



Transforming IT Training Programs into Successful Career On-Ramps

AT A GLANCE

The IT industry is dynamic and quickly evolving. As a surge of diverse training models across subsectors and occupations is becoming available, this is a unique opportunity to enhance training practices and better align them to meet industry and employer needs. This brief offers recommendations for IT training providers to strengthen their work and more successfully connect participants to career advancement opportunities. It also lays out key considerations for employers to help minimize barriers to entry and increase equity in the industry.

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<i>Flatiron School</i>	<i>Philadelphia Works</i>	<i>Vermont HITEC</i>
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<i>HOPE Project DC</i>	<i>Sabio</i>	<i>IT Program</i>
<i>JEVS Human Services</i>	<i>Tech Elevator</i>	<i>Year Up</i>

The insights and information that they shared helped to shape the brief. We truly appreciate their willingness to engage in thoughtful and candid conversations about what is needed to improve the field and expand equitable access to IT career pathways.

ABOUT JFF

JFF is a national nonprofit that drives transformation in the American workforce and education systems. For 35 years, JFF has led the way in designing innovative and scalable solutions that create access to economic advancement for all. Join us as we build a future that works. www.jff.org

Table of Contents

Introduction	1
The Promise of IT for Workers Without a Four-Year Degree	3
What is Working in the Field Today	5
How to Transform IT On-Ramps	8
Opportunities to Enhance Existing IT Training Practices	10
Considerations for Employers	17
Conclusion	19
Appendix	20
Endnotes	21

A photograph of three young professionals in a meeting. A woman with curly hair is looking at a man with glasses, who is looking at another man. They are all dressed in business casual attire.

Introduction

The IT industry is growing rapidly, resulting in an increasing demand for skilled workers and a boom in investment in IT training programs across the country. The influx of training programs is helping to connect a larger population to IT jobs, but they aren't all equally effective. These programs vary tremendously in what they teach, how much they cost, how closely they're tied to careers, and their quality. These inconsistencies have created confusion in the marketplace for employers, training providers, and participants. Employers are stuck without the talent they need as they grapple to understand the benefits that different training programs offer. Training providers struggle to design curricula and activities that connect to a broad range of career pathways beyond entry-level employment. Jobseekers, particularly those from communities and populations underrepresented in IT, can get lost trying to navigate a field that demands a high level of self-advocacy and self-direction. For some people, such as opportunity youth and justice-involved individuals, such hurdles limit their access to this industry and the high-wage occupations it offers.

Building clear, accessible on-ramps into IT is even more important as the country and our economy respond to the COVID-19 crisis. In these first several months of the pandemic, IT has not faced the same level of challenges as other industries that have been struggling to keep workers employed and engaged. While the recession triggered by COVID-19 has resulted in job loss across most sectors of the economy—including IT—longer-term growth among IT roles is expected and is likely to resume as nationwide reopening progresses.

In fact, the increased use of technology to support remote working, virtual learning and training, and efforts to overcome the digital divide could contribute to a greater need for a skilled IT workforce. Although economic uncertainty remains, the early trends of COVID-19 and the long-term trajectory for the sector suggest that skilled IT workers will remain invaluable to an economy that will continue to rapidly adapt to technological change.

In order to understand how the IT training field could be enhanced to serve a wider and more diverse population, we reviewed

a range of nondegree-bearing training models that are intended to support entry into the IT sector. What we discovered and share in this brief is the promise of IT jobs to provide high-quality, high-wage careers to a much broader pipeline of workers. We highlight the successes that several training providers have had in increasing access to IT careers and explore how IT training can be reimagined to consistently offer high-quality training and credentials aligned with employers' entry-level hiring needs, and to prepare participants for long-term career advancement and mobility.

A man and a woman are standing in a server room, looking at a laptop held by the man. The room is filled with rows of server racks under bright lights.

The Promise of IT for Workers Without a Four-Year Degree

Before the emergence of COVID-19, the [U.S. Bureau of Labor Statistics projected](#) that computer and IT occupations would grow 12 percent from 2018 to 2028, resulting in more than 546,200 new IT jobs. In addition to the growth among IT companies, IT occupations are also projected to grow in other industries, such as health care, manufacturing, and finance, over the next eight years. In a 2019 report, Burning Glass Technologies and Oracle Academy found that 90 percent of IT skills and jobs exist in non-IT industries.¹ These jobs are highly desirable, with a median annual wage that range from around \$50,000 to well over \$140,000, but they are not accessible to all workers.² IT is a highly skilled profession, and almost 80 percent of job postings currently request a four-year degree.³

While there are certainly IT occupations where a postsecondary degree is essential, many jobs—including entry-level occupations in high-growth subsectors—

do not. In these cases, the requirement of a four-year degree can act as a filter and bar access to these jobs for many workers, even if they possess a combination of on-the-job experience, certifications, and IT skills and competencies. It is critical that training providers and employers understand the unique career pathways that exist across subsectors and the realities of what is needed to enter into them, in order to effectively connect potential job candidates with opportunities for advancement.

For individuals without a bachelor's degree, there are opportunities to enter the field through three primary pathways: **programming, IT support, and cybersecurity**. According to labor market information from Burning Glass Technologies, the entry-level jobs in each of these areas generally have strong projected growth, offer median earnings of at least \$25 per hour, and can serve as a launching point for other roles in the IT field.

Entry-Level Job



Web Developer

\$69,000

Median salary

9% Growth
from 2020–2025

Web developers can advance to become software developers (applications) with additional knowledge of Java and software engineering. Web developers can also move into roles as software developers (systems) by gaining knowledge and competencies on Oracle. The median salary for this occupation is approximately \$69,000 per year and web developer roles are projected to grow by 9 percent between 2020 and 2025. There are more than 135,000 people currently employed as web developers, and 32 percent of workers in this role have a two-year degree or less.⁴



Network support

\$68,050

Median salary

5% Growth
from 2020–2025

Network support specialists are well positioned to move into network administrator roles as they gain an understanding of systems administration, Linux, and VMware. Growth in this occupation is slower than others and is projected to increase by only 5 percent by 2025. However, there are more than 181,000 people employed in the position, 53 percent of whom have a two-year degree or less, and it offers a median salary of \$68,050.



Cybersecurity

\$98,300

Median salary

15% Growth
from 2020–2025

Cybersecurity roles can be accessed through a range of IT pathways—including programming, IT support, and networking.⁵ These are often hybrid positions that require distinct skills and competencies in areas such as information security, network security, and information systems, and they typically require some proficiency in programming languages such as Linux and Python. Information security analysts, who fill a specific job within the cybersecurity space, are in demand, with over 122,800 people currently employed and projected growth of 15 percent from 2020 through 2025. It also has a high median salary, at \$98,300, and a third of its workforce has a two-year degree or less.⁶



What is Working in the Field Today

To meet the demand for highly skilled IT workers in these occupations, a decentralized training landscape has emerged that offers a range of training designs tailored to jobseekers with different backgrounds. Such programs are largely focused on the most in-demand and accessible parts of the IT sector and have made early progress in expanding the pipeline of workers into IT. Individual successes and trends across some of these programs point to a path forward for the field.

The design and structure of IT training models are broad, encompassing community college certificate programs; short-term training programs delivered by community-based organizations; and boot camp programs, which are unique to IT. These models account for a wide range of learning and skill-development needs, and individuals can seek out the model that best fits their needs based on their experience, education, and career goals.

Boot camps have received much of the attention in the IT sector and are widely perceived as best serving individuals who already have a four-year degree but are looking to transition into IT. In practice, many of the other types of IT on-ramps are more inclusive and engage workers and participants with broader experience.

From our scan of existing training programs, we found that ecosystem training models commonly offered by community-based organizations like [JEVS Human Services](#) are the most widely accessible because they provide participants with multiple on-ramps and entry points into training based on

Bright Outlook Occupations

O*Net, the U.S. Department of Labor's Occupational Information Network, categorizes the following IT jobs as [Bright Outlook Occupations](#), meaning that they are anticipated to grow more quickly than others.

- Computer systems analysts
- Computer systems engineers and architects
- Computer and information systems managers
- Computer and information research scientists
- Computer support specialists
- Database administrators
- Information security analysts
- Information technology project managers
- Software developers (applications)
- Software developers (systems)

their skill levels and career goals. Bridge programs like The Door's [TechBridge](#) and, to an extent, pre-apprenticeship programs are the most effective in preparing participants for longer-term training programs by helping to close existing academic and skill gaps.

Programs established under the federal TechHire initiative, like [TechHire New Mexico](#), are successful in offering accelerated training models that are more widely accessible and that more quickly connect jobseekers to the workforce. Apprenticeships like those offered by [Apprenti](#) provide the most robust level of training and preparation because of the comprehensive work-based learning and hands-on training they provide.

Most of the programs included in JFF's IT scan prepare individuals for web development or network support occupations, which offer the most promise for workers with nontraditional backgrounds looking to enter the IT field. The majority also offer the [CompTIA](#) suite of trainings, which are accepted across a range of in-demand occupations.

As these training programs have emerged, employers have slowly begun to acknowledge that providing competency- and skill-based training can be an effective strategy for connecting those who lack a postsecondary credential or prior work experience to high-wage occupations. This is reflected, in part, by the recent growth of Registered Apprenticeship programs in IT. Large employers like IBM have scaled new apprenticeship programs, Apprenti has created a network of apprenticeships for employers in 16 states, and local employers are sponsoring their own programs around the country.

Common Models of IT Training Programs

Apprenticeship

A training model that combines paid on-the-job learning and formal classroom or online instruction to help a worker master the knowledge, skills, and competencies needed for career success.

Boot camp

An accelerated, often private, training program focused heavily on software positions. These programs are usually full time and are tuition-based.

Bridge program

A short-term training program that helps participants close academic skill gaps so that they can enter a longer training program, such as a pre-apprenticeship.

Ecosystem model

An approach that leverages a variety of on-ramps designed to meet participants where they are and provide multiple entry points into a training program.

Certificate program

Programs that are often offered at the community college level, involving classroom training and, in some cases, an internship component.

Internship

A form of experiential learning, often tied to a secondary or postsecondary program of study, in which participants work for an employer under the guidance of a supervisor for a limited period of time, typically three to six months.

Pre-apprenticeship

A program designed to prepare individuals to enter and succeed in Registered Apprenticeships or other high-quality apprenticeship programs and, ultimately, careers.



How to Transform IT On-Ramps

Despite the progress made by many IT training providers around the country, the sector remains difficult to enter, particularly for women, people of color, and individuals from other populations underrepresented in IT. It is crucial that we address these challenges now so we can ensure that, as the industry continues to evolve, opportunities for career growth and advancement are accessible to all jobseekers. By elevating opportunities to strengthen new and existing training programs now, we hope to support the creation of a coherent approach to supplying talent to the IT workforce before pathways to careers become too disconnected. Advancing strategies to increase employer engagement and involvement in training will promote stronger workforce alignment across the supply and demand sides of the industry.

IT training programs have not been as successful as those of other industries—such as manufacturing, construction, and the culinary and hospitality sector—in removing initial barriers to entering promising career pathways. In some cases, this is because of the requirements of the sector. For example, many IT training

programs require participants to have a high school credential, which diminishes access compared with similar training in other sectors but also reflects the reality of a high-skill industry. Boot camps often require extensive unpaid prework that can last upwards of 12 weeks prior to entry, which screens out individuals who cannot afford to meet that time commitment or who need more hands-on support at the start of their learning.

IT training programs are often tightly focused on providing critical technical skills for a specific target occupation rather than offering more holistic preparation for an IT career. Unlike programs in other sectors, many IT training programs do not fully prepare participants for advancement beyond entry-level employment and do not include career exploration activities in their program design. IT programs also often lack wraparound services, such as mentoring, academic tutoring, or assistance with housing and transportation, that support program completion and position participants for successful employment.

The instructional design of many IT

programs does not allow for self-paced or hands-on learning. Most training programs follow a set timeline that is static across cohorts. Participants are expected to complete their training in the time allotted and move through coursework synchronously with their peers. Self-paced learning, on the other hand, can provide flexibility to meet the needs of diverse learners, and offering multiple entry points can allow participants to leverage their existing experience to gain the specific skills they need to meet their career goals. Work-based learning options such as job-

shadowing programs and internships are limited in entry-level IT training programs but provide a setting for applied learning and real-world experience, which is especially important given the emphasis IT employers place on work experience. Not all of these challenges can be easily addressed by IT training providers. We recommend that IT training programs focus on enhancing several practices that have the greatest potential to promote equity across program models and foster the long-term career advancement of participants.



Opportunities to Enhance Existing IT Training Practices

Embed a Career Pathway Strategy in Program Designs to Support Advancement Beyond Entry-Level Employment

THE CHALLENGE

One of the most common issues observed across IT training programs, regardless of model, is a lack of clarity about what an individual needs to do to advance beyond an entry-level job into more gainful and skilled employment within the industry. Most programs are training participants in the skills, competencies, and credentials required for entry-level employment but are not investing in providing meaningful career exploration services that will help participants understand how to advance along a targeted career pathway.

WHY THIS MATTERS

While it is important to make sure that participants are set up for success in their first job placement, by not providing them with opportunities to explore the range of IT career pathways available or to assess how their skill development and interests align with these pathways, training providers are not properly equipping them with the tools needed to successfully access long-term career advancement. Without

career exploration services, participants are at a significant disadvantage when it comes to accessing career growth opportunities in any industry, but especially in IT. Career exploration is essential to helping participants contextualize their skills and connect them to the broad range of occupations and respective career pathways offered by IT.

HOW TO SOLVE

To address this gap, we recommend that training programs leverage a number of resources to establish and embed a career pathway strategy into their program design. First, programs should incorporate the six elements of pre-apprenticeship, as outlined in [JFF's IT pre-apprenticeship framework](#). Even if a program does not identify as a pre-apprenticeship, these elements can provide valuable structure to any training by strengthening connections between skill development and credential attainment, prioritizing work-based learning, and supporting employer engagement. Programs should also map their training back to

existing competency models such as those created by the [Urban Institute](#) and should leverage career exploration tools like those offered by [O*Net](#) and [CareerOneStop](#).

These tools can help participants deepen

their knowledge of IT occupations across industries and offer opportunities to explore careers and career pathways based on their skills, interests, and long-term goals.

Increase Employer Engagement and Expand Work-Based Learning Activities

THE CHALLENGE

Many IT training programs state that they include employer feedback in their program designs; however, this feedback is often used only to inform general best practices, and it is rare that employers from the local labor market are intentionally integrated into the development and provision of hands-on training and work-based learning opportunities.

WHY THIS MATTERS

A lack of employer engagement can contribute to the misalignment between the skills and competencies participants develop in training and the actual needs of employers. It also contributes to the limited availability of work-based learning activities for students, given that employer partnerships are an important component in providing quality hands-on learning activities in real-world workplace settings. Finally, it reduces the commitment of employers to hire program graduates, because the employers have not witnessed the students' skills in use.

HOW TO SOLVE

To strengthen and enhance work-based learning opportunities, IT training programs—regardless of model—should develop comprehensive engagement strategies to build employer partnerships. Training providers should look to expand their pool of potential partners to include not only IT employers but also employers from other industries that have IT jobs available, as well as industry associations and local workforce boards. Training providers should also engage partners in a way that offers multiple touchpoints with the program and opportunities for constant collaboration, such as the following:

- Acting as mentors or job coaches
- Serving as members on advisory boards
- Developing classroom training and curricula
- Providing career navigation supports and wraparound services
- Creating and delivering of work-based learning activities

Employer feedback is crucial to shaping effective work-based learning activities that accurately represent the work required in an IT occupation, and that help participants contextualize their skill development and connect it to a variety of career pathways.

Additionally, programs can use JFF’s [work-based learning navigation tool](#) to identify the best ways to start building out activities that both fit into their program design and meet the needs of their participants.

Expand the Provision of Wraparound Services and Supports

THE CHALLENGE

Wraparound services—which can include stipends for transit, childcare, or housing; support in completing applications for assistance programs; flexible schedules; and even mentoring—are not consistently offered across training programs. They are most often incorporated into pre-apprenticeships and bridge programs that serve populations that are or have been disconnected from the workforce. Boot camps and even in-school training programs are less likely to offer wraparound supports, which are an important component in helping participants successfully complete and advance beyond a training program.

WHY THIS MATTERS

These services provide valuable and often much-needed support to jobseekers who may not have the same resources, time, or flexibility as their peers. Providing them to participants supports their ability to complete a training program and successfully enter into the workforce and advance along targeted career pathways.

PROGRAM EXAMPLE

TechBridge

TechBridge in New York City is a strong example of how to effectively integrate career exploration and wraparound services into an IT training program. TechBridge is a five-week bridge program offered by The Door that connects to a longer-term IT training program offered by Per Scholas. They work with young people ages 18-24 who are not quite ready for the more rigorous training offered by Per Scholas, providing comprehensive training and support focused on closing academic and technical skill gaps alongside career services and wraparound supports. When students’ progress into Per Scholas, they stay connected to a case manager from TechBridge who continues to provide career navigation and mentoring as well as help accessing services. According to program staff, “TechBridge and Per Scholas work as a team. TechBridge case managers inform Per Scholas of the progress participants in the current cohort are making, and coaching support is provided at both sites.” This approach helps to ensure that participants have everything that they need to further their training and successfully advance in their careers.

HOW TO SOLVE

We recommend that all IT training programs provide participants with wraparound services and supports to the fullest extent possible. Training providers can employ a number of practices to increase access to wraparound supports, including adding case managers and career counselors to their training staffs, and adapting training models that allow for increased flexibility for participants.

Programs should also explore a range of partnerships with entities that can help provide services and supports, including community-based organizations, state and local agencies, and local workforce boards. Some training providers have also found success in collaborating with other IT training programs that are offering wraparound services, helping to create a supportive bridge or series of on-ramps into training.

Increase On-Ramps into Training Programs

THE CHALLENGE

Training programs often operate within their own independent networks and apply their own unique styles and philosophies to training delivery.

Traditional pre-apprenticeships and certificate and in-school training programs tend to offer longer enrollment periods with coursework that is complemented by career and wraparound services. Bridge programs typically serve as on-ramps to longer-term training opportunities, and boot camps frequently follow an accelerated learning model that is more intensive and focused primarily on credential and technical skill attainment.

WHY THIS MATTERS

This variability across programs can contribute to a lack of clarity around what is needed to enter into and succeed within

PROGRAM EXAMPLE

Code Fellows

Code Fellows uses a segmented training model that offers multiple entry points for participants based on their experience and readiness. This approach makes the training accessible to all types of workers, whether new to the workforce, looking to upskill and advance in their careers, or returning to work. This helps to ensure that participants are able to be successful in the training and beyond.

a training program and subsequently an occupation. This can also reduce the number of training on-ramps that are available to potential participants—especially those who lack postsecondary credentials or prior work experience, or who may require additional upskilling or academic support.

HOW TO SOLVE

JFF recommends that IT training partners more intentionally collaborate through partnerships, co-enrollment, and other strategies. Partnering across training programs can result in increased clarity on what is needed to enter into and advance within the industry and can support the alignment of training across different program models. For example, an accelerated learning program, such as a boot camp, could form a partnership with

a workforce agency, pre-apprenticeship program, or community-based program that has the capacity to offer supplemental training along with career exploration and wraparound services. Collaboration across training programs can also be leveraged to develop an ecosystem of on-ramps into IT that includes multiple pathways within a training program and can create seamless transitions through the various stages of an IT career pathway or continuum.

Strengthen and Increase Connections to the Apprenticeship System

THE CHALLENGE

Apprenticeship in IT is still very new, and there are fewer opportunities available compared with other sectors. As a result, few IT training programs have clear and direct connections to apprenticeships in the industry through employer partners, industry associations, or local workforce boards.

WHY THIS MATTERS

Apprenticeships have a proven track record of providing individuals with quality on-the-job training and effective skill development that corresponds to long-term career advancement in multiple industries. Apprenticeship can be a valuable opportunity for many people, including opportunity youth, justice-involved

individuals and those who need or want additional on-the-job training before entering the workforce.

HOW TO SOLVE

To successfully establish a pathway to any apprenticeship, it is important that training providers, employers, and local workforce development systems collaborate. JFF recommends that IT training providers build partnerships with local technology councils and, if available in their area, regional industry-sector partnerships, which bring employers and training providers together.

JFF also recommends that training providers help prepare participants for apprenticeship by providing them with

working knowledge of the IT industry, including commonly used terminology and job expectations, and by creating training programs that are flexible and responsive.⁷ This can be done by aligning training to [the core elements of pre-apprenticeship](#), including the following:

- [Work-based learning](#)
- Strong partnerships with employers that play a role in designing and facilitating the training
- The attainment of an industry-recognized credential upon program completion
- The provision of interpersonal and technical skill development that will allow participants to advance in the IT sector or in IT occupations in other industries

PROGRAM EXAMPLE

JEVS Human Services

[JEVS](#) in Philadelphia offers comprehensive services and supports to participants along with [multiple on-ramps](#) to IT that include pre-apprenticeship programming, internships, college preparatory courses, workforce readiness training, national service opportunities, and GED attainment programs. Its ecosystem approach intentionally connects to [apprenticeship opportunities](#) in the IT industry and beyond, and offers some apprenticeship training in partnership with local school system to minimize the risk of participant drop-off. By offering an array of options for training and credential, JEVS has created a training model that is accessible to a more diverse talent pool. The intentional connections made to apprenticeship and registered apprenticeships for participants helps to expand access to these opportunities and increase access to meaningful career pathways and advancement opportunities.

Improve Clarity across the Industry with Respect to What Is Needed to Advance along an IT Career Pathway

THE CHALLENGE

Different IT employers have different requirements: some require postsecondary education, others prioritize job experience or certifications, and others are looking for jobseekers equipped with a strong set of life skills. There are employers that are willing to provide certifications and credentials if new hires have the appropriate IT

competencies, whereas others will not hire applicants unless they have a degree or industry-recognized credentials.

WHY THIS MATTERS

Because these requirements are employer dependent rather than uniform across occupations, training providers are left to decipher individual employer needs

and requirements and have to then create training that speaks to these differences. This is compounded by the fact that a consequence of the IT industry's rapid growth is that many employers are reluctant to commit to longer-term training programs, worrying that the skills participants gain will be outdated upon completing the program.

HOW TO SOLVE

There are a variety of things that training providers can do to clarify what is needed for growth and advancement in the IT industry. First, they should seek to more intentionally partner with employers in order to strengthen the alignment between their training and the employment needs

of the industry. Such partnerships can include having employers participate in advisory councils, contribute to the design of classroom training, and deliver work-based learning activities to participants. Training providers can also collaborate with employers to help them understand how they can play a role in an individual's ongoing training and education. For example, should an employer prioritize the provision of credentials, or should it commit to supporting workers in cultivating life skills and core competencies through on-the-job training? These approaches to partnership will expand an employer's talent pipeline and ensure that training providers are teaching and training to the most effective set of skills and competencies.



Considerations for Employers

While this brief focuses on the transformation of IT training programs, even the best programs will facilitate access to the sector only if employers are willing to recognize their value. As the need for comprehensive and effective training programs that meet the needs of diverse employers in IT continues to grow, there is an opportunity to reimagine what training and the future of work in this industry looks like. By scaling best practices and prioritizing collaboration across programs and with employers, the number of on-ramps into gainful IT careers could be expanded to include a broader and more diverse population of workers.

There is a need now, more than ever, to enhance racial and social equity in career pathways across industries. This is particularly relevant in IT, where a 2017 study showed that 40 percent of individuals who left the industry did so, at least in part, because of mistreatment by employers, and that women and people of color were much more likely to experience stereotyping.⁸ We recommend that employers conduct a critical and honest assessment of their existing diversity, equity, and inclusion (DEI) practices in partnership with their

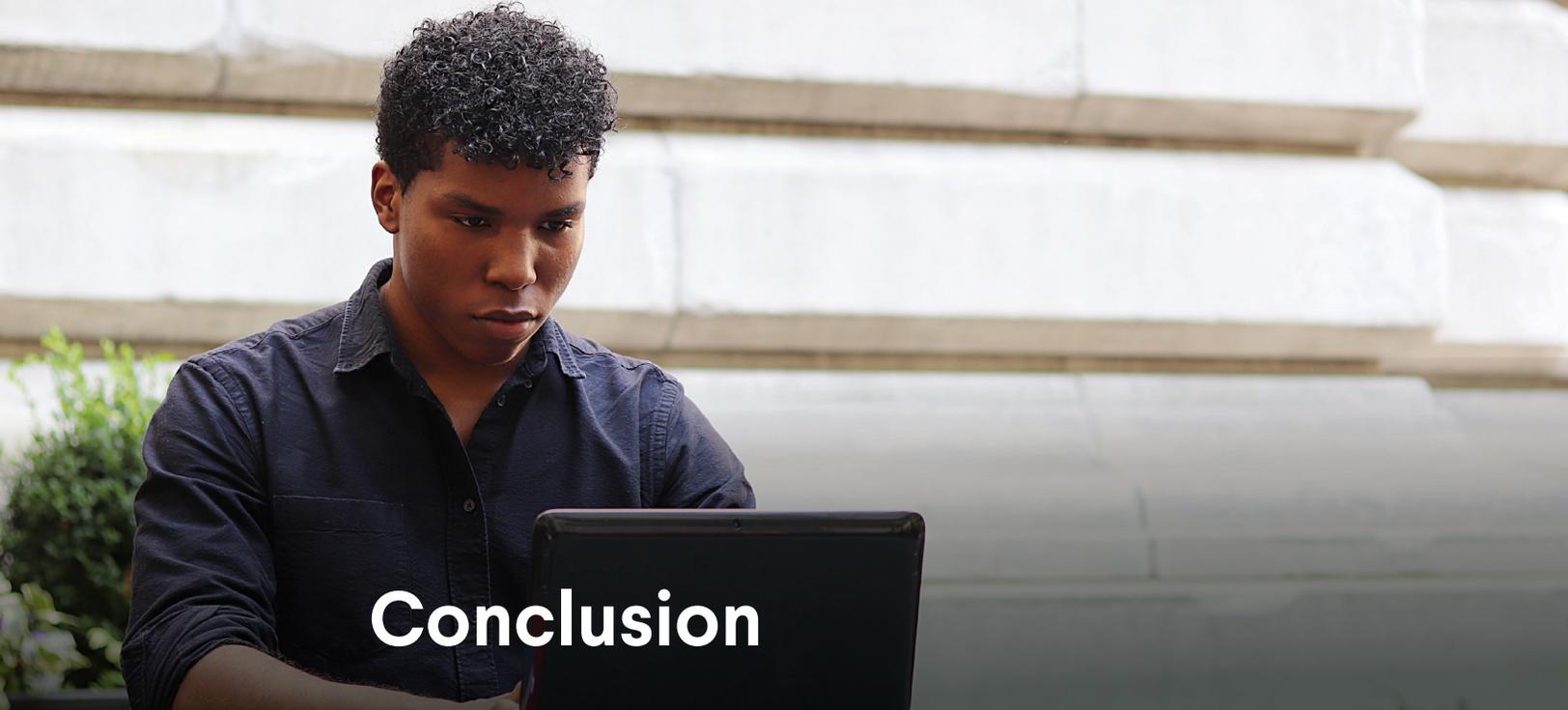
human resources department, hiring managers, and senior leadership to determine the extent to which equitable and inclusive practices are being implemented. Employers should promote diversity within their leadership teams and should create intentional, action-oriented plans to improve equity across all occupational levels, ensuring that all employees have access to growth opportunities.

The application of a racial and social equity lens to hiring and advancement practices in particular, is critical to ending discrimination and fostering equity in all industries. Quite often, these policies do not translate into real-world hiring practices and, as a result, act as a barrier to entry for nontraditional and dislocated workers. As the demand for skilled labor increases in the IT industry, it is important that these occupations are made accessible to a wider and more diverse pool of applicants, and that meaningful opportunities for advancement into leadership positions are accessible to all employees. [Examining the practices of two dozen businesses and industry representatives](#), we found that updating outreach and marketing materials

to show a diverse workforce, removing the use of hiring proxies in recruitment (like the requirement of postsecondary credentials for positions where they are not needed),⁹ eliminating restrictions based on criminal history, and collaborating with community-based organizations and workforce boards that are serving a diverse population can help make the entry into the workforce more equitable and inclusive. We recommend that employers conduct a thorough review of their job listings and existing hiring practices to ensure that they are requesting the correct set of skills and credentials. Employers should also explore the use of competency-based assessments as a means of selecting job applicants rather than relying primarily on formal degrees or years of experience as a means to determine whether or not a

candidate has the knowledge, skills, and competencies needed to be successful.

Finally, it is crucial that employers recognize common barriers to entry that participants may experience, such as educational requirements, extensive prework required to enter a training program, justice-related barriers, and limited options for self-paced learning. Employers should work in close concert with stakeholders across the industry to examine whether these barriers could be removed and should collaborate with a broad range of partners to eliminate them where possible. This will expand access to jobs within the sector, helping to meet the demand for labor while increasing career advancement opportunities for more individuals.



Conclusion

The increasing number of IT training programs coming online for today's workforce are seeking to fill the demand for skilled workers in occupations across the industry. As more training opportunities are made available to a larger and more diverse workforce, it is crucial to strengthen their alignment with employer needs, increase connections to apprenticeships, and promote quality in content and implementation. The recommendations laid out in this brief provide a foundation for achieving this in a way that promotes equity and career advancement. However, to create training models that are truly effective and fully promote DEI, such programs should consider providing a wide range of supports to their participants and actively engage with peers in the training space to develop ecosystems of bridges and on-ramps between programs. This work should be coupled with deep and intentional employer engagement that honestly addresses shortcomings in DEI practices, develops strategies to address barriers to entry, and ensures that competency and skill building is happening in alignment with occupational needs.

Appendix

For the labor market information analysis, JFF drew on several data sources, including federal and state data available through Emsi and job posting data from Burning Glass Technologies' Labor Insight tool. JFF examined the earnings, projected growth, typical entry-level education, and employer demand (e.g., baseline and technical skills and credentials) associated with each of the target occupations. JFF grouped IT occupations into several career pathway areas and validated these groupings with stakeholders from the IT sector.

To develop recommendations for training providers, JFF researched more than 50 IT training programs, including boot camps, pre-apprenticeships, apprenticeships, community college programs, TechHire grants, and bridge programs. Through a series of interviews with IT training providers, JFF cultivated a deeper understanding of the range of training programs offered, including the common trends across program models and divergences in approach. The information gathered through the scan underscored the need for better alignment across training programs and deeper engagement with employer partners. It highlighted the challenges that exist in the field around clarity, access, and advancement, and revealed a number of trends and divergences in approaches to program design and connections to career advancement beyond entry-level employment.

This research was complemented by a review of JFF's full body of work in the IT industry. In collaboration with our colleagues across projects, we looked at the role of employers in training and identified a number of employer-specific challenges that have contributed to the dilution of and strain on training programs. We also looked at the trends and divergences in the roles that community-based organizations, workforce boards, and community colleges play in creating effective on-ramps into IT careers.

Information Support and Service

SOC Code	Occupation Title
15-1151	Computer User Support Specialists
15-1199	Computer Occupations, All Other
27-3042	Technical Writers
15-1152	Computer Network Support Specialists
43-9011	Computer Operators
15-1121	Computer Systems Analysts

Networking

SOC Code	Occupation Title
15-1121	Computer Systems Analysts
15-1122	Information Security Analysts
15-1142	Network and Computer Systems Admins
15-1143	Computer Network Architects
15-1199	Computer Occupations, All Other

Programming and Software

SOC Code	Occupation Title
15-1132	Software Developers, Applications
15-1134	Web Developers
15-1141	Database Administrators
11-9041	Architectural and Engineering Managers
15-1131	Computer Programmers
27-1024	Graphic Designers
15-1133	Software Developers, Systems Software

Cybersecurity

SOC Code	Occupation Title
15-1122	Information Security Analysts
15-1199	Computer Occupations, All Other
15-1132	Software Developers, Applications
15-1143	Computer Network Architects
15-1142	Network and Computer Systems Admins
15-1151	Computer User Support Specialists
15-1121	Computer Systems Analysts

Note: Because cybersecurity roles are cross-functional and do not have dedicated occupational codes, there is overlap between occupations listed below and other career pathways within IT.

Endnotes

1. Burning Glass Technologies, *Beyond Tech: The Rising Demand for IT Skills in Non-Tech Industries* (Boston: Burning Glass Technologies, 2019), <https://www.burning-glass.com/research-project/beyond-tech/>.
2. Wage data is drawn from Emsi 2020.2 Class of Worker data. Extracted by S. Lamback in May 2020.
3. Job posting data is from Burning Glass Technologies Labor Insight. Education level based upon nationwide IT job postings for the one-year period from June 2019 to May 2020. Data extracted by S. Lamback in May 2020.
4. All data in this section is nationwide data from Emsi 2020.2 Class of Worker—except for the percentage of web developers with an education below a bachelor’s degree. This data point is from the U.S. Census Bureau, American Community Survey (2018), drawn from Burning Glass Technologies Labor Insight. Extracted by S. Lamback in May 2020.
5. Burning Glass Technologies, CompTIA, the National Initiative for Cybersecurity Education, and [CyberSeek](#) Cybersecurity Career Pathway.
6. All data in this section is nationwide data from Emsi 2020.2 Class of Worker—except for the percentage of information security analysts with an education below a bachelor’s degree. This data point is from the U.S. Census Bureau, American Community Survey (2018), drawn from Burning Glass Technologies Labor Insight. Extracted by S. Lamback in May 2020.
7. Gretchen Cheney, *Growing Equity and Diversity through Apprenticeship: Business Perspectives* (Boston: JFF, 2019), https://www.jff.org/resources/growing-equity-and-diversity-through-apprenticeship-business-perspectives/?utm_source=report&utm_medium=link&utm_campaign=itstateoffield.
8. Allison Scott, Freada Kapur Klein, Uriridiakoghene Onovakpuri, *Tech Leavers Study* (Kapur Center, 2017), <https://www.kaporcenter.org/tech-leavers/>.
9. Cheney, *Growing Equity and Diversity*.



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