What Works in Tech Apprenticeship

Best Practices for Expanding Registered Apprenticeships in the Tech Sector

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Employers face challenges finding talent to fill available information technology (IT) openings. Although there are about 65,000 computer science graduates in the United States every year (Loyalka, Liu, and Tognatta 2019), there are currently twice as many job openings for software developers and engineers alone (CompTIA 2022). Ninety percent of hiring managers consistently report difficulties in finding and hiring the right tech talent, and 83 percent report that this shortage of workers is slowing company revenue growth.[1] Three-quarters of Business Roundtable CEOs also reported being unable to find workers to fill jobs in STEM–related fields.[2]

Meanwhile, women and people of color have experienced numerous systemic barriers in tech training and higher education, which has further narrowed the available talent pool.[3] Yet numerous high-quality and free online training courses abound in tech[4]—large tech companies, for example, offer several trainings and certificates that are taken by millions of users who do not fit the typical hiring profile.[5] There exists a pool of talented and capable Americans with the potential for and interest in working in tech, but they face hiring challenges because they lack certain credentials or prior work experience in the field. It is increasingly evident that there is a mismatch between traditional tech hiring practices and the talent pool that could fill entry-level positions.

Registered apprenticeships represent an ideal solution to this mismatch and are growing in popularity in the tech sector. In recent years, registered apprenticeships in computer and mathematical occupations—as varied as IT generalists, software developers, and mainframe technicians—have expanded from 369 total in the United States in 2015 to 2,684 by 2021.[6] Despite the growth of the registered apprenticeship system and its use in the tech sector, it remains an underused tool. In

Germany, for example, 55 percent of young people pursue an apprenticeship rather than a college degree after completing their general education studies (Elliott and Farnbauer 2021). Other countries including Australia, Austria, the United Kingdom, and Switzerland also have robust apprenticeship systems, underscoring the significant room for growth for similar programs in the United States (Organisation for Economic Co-operation and Development 2018).

Apprenticeships pair talented learners who are eager for an opportunity in tech with employers seeking to fill openings and train workers according to their own standards. Specifically, a registered apprenticeship program pairs theoretical instruction—whether in a traditional classroom or through virtual or self-paced coursework—with experiential learning and mentoring on the job. Apprentices typically apply what they learn through their coursework to their tasks at work, reinforcing academic concepts with real-world applications.

Employers hire apprentices for their potential, treat them as employees, and quickly begin assigning them to productive work. This model is a successful strategy for workers and employers alike, who both realize positive benefits from the relationship. By earning a credential and gaining meaningful work experience, apprentices become stronger applicants and are more likely to have long-term career success in the tech industry. According to a 2018 study, employers received a 1-to-1.26 average return on their investment in five years' time and more than double that amount over seven years (Advance CTE 2020), improved company diversity (Kuehn 2017), and developed skilled employees who were more likely to remain with the company (Apprenticeship USA 2018).

Intermediaries are organizations with expertise on the registered apprenticeship system that engage with employers and others across a range of activities (Elliott and Farnbauer 2021). The Urban Institute has served as a tech apprenticeship intermediary for three years, helping employers and sponsors design, register, and implement their programs. By working hands on and in partnership with employers, we documented what works in implementing tech apprenticeships. This brief includes the following takeaways:

- Incentive funding is important to offset a employers' upfront investments and secure their engagement, particularly when employers are paid after taking on apprentices.
- The registration and implementation processes are complex, so making it easier for employers is key. Knowledgeable intermediaries can help facilitate this process.
- Many employers seek flexibility and customization in the programs they implement to meet their specific needs.
- Building awareness and improving the technical capabilities of intermediary staff and workforce development professionals is critical for advancing high-quality programs.
- Registered apprenticeships can build diversity, equity, and inclusion in the tech industry. Supporting organizations that deliver on these aims is paramount.

This brief shares recommendations and lessons learned from Urban's Apprentice Expansion and Modernization Fund (AEMF) project about how best to promote and create high-quality apprenticeships in tech nationwide.

BOX 1

What Is the Apprenticeship Expansion and Modernization Fund Project?

The US Department of Labor (DOL) launched the Apprenticeship Expansion and Modernization Fund (AEMF) to support national intermediaries facilitating the development, implementation, and growth of registered apprenticeship programs. Intermediaries under the AEMF award provide outreach and technical assistance support to prospective and current registered apprenticeship program sponsors and pursue innovation pilots to advance and expand the system.

Urban's AEMF project engages in technical assistance ranging from intermittent support to longer-term, one-on-one work. This includes answering employers' questions about apprenticeships, working with employers to select occupations and develop standards and curriculum plans, connecting employers with community colleges and other organizations that recruit and train apprentices, helping employers with registering programs, ensuring compliance with regulations such as Equal Employment Opportunity policies on apprenticeship, tracking apprentices in the Registered Apprenticeship Partners Information Database System (RAPIDS), and providing funding to help employers offset costs related to training and mentorship.[7]

Furthermore, Urban's AEMF project has introduced various innovations to expand apprenticeships, including a "pay-for-performance" incentives process requiring employers to register apprentices and demonstrate their related expenses before receiving funds. The project also supported the creation and implementation of a degree-based apprenticeship program within a consortium of historically Black colleges and universities in South Carolina. Urban designed these efforts to connect new talent pools with tech employers and facilitate greater diversity in the sector.

By the time Urban's AEMF project ends in 2022, we will have helped approximately 1,800 apprentices start their careers, supported the launch of 21 new registered apprenticeship programs, and provided more than 400 distinct technical assistance activities to more than 36 employers, sponsors, and other stakeholders. Importantly, Urban's work has helped grow awareness of the benefits of apprenticeship in tech for both employers and workers.

Lessons Learned and Recommendations for Advancing Registered Apprenticeships in Tech

Registered apprenticeships in the tech sector are beginning to find traction nationwide. Urban's work as an intermediary for tech apprenticeships has revealed important lessons about how to successfully implement programs in the field and improve existing practices and processes. In this section, we present lessons learned and recommendations to advance and expand the apprenticeship system in tech.

Incentive Funding Is an Important Motivator for Employers

Direct incentives to employers are uncommon in the United States. Urban's AEMF project provided incentives to offset employer costs and yielded important lessons for future work.

LESSON LEARNED: INCENTIVES FACILITATE NEW AND EXPANDED PROGRAMS

Recent evidence from a grant program to stimulate apprenticeships suggests that the average cost per apprentice borne by apprenticeship intermediaries is about $4,000; these costs may cover program administration but do not include what a sponsor paid for training, mentorship, wages, or other expenditures (Lerman et al. forthcoming). In comparison, the average cost of hiring a new employee across all industries is $4,700 and may seem like an easier option to many employers.[8] But the estimated cost of recruiting a developer or programmer in tech is nearly $32,000 before considering lost productivity.[9] Although taking on apprentices would likely result in long-term savings for most tech employers, the startup costs and training investments can deter employers from this practice. Kimberly Nichols, CEO of the tech intermediary Franklin Apprenticeships, shared, "The US DOL has stated that it costs $10,000 per apprentice, but a fraction of that [is available] in funding. And high-quality programs cost more. The funding amount per apprentice needs to better align with costs to incentivize more employers." Recognizing that costs can pose a barrier to starting or expanding programs, our award provided $5,100 per apprentice to employers that had existing registered apprenticeship programs and $6,200 per apprentice to employers with newly registered programs, in recognition of higher startup costs. Although not all employers we worked with chose to accept incentives or used all that was provided to them, this funding was an important motivator and, in some cases, was the reason employers agreed to start or expand a registered program and hire apprentices. The significant, time-limited incentives also encouraged employer action over the three-year project. Moreover, the incentives were instrumental in offsetting the proportionally greater startup expenses for small employers.

RECOMMENDATION: PROVIDING DIRECT, GENEROUS, AND EASY-TO-ACCESS INCENTIVES IN A PAY-FOR-PERFORMANCE WAY ENCOURAGES REGISTRATION

Delivering incentives directly to sponsors and employers is not very common in the US registered apprenticeship system. Some states have modest tax incentives or tuition support[10]—for example, South Carolina has a $1,000 tax incentive per apprentice per year of enrollment[11]—but this funding does not cover upfront costs such as design, registration, recruiting, and curriculum development that employers and others incur. Some intermediaries with federal or state funding also offer incentives, but the amounts were rarely as generous as what Urban could offer through the AEMF project on a per apprentice basis. Furthermore, Urban created a streamlined agreement process to facilitate payments: when Urban received invoices for related costs from employers, it typically issued reimbursements within 30 days. Generous and direct incentive funding was an important program design element of Urban's intermediary functions.

Another important element was integrating "pay-for-performance" principles into Urban's reimbursement process. In other words, employers could only receive incentives after they registered a program (if they were a new sponsor); hired, onboarded, and registered apprentices in the state and national systems; incurred allowable costs, such as for training or mentoring; and invoiced Urban for those expenses. Thus, Urban only paid incentives to employers that followed through on their commitments. Multiple programs used our technical assistance support but, for various reasons, did not register their programs or apprentices within the three-year project window. Without the pay-for-performance contingency, those programs could have received incentive funds without demonstrating that they had hired and registered apprentices. Although this model rewards actions rather than intentions, it is not standard practice in the field, despite the demonstrable return on investment.

Based on Urban's AEMF award, we recommend providing sufficiently significant incentives to motivate employers to act. While there is no definitive evidence on the optimal incentives amount for employers, we know that state incentives to employers range from $1,000 to $4,000[12] and that intermediaries spend, on average, about $4,000 to $5,000 per apprentice (Lerman et al. forthcoming). This suggests that incentives in the $2,000 to $5,000 range could be sufficient offsets. Furthermore, our project suggests that the importance of delivering financial incentives only after employers have followed through with hiring and registering apprentices.

The incentives available to help sustain and advance our current apprenticeships are crucial to our training and workforce development. We are able to continue offering high-tech, advanced manufacturing training with [this support].
—Monica Greene, president, Vermont Precision Tools

Making Registration Easier for Employers Is Key

Registration is not a straightforward process in the US apprenticeship system. Urban's AEMF project worked to make this as easy as possible for employers to facilitate program starts and expansion.

LESSON LEARNED: THE REGISTRATION PROCESS IS COMPLEX AND DAUNTING WITHOUT EXPERT HELP

Employers and other sponsors that are new to registered apprenticeships often demonstrate strong interest but do not necessarily know how to navigate the system to start a program. This is in part because of the United States' fragmented apprenticeship system—30 states and territories have their own state apprenticeship agencies, only 24 are within a unified national office, and additional states have established their own systems.[13] Employers and intermediaries expressed frustrations with the process and how daunting it can be to navigate complex, varying systems, including different

apprenticeship policies and registration processes. As Franklin Apprenticeships CEO Kimberly Nichols stated, "State agencies say it's easy to register standards already approved at the federal level. This is not the case. Each state has made us jump through multiple hoops and each has a different process. Very time-consuming. States that don't use RAPIDS make processing and reporting difficult." Additionally, delays in getting answers or finding help can discourage employers from starting these programs, especially given the tech sector's fast-paced environment. Employers need intermediaries' help over the long term to troubleshoot compliance and other issues and to expand into additional occupations after their initial program registration.

Apprenticeship Carolina, a state intermediary organization, is one example of a highly effective model that expanded the number of apprentices sixfold over a six-year time period through a combination of technical expertise and ease of registration.[14] Such activities can be as simple as facilitating connections between stakeholders in the system or actively engaging with employers to design, register, and implement programs. Because of the complexity of the national and individual state apprenticeship registration processes, intermediaries and their expertise are critical for the success and scale of apprenticeship expansion in the United States. Intermediaries also fill staffing gaps in the apprenticeship system, helping states that typically only have one or two people serving in these roles. Furthermore, providing this support at no or low cost is also important for advancing this idea among employers that may be skeptical of incurring the expenses of an apprenticeship program. As Aurora Geis at the intermediary New Apprenticeship stated, "Employers who collaborate with intermediary partners benefit from a turn-key, work-based training program, removing administrative and labor compliance burdens from managers and HR professionals."

RECOMMENDATION: STREAMLINING THE REGISTRATION PROCESS AND SUPPORTING EXPERT INTERMEDIARIES CAN FACILITATE UPTAKE

Specifically, employers new to apprenticeship need direct support and expert guidance, fundamental information about how to begin, and resources that can help them understand what actions to plan and how to execute them.

We recommend the following strategies to make registration easier for employers and others:

- Strategies employed by some government agencies, such as offering a central customer helpline or chat function supported by technical staff, would help employers and sponsors ask questions and access the appropriate resources to start designing a program.
- Prepopulating registration forms and providing interactive, responsive guidance would help people understand the importance and implications of particular decisions and enable employers and others to navigate the system more confidently. Notably, the federal government designed the website Standards Builder to serve many of these functions, but this tool has not been widely used by employers and sponsors starting new programs.
- Because of high-quality intermediaries' central role in facilitating the expansion of registered apprenticeships, the federal government should support them with reliable, adequate funding

and technical training. Elevating the work of national-level intermediaries that are successfully registering significant numbers of new apprentices, creating innovative new programs, and advancing best practices would showcase their important role in the system and encourage further contributions.

We had been doing unregistered apprenticeships for four years. The conversion rates were over 94 percent, so even though we weren't registered, we knew our program was successful and meeting the needs of employers and apprentices alike. When we started looking into getting registered, we did not know who to reach out to and how to navigate the process. Being registered gives us a stamp of approval and a new level of trust and credibility when talking to potential clients and has validated the great work we've always done, allowing us to create more life-changing opportunities for folks who are underrepresented in tech.
—Odette Nemes, head of growth, Onramp

Employers, Sponsors, and Intermediaries Seek Customized Technical Assistance and Trainings

Employers, sponsors, and intermediaries seek to learn more about the registered apprenticeship system and process, but technical information and trainings are not readily available to this audience. These groups need more resources to help improve their knowledge and simplify the program implementation process.

LESSON LEARNED: EMPLOYERS SEEK PROGRAMS THAT ALIGN WITH THEIR NEEDS AND THE KNOWLEDGE TO CONTINUE THEIR PROGRAMS SUCCESSFULLY

Most of the employers we assisted had their own preferences on program design, related technical instruction providers, recruiting processes, and many other important decision points along the way. They benefited from existing resources, such as Competency-Based Occupational Frameworks,[15] but often wanted to add or subtract specific on-the-job training needs to their standards. They also had preferences for the program curricula and certifications they wanted their apprentices to achieve in line with their organizational priorities. With only a few exceptions, the sponsors and employers we worked with customized their standards and selected their own training providers to meet their needs.

In tech apprenticeships, such flexibility is critical. First, all employers and sponsors that worked with Urban sought competency-based apprenticeships because they aligned with the results-based expectations for workers in the industry. Second, competency-based apprenticeships also enabled

numerous apprentices with preexisting tech aptitude and experience to receive credit for those skills in their programs, facilitating faster program completion. Most of the apprenticeships implemented by Urban's partners lasted only one to two years as a result.

Employers and intermediaries were also eager to enhance their understanding of the registered apprenticeship system, in part to ensure successful program management and compliance with registration requirements. For instance, partners expressed that they needed support and guidance on engaging with veterans,[16] preparing for Equal Employment Opportunity compliance (Eldridge, Boren, and Arabandi 2021), and determining wage scales (Eldridge and Boren 2021). Professionals in the field also expressed deep interest in connecting with and learning from their peers to understand industrywide best practices.

RECOMMENDATION: SUPPORT THE TRAINING AND DEVELOPMENT FOR INTERMEDIARIES, EMPLOYERS, SPONSORS, AND OTHERS TO ADVANCE THE FIELD

Robust trainings will build capacity in the registered apprenticeship system. Intermediaries need expertise on many facets of the design and registration process to help employers customize their programs, and employers need to feel self-sufficient and knowledgeable enough to expand and sustain their programs and champion apprenticeship among the next generation of tech employers.

We recommend that state or national entities develop training programs for intermediaries and other workforce development professionals on registering and maintaining compliant apprenticeship programs to improve their capacity. Specialized trainings tailored to the needs of employers to help them sustain high-quality programs would further advance best practices in this sector. Developing trainings and specific guidance materials would also elevate the knowledge base across the field.

Flexibility and customization are key, especially in the field of information technology. Being able to customize the training curriculums to meet the IT skillsets needed makes the difference in apprenticeship training versus a boot camp–type training. The apprentice graduates are ready to begin working to fill the positions needed once the apprenticeship training program is completed.
—Connie Robbins, director of apprenticeship and federal programs, Xpanxion

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Spread Awareness of Apprenticeship through Messages that Resonate in Tech

Few employers in tech are familiar with apprenticeship. and even those that know about the model may hesitate to actually start a program. For employers to consider apprenticeship as a hiring strategy, messages should be accessible and relevant to the variety of needs facing the tech sector.

LESSON LEARNED: AWARENESS OF APPRENTICESHIP IN THE TECH SECTOR REMAINS LOW

Many employers in tech find it challenging to fill roles and find candidates through traditional recruiting practices.[17] Yet awareness of apprenticeship among tech employers remains quite low. Many intermediaries in tech—and across other sectors more generally—have to make the case for apprenticeship as a viable option. Throughout Urban's innovation pilot efforts, we conducted hundreds of technical assistance and outreach activities, reaching hundreds of new individuals and organizations either indirectly or directly through calls, presentations, and solicitations. Yet in the end, only 36 employer partners signed on to work with us over the three-year project. This outreach was the first time many organizations had heard of this talent development approach despite their ongoing challenges hiring software developers, user experience designers, cybersecurity technicians, and other tech employees.

Furthermore, messages resonate differently with employers, and no single message affects their decision to start a program. Some employers are keenly aware that the industry lacks gender and racial diversity[18] and seek to address this imbalance through apprenticeships.[19] Others see the benefit of hiring workers from the local community, not only to address immediate hiring needs but also to respond to the workforce development needs in their areas.[20] Some employers have tried traditional means of meeting their talent needs, such as spending tens of thousands of dollars per job opening to recruit talent, yet continue to struggle with hiring and retaining employees. Each of these themes may motivate different organizations, so communicating data about how registered apprenticeship can address each is an important strategy for expanding uptake in the tech industry.

RECOMMENDATION: TAILOR MESSAGES TO THEMES THAT RESONATE WITH EMPLOYERS

Organizations and intermediaries that frequently interact with employers will benefit from technical assistance materials and talking points that make strong and evidence-based cases for different interventions. Materials that explain how registered apprenticeships, alongside other work-based learning strategies, can address a variety of hiring concerns and interests could help advance hiring innovations in the tech industry.

Workforce professionals continue to develop their awareness of the most sustainable delivery of our workforce talent's skill and competency through apprenticeship programs. Continuing to invest in talent and technology creates a responsive and flexible workforce system for all stakeholders.
—Aurora Geis, national director of strategic relationships and head leadership coach, New Apprenticeship

Encourage, Support, and Elevate the Work of Organizations Advancing Women and Candidates of Color in Tech

The tech industry lacks diversity, and many hiring managers are seeking ways to remedy this issue. Apprenticeship provides a viable pathway to diversifying the field, and organizations that are committed to these efforts need support to continue this work.

LESSON LEARNED: TECH IS NOT DIVERSE AND NEEDS TO ACTIVELY DEVELOP NEW TALENT

The tech industry suffers from a lack of gender, racial, and ethnic diversity within the workforce.[21] Apprenticeship represents an immediate strategy to support nontraditional learners and people from underserved and underrepresented groups in entering the tech industry. To disrupt typical hiring streams, the tech sector needs creative approaches such as apprenticeship to shift the demographics of the workforce and create more pathways for leaders to grow within the field. Aurora Geis at New Apprenticeship noted, "In a highly competitive talent market, developing an innovative talent strategy through tech apprenticeships attracts diverse, hidden, and underserved talent, which is key to every employer's retention strategy."

Urban's project, for example, supported a consortium of historically Black colleges and universities to create a degree-based registered apprenticeship program for software developers to connect talented students in these schools with employment opportunities while they earned their degrees. The employers that hire and train participating apprentices have committed to creating opportunities for Black students to enter the tech sector.

RECOMMENDATION: UPLIFT ORGANIZATIONS PRIORITIZING DIVERSITY, EQUITY, AND INCLUSION THROUGH APPRENTICESHIP

Not all tech employers are prioritizing efforts in diversity, equity, and inclusion, nor have they fully embraced apprenticeship as an opportunity to expand access to employment among underrepresented groups. For that reason, it is important for sponsors and intermediaries to highlight organizations that prioritize this work and support their efforts to open more points of access in tech. Rewarding

organizations that demonstrate this commitment and show results will enhance the use of registered apprenticeship as a critical long-term strategy for inclusion in the tech workforce.

We have seen firsthand how registered apprenticeships can build [diversity, equity, and inclusion] in the tech industry, especially for underrepresented parties. Organizations that deliver these programs require the utmost support to continue impacting our workforce.
—Courtney Jackson, CEO, Paragon Cyber Solutions

Conclusion

Apprenticeships in the tech sector present an opportunity to expand access to underrepresented workers while meeting employers' needs for a talented workforce. Yet the path to expanding and creating tech apprenticeships has numerous barriers, including challenging registration processes, few available financial incentives for employers, and a lack of technical assistance and training materials to help interested parties. Solving these challenges is key to expanding the apprenticeship model. Meredith Stowell, vice president of IBM Z® Ecosystems, remarked, "New IT employer adoption of apprenticeship programs is a direct result of eliminating the barriers to entry, simplifying the process, reducing financial risk, and providing a continuous support structure." Supporting highly skilled intermediaries and employers who create and expand high-quality programs—particularly those that build diversity, equity, and inclusion into the tech sector—is an important way to advance this work over the next decade and beyond.

Notes

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