a philanthropic leader.

Tour of Service Example: United States Department of Health and Human Services Innovator-In-Residence Program

Program: the Innovator-in-Residence (IIR) program, which brings an expert to the United States Department of Health and Human Services (HHS) for a two-year period, is a collaboration between HHS and outside organizations. The outside not-for-profit organization sponsors the position, which enables HHS to leverage outside talent to work on issues of common interest to HHS and the partner organization.

Target Participants: the HHS Innovator-in-Residence program partners the HHS with not-for-profit private organizations. The IIR position is a two-year program for applicants with experience in the healthcare industry or healthcare policy.

Impact: since the position was established in 2012, IIRs have helped create the first standards for the sharing of Blue Button data, which are downloadable health records. IIRs have also been integral in developing solutions to increase patient engagement and ensure patient data matching.

Source: http://www.hhs.gov/idealab/what-we-do/hhs-innovator-in-residence/

Best Practices and Design Considerations

- *Advertise Success:* interviewees pointed to a lack of awareness in technologists as a barrier to increasing the number of tours of service. "There's an opportunity to highlight what's going on," said an advocate, "There's a large number of small-scale programs trying to solve this. There's a lot of interest – we've had no problem finding world-class people to do this kind of work."

- *Frame Public Interest Technology Effectively:* an advocate indicated that certain messages will resonate more with technologists. Said the advocate, "It can't be seen as a 'government's broken' problem, but rather a 'how do we make it attractive again?' problem. I hope there will be a group of thinkers that start to articulate what that possibility will look like."

- *Target Technologists Strategically:* an interviewee suggested looking for a specific type of technologist in building the number of tours of service. "What you want in the pool is people who want new puzzles all the time, you want people who can move across to new puzzles all the time," the researcher said.

3. Innovation Teams

Philanthropy could support successful examples of innovation teams at a given locus in public interest organizations by expanding or augmenting existing efforts, developing new innovation teams, or conducting an efficacy study.

Innovation teams are seeing increased attention from government, interviewees said. A public interest technologist noted, "[Those in government] still have brutal hiring problems, but in terms of trying to create a space and a culture for it, they are doing the right things." A government practitioner described their experience with innovation teams: "Create a hub, rather than sprinkling technologists here and there—they tend to thrive when together. It's very effective to pull together the resources and create legal and technical structures, so that people are able to come in easily and work more freely and openly."

Part of the need for innovation teams stems from exposure to new ideas from colleagues. Said a public interest technologist, "People need to be exposed to working in new ways." The technologist added, "A lot of this work is also – I'm not sure if this a fad of the moment – but the work is inherently collaborative. You can't do design synthesis if you have no one to synthesize with." A scholar reinforced this sentiment, "If you are a solo technologist you're not going to thrive and you're not going to make a difference. The people who are able to engage, they are successful. Those kinds of relational skills and collaborative skills, learning how to take feedback, all of those things are important skills" that may be bolstered by innovation teams.

Due to bureaucratic inertia, not all interviewees were convinced that innovation teams have staying power in government. "In government, technologists are separated to protect them from the bureaucracy," said an interviewee, continuing, "I'm not sure that's going to be a long-lived experience."

Innovation Team Example: 18F

Program: 18F, a government consultancy, is a subsidiary agency of the General Services Administration that provides digital products to a wide range of government organizations. It utilizes lean startup methods to service client demands.

Target Participants: 18F employs technologists, researchers, and designers in cities across the U.S., including but not limited to: Washington, D.C., Chicago, San Francisco, Dayton, and New York. Applicants to 18F must be skilled in software development, design, and content development.

Impact: 18F creates tools for a variety of governmental departments. 18F categorizes its projects into four phases, with the final stage meaning the service is available to the public. It has sixteen projects in the pipeline and two services that have been released to the public.

Source: https://18f.gsa.gov/

Opportunity for Investment

Innovation teams currently exist in many public interest organizations – notable examples include 18F and New Urban Mechanics, both profiled in this section – but new interventions may best be conducted in the mid-term in order to account for the difficulties of introducing structural change to an organization. Opportunities for investment include:

- ***Innovation Teams:*** philanthropy can create new innovation teams in civil society and government or augment current teams. Said a public interest technologist, "Don't try at this point to thinly seed people with innovation skills across government agencies. Instead, create protective pods for them where they will all work together."

- ***Comparative Study:*** some indicated that the efficacy of enabling teams rather than distributing technologists across departments is still in question, proposing a study to determine what is most successful. "That's an issue that's deserving of more study," a scholar said. "There's a variety of opinions on the matter and I certainly think one way that a city can send a signal is by coming directly to departments," the individual added.

Best Practices and Design Considerations

- ***Ensure Products Are Used:*** an interviewee related that failure is possible if the tools that are built by innovation teams are not used. "I've seen innovation shops that are really good and make you think," a government practitioner said. "Where they fail is that they don't put their successful widgets into production," the individual continued. A public interest technologist concurred, "We need to give people projects and start things outside of the structure of the organization. But if we don't provide support to fold it back into the organization and use it, then all that was just humoring someone."

- ***Create a Virtuous Cycle of Interest through Successful Projects:*** even exciting organizations must have attractive projects to work on in order to attract technologists, interviewees said. "The single most important thing that attracts people is the quality of our work," said a government practitioner. The practitioner noted that the quality of their work led to a virtuous cycle of interesting projects: "But what we've found when we created our team

whose day job it was to think outside the box, we were able to build a pipeline of projects."

- *Relationship Building Still Matters:* despite developing a dedicated team at a specific locus within an organizations, interviewees advised that external relationships are still critical to success. Said a government practitioner, "You or your team may be nimble, but you have to know how to push skillfully and build relationships within the larger organization."

- *Position the Innovation Team Appropriately:* interviewees indicated it may be useful to view innovation teams as in-house consultants in order to frame technologists effectively for other employees. One government practitioner suggested communicating to others in the organization that "you think you know what the answer is, but we'll come back to you with a set of issues. It's important to know what you don't know."

Innovation Team Example: New Urban Mechanics

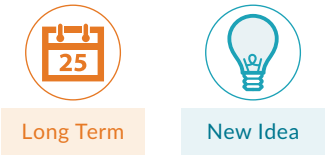
Program: New Urban Mechanics facilitates collaboration between private entrepreneurs and government agencies. The aim is to develop innovative policy solutions for issues facing city residents.

Target Participants: with offices in three cities, New Urban Mechanics collaborates with private sector entrepreneurs and local government agencies.

Impact: New Urban Mechanics projects leverage technology for meaningful community solutions. One result of their work is a mobile app that lets residents send reports to City Hall regarding problems, such as graffiti, that they notice in the community. The app has resulted in the resolution of 10,000 neighborhood issues.

Source: http://newurbanmechanics.org/

4. Contracting Reform



To streamline government procurement and contracting, philanthropy can help ensure that officials have the expertise and ability to hire innovative technology contractors by developing best practice and procedural studies, supporting the hiring of experts, and creating a state-based competition.

Interviewees expressed generally pessimistic views of how procurement and contracting is conducted in government but felt that reform could have tremendous impact on our local, state, and federal governments. "Procurement, budgeting, and personnel are absurdly long and complex processes in government," said an advocate. One government practitioner agreed, commenting, "a very big problem with these massive procurements is that they are over schedule and over cost. You're not doing it the lean and agile way. There's both practical and intellectual problems with them." "Procurement processes are usually not by design, but more by practice, absurdly complex and long," another advocate said, continuing, "I will say that the most surprising part for me, which is the biggest challenge and opportunity, is the way that governments procure people is so out of date it makes me surprised that they get anybody." The advocate added, "Some of these things were put in for historical reasons to make sure there's no graft, but they are totally out of whack with today's world. It's totally out of whack if you're trying to foster innovation."

One need could be attracting procurement experts to government. "We need to figure out how to have a massive insertion of talent," said the advocate, adding, "I am not confident that some big national program driven by Congress will actually make a difference."

Opportunity for Investment

Interviewees viewed contracting and procurement as a complex and challenging issue likely dealt with in the long term. Additionally, interviewees did not see many inter-

ventions currently happening in this space, and suggested the following:

- ***Best Practice and Procedural Studies:*** interviewees suggested examining how government can change processes to streamline contracting. "Philanthropy can help by investing resources to help government figure out how to hire and pay small, innovative service providers," said a public interest technologist. An advocate echoed this statement, saying, "You can do an all-hands-on-deck program to do a massive talent rethink," specifically targeted toward procurement.

- ***Support Hiring of Experts:*** building capacity in public interest organizations to conduct procurement in a sophisticated manner was also mentioned by interviewees as a possible opportunity for investment. Said a philanthropic leader, "I guess one conception would be the cornucopian one, where there isn't a shortage and the government doesn't rely on outside contractors. It would be people within the government who are able to negotiate with outside contractors."

- ***State-Based Competition:*** an interviewee suggested sponsoring a competition for governments to increase the speed of their changes to contracting and procurement. "You could imagine a state-based program that would be like a competition that would incentivize and provide resources for states to accelerate their movement on those topics," the advocate said.

Best Practices and Design Considerations

- ***Build a Community of Change Agents:*** interviewees underscored the benefits of sharing best practices and success stories. Said an advocate, "Can [government officials] see someone who can do this? As hard as that is figuring out how to navigate their processes, if you can do that together you can get more sustained impact, moving process and making that commonplace."

5. Technology Consulting (as a Stopgap)

Short Term

Existing Idea

Philanthropy could help organizations fill an immediate need for technologists working in the public interest by supporting technology consulting as a stopgap measure.

Many of the interventions discussed in this report may take a while to develop; technology consulting may be considered as a short-term option to fill an immediate need. A philanthropic leader underscored the case for consulting technology, noting that it is time-limited. "There certainly is a role for consulting technology like DataKind [which organizes time-limited pro bono data science projects for social organizations], but it is supplemental to a healthy future state as opposed to a solution to the current problem," said the individual.

A government practitioner said, "There's things like civic consulting, but it's not as big as it needs to be." At the same time, the practitioner noted, "You need to be careful about a person going into government from a private company" as opposed to something like a fellowship program, as the person's interests may not align as well as they would otherwise.

Technology Consulting Example: Citizen Engagement Laboratory

Program: CEL is a consulting service to organizations that seek to enact change. CEL provides resources that assist in integrating innovative technology and engagement tools in client organizations.

Target Participants: CEL works with various philanthropies, startups, and activists pursuing social change.

Impact: CEL assists "changemakers" to leverage technology to pursue their agendas.

Source: http://engagementlab.org/

Opportunity for Investment

Technology consulting is an existing intervention that may be added to relatively quickly if philanthropic organizations want to invest in current opportunities. Opportunities for investment mentioned by interviewees included:

- ***Support Embedding Consultants:*** a role exists for philanthropy to support consulting technology projects in public interest organizations, particularly in cases in which consultants have deep knowledge of the organization or community in question, interviewees said. "One of the elements of success is bringing everyone together to solve a real problem," said a field expert. The individual continued, reflecting on past experience, "Embedding in non-profit in an ecosystem built up from funders and government paid off on the civic technology side too, which involved really knowing the community and then layering technology projects on."
- ***Pool Resources for Efficiency:*** in order to combat inefficiencies, one interviewee advised pooling resources like technology consulting across a number of non-profit institutions. "Part of it is, how do you get [non-profits] to hybridize when they don't want to hybridize?" the researcher asked after positing shared resources. "And then you have your engineers pool across them, they are constantly connected and constantly moving," which would help improve efficiency, the individual continued.

"Part of it is, how do you get [non-profits] to hybridize when they don't want to hybridize?" —Researcher

Technology Consulting Example: DataKind

Program: DataKind partners their teams of pro bono data scientists with organizations seeking solutions to humanitarian issues. The DataKind teams provide knowledge regarding how humanitarian organizations can obtain and integrate the necessary data that will inform their missions and approaches.

Target Participants: DataKind's efficient data analysis benefits a variety of organizations, such as the UK's St Mungo's Broadway, a charity that assists the homeless. DataKind also sponsors meet-ups in the cities where it operates, which allows for productive, informal gatherings between data scientists and charity-minded people in the community.

Impact: DataKind's teams of data scientists help humanitarian organizations efficiently utilize data to inform their approach to their missions.

Source: http://www.datakind.org/

Best Practices and Design Considerations

- ***Use Technology Consulting to Help Foster Culture Change:*** interviewees said that consultants may be able to help foster culture change in an organization. "Let talent flow into and out of your organization," advised an advocate. "Cultivating open, collaborative culture means you care about talented people and the exploration that they need to make," the advocate said.
- ***View Technology Consulting as Part of the Broader Ecosystem:*** an advocate said that current sector distinctions may not be as important as some portray them. "A friend of mine once said the smartest people don't necessarily work for you, but you need a way and flexibility to accommodate them in your organization for the time they have available," the individual said, advising, "Allow them to join you and leave you and ideally they will return to you."

- ***Leverage Tools to Change Paradigms:*** a useful tool may help shift how people understand problems, said an interviewee. "The Crisis Text Line was founded by DoSomething.org and is a national platform for teenagers to use when they are depressed, bullied, or abused," said the field expert. "They text, and the caseworkers see the text and also the history of all the texts previously, and they can use keyword searches—that's an example of using technology and changing an entire way that people view the problem," the expert continued.

E. Growth and Retention Interventions

The final subsection of interventions includes those that relate to the growth and retention of technologists in public interest organizations. Interventions in this subsection are: (1) Mentorships; (2) Software & Hardware Infrastructure Development; (3) Reform Grantmaking Processes; (4) Promote Best Practices.

1. Mentorships

Short Term

Existing Idea

Philanthropy could establish or support programs that partner existing and potential public interest technologists, potentially from the same community. Mentorships serve to onboard new talent, support career development, and grow the field. Examples of existing mentorship programs include Black Girls CODE, Girls Who Code, and Aspirations in Computing.

Interviewees offered strong support for mentorship programs as a method to diversify public interest technology and support skill building. In the words of one advocate, "Mentorship programs are key." "We have theories right now about what works, and the mentorships piece is the one component that there's really strong evidence for," a scholar explained, continuing, "The lack of mentors is a good reason why women and minorities drop out of the tech scene." Another scholar agreed: "We can't overstate how important it is to have guidance counselors and people paying attention to the people going through [programs], someone checking in, helping them along the path." The scholar added, "Having just the machinery won't in and of itself be enough."

Mentorships also help people acquire public interest technology skills: "Mentorship is very important for workforce development," remarked one field expert. "The only way I'm able to do this is I have a handful of close colleagues who are mentoring me and shielding me from the biggest blunders," a scholar stated, noting, "It's important to have mentors and peers that are trying [the field] out and struggling with the same things."

Mentorship Example: Black Girls CODE

Program: Black Girls CODE introduces programming and game design to girls of color. Through workshops and after school classes, the organization seeks to eventually democratize the tech industry by producing technologically competent applicants.

Target Participants: Black Girls CODE engages with young girls of color ages 7-17. It holds hackathons for girls of color in grades 6-12.

Impact: Black Girls CODE strives to introduce 1 million girls to coding by 2040.

Source: http://www.blackgirlscode.com/

Opportunity for Investment

Several forms of mentorship programs have already been established that might serve as opportunities for investment, including Black Girls CODE and Women Who Code, both profiled in this section. Mentorships can play a valuable role in helping people pursue careers as technologists, and an influx of financial support could help some programs scale quickly, interviewees said. Specific investments include:

"We have theories right now about what works, and the mentorships piece is the one component that there's really strong evidence for." —Scholar

- *Youth Mentorship Programs:* although many types of youth mentorship programs have been developed, interviewees reported that there is a need for further investment. "I think there is a great role for philanthropy," an advocate remarked, "as the likelihood for this type of problem to fix itself is low. [Philanthropy] could fund a series of projects such as Girls Who Code—we need to make those opportunities happen. I hope there will be programs brought to scale." Interviewees also discussed the role of youth mentorship programs in building student interest in public interest technology, not simply technology. "Cyber Patriots—people tend not to know about it because it's run by the Department of Defense, but it's actually one the most successful programs to reach kids in public high schools," one scholar commented. "They give a lot of money to schools to develop these programs, and they take mentorship super seriously," the scholar said.

- *Professional Mentorship Programs:* interviewees also remarked upon the importance of professional mentorship opportunities for creating a healthy pipeline. A scholar advocated for a program that would be "about getting those social-minded people that already exist in technology and providing them with support, funding, and mentorship." Similar efforts could be made for technology-minded individuals who exist in government or civil society. Professional associations may be another avenue to support less comprehensive mentorship programs.

Mentorship Example: Women Who Code

Program: Women Who Code (WWCode), encourages women to work in a technology sector. WWCode conducts several initiatives that include education through coding training, facilitating connection between leaders, and consulting with companies to inspire them to run a diverse workplace.

Target Participants: WWCode encourages women to pursue careers in technology. It targets women who are already involved in computer science as well as women who want to learn how to code.

Impact: with over 25,000 members, WWCode has a presence in 15 countries and has organized 1,200 technical events free of charge.

Source: https://www.womenwhocode.com/

Best Practices and Design Considerations

- *Reflect The Community:* interviewees indicated that mentees should be able to identify with their mentors. One advocate mentioned, "We're looking for other groups to work with to make sure our [mentorship groups] reflect the communities where they work."

- *Support Mentors alongside Mentees:* mentor training was suggested as an important component of any mentorship program. "Let's at least make it so that when we do find a good student, we're able help them in the best way possible—nobody has taught me how to teach," commented a public interest technologist.

- *Provide Consistent Support to Mentees:* interviewees lauded programs that span from youth to career and help individuals at every step of the way. A government practitioner discussed one example: "Aspirations in Computing looks at women from middle school through college and supports them to make sure that they are aware of opportunities. They focus all the way from middle school through career."

- *Think Broadly:* while coding programs have recently gained prominence, interviewees remarked that

there is more to public interest technology than coding alone. "You probably know about the [mentorship programs] around gender like Girls who Code, and there are a lot of programs around coding. I thought Cyber Patriots was interesting because it's more about IT. Coming out of Silicon Valley, you see a lot of the coding focus and not IT." Leadership in the public interest is likely a necessary core element.

2. Software and Hardware Infrastructure Development

Mid Term

In Process

Philanthropy could help ensure that public interest organizations have the physical technology infrastructure necessary to develop and execute technology-dependent projects.

Interviewees suggested that the software and infrastructure at some public interest organizations can, at best, be frustrating and, at worst, repellent to technologists. At the beginning of the pipeline, physical infrastructure was suggested as a fundamental aspect of ensuring that students are able to learn technology skills—good educational programs alone are not enough: "We need low-cost computers and ways for students to access technology once they leave the workshop," stated one advocate.

Interviewees also remarked that public interest organizations' lack of adequate physical infrastructure creates a challenging environment for public interest technologists to do their jobs. As one advocate explained, "I spent the last three weeks working on a computer that still has a floppy drive on it. That's an example of the tools we're using to do really basic [work]. It's not just about getting smarter people in the building." Other interviewees agreed, with a public interest technologist describing their organization as "a tech dinosaur," and a government practitioner remarking, "If you go into any government office, their hardware is atrocious."

> "I spent the last three weeks working on a computer that still has a floppy drive on it. That's an example of the tools we're using to do really basic [work]. It's not just about getting smarter people in the building." —Advocate

Infrastructure Example: Technology for Social Good – Tech Warehouse (JPMorgan Chase & Co.)

Program: Tech Warehouse gives refurbished technology to non-profit organizations and schools. It also pursues a zero-waste initiative by ensuring that used hardware is recycled and not thrown into landfills.

Target Participants: Tech Warehouse brings together non-profits and schools with corporations.

Impact: since its founding in 2009, Technology for Social Good's Tech Warehouse has redistributed nearly 30 percent of the technology collected. It has provided more than 3,000 assets to over 1,000 organizations.

Source: http://www.jpmorganchase.com/corporate/Corporate-Responsibility/technology-for-social-good.htm

Opportunity for Investment

Given the rapidly changing nature of technology, physical infrastructure development is often considered an ongoing process rather than a one-time investment. Even so, this does not lessen the need for updated technology to meet educational and business operating needs. Specific investment opportunities include:

- ***Direct Investment in Physical Infrastructure:*** philanthropic leaders may consider direct investment in infrastructure improvements for public interest organizations.
- ***Develop Recycling Programs:*** recycling programs may be an affordable and sustainable method of helping public interest groups update their technology. "I don't know of anybody donating computers—that would be good," mused a government practitioner. One possible method of accomplishing this is creating or supporting an organization that would help technology companies deliver their used computers to public interest organizations. Since technology companies often update their hardware, there may be an opportunity to regularly provide quality computers to organizations that could not otherwise afford them.
- ***Support Software Development Kit Creation:*** a software development kit could be very helpful for public interest technologists looking to scale their work. As one government practitioner explained, "There needs to be infrastructure for civic technology. Right now if you talk to two [governmental] departments, you need unique logins. Then take that to the nth level—if you're trying build software that scales, it's impossible. You need an SDK, a software development kit. It's a set of standards where if you build something it will work on the platform." Were an SDK for public interest organizations to exist, it might improve the workplace experience for public interest technologists and maximize their value to organizations.

Best Practices and Design Consideration

- ***Focus on Sustainability:*** technology can be expensive and constantly changing, and interviewees expressed that there is a continuing need for material investment by philanthropy. A government practitioner advised that philanthropy should "be focused on providing a sustainable kick start" for material needs, including both hardware and software.

3. Reform Grantmaking Processes

Mid Term

Existing Idea

Philanthropy could reform grantmaking processes by providing support for core funding and offering long-term funding commitments to help organizations make investments in organizational infrastructure needs, as well as strengthen programming by ensuring that measurement and evaluation is sophisticated, outcome-based, and consistent.

Interviewees suggested that reforming grantmaking processes has the potential to maximize grantee output. In particular, by providing long-term stability and using sophisticated, outcome-based evaluation methods, grantees may better achieve their aims. Some interviewees emphasized the importance of organizational stability for recruiting purposes. "This is where I see the resource question coming back into play—it's a question of stability," explained one advocate. The advocate continued:

> *This is a conversation I have with folks at job fairs. Because of how we're funded as an organization, I can't look at you in the face and say that we're stable. Prima facie, we're not stable. How do we get around that? It's not that we need more money, but I need to be able to say that we'll be around in five years. Right now I can't.*

Another advocate concurred: "These [public interest] organizations can come and go when their funding is not clear."

Interviewees also advocated for more holistic and sophisticated program evaluation methods. "When the evaluation can be done, it tends to be the wrong kind of evaluation," stated a public interest technologist. The individual continued, "People might be willing to say that the human-centered, qualitative way of making things

has the potential to have value. But then they still want a quantitative evaluation of a qualitative process. If you have a better evaluation process, you might have better results."

Other interviewees emphasized how grantmaking procedures could be used to signal foundation priorities and encourage grantee transformation by using techniques such as simply asking about technology strategies on grant applications.

Opportunity for Investment

Reforming grantmaking processes, while not a new idea, was still desired by many interviewees and achievable in the mid-term. Specific opportunities include:

> "Right now, people are as successful as the environments they operate in. There are not many government environments that can bring good results." —Advocate

- ***Provide Long-Term Support:*** interviewees proposed that philanthropy could focus on providing core funding to organizations. Core grantee organizations that are particularly prepared to work with technologists could be prime candidates for this type of long-term investment. "I would really like to see some way to create stability in the market," said an advocate, continuing, "I would love [for a foundation] to come in and give us a million dollars for 10 years. That's something we could sell potential hires." Another advocate agreed: "To provide core funding is to provide stability and the ability to retain top talent."

- ***Fund the Individual, Not the Organization:*** another method of providing organizational stability discussed by interviewees was funding individuals for long periods of time. "Say that [foundations] will dedicate 10 people a year and pay their full salary and place them in partner organizations—doing that would be an incredible boon to our community," said one advocate.

- ***Use Evaluation for Knowledge Sharing:*** rather than just using evaluation to assess the final outcomes of a project, interviewees suggested that evaluation could also be a useful tool for organizations to improve their work and build success across the field. As a government practitioner explained of the individual's experience: "In the past there wasn't a lot of research or comparing notes and building on the successes of other projects." The practitioner stated that to overcome this, "We started with alliances that were inward-looking and building up their infrastructure. Next, we started looking at evaluation and what the alliances were accomplishing, and we pushed them to develop best practices and work together." An advocate agreed about the potential power of better evaluation and knowledge sharing among organizations: "A lot of top-down efforts, when coupled with bottom-up community strategies, can be more impactful. Monitoring and evaluation and hearing directly from recipients can really show how information can change dynamics between organizations." Philanthropic organizations could develop procedures and systems that might help grantees learn from experience, both within their own foundation and across the network.

Best Practices and Design Considerations

- ***Go Beyond Project-Based Funding:*** one interviewee cautioned against project-based funding support. Funding a person "gives an incredible sense of stability—I know that I can try things and feel as comfortable as possible, because I know they have my back for the next three years," commented an advocate. The advocate continued, "By funding the project at the outset, you're saying our funds are revoked. By being successful you are creating your destruction."

- ***Leave Room for Innovation:*** one interviewee expressed concern that some evaluation processes can stifle innovation. Said a public interest technologist:

  Government doesn't like to evaluate impact although it says it does—people are afraid that they

might evaluate a program and prove it doesn't work. That means when you're trying to make the case for innovation, sometimes it's difficult to convince people to do the evaluation. This stifles the ability to do the work.

Philanthropic leaders might learn from this experience by creating flexible evaluation processes that take the challenges of innovative programs into account.

- *Encourage Integration of Technologists Into Projects:* one possible method of promoting compliance with best practices and integration of technologists into the public interest sphere is tying these aspects to funding decisions. For example, philanthropists could ask grantees how they intend to integrate technologists into their projects. Interviewees suggested that technologists are most effective and find their work most fulfilling when their work is fully integrated into the rest of the organization. A government practitioner described how integrating technologists into strategic thinking is key:

> *What this does is help create a dialogue and a different dynamic. One of the challenges is that a lot of early uses of technologists in government was 'I have this narrow thing that I need an answer for.' For technologists, this isn't interesting. Having a broader dialogue helps people learn the policy side of things and they get something out of it.*

4. Promote Best Practices

Long Term

In Process

Philanthropy could help build public interest workplace environments that are attractive for technologists by identifying and fostering best practices among grantees and particularly leaders in grantee organizations.

There was substantial concern from interviewees regarding the workplace environment of public interest organizations and the negative impact this can have on their abilities to attract and retain technologists. A philanthropic leader noted that technologists need to be set up for success when they arrive in an organization: "For me, the dearth of a tech person inside of a program isn't necessarily a problem. I've seen lots of projects where a tech person parachutes in and is isolated and runs away screaming." An advocate agreed, saying, "Right now, people are as successful as the environments they operate in. There are not many government environments that can bring good results."

Interviewees did not necessarily perceive workplace environment issues as limited to the government. "Social justice people and change-makers are accustomed to hierarchies, and folks that come from technology don't know how to deal with hierarchy," stated a researcher, continuing, "The movement people learned their hierarchy from government. They are actually in the same organizational place as government people. [Tech and public interest organizations] are night and day culturally."

> "I know so many folks who'd rather be in the public sector than where they are. It's almost that things have to discourage you rather than not attract you." —Government Practitioner

Along with less competitive salaries, interviewees frequently cited workplace culture issues as one of the biggest barriers for technologists working in the public interest. Said a government practitioner:

> *How do we offset or create incentives so that talent will be just as likely to go to government or the public interest as they would to the private sector? For me personally, I had to take a 60 to 70 percent pay cut. There's no upside in terms of stock, and [working for the public interest] is more restrictive in terms of places to work. There's more bureaucracy, it's less efficient. The culture isn't there.*

Another government practitioner agreed: "I know so many folks who'd rather be in the public sector than where they are. It's almost that things have to discourage you rather than not attract you." The practitioner continued, "I think it's more a question of barriers—the private sector

is better able to pay and advance its employees, and the public sector often does not have the most dynamic workplaces."

Another concern of interviewees was a lack of workplace diversity. "Being in offices full of district and state CTOs, these are the whitest rooms I've been in in my life," remarked a government practitioner. "Not that they aren't smart, talented people, [but] some government agencies are starving themselves of talent because they are signaling to almost half the population of the country this is not a good place to work," the individual continued.

Opportunity for Investment

Some interviewees mentioned attempting to shift their workplace cultures, but given that establishing more attractive workplace environments will likely require adjusting the ways that many public interest organizations fundamentally operate, it may take time for any intervention to fully take hold. Specific opportunities for investment include:

- ***Develop Best Practices Toolkit:*** philanthropy could support practices that aid public interest organizations in becoming more technologist-friendly, particularly by creating resources for leaders in the public interest. Organizations may need basic assistance in understanding how technologists work and the value they can bring. One advocate spoke of a colleague's experience with the "performance art of convincing people that her work is relevant. It's challenging to build support among people who might not understand [her projects], and much of her time is spent explaining the value proposition." Some public interest technologists are already attempting to change their workplace environments: "I'm trying to create the culture that can support this kind of work—fast and also casual, both in approach and attire," reported a government practitioner. An advocate agreed that part of the individual's work is trying to "create a culture change, a move from a hierarchical structure to networked one. This will feel appealing to people in the tech industry. People don't want crazy levels of bureaucracy when they make a decision." To support awareness of workplace best practices, philanthropy could develop a best practices guide and circulate it throughout leaders and others in the non-profit community.
- ***Develop a Report Cataloguing Successes:*** a report that catalogues successes across public interest technology efforts could have substantial value, an interviewee indicated. Philanthropy could fund an organization to develop a report "with some external validators," a scholar said, continuing, "Voices that are respected by technologists and are able to make the case that there is important stuff going on in government would be the most useful."
- ***Bonuses for Diverse Hiring:*** incentives may be used to diversify public interest technology, said some interviewees. "Why don't [organizations] double or triple [a referral] bonus if you hire someone who is different from you in the company, either by race or gender or age," said a field expert, continuing, "For companies that are already paying more for difficult-to-fill jobs, it makes sense to take it farther."

Best Practices and Design Considerations

- ***Streamline Hierarchy:*** interviewees discussed how technologists go into public interest roles because of the potential to have meaningful impact. "People come in with big visions and we need to find somewhere that can happen," said one advocate. However, current bureaucratic structures only serve as barriers to action, interviewees said. One advocate compared the working conditions between the private sector in Silicon Valley and public interest organizations:

  > *[In Silicon Valley,] there's clear authority on project you're working on. When you go into the government, there are several elements of that story that are missing, including that there is no one in charge to make decisions, no one is empowered to say yes to things, and everyone is empowered to say no.*

> "People come in with big visions and we need to find somewhere that can happen." —Advocate

There's no such thing as a product manager, and government will not be successful until they empower people in those roles.

Streamlining the chain of command and removing hierarchical barriers are possible ways to better the workplace for technologists, a best practice that could be internalized among public interest technology leaders.

- ***Support Meaningful Work:*** many interviewees stated that technologists should be empowered to work on broad, appealing projects rather than ones of limited scope and significance. A government practitioner remarked, "If you bring in a technologist and you want them to work in a narrow way, the technologist is going to get frustrated. They may see great opportunities but not see value in being heard."
- ***Foster Diversity among Leadership:*** some interviewees suggested that one method of encouraging diversity within organizations is by starting with organizational leadership. A researcher discussed the individual's own success with recruiting a diverse pool of talent: "What we keep hearing is that [our organization] is good for people in tech that tech usually isn't good for. This has made me think more about who is at the helm of the organization, and what this also means is that we're pulling people from the pool that are otherwise invisible."

IV. CONCLUSION

The public interest technology sector has made progress and matured in the past few years. This document identifies challenges and potential interventions for decisionmakers to consider.

This report is intended to be a decisionmaking tool, and it includes both a compendium of more than two dozen-specific ideas. It is our hope that this document serves as a useful resource for philanthropy and others working to strengthen the public interest community's technology capacity.

While the report describes many obstacles, interviewees also said this is a moment of great opportunity. As one advocate put it:

> *We need a national call to action. With the right group of philanthropic support and research, a resurgence of talent into the public service is possible.*

Using smart choices and strong leadership, many of the interventions discussed in this report can form a new approach to improving the talent pipeline. It is indeed a pivotal moment for decisionmakers to chart a new, effective course.

APPENDIX A: LIST OF INTERVIEWEES

This appendix lists the individuals interviewed for this report; we are deeply grateful for their time and expertise in helping to develop this research. The titles listed below were current as of the time interviews were conducted.

Alessandro Acquisti, Professor of Information Technology and Public Policy, Heinz College, Carnegie Mellon University

Chelsea Barabas, Senior Advisor for Social Impact, Digital Currency Initiative, Massachusetts Institute of Technology Media Lab; Research Assistant, Massachusetts Institute of Technology Center for Civic Media

Lane Becker, Director of Products and Startups, Code for America

Andrew Bentley, National Digital Inclusion Program Manager, Google Fiber

Christopher Berry, Associate Professor, Harris School, Director of the Center for Municipal Finance, Faculty Director of the Master of Science Program in Computational Analysis and Public Policy, University of Chicago

danah boyd, Principal Researcher, Microsoft Research; Founder, Data and Society Research Institute

John Bracken, Vice President, Media Innovation Program, John S. and James L. Knight Foundation

Catherine Bracy, Director of Community Organizing, Code for America

Kimberly Bryant, Founder, Black Girls Code

Susan Crawford, John A. Reilly Visiting Professor in Intellectual Property, Harvard Law School; Professor, Cardozo Law School, Yeshiva University; Former Special Assistant to the President for Science, Technology, and Innovation Policy

Janice Cuny, Program Director for Computing Education, National Science Foundation

John Donahue, Raymond Vernon Senior Lecturer in Public Policy, Faculty Chair of the Master of Public Policy Program, Harvard Kennedy School

Mieke Eoyang, Director, National Security Program, Third Way

Michael Flowers, Urban Science Fellow, New York University Center for Urban Science and Progress; Former Chief Analytics Officer and Chief Open Platform Officer, New York City

Vanessa Fox, Chief Executive Officer, Keylime Toolbox

Brett Goldstein, Senior Fellow in Urban Science, Harris School of Public Policy, University of Chicago; Former Chief Executive Officer, City of Chicago

Janet Haven, Associate Program Director, Open Society Foundations

Harlo Holmes, Mobile Developer, The Guardian Project

Mimi Ito, Professor in Residence, Humanities Research Institute, University of California, Irvine

Nigel Jacob, Co-Founder, Mayor's Office of New Urban Mechanics

Benjamin Jealous, Partner, Kapor Capital; Senior Fellow, Center for American Progress; Former President and Chief Executive Officer, National Association for the Advancement of Colored People

Thomas Kalil, Deputy Director for Policy, White House Office of Science and Technology Policy; Senior Advisor for Science, Technology and Innovation, United States National Economic Council

Freada Kapor Klein, Partner, Kapor Center for Social Impact

Chris Kingsley, Associate Director for Local Policy and Advocacy, Data Quality Campaign

Seamus Kraft, Executive Director, Co-Founder and Vice-Chairman, OpenGov Foundation

Ramayya Krishnan, Dean, Heinz College, Carnegie Mellon University

Katherine Maher, Chief Communications Officer, Wikimedia; Former Advocacy Director, Access

Chelsea Mauldin, Executive Director, Public Policy Lab

Lori McGlinchey, Program Officer, Ford Foundation

Lenny Mendonca, Co-Founder and Chairman, Fuse Corps

Dan Meredith, Director, Open Technology Fund, Radio Free Asia

Travis Moore, Founder, Tech Congress

Deirdre K. Mulligan, Associate Professor, School of Information, and Co-Director, Berkeley Center for Law and Technology, University of California, Berkeley

Abhi Nemani, Chief Data Officer, City of Los Angeles

Chris Osgood, Co-Chair, City of Boston Mayor's Office of New Urban Mechanics

Jennifer Pahlka, Founder and Executive Director, Code for America

John Palfrey, Head of School, Phillips Academy

Jon Peha, Professor, Department of Engineering and Public Policy and Department of Electrical and Computer Engineering, Carnegie Mellon University; Former Assistant Director, White House Office of Science and Technology Policy; Former Chief Technologist, Federal Communications Commission

Alaina Percival, Board Chair and Chief Executive Officer, Women Who Code

Kathryn Pettit, Senior Research Associate and Director of National Neighborhood Indicators Partnership, Urban Institute

Andrew Rasiej, Co-Founder, Personal Democracy Media

Juliana Rotich, Executive Director, Ushahidi

Ross Rubenstein, Professor and Chair, Department of Public Administration and International Affairs; Associate Dean, Maxwell School of Citizenship and Public Affairs, Syracuse University

Reshma Saujani, Founder, Girls Who Code

Jason Schultz, Professor of Clinical Law, New York University; Director, New York University Technology Law and Policy Clinic

Eric Sears, Program Officer, MacArthur Foundation

Ashkan Soltani, Chief Technologist, Federal Trade Commission

Christopher Soghoian, Principal Technologist, American Civil Liberties Union

Dave Steer, Director of Advocacy, Mozilla Foundation

Eli Sugarman, Program Officer, William and Flora Hewlett Foundation

Mark Surman, Executive Director, Mozilla Foundation

Latanya Sweeney, Director of the Data Privacy Lab, Institute for Quantitative Social Science at Harvard University; Professor of Government and Technology in Residence, Harvard University Department of Government

Daniel Tangherlini, Chief Operating Officer, Artemis Real Estate Partners; Former Administrator, United States General Services Administration

Joshua Tauberer, Co-Founder, if.then.fund (Civic Responsibility LLC); Creator and Maintainer, GovTrack; Primary Contributor, The Open Senate Project

Jenny Toomey, Director, Ford Foundation

Jeff Ubois, Program Officer, MacArthur Foundation

Clarence Wardell, Presidential Innovation Fellow, Department of Energy; Research Affiliate, Berkman Center for Internet and Society, Harvard University

James Weinberg, Chief Executive Officer, Fuse Corps

Daniel Weitzner, Director, Massachusetts Institute of Technology Computer Science and Artificial Intelligence Laboratory (CSAIL) Decentralized Information Group; Former United States Deputy Chief Technology Officer for Internet Policy, White House

Ethan Zuckerman, Director, Massachusetts Institute of Technology Center for Civic Media

APPENDIX B: SUMMARY TABLES OF INTERVENTIONS

This appendix organizes the interventions from section III of this report by where they sit in the public interest technology ecosystem: the supply side, the demand side, or the marketplace.

Supply-Side Interventions

Intervention	Description	Timeframe	Level of Maturity	Pipeline Stage
1. Digital Inclusion	Philanthropy could help to grow the supply of technologists and diversify the pipeline in the long term by ensuring everyone has access to the Internet and at least a basic understanding of and literacy in technology. Investment in this intervention could take the form of continued support to organizations as well as a call for additional government programs.	 Mid Term	 In Process	Interest Cultivation
2. Student Incentives	Opportunities to sponsor financial incentives for university students to pursue public interest technology careers through scholarships, loan forgiveness, and competitions exist. These programs could expand the supply of technologists and enhance opportunities for individuals from low-income backgrounds.	 Mid Term	 In Process	Interest Cultivation
3. Internships	Philanthropy could provide funding for internships, potentially with a formalized structure that allows interns to rotate among public interest organizations, to provide early opportunities to engage students in public interest work and create opportunities for individuals from a variety of backgrounds.	 Mid Term	 In Process	Interest Cultivation

Intervention	Description	Timeframe	Level of Maturity	Pipeline Stage
4. K-12 Computer Science Curricula	Philanthropy could support the development of computer science and web literacy curricula that are appealing, useful, and culturally relevant. Upon completion of successful pilot programs, the curricula could later be taken to scale and taught at schools around the country. Investment in this intervention could entail funding original curriculum development or supporting the expansion and refinement of existing programs.	Mid Term	In Process	Skill Building
5. Higher Learning: Interdisciplinary Curricula at Universities	Philanthropy could work to improve the environment for interdisciplinary studies at universities through a number of methods, including: supporting hybrid coursework, creating accelerated programs, encouraging technical core requirements and capstone projects that aid public interest organizations, and broadening the definition of "interdisciplinary."	Mid Term	In Process	Skill Building
6. Online Learning Opportunities	Philanthropy could increase diverse communities' access to existing programs by bringing them online and adapting content to make it resonate with different learning styles and realities. Online learning opportunities can coexist with traditional education models or be used independently of formal education settings for continuing education.	Mid Term	In Process	Skill Building

Intervention	Description	Timeframe	Level of Maturity	Pipeline Stage
7. Teacher Training	By strengthening professional development opportunities, philanthropy could help ensure that those teaching computer science curricula have adequate training and all teachers have basic computer literacy.	Mid Term	In Process	Skill Building
8. Improve Faculty Incentives	Philanthropy could improve incentives for faculty by developing and socializing interdisciplinary journals, recruiting senior field advocates to form a community, and creating endowed chair positions.	Long Term	In Process	Skill Building
9. Recruitment via Networking and Partnerships	Philanthropy could sponsor networking opportunities, potentially including volunteer positions or initiatives, to identify potential public interest technologists, leverage city officials to make asks, and reach diverse communities.	Short Term	Existing Idea	Recruitment and Training
10. Boot Camps	Philanthropy could offer a short-term intensive training for technologists to bring them up to speed on how to be effective across the breadth of technology projects in the public interest and give them a better understanding of how government and civil society operate.	Short Term	New Idea	Recruitment and Training

Intervention	Description	Timeframe	Level of Maturity	Pipeline Stage
11. Management and Communications Training	Philanthropy could support programs to enhance management and communications skills of public interest technologists through professional development with a public interest lens.	Mid Term	In Process	Recruitment and Training
12. Fellowship Programs	By strengthening professional development opportunities, philanthropy could help ensure that those teaching computer science curricula have adequate training.	Short Term	Existing Idea	Skill Deployment
13. Mentorships	Philanthropy could establish or support programs that partner existing and potential public interest technologists, potentially from the same community. Mentorships serve to onboard new talent, support career development, and grow the field.	Short Term	Existing Idea	Growth and Retention

Demand-Side Interventions

Idea	Description	Timeframe	Current Status	Pipeline Stage
14. Conferences and Alliances	Philanthropy could support conferences and alliances for public interest technologists to help bring in new individuals and to build communities and a professional identity. This intervention would likely have a corollary benefit of improving dissemination of public interest technology job opportunities.	Mid Term	Existing Idea	Interest Cultivation
15. Highlight Success	This intervention involves assisting public interest organizations in efforts to broadcast successful case studies to raise visibility of the need for public interest technologists, highlight the projects where they are succeeding, and potentially reach new, diverse communities. This broadcasting could take the form of documents for city leaders, a speaker series, and general communications assistance.	Short Term	Existing Idea	Interest Cultivation
16. Better Job Descriptions	Philanthropy could create appealing, accurate templates that organizations can use to help attract technologists to public interest work and facilitate hiring in bureaucratic structures.	Short Term	Existing Idea	Recruitment and Training

Idea	Description	Timeframe	Current Status	Pipeline Stage
17. Credentialing	Philanthropy could create effective, widely recognized systems that signal the skills technologists have developed and facilitate easier evaluation and hiring decisions for public interest organizations, potentially enhancing diverse individuals' opportunities to obtain relevant jobs.	Mid Term	In Process	Recruitment and Training
18. Innovation Teams	Philanthropy could support successful examples of innovation teams at a given locus in public interest organizations by expanding or augmenting existing efforts, developing new innovation teams, or conducting an efficacy study.	Mid Term	Existing Idea	Skill Deployment
19. Software & Hardware Infrastructure Development	Philanthropy could help ensure that public interest organizations have the physical technology infrastructure necessary to develop and execute in technology-dependent projects.	Mid Term	In Process	Growth and Retention
20. Promote Best Practices	Philanthropy could help build public interest workplace environments that are attractive for technologists by identifying and fostering best practices among grantees and particularly leaders in grantee organizations.	Long Term	In Process	Growth and Retention

Marketplace Interventions

Idea	Description	Timeframe	Current Status	Pipeline Stage
21. Online Job Board/ Clearinghouse	Philanthropy could develop a sophisticated and user-friendly job board and email listserv, potentially including a clearinghouse, for public interest technology opportunities.	Mid Term	New Idea	Recruitment and Training
22. Placement Agency	Philanthropy might build an agency or intermediary with knowledge of both the supply and demand side that can help place talented technologists in public interest opportunities.	Mid Term	Existing Idea	Recruitment and Training
23. Enable a Tour of Service	Philanthropy could enable technologists' short- to mid-term tours of service in public interest organizations by making it easier procedurally to onboard new employees and deploy their skills on a time-limited basis.	Long Term	In Process	Skill Deployment
24. Contracting Reform	To streamline government procurement and contracting, philanthropy can help ensure officials have the expertise and ability to hire innovative technology contractors by developing best practice and procedural studies, supporting the hiring of experts, and creating a state-based competition.	Long Term	New Idea	Skill Deployment
25. Technology Consulting (as a Stopgap)	Philanthropy might help organizations fill an immediate need for technologists working in the public interest by supporting technology consulting as a stopgap measure.	Short Term	Existing Idea	Skill Deployment

Idea	Description	Timeframe	Current Status	Pipeline Stage
26. Reform Grant-making Processes	Philanthropy could reform grant-making processes by providing support for core funding and offering long-term funding commitments to help organizations make investments in organizational infrastructure needs, as well as strengthen programming by ensuring that measurement and evaluation is sophisticated, outcome-based, and consistent.	 Mid Term	 In Process	Growth and Retention

APPENDIX C. BACKGROUND AND METHODOLOGY

This section details the methodology, and terminology used for this study. This report aimed to conduct research on potential solutions to pressures facing the technology talent pipeline for public interest organizations, including civil society and government. The research illuminated existing and potential interventions that could be used to attract and retain qualified technologists to the public interest, with a particular focus on the role for philanthropy.

Methodology

Freedman Consulting, LLC, conducted interviews with 60 individuals relevant to the field to form the foundation for this report. Interviewees were asked to identify existing models, describe what elements help spur successful and unsuccessful interventions, and pinpoint the most promising avenues for advancing a talent pipeline program. Interviewees included the following types of people:

- Government Practitioners and Experts
- Public Interest Technologists
- Scholars and Researchers
- Advocates and Field Experts
- Philanthropic Leaders

For a complete list of interviewees, please see Appendix A. Interviewees primarily represented domestic organizations, though some suggestions and findings from these interviews may be applicable to international counterparts. Additionally, information provided by interviewees was supplemented by background research and media scans of relevant models and interventions.

Theory of Change

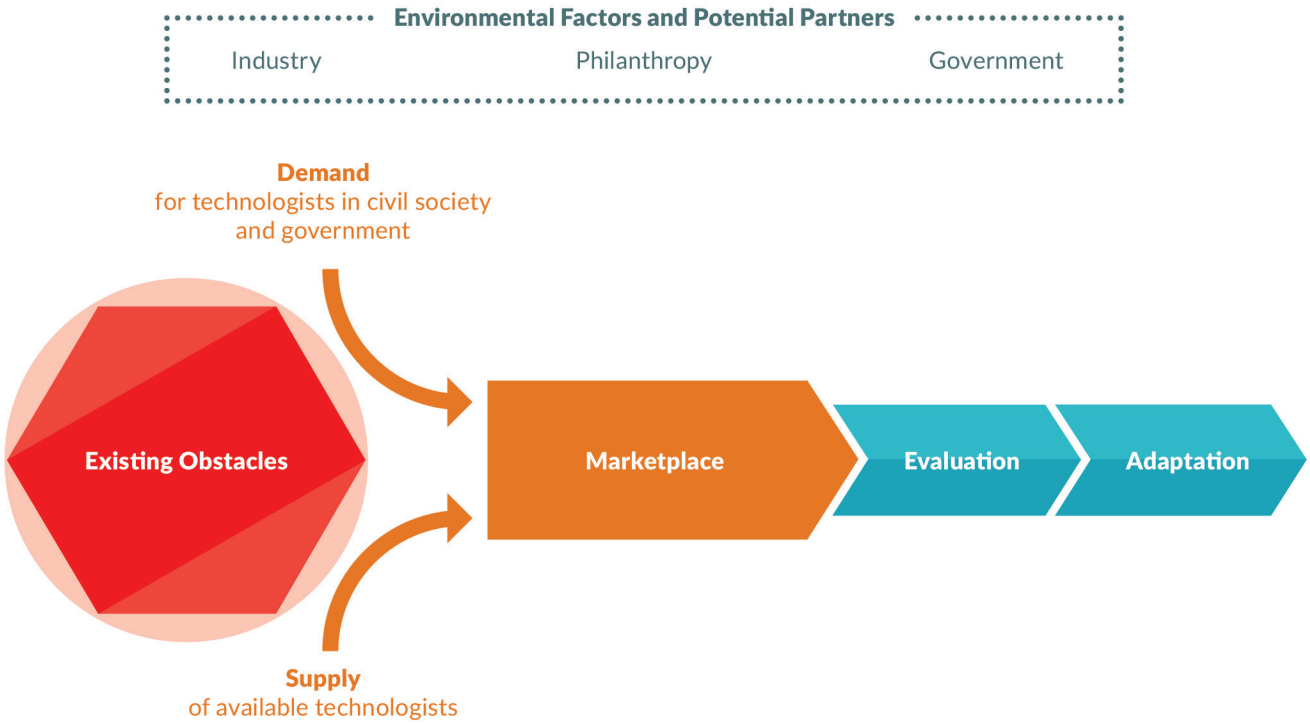
As discussed in *A Future of Failure? The Flow of Technology Talent into Government and Civil Society*, the technology talent pipeline can be conceptualized roughly into five stages or nodes within the pipeline. This conceptualization is illustrated in the diagram below.

These nodes are largely similar to talent pipelines from other fields, but have several unusual aspects described in that report:

> *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.*[1]

In the diagram on the next page, existing obstacles facing the talent pipeline are impacting both public interest organizations and technologists from the demand and supply side, respectively. In a healthy pipeline, both sides will come together to form an adequate marketplace to enable

1 Freedman Consulting, LLC. "A Future of Failure? The Flow of Technology Talent into Government and Civil Society—A Report." *Freedman Consulting, LLC*. 2013. http://www.fordfoundation.org/pdfs/news/afutureoffailure.pdf.



matching of technologists to public interest organizations, which include civil society and government, after which evaluation and adaptation should occur to ensure effective programs.

Within the elements of the diagram are additional obstacles as well as potential solutions. This report aims to synthesize and catalogue both the obstacles and solutions, and also identify the relative feasibility and temporal scope of each potential solution. The talent pipeline ecosystem is also affected by environmental factors, which may include issues like institutional culture and diversity, and the actions and resources of potential partners, such as industry and government.

ABOUT THE AUTHORS

Tom Freedman, President

As President of Freedman Consulting, LLC, Tom Freedman is an advisor to leading political figures, corporations, and non-profit organizations developing policy ideas that become part of an effective strategic message. Mr. Freedman served in the Clinton Administration as Senior Advisor to the President, and prior to that as Special Assistant to the President for Policy Planning. In the 1996 presidential campaign, Mr. Freedman was Chief of Staff for Strategy, helping to create the policy and communications plan for Clinton/Gore '96. Previously he was Press Secretary and later Legislative Director to then Congressman Charles E. Schumer (D-NY). He co-founded the non-profit organization the Welfare to Work Partnership, which grew to include more than 20,000 companies that hired more than 1 million Americans off of public assistance. Mr. Freedman served as a member of the 2008 presidential Obama-Biden Transition Project on the Technology, Innovation, and Government Reform Policy Working Group, and was a policy consultant for President Obama's reelection campaign in 2012, Obama for America.

Jessica Roeder, Vice President

As a Vice President at Freedman Consulting, LLC, Jessica Roeder brings her experience in program management and consulting to direct project teams and achieve the client's vision. Ms. Roeder has worked across the public sector with government agencies and non-profits such as the United States Agency for International Development (USAID), National Parks Service, Department of Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE), and US Ignite. Previously as the Director of Community Innovation Programs at US Ignite, Ms. Roeder assisted the new organization from launch to sustained operations and united academics, community leaders and technical innovators to cultivate advanced Internet applications for public benefit. In that position, she worked in close collaboration with the White House Office of Science and Technology Policy and the National Science Foundation

Alexander C. Hart, Project Director

Alexander C. Hart is a Project Director with Freedman Consulting, LLC, where he leads and conducts projects in research, media and program evaluation, policy and strategic planning, and public opinion research. His work for firm clients covers a broad portfolio of issues including technology openness and access, poverty and economic opportunity, municipal policy, children and family policy, voting rights, and genomic medicine. Mr. Hart has worked with major political campaigns, foundations, and non-profit organizations including the Ford Foundation, Next Generation, Open Society Foundations, President Obama's 2012 reelection campaign, and *Spotlight on Poverty and Opportunity*. Mr. Hart was also one of the lead authors on the report *A Future of Failure: The Flow of Technology Talent into Government and Civil Society*, which was featured in Politico and cited in a White House report on Big Data.

Kyle Doran, Project Manager

Kyle Doran is a Project Manager with Freedman Consulting, LLC, where he undertakes program evaluation, strategic planning, and policy research for firm clients, including on government innovation and Internet policy analysis for Bloomberg Philanthropies and the Ford Foundation, respectively. Prior to joining the firm, Mr. Doran worked on President Obama's 2008 and 2012 campaigns, including as a 2012 Deputy Data Director in Iowa, was a member of the data team for the 2013 Presidential Inaugural Committee, and served in the Peace Corps in Armenia.

Kaye Sklar, Research Associate

As a Research Associate with Freedman Consulting, LLC, Kaye Sklar provides support on policy and strategic planning, research, and communications for firm clients. Previously, she worked for Facebook as a Communications Extern on the product, policy, and corporate communications teams. Ms. Sklar has also worked with Planned Parenthood Federation of America and the World Affairs Council of Oregon, and she interned with the U.S. Department of State.