

February 23, 2021

Andrew Hirshfeld
Commissioner for Patents
United States Patent and Trademark Office
600 Dulany Street
Alexandria, VA 22314

RE: Comments in Response to 85 FR 83906, “Request for Comments on the National Strategy for Expanding American Innovation,” Docket No. PTO-P-2020-0057

Dear Commissioner Hirshfeld:

Invent Together appreciates the opportunity to submit comments to assist the National Council for Expanding American Innovation (NCEAI, or the “Council”) with the development of a national strategy for expanding American innovation (the “National Strategy”) by answering selected questions about creating innovators and practicing and realizing innovation.

The United States Patent and Trademark Office (USPTO) and leading researchers have found that women, people of color, and lower-income individuals patent inventions at significantly lower rates than their representation in the population:

- Less than 13 percent of all inventors who hold a U.S. patent are women.¹ Women hold only 5.5% of commercialized patents.²
- Inventing activity by Black inventors peaked in 1899 and has not recovered.³ Black and Hispanic college graduates patent at half the rate of White college graduates.⁴

¹ USPTO, Progress and Potential: 2020 Update on U.S. Women Inventor-patentees (July 2020) at 3, <https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf>.

² Jennifer Hunt et al., Why Don’t Women Patent, National Bureau of Economic Research Working Paper No. 17888 (2012), at 1, <https://www.nber.org/papers/w17888>.

³ Lisa D. Cook, Violence and Economic Growth: Evidence from African American Patents, 1870 to 1940, *Journal of Economic Growth* (June 2014), at 221–257, https://lisadcook.net/wp-content/uploads/2014/02/pats_paper17_1013_final_web.pdf.

⁴ Institute for Women’s Policy Research, Equity in Innovation: Women Inventors and Patents (2016) (“Equity in Innovation”), <https://iwpr.org/wp-content/uploads/2020/12/C448-Equity-in-Innovation.pdf>.



- Children in families in the top one percent of income are ten times more likely to patent as adults than children in the entire bottom half of family income.⁵

These disparities impair economic growth and U.S. leadership in innovation and deny individual members of underrepresented groups the benefits and opportunities that patent ownership creates. Increasing participation in inventing and patenting by underrepresented groups would quadruple the number of American inventors⁶ and increase annual U.S. GDP by almost one trillion dollars.⁷

We believe that everyone should have the opportunity to invent and patent. That's why we created Invent Together—an initiative supported by organizations, universities, companies, and other stakeholders dedicated to understanding the gender, race, and other diversity gaps in invention and patenting and supporting public policy and private initiatives to close them.

Over the past several years, Invent Together has worked with inventors, academics, industry representatives, advocacy groups, and others to make progress on these issues, including by:

- Supporting research by leading academics and think tanks to quantify the patent gaps and identify best practices to close them;
- Supporting the successful passage of the SUCCESS Act, which required the USPTO to study and report on the number of patents applied for and obtained by women, minorities, and veterans and to make recommendations for legislative and executive actions to reduce disparities in patenting; and
- Convening two roundtable workshops, bringing together academics, practitioners, organizations, universities, companies, policymakers, and other stakeholders to discuss these issues.

In fall 2020, Invent Together launched a public website—www.inventtogether.org—to provide a platform and additional tools for educating and informing stakeholders about the importance of diversity in invention and patenting and advocating for public and private initiatives to close the patent gaps. Today, Invent Together continues to actively support closing the patent gaps, including by:

⁵ Alex Bell et al., Who Becomes an Inventor in America? The Importance of Exposure to Innovation (“Who Becomes an Inventor in America?”) (November 2018), http://www.equality-of-opportunity.org/assets/documents/inventors_paper.pdf.

⁶ *Id.*

⁷ Lisa D. Cook, Economic and Social Implications of Racial Disparities, June 8, 2020, <https://bcf.princeton.edu/wp-content/uploads/2020/11/Combined-Slides-10.pdf>.



- Educating policymakers, practitioners, and the public about the patent gaps and the benefits of patent diversity;
- Supporting new research on the reasons for the patent gaps and how to close them;
- Promoting public and private sector initiatives to develop and institute best practices for patent diversity;
- Sharing stories of diverse inventors; and
- Advocating for public policies to collect demographic data on inventors, as recommended by the SUCCESS Act report, and to expand and refine existing government resources for inventors.

Invent Together is pleased that the USPTO established the NCEAI, as announced in the SUCCESS Act report, to “develop a national strategy for promoting and increasing the participation of underrepresented groups as inventor-patentees, entrepreneurs, and innovation leaders.”⁸ The Council brings together academics, industry leaders, and policymakers at the highest levels, underscoring the national importance of building a more inclusive innovation ecosystem. Invent Together strongly supports the NCEAI’s development of a detailed National Strategy that provides recommendations for both programmatic adjustments and deeper structural changes in both the public and private sectors.

Invent Together and its partners are important stakeholders in our innovation economy. As inventors, academics, businesses, and advocacy groups, we participate in every aspect of the innovation pipeline, and offer a range of perspectives on how to address disparities in inventing and patenting. Below, we answer selected questions and provide additional information we hope the USPTO will consider as it develops a National Strategy to Create Innovators, Practice Innovation, and Realize Innovation.

I. General

- (2.) **Women and some minorities have not participated proportionally in the patenting of inventions. What barriers to innovation inclusion are specific to underrepresented groups? What supporting role should government organizations play in helping underrepresented groups overcome these barriers?**

Women, people of color, and other underrepresented groups face numerous barriers to equitable participation in the patenting of inventions, including a lack of access to invention

⁸ USPTO, Report to Congress Pursuant to P.L. 115-273, the SUCCESS Act (Oct. 2019) (“SUCCESS Act Report”), at 23, <https://www.uspto.gov/sites/default/files/documents/USPTOSuccessAct.pdf>.



education, mentorship opportunities, and capital, as well as entrenched cultural issues, such as unconscious bias and discrimination. We discuss these barriers and best practices to overcome them throughout this comment, but it is worth highlighting a few key barriers in this response, as well as the role of government in overcoming them.

Barriers to Participation

- **Exposure and education:** According to a study by Harvard researchers, “Children who grow up in areas with more inventors—and are thereby more exposed to innovation while growing up—are much more likely to become inventors themselves.”⁹ Indeed, children whose parents are inventors are nine times more likely to become inventors,¹⁰ and “children who grow up in a neighborhood or family with a high innovation rate in a specific technology class are more likely to patent in *exactly the same* class.”¹¹ Children who attend similar colleges also tend to patent at similar rates, suggesting “that factors that affect children before they enter the labor market, such as childhood environment and exposure to innovation, drive much of the gaps in innovation.”¹² As discussed in further detail in Section II of this comment, access to high-quality invention education is critical to helping people to develop the technical skills and problem-solving mindset necessary to become inventors.
- **Mentorship:** As discussed in our response to Question 15, social networks are key to helping inventors “evaluat[e] whether it would be worthwhile to pursue a patent” in the first place since an inventor is likely to first seek advice from his or her own peers.¹³ Because inventors tend to seek mentors who share similar backgrounds, and there are fewer women and people of color in positions to act as mentors for inventors, it is harder for underrepresented inventors to find inventors to mentor them.¹⁴
- **Capital:** Fewer than 5 percent of all venture capital (VC) deals—and only about 2 percent of all VC funding—go to women.¹⁵ This massive funding gap penalizes women inventors, who are less likely to receive venture backing for their ideas than their male counterparts. Funding helps inventors research and develop their ideas, and eventually bring them to market. Patents are also important assets for attracting investment capital

⁹ Alex Bell, Comments before the USPTO, SUCCESS Act Hearings (2019), at 7.

¹⁰ See Alex Bell et al., Who Becomes an Inventor in America?, at 17–18.

¹¹ *Id.* at 1.

¹² Alex Bell, Comments before the USPTO, SUCCESS Act Hearings (2019), at 8.

¹³ IWPR, Equity in Innovation, at 22.

¹⁴ See *id.*

¹⁵ Valentina Zarya, Venture Capital’s Funding Gender Gap is Actually Getting Worse, *Fortune*, Mar. 13, 2017, <http://fortune.com/2017/03/13/female-founders-venture-capital/>.



in potential businesses. Disparities in patent rates, therefore, lead to disparities in investment rates, and vice versa.

- Bias and discrimination: Discrimination against women and people of color in the workplace, cultural inertia in academia and industry, and unconscious bias from gender and racial stereotypes all contribute to the patent gaps.

Although overcoming these barriers will require conscious effort and institutional change by schools, industry, and other organizations that support inventors, the federal government is uniquely positioned among stakeholders to make progress on participation in invention and patenting.

Recommendations for Government

A strong National Strategy requires a bold, whole-of-government approach. The USPTO must work with other federal agencies, the White House, and Congress to expand participation in innovation.

The Administration should publicly emphasize the importance of an inclusive innovation economy and celebrate the role of diverse inventors in U.S. innovation and technology leadership at the highest levels. The voices of President Biden, Vice President Harris, the next Commerce Secretary, USPTO Director, Small Business Administrator, and other senior officials in the Administration are critical to promoting broad participation in invention and patenting, and to enjoying the job growth and technology leadership benefits associated with greater inclusion in invention and patenting. These efforts should be accompanied by a public awareness campaign that features diverse inventors with compelling stories and utilizes the Internet, social media, and television/streaming.

The Administration should also develop bold goals and promote new policies, such as universal invention education and significant new R&D programs and investments. Although there are a number of existing public and private invention education programs, the federal government could ensure that invention education occurs in schools, and the USPTO could develop model invention education programs for community organizations. The government could also provide greater funding opportunities for diverse inventors, including by expanding existing research and development programs, such as the SBIR and STTR programs, and creating new grant programs. For example, President Biden has said that his Administration will make a \$300 billion investment in research and development and breakthrough technologies, and that he will work to ensure innovation funding is allocated equitably. This effort would not only help diverse inventors overcome the barrier to capital, but also help the United States remain a



global leader in technology development. Congress should also pass, and the President should sign, the bipartisan Endless Frontier Act, which would authorize \$110 billion over five years to advance research and innovation in key technology areas, including grants for universities and partners to establish technology centers, test beds, and lab-to-market programs; for universities to provide scholarships and fellowships; and for consortia to create regional technology hubs.

In addition to pursuing bold goals and new policies, the Administration should engage in further study of the disparities in and benefits of invention and patenting as a critical first step in expanding participation in the innovation economy. As discussed in more detail in our response to Question 5, the USPTO should gather demographic data on inventors to better understand the gaps and measure the effectiveness of efforts to reduce them. The Administration should also implement the SUCCESS Act report recommendation that Congress and the Administration make it easier for federal agencies to share data with the USPTO to facilitate the study of patent gaps, including by ensuring that the Office of Management and Budget (OMB) designate the USPTO a data-sharing agency under the Confidential Information Protection and Statistical Efficiency Act (CIPSEA). The Administration should also conduct new studies on the patent gaps and impact of patent diversity on the U.S. economy. The Council of Economic Advisers (CEA) should study and report the patent gaps for people of color, women, and other underrepresented groups, and quantify the positive impact that greater access to inventing and patenting would have on individual income, wage gaps, national GDP, and U.S. technology leadership, compared to our competitors around the globe. The Federal Reserve should study and report the positive impact that expanding the number of inventors of color and patents granted to inventors of color would have on existing racial economic gaps and U.S. economic growth and recovery in the wake of the ongoing coronavirus pandemic, which has presented financial challenges for millions of Americans and exacerbated existing economic disparities.

The Administration should also improve existing programs and resources to ensure diverse inventors have equitable access to capital and information. For example, the USPTO should work with Congress to lower the high costs associated with patenting that create barriers to entry. High fees associated with filing and defending a patent can pose a substantial barrier since people from underrepresented groups earn less, on average, than white men. Attorney fees alone for filing a patent application can cost \$5,000 to \$16,000 by some estimates,¹⁶ excluding other associated costs. Programs like the USPTO Pro Bono Assistance Program, which matches qualified low-income applicants with volunteer patent attorneys who practice at private firms or in solo practices, and the USPTO Pro Se Assistance Program, which provides advice to inventors

¹⁶ Gene Quinn, The Cost of Obtaining a Patent in the U.S., IPWatchdog, April 4, 2015, <http://www.ipwatchdog.com/2015/04/04/the-cost-of-obtaining-a-patent-in-the-us/id=56485/>.



who wish to pursue patents without the help of an attorney, can help to mitigate the high costs of patenting an invention, but they could be expanded to help small businesses and others for whom attorneys' fees are a major barrier to entry. The USPTO should also continue to expand its Law School Clinic Certification Program. Today, students at more than 60 participating law schools provide pro bono assistance to independent inventors seeking patent advice under the supervision of their law school clinical faculty.¹⁷ Increasing the availability of pro bono legal services to all types of inventors is essential to lowering barriers to patenting.

The Administration should also improve the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs to help to ensure innovation funding is allocated equitably. These programmatic improvements should include increasing the diversity of application reviewer pools, conducting blind reviews of technical merit sections of applications, studying the application and appeals processes for potential biases and barriers to participation, and developing outreach and education initiatives focused on underrepresented populations. The SBIR/STTR programmatic improvements should additionally include greater pre-application support to first-time and underrepresented program applicants, such as “Phase 0” assistance programs—similar to the program offered by the Department of Energy—at all agencies, and a longer application period for Phase 0 program participants. Federal government agencies should ensure that existing technical resources for diverse inventors and business owners (e.g., the SBA Learning Center, Business Guide, and Emerging Leaders curriculum) incorporate invention and patent education.

Federal agencies must also better coordinate with each other. A 2020 Government Accountability Office (GAO) report found that only two of twelve Small Business Development Centers (SBDCs) interviewed worked with the USPTO to help small businesses protect their IP, even though the Small Business Innovation Protection Act of 2017 requires that SBDCs provide IP training in coordination with the USPTO.¹⁸ The Administration should ensure that the SBA and SBDCs coordinate with USPTO programs at the local level to train small businesses on IP protection to ensure that diverse small business owners have access to the information and support they need to pursue patents. For the same reason, the Administration should also ensure that Women's Business Centers (WBCs) and MBDA Business Centers coordinate with USPTO

¹⁷ USPTO Adds Additional Schools to Law School Clinic Certification Program, June 20, 2018, <https://www.uspto.gov/about-us/news-updates/uspto-adds-additional-schools-law-school-clinic-certification-program>.

¹⁸ U.S. Gov't Accountability Off., GAO-20-556, Intellectual Property: Additional Agency Actions Can Improve Assistance To Small Businesses And Inventors (2020), <https://www.gao.gov/assets/710/709024.pdf>.



programs at the local level to train women and inventors of color on intellectual property protection.

Finally, policy efforts to promote equitable participation in invention and patenting must ensure nondiscrimination laws are fully enforced, and that women and people of color receive equal pay for equal work. Paid family and medical leave, paid sick days, and work-life balance policies are also essential to ensuring that everyone can contribute to the innovation economy.

- (3.) Mentoring and networking have been shown to be effective tools in supporting and encouraging underrepresented inventors and entrepreneurs. How can organizations and intellectual property practitioners in the innovation ecosystem better connect underrepresented innovators to each other and to mentors, both internally and across organizations?**

Please see our response to Question 15.

- (4.) Developing organizational metrics to document the effectiveness of diversity and inclusion initiatives is necessary to track outcomes of action plans and initiatives. What are best practices that organizations can internally employ to measure their own progress, particularly in the area of intellectual property protection?**

Private companies and universities should monitor and assess their own diversity initiatives. The Intellectual Property Owners Association (IPO) Toolkit discussed in more detail in our response to Question 11 provides one example of a self-assessment program. All stakeholders should engage in concerted efforts to evaluate, review, and adapt patent diversity programs to identify and scale up their most effective features. Exemplary metrics identified by the IPO include: the number or percentage of female or diverse inventors on patent applications, issued patents, or invention submissions and trajectory over a defined time period; number or percentage of female or diverse first-time invention submitters or patent inventors and trajectory over a defined time period; number or percentage of female or diverse repeat invention submitters or patent inventors and trajectory over a defined time period; number or percentage of female or diverse new technical employees submitting inventions for patenting and trajectory over a defined time period; number of affinity groups to whom presentations to increase awareness have been made; number of invention submissions received from each affinity group; number or percentage of women or diverse employees on key inventive programs and trajectory over a defined time period; and the reduction in pipeline leak of diverse employees and diverse



leaders.¹⁹ The IPO Toolkit also suggests that organizations should regularly review their programs and initiatives, make improvements as needed, and share findings within the organization.²⁰

- (5.) Measuring national progress in realizing greater inclusion and diversity in invention, entrepreneurship, and intellectual property may take years, and it will be critical to identify complementary short- and long-term metrics that are precursors to and indicators of expanding innovation. What are some specific, meaningful, and relevant measures that can be used to:**
- (a.) Support year-over-year performance of action plans and initiatives in the short-term?**
 - (b.) Demonstrate the long-term creation of diversity and inclusion in the innovation ecosystem while complementing short-term performance metrics?**

Invent Together strongly supports efforts to measure and monitor progress on expanding innovation. As the USPTO recognized in the SUCCESS Act report, “there is a limited amount of publicly available data regarding the participation rates of women, minorities, and veterans in the patent system.”²¹ The limited data pose a challenge for researchers and government both in determining the true scope of the patent gaps, and tracking progress in real time.

Today, the USPTO collects no data on race, gender, or income from patent applicants, requiring researchers to use name-matching software and other techniques to study disparities in patenting. Reliable studies of both the patent gaps and their remedies require a current and comprehensive data source that the USPTO can create and publish to maintain accountability for equity in patenting. As with other government programs, the collection of this data would be segregated and would not be known or considered in the decision about whether to grant a patent.

Invent Together supports the Inventor Diversity for Economic Advancement (IDEA) Act, a bipartisan bill that would direct the USPTO to collect demographic data—including on gender, race, and veteran status—on inventors from patent applicants on a voluntary basis, and make this

¹⁹ Intellectual Property Owners Association, Gender Diversity Toolkit (2019), at 65, <https://ipo.org/wp-content/uploads/2019/09/GenderDiversitytoolkit-final.pdf>.

²⁰ *Id.* at 66.

²¹ SUCCESS Act Report, at 1.



information available to the public.²² The bill would require the USPTO to keep this information separate from the patent application to help prevent implicit bias in the patent examination process. Collecting demographic data from patent applicants will allow the USPTO and the public to accurately examine the patent gaps in real time and track progress toward closing them.

Having complete and accurate information on the demographics of inventors is a critical step in measuring national progress toward realizing greater diversity and inclusion in invention and patenting. Without information, Congress, the USPTO, and public stakeholders have no reliable way to understand the nature and scope of the patent gaps, and no basis to measure the impact of public and private initiatives to close them.

Invent Together also supports the SUCCESS Act report recommendation to conduct a voluntary, confidential, biennial survey of individuals named in patent applications that have been filed with the USPTO to gather demographic data.²³ Separate from the IDEA Act, conducting a survey would allow the USPTO to gain additional insight into the characteristics of inventors who have applied for U.S. patents.

(6.) Invention, entrepreneurship, and intellectual property protection have been shown to be concentrated in certain areas of the country and among individuals from higher socioeconomic groups. What new or existing channels could be created or utilized to more effectively deliver information and resources to prospective innovators from all demographic, geographic, and economic backgrounds?

The USPTO and other stakeholders should directly engage with potential inventors and deliver information and resources to them via a public awareness campaign that features diverse inventors with compelling stories and utilizes the Internet, social media, and television/streaming.

In addition, independent inventor organizations can be used to deliver information and resources to inventors at the local level. Organizations have emerged across the country to support and advocate for the needs of independent inventors. The Chicago Inventors Organization (CIO), for example, was founded to “provide underserved independent inventors and innovators with the required resources to bring their inventions to fruition.”²⁴ The organization recognizes that “the underserved inventor and entrepreneur is typically left to fend

²² S. 4394/H.R. 7890, 116th Cong. (2020).

²³ *Id.* at 26.

²⁴ Chicago Inventors Organization, Our History and Purpose, <https://www.chicago-inventors.org/history-and-purpose>.



for him or herself without the financial means to accomplish his/her goals.”²⁵ CIO holds regular meetings and conferences—which have attracted more than 5,000 attendees—to support independent inventors and “guide and encourage each member to acquire, at the very least, a patent, copyright/trademark protection, a prototype or drawing of their concept, and a project and marketing plan.”²⁶ Regional inventor support programs like CIO enable inventors without access to institutional support to invent and commercialize despite their unique challenges.

II. Creating Innovators—Helping To Prepare People To Obtain the Skills and Develop the Interests Necessary To Become Innovators, Problem Solvers, and Entrepreneurs

Exposure to innovation and invention education beginning at a young age are critical elements of closing diversity gaps in patenting.

Exposure to Innovation

We must expand opportunities to expose young Americans from all demographic groups to inventors and entrepreneurs. According to a study by economist Alex Bell and his colleagues at Harvard, “Children who grow up in areas with more inventors—and are thereby more exposed to innovation while growing up—are much more likely to become inventors themselves.”²⁷ Importantly, “[t]argeting exposure programs to children from underrepresented groups who excel in math and science at early ages is likely to maximize their impacts.”²⁸ Incorporating innovation exposure into school curricula, math and science camps, and other youth programs is therefore critical to inspiring young people to become inventors later in life.

STEM and Invention Education

Ensuring that girls and women, people of color, and lower-income individuals have access to high-quality STEM and invention education is critical to helping people to obtain the skills and develop the interests necessary to become inventors. In light of evidence that children who are not exposed to STEM before middle school are less likely to pursue STEM careers, STEM education in primary and secondary schools can play an important role in inspiring

²⁵ *Id.*

²⁶ *Id.*

²⁷ Alex Bell, Comments before the USPTO, SUCCESS Act Hearings (2019), at 7.

²⁸ *Id.* at 5.



diverse students to pursue these fields.²⁹ Encouraging more gender, race, and income diversity in the most patent-intensive STEM fields in colleges and graduate schools—i.e., mechanical engineering and electrical engineering—would help to close the portion of the patent gaps attributable to gaps in education.

Private invention education programs also help to close the portion of the patent gaps attributable to gaps in education. For example, the Qualcomm Thinkabit Lab offers daylong programs for elementary and secondary school classes, free of charge, to expose children to careers in science and engineering—“careers they may not know exist.”³⁰ Thinkabit is an initiative that engages elementary and middle school students with cutting-edge technologies through a hands-on approach. Students participating in the Thinkabit program learn about 5G wireless, the Internet of Things (IoT), and careers in technology; then they program a simple circuit board to act as the core of their own IoT invention. Over the past five years, Qualcomm has created Thinkabit Labs in 16 sites across 5 states, including in libraries, school districts, and university hubs in underserved parts of the country, leveraging these organizations’ expertise to promote STEM education. Qualcomm has entered into public/private partnerships to create “hub” Labs with the Detroit Public School system and the University of Michigan, with Virginia Tech in the National Capitol Region, with the Chula Vista Public Library in California, and with the Porterville Unified School District in the rural, agricultural central valley of California. Programs like Thinkabit, Girls Who Code, and Girl Develop It are key to ensuring that children of all backgrounds learn about STEM and invention early in life. More than 500 middle-school-aged children have participated in one-to-two-week Thinkabit camps, and through partnerships with schools and other sites, the program has reached more than 78,000 young inventors.³¹

It is important to note that disparities in STEM and invention education are only part of the reason for the patent gaps. From 1977 to 2010, the percentage of STEM degrees awarded to women increased from 20.2% to 33.5%.³² Yet this increase in STEM-educated women has not led to greater equity in patenting. According to the Institute for Women’s Policy Research (IWPR), “[W]omen’s representation in key patent-intensive STEM fields (such as engineering) may play an even larger role than women’s representation in STEM overall.”³³ Thus, even as women earn a higher share of STEM-related degrees, it is critical to continue encouraging members of underrepresented groups to pursue careers in patent-intensive fields.

²⁹ See Talia Milgrom-Elcott, *STEM Starts Earlier Than You Think*, *Forbes*, July 24, 2018, <https://www.forbes.com/sites/taliamilgromelcott/2018/07/24/stem-starts-earlier-than-you-think/#1fbc0938348b>.

³⁰ Qualcomm Thinkabit Lab FAQs, <https://www.thinkabitlab.com/faqs#t107n393>.

³¹ Qualcomm Thinkabit Lab Impact, <https://thinkabitlab.com/impact>.

³² IWPR, *Equity in Innovation*, at 8.

³³ *Id.* at 8.



III. Practicing Innovation—Harnessing Skills and Interests to the Act of Innovation

Creating innovators through exposure and education is only part of the solution. Mentorship, social and professional networks, and corporate and academic cultures that empower inventors from underrepresented groups and encourage invention and entrepreneurship are critical components of the National Strategy. The women and people of color who are able to enter and stay in the pipeline face additional barriers in the workplace that affect their ability to participate fully in inventing and patenting. Only by breaking down these barriers can we build a truly inclusive innovation ecosystem.

(10.) Recent progress in developing STEM graduates from underrepresented groups has been documented. How can similar rates of invention and entrepreneurship be attained? How can organizations best recruit and retain innovators from diverse backgrounds?

Organizations should take steps to build pro-patent and pro-diversity initiatives into their cultures. This includes efforts to educate employees about the importance of patenting and how to seek patent protections for their work; to recruit and retain a more diverse pool of scientists and engineers; and to support formal and informal networks for women inventors and inventors of color.

Patenting can be a complex and intimidating process, even within a large company with more resources than a startup. Training programs that help inventors learn what inventions might merit patent protection and how to navigate the patent process demystify the patent system and make patenting more accessible to all types of inventors.

Recruitment and recognition of patented inventions can also help to inspire more innovation. Many organizations already make a concerted effort to recruit and retain employees from diverse backgrounds, but ensuring that inventors are valued for their contributions is critical to attracting and retaining diverse talent. Some companies offer special recognition to employees who obtain patents, such as monetary awards, congratulatory letters, special notations on email signature, and public websites that promote the patenting of company inventors.³⁴

³⁴ See, e.g., Qualcomm, *Chronicles of Invention*, <https://www.qualcomm.com/invention/chroniclesofinvention/index.html>.



Innovative companies should also train senior management about the value of diversity and inclusion, and support the development of employee-led networks to promote professional development and collaboration among different employee groups. Research has shown that well-crafted diversity and inclusion trainings can create a shift toward more inclusive attitudes and behaviors.³⁵ Research has also shown that organizations with inventing “networks” tend to result in more collaborative environments with more productive and diverse patenting teams.³⁶

(11.) Inventors thrive when cultural and institutional barriers within workplaces are minimized or removed. What are examples of these barriers, and how can organizations remove them to create an inclusive, innovative workplace culture?

Please see our response to Question 2 for a general discussion of cultural and institutional barriers within workplaces.

In addition to common barriers to participation, diverse inventors who work in different types of institutions face barriers unique to those professional settings. These unique challenges require different strategies.

Corporations

As discussed in our response to Question 10, U.S. businesses should take steps to build pro-patent and pro-diversity initiatives into their cultures. The IPO Toolkit mentioned in our response to Question 4 provides detailed guidance on a four-step process that empowers companies to raise awareness about the importance of diversity in patenting, identify and evaluate root causes of patent gaps, develop programs that close the patent gaps, and monitor and assess the success of those programs. Adopting this toolkit would help companies create more inclusive and innovative workplace cultures.

³⁵ See, e.g., Katerina Bezrukova et al., Reviewing Diversity Training: Where We Have Been and Where We Should Go, 11 *Academy of Mgmt. Learning & Educ.* 207–227 (2012); Joelle Emerson, Don’t Give Up on Unconscious Bias Training — Make it Better, *Harv. Bus. Rev.* (Apr. 28, 2017), <https://hbr.org/2017/04/dont-give-up-on-unconscious-bias-training-make-it-better>.

³⁶ See Kjersten Bunker Whittington, Patterns of Male and Female Scientific Dissemination in Public and Private Science, in *Science and Engineering Careers in the United States: An Analysis of Markets and Employment*, Univ. of Chicago Press (2009), at 219–220, <https://www.nber.org/system/files/chapters/c11622/c11622.pdf>.



Universities

Universities should work to promote a culture of innovation across their institutions, beyond technology transfer offices. From university leadership to department chairs, active support for inventing and patenting activities—including factoring patenting activity into tenure and promotion decisions—would encourage diverse faculty to patent. AUTM has developed a Women Inventors Toolkit to assist universities with implementing programs designed to help women faculty members disclose, protect, and commercialize their research.³⁷ The AUTM Women Inventors Toolkit provides practical tips on how to gain support for such programs within a university and how to fund and design events.³⁸

(12.) Access to information and resources is pivotal for the development of individual inventors and small businesses. How can the nation better support individual inventors and small businesses with resources so they can successfully translate their skills and creativity into the acts of invention, intellectual property protection, and entrepreneurship?

Please see our response to Question 2 for a discussion of the federal government’s role in supporting diverse inventors and women- and minority-owned small businesses.

(13.) Another important objective is increasing diversity in the entire intellectual property field. What are ways of promoting diversity in the corps of intellectual property attorneys and agents who represent innovators?

The USPTO does not collect demographic data on patent practitioners, but studies from 2011 and 2014 suggest that women make up as little as 18% of patent agents and attorneys.³⁹ Recent USPTO research found that between October 2019 and December 2020, less than 30 percent of applicants for the patent bar exam had selected the “Ms.” honorific—an imperfect proxy for gender.⁴⁰

³⁷ AUTM, Women Inventors Toolkit, <https://autm.net/AUTM/media/Surveys-Tools/Documents/WIC-TOOLKIT-1118.pdf>.

³⁸ *See id.*

³⁹ Annette I. Kohler, Examining Exclusion in Woman-Inventor Patenting: A Comparison in Educational Trends and Patent Data in the Era of Computer Engineering Barbie, 19 *American Univ. Journal of Gender, Social Policy & the Law* 773, at 791-92 (2011); Saurabh Vishnubhakat, Gender Diversity in the Patent Bar, 14 *John Marshall Rev. of I.P. Law* 67, at 80 (2014).

⁴⁰ USPTO, Letter to Senators Tillis, Coons, and Hirono, Jan. 19, 2021, at 2, <https://www.ipwatchdog.com/wp-content/uploads/2021/01/USPTO-response-to-Sens.-Hirono-Tillis-Coons-letter-01192021-1-2.pdf>.



Several recent papers argue that the criteria the USPTO has set for registration for the examination exclude qualified women and other individuals from membership in the patent bar.⁴¹ Only candidates with certain scientific and technical qualifications may sit for the exam. These criteria allow individuals with degrees in engineering and physical sciences to sit for the exam, but not other majors more common among women, such as mathematics, industrial or fashion design. In addition, individuals with undergraduate degrees in certain majors automatically qualify for the exam, but those with master's degrees or doctorate degrees in the same subjects do not.

Senators Mazie Hirono (D-Hawaii), Thom Tillis (R-NC), and Chris Coons (D-Dela.) recently wrote to the USPTO regarding this issue, asking the Director to look into and address the gender gap.⁴² During his last few days as USPTO Director, Andrei Iancu responded to the Senators' letter.⁴³ Iancu wrote that the USPTO is exploring changes to the patent bar requirements, to ensure they are up to date and do not discourage applications from women or other underrepresented groups.

Invent Together strongly supports the changes the USPTO is considering, and urges the USPTO to further evaluate whether additional changes may be made in the near term and to regularly review these criteria.

In addition, educational institutions, law firms, and other stakeholders can assist with promoting diversity among IP attorneys. Law schools and legal organizations should host events and information sessions geared toward increasing interest in IP law among diverse law students, and law firms with IP practices should focus on recruiting diverse attorneys.

IV. Realizing Innovation—Reaping the Personal and Societal Benefits of Innovation

The benefits of patenting for inventors, businesses, and the broader economy are best realized through commercialization—the process of bringing an invention from the lab, classroom, or garage to the marketplace. We need to ensure that inventors who do obtain patents

⁴¹ See, e.g., Mary T. Hannon, *The Patent Bar Gender Gap: Expanding the Eligibility Requirements to Foster Inclusion and Innovation in the U.S. Patent System*, 10 I.P. Theory 1, at 2 (2020), <https://www.repository.law.indiana.edu/ipt/vol10/iss1/1>.

⁴² U.S. Senate, Letter to USPTO, Dec. 11, 2020, <https://www.ipwatchdog.com/wp-content/uploads/2020/12/2020.12.11-Letter-to-PTO-re-Patent-Bar-Gender-Gap.pdf>.

⁴³ Letter to Senators Tillis, Coons, and Hirono.



are bringing them to market. Women, for example, hold only 5.5 percent of commercialized patents, which “are more important for economic growth,” according to a study by the National Bureau of Economic Research (NBER).⁴⁴ University technology transfer, venture capital, and assistance programs for entrepreneurs all play important roles in promoting commercialization of patented inventions among underrepresented groups.

(14.) Financial support is a critical element in translating an innovation into commercial success. What organizations, programs, or other efforts help promote access to capital to an expanded group of inventors and entrepreneurs—demographically, geographically, and economically?

Technology Transfer

At the university level, technology transfer offices exist to help researchers patent and commercialize their inventions. Underrepresented groups often lack access to the resources and expertise to support the commercialization process, and absent robust networks with industry, it can be difficult for individual inventors and entrepreneurs to attract investors for their businesses. Strong technology transfer offices ensure that diverse innovators at universities have the institutional support to bring their inventions to market. For women and people of color, whose access to social networks is more limited, technology transfer offices can prove especially valuable to help navigate the patenting process and grow their networks,⁴⁵ but technology transfer offices are also critical to helping university researchers patent their inventions, identify corporate partners for academic research projects, and incubate startups.⁴⁶

Certain colleges and universities have no or under-resourced technology transfer offices. These institutions could benefit from government support, including funding and information on how to stand up technology transfer offices.

⁴⁴ Jennifer Hunt et al., Why Don't Women Patent, at 1.

⁴⁵ Ding et al., at 665–67.

⁴⁶ See Assoc. of Univ. Tech. Managers, What is Tech Transfer, Anyway?, <https://autm.net/about-tech-transfer/what-is-tech-transfer>.



Venture Capital

As described in our response to Question 2, access to capital is a barrier to participation in innovation. If more VC firms focused on investing in underrepresented entrepreneurs, that would help to address underrepresented inventors' limited access to capital. Some venture funds are already focused on investing in underrepresented groups. 1863 Ventures, for example, is a Washington, D.C.-based venture fund focused on investing in what they call “New Majority entrepreneurs.”⁴⁷ From 2016 to 2018, 1863 Ventures achieved its ambitious goal to support 500 “high potential entrepreneurs of color.”⁴⁸ 1863 invested in 525 entrepreneurs of color, creating over 3,000 jobs in the District of Columbia, and generating over \$267 million in economic impact.⁴⁹ In the next 10 years, 1863 aims to generate \$100 billion in new wealth for women and entrepreneurs of color through its Pipeline Program.⁵⁰

Government Assistance Programs for Entrepreneurs

Please see our response to Question 2 for a discussion of government assistance programs for entrepreneurs.

(15.) Successfully commercializing an inventive product or concept requires in-depth knowledge about production processes, market forces, and other pertinent information. What types of mentoring initiatives could be implemented or expanded to help experienced entrepreneurs impart this specialized knowledge to diverse and novice inventors?

Mentorships and social networks play significant roles in encouraging the commercialization of invention. Social networks are key to helping inventors “evaluat[e] whether it would be worthwhile to pursue a patent” in the first place since an inventor is likely to first seek advice from his or her own peers.⁵¹ Moreover, the relative “exclusion from STEM fields” of women, people of color, and other underrepresented groups has led to limited available mentorship opportunities and networks. Because inventors tend to seek mentors who share similar backgrounds, and there are fewer women and people of color in positions to act as

⁴⁷ See 1863 Ventures, Pipeline, <https://1863ventures.net/pipeline>.

⁴⁸ Melissa L. Bradley, 1863: Rebranding our Future, <https://medium.com/1863ventures/1863-rebranding-our-future-a1d6fc16b546>.

⁴⁹ *Id.*

⁵⁰ *Id.*; see also 1863 Ventures, Pipeline, <https://1863ventures.net/pipeline>.

⁵¹ IWPR, Equity in Innovation, at 22.



mentors for inventors, it is harder for underrepresented inventors to find inventors to mentor them.⁵²

A number of public, private, and university programs offer models for promoting the patenting and commercialization of inventions among underrepresented communities.⁵³ For example, the Accelerating Women And under-Represented Entrepreneurs (AWARE) program at the University of Illinois Urbana-Champaign, hosts seminars and networking events at the University to connect graduate student and faculty inventors with mentors and investors. The program also employs an Entrepreneur in Residence (EIR) who works one-on-one with participants to guide them through the patenting and commercialization process. The AWARE program also provides small proof of concept or seed grants to participants to start the innovation process.

Likewise, the Empowering Women In Technology Startups (EWITS®) at the University of Florida offers a 10-week hands-on experiential learning program focused on helping professional women understand the process of commercializing an invention. The women in the program are split into teams and asked to develop a business model for a real technology (not their own) and develop the elements of a company to commercialize the innovation. The EWITS program has been highly successful at empowering participants: more than 60 percent of participants reported that after the program, their knowledge of technology commercialization was “above average or excellent,” compared to just 9 percent prior to the program.⁵⁴ Almost a quarter of all EWITS participants reported having “entrepreneurial intentions” after completing the program.⁵⁵

Another initiative, STEM to Market, is a two-part program run by the Association for Women in Science with cohorts based in Washington, D.C., Chicago, Illinois, and the San Francisco Bay Area. STEM to Market provides entrepreneurial training and support to women working in science, technology, engineering, and math fields, and works with key decision makers, investors, and funders to increase innovation and entrepreneurship among diverse

⁵² *See id.*

⁵³ *See generally* IWPR, Closing the Gender Gap in Patenting, Innovation, and Commercialization: Programs Promoting Equity and Inclusion (2018) (“Closing the Gender Gap in Patenting, Innovation, and Commercialization”), https://iwpr.org/wp-content/uploads/2020/10/C471_Programs-promoting-equity-7.24.18_Final.pdf.

⁵⁴ *Id.* at 17.

⁵⁵ *Id.* at 18.



groups of women through systems change. More than 2,000 women entrepreneurs participated in the first year of program, and more than 60 percent of participants were women of color.⁵⁶

Invent Together has supported research on successful programs like these with mentorship components, and strongly supports efforts to provide mentoring opportunities for underrepresented inventors.

(16.) Formalized partnerships like tech transfer offices/conferences, accelerators, and incubators can help streamline commercialization objectives such as product development, licensing, and distribution. What can be done to make these partnerships more accessible and effective at supporting all inventors and entrepreneurs?

An IWPR survey of seven commercialization programs designed to address female underrepresentation in innovation found that best practices for supporting women inventors include sharing information and education, building networks and mentorship, changing culture, and tracking outcomes.⁵⁷ Program leaders interviewed by IWPR indicated that “the women they served had received little information or education to equip them to pursue patenting and entrepreneurship and did not see commercialization of innovation as part of their career paths.”⁵⁸ As noted throughout this comment, lack of exposure/education is one of the primary barriers to participation in innovation. Structured curricula, one-on-one advice, and seminar-based instruction can help to close this gap. Because “women are less likely to be connected to peer networks, to have access to mentors, and to have connections to those who can be considered ‘sponsors,’” the programs featured in the IWPR report all seek to help participants build networks and develop connections with peers and potential investors by “hosting symposiums and workshops, bringing experts into the program, and connecting individual innovators to mentors.”⁵⁹ The programs reviewed by IWPR also made a conscious effort to “foster broader cultural change in patenting, innovation, and entrepreneurship through awareness-raising campaigns and speaking about the importance of diversity to broader audiences, including students, faculty, and staff at universities; stakeholders in local communities; and investors.”⁶⁰ Each program reviewed by IWPR also formally or informally track outcomes, and all seven

⁵⁶ Assoc. of Women in Science, *Revolutionizing the STEM Entrepreneurship Ecosystem* (2018), <https://cdn.coverstand.com/54596/491204/6b7731641077f095672fe94d87d7e0f28df8d31a.2.pdf>.

⁵⁷ See IWPR, *Closing the Gender Gap in Patenting, Innovation, and Commercialization*, at 6–7.

⁵⁸ See *id.* at 6.

⁵⁹ See *id.*

⁶⁰ See *id.* at 6–7.



programs had “concrete goals by which to measure their program’s success.”⁶¹ Developing concrete goals, measuring progress, and monitoring outcomes are all critical components of ensuring that commercialization programs are effective at reaching diverse inventors. These same strategies could be applied to programs focused on increasing the representation of other underrepresented groups, such as people of color.

Please see our response to Question 14 for further discussion of technology transfer offices and our response to Question 15 for examples of well-designed accelerators and incubators.

* * *

Thank you for the opportunity to share our views on the development of the National Strategy. Invent Together looks forward to continuing to work with the USPTO and the NCEAI to advance diversity and inclusion among patented inventors, and to ensure inventors of all backgrounds can participate fully in inventing and patenting.

Sincerely,



Holly Fechner

⁶¹ See *id.* at 7.

