Dear Fellow Ohioans,

As more employers come to Ohio to capitalize on our growth-focused policies, we are continuing to invest in ways to build a dynamically skilled, productive, and purposeful workforce.

Our goal is to prepare Ohioans at all stages of their careers to meet the demands of our growing economy. Whether it’s someone who is mid-career or a student in high school, we will continue to work to make sure that every Ohioan has the opportunity to live up to their God-given potential. Through the Governor’s Office of Workforce Transformation, we will continue to focus on creating opportunities for more Ohioans to earn the skills and credentials needed to get a high-demand job and succeed in a technology-infused economy.

We have multiple apprenticeship programs, grant opportunities, and investments dedicated to strengthening our broadband and 5G workforce. They are designed to attract more employers who want to build their industries in a state that is prepared to meet tomorrow’s workforce needs.

We know that when we focus on in-demand, high-wage jobs that empower Ohioans, it will give our state a strategic economic advantage.

There is no better place to live, to work, to create a business, to build a business than the state of Ohio.

Very respectfully yours,

Mike DeWine
Governor
Dear Ohioans,

In today’s rapidly changing economy, Ohio is creating jobs faster than we can identify and train people to fill them. Businesses are leaving the coasts and putting down roots in Ohio thanks to the many business-friendly policies put in place. This has brought thousands of new jobs to the state. While this is great news, it compounds the current workforce shortages, putting additional strain on businesses from every industry.

The DeWine-Husted Administration and the Governor’s Office of Workforce Transformation recognize the urgency of this workforce challenge, as well as the opportunity it creates for innovation and advancement.

The State of Ohio is focused on training and upskilling Ohioans so they are prepared to take advantage of job opportunities and enter the workforce with a high-wage job. Everyone, regardless of their age, should have access to quality education and training that will provide them with in-demand skills and new opportunity that makes them employable and valuable to businesses. We are proud to have a variety of pathways to careers in Ohio, allowing individuals from every walk of life to succeed in any industry.

This report will highlight priority programs from the Governor’s Office of Workforce Transformation that aim to address the current workforce challenge at every level. We made a lot of progress during 2021 despite many obstacles, but there’s more work to do.

We remain committed to continuously improving Ohio’s workforce and economic development efforts so that we can become the most prosperous state in the Midwest. We know that when businesses succeed, so do communities and the individuals who call them home. Our mission at the Governor’s Office of Workforce Transformation is to ensure every Ohioan has the opportunity to live their version of the American Dream, right here in the great state of Ohio.

Sincerely,

Jon Husted
Lt. Governor
Director, Governor’s Office of Workforce Transformation
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# Appendix

Appendix 1   Strengthening Ohio’s Broadband & 5G Workforce Strategy
Governor’s Office of Workforce Transformation

The Governor’s Office of Workforce Transformation (OWT) sets the strategy for workforce development in Ohio and coordinates with Ohio’s state agencies and partners that impact the workforce. Led by Lt. Governor Jon Husted, OWT works closely with the Governor’s Executive Workforce Board, state partners, and local communities to meet the needs of job seekers and businesses.

MISSION: To connect Ohio’s business, training, and education communities to build a dynamically skilled, productive, and purposeful workforce to create greater opportunity for every Ohioan.

The State of Ohio’s Workforce Investment

The Governor’s Office of Workforce Transformation serves as the lead convening entity to align state workforce efforts to create greater opportunity for every Ohioan.

These partners include:

- Governor’s Children’s Initiatives
- Governor’s Office of Appalachia
- JobsOhio
- Ohio Department of Aging
- Ohio Department of Development
- Ohio Department of Developmental Disabilities
- Ohio Department of Education
- Ohio Department of Health
- Ohio Department of Higher Education
- Ohio Department of Job and Family Services
- Ohio Department of Medicaid
- Ohio Department of Mental Health and Addiction Services
- Ohio Department of Rehabilitation and Corrections
- Ohio Department of Veterans Services
- Ohio Department of Youth Services
- Ohio National Guard
- Opportunities for Ohioans with Disabilities
- RecoveryOhio

Ohio has 18 state partners offering nearly 200 workforce-related programs that invested over $1 billion in 2021.

Governor’s Executive Workforce Board

The Governor’s Executive Workforce Board engages communities, state agencies, and stakeholders in Ohio to identify ways to prepare Ohioans with skills needed for in-demand jobs. The board advises the Governor on public policy to drive a stronger workforce.

MISSION: Focus on in-demand, quality wage jobs that empower Ohioans and give our state a strategic economic advantage.

Lt. Governor Husted hosted one virtual meeting and two in-person meetings this year. These meetings featured topics ranging from the OhioMeansJobs.com redesign to the value of apprenticeships in Ohio, as well as highlighted key workforce programs such as TechCred, IMAP, and the Industry Sector Partnership Grant.
TechCred

TechCred gives businesses the chance to upskill current and future employees in today’s technology-infused economy. Credentials eligible for TechCred must be short-term, industry-recognized, and technology-focused. The state will reimburse up to $2,000 of training upon completion of a credential, up to $30,000 per employer during each application period.

After a successful start to the program, the Governor’s Office of Workforce Transformation set a new goal of funding 20,000 tech-focused credentials each year for Fiscal Years ‘22 and ‘23. After 11 application periods in two years, just under 32,300 credentials have been funded – overdelivering on the original promise made by the administration.

Credentials on the TechCred pre-approved list are determined by Ohio employers, making it a business-driven program. Employers are encouraged to submit a credential through their application that is not on the pre-approved list if it is needed by their business. As of December 2021, 1,766 credentials were on the pre-approved list.

Learn more about TechCred at TechCred.Ohio.gov.

After 11 application periods:

1,615 unique Ohio employers awarded a total of over
$35 million to support Ohioans earning
32,269 tech-focused credentials

“Since the launch of TechCred two years ago, we have helped tens of thousands of Ohioans earn new technology credentials so they can advance their careers and achieve greater earning potential and job security.”
– Lt. Governor Husted

TechCred Dashboard

In June, the Governor’s Office of Workforce Transformation launched a public dashboard on DataOhio to display the latest awardee information from the TechCred program. This interactive visualization allows anyone to learn how the program is serving Ohioans and Ohio businesses by viewing a variety of data, including information about businesses that have participated, the number of credentials approved, and the dollar amount awarded.

View the TechCred Dashboard at Data.Ohio.gov.
The “Strengthening Ohio’s Broadband & 5G Workforce” Strategy underscores the significant public and private investments being made in broadband and 5G at the state and federal level, which in turn is expected to create tens of thousands of jobs in Ohio over the next decade. To ensure Ohio has a skilled and prepared workforce to fill these kinds of jobs, the strategy outlines a plan for increasing broadband industry career awareness and creating more training and education programs in the state.

This strategy addresses three key issues:

1. Increasing broadband industry career awareness by exposing middle school and high school students to opportunities through curriculum and internships.
2. Developing and supporting programs to educate and train Ohioans.
3. Capitalizing on state and federal funding programs, like TechCred and WIOA, to help finance the education and training that will bring to market the talent supply needed for the broadband and 5G industry in Ohio.

Ensuring Ohio has universal broadband access and a mature 5G network is a top priority for this administration. The Governor’s Office of Workforce Transformation and BroadbandOhio have begun implementing strategies to address these key issues. In addition to supporting the launch of several training programs around the state, Ohio has also taken steps toward establishing a Broadband and 5G Sector Partnership, which will be announced in January 2022. The Sector Partnership will be a collaborative effort between education, industry, training providers, and government stakeholders to implement the strategies identified in the “Strengthening Ohio’s Broadband 5G Workforce” analysis.

The ultimate goal of this strategic plan is to fully connect Ohio and make our state a prime destination for new, innovative technology companies to form and utilize the next generation of wired and wireless communications. Reaching that goal requires a skilled workforce.
Industry Sector Partnership Grant

Industry Sector Partnerships develop regional or industry-specific workforce strategies, with the goal of driving collaboration between local businesses, education and training providers, and community stakeholders to meet a workforce need. The program aims to ensure that Ohioans can participate in the workforce pipeline while meeting the needs of job creators and the local economy.

Grant funding supports the operations of these partnerships including new tools, programs, and other expenses associated with launching new partnerships.

The first round of the Industry Sector Partnership Grant program awarded 12 partnerships a total of $2.5 million in January 2021. Lt. Governor Husted announced a second round in September, with just over $2.45 million available for new and existing partnerships. Grant recipients from the second round will be announced in early 2022.

"The role state government can play is to help fund and build these local partnerships so educators know what to teach, businesses have access to home-grown talent and Ohioans earn higher wages and have more job security."
– Lt. Governor Husted
Individual Microcredential Assistance Program

The Individual Microcredential Assistance Program, or IMAP, helps Ohioans who are low income, partially unemployed, or totally unemployed participate in a training program to receive a credential at no cost. IMAP training providers will cover all tuition, fees, and additional costs to help individuals learn new skills and earn a credential that can lead to a good job.

The second grant application, open to training providers such as universities, colleges, Ohio Technical Centers, or private sector training businesses, launched in November. Training providers that receive awards will be reimbursed up to $3,000 for each completed credential issued and up to $250,000 per provider. Awards from the second IMAP grant application in this fiscal year will be announced in early 2022.

The opportunity for Ohioans to access training at no cost through these awarded training providers is ongoing. Eligible Ohioans work directly with the awarded training provider of their choice to enroll in the training program that works best for them.

Learn more or enroll in a training program today at Workforce.Ohio.gov/IMAP.

“IMAP helps individuals earn new skills that will lead to a career with more job security and higher pay, while at the same time providing Ohio businesses access to the new talent they need to compete”
– Lt. Governor Husted

More than $2.2 million awarded to 11 training providers to help up to 1,592 Ohioans

54 training programs offered

37 of which can be completed 100% virtually from anywhere in the state
In March, Lt. Governor Husted and InnovateOhio, in partnership with the Governor’s Office of Workforce Transformation and the Ohio Department of Job and Family Services, unveiled a fully redesigned, more accessible OhioMeansJobs.com website for Ohio jobseekers and employers. The update made it easier for users to register for an account, navigate job opportunities, and apply for positions on mobile devices, all driven by user feedback and upgraded technology tools.

OhioMeansJobs.com includes sections that specifically serve veterans, K-12 and college students, apprentices, workers with disabilities, public assistance and Medicaid recipients, and restored citizens.

“The revamped site helps Ohioans looking for work, and also makes the tough task of searching for a new employee much easier by connecting businesses to candidates with the right skill-set and experience.” – Lt. Governor Husted

In July, the OhioMeansJobs website was upgraded again with another new tool for job seekers. SkillsMatch allows individuals to directly upload their resume to OhioMeansJobs.com, select the skills on their resume to match with potential job opportunities, and watch in real-time as the tool displays which skills line up with a particular job posting.

SkillsMatch also shows job seekers which skills are missing from their resume based on keywords in job postings on the site, creating the opportunity to improve and update their resume so they have a better chance of finding a position that aligns with their interests and qualifications.
High School Tech Internship Pilot Program

Lt. Governor Husted launched the High School Tech Internship Pilot Program in January 2021. This program is an opportunity for Ohio employers to receive reimbursement for establishing a recruitment pipeline by hosting high school interns. The goal of this program is to provide businesses with the tech talent they need while also providing students with valuable work experience at an early age.

There were 12 pilot schools selected, two in each region of the state. The students were placed in summer internship roles focusing on software, data, cloud and IT infrastructure, and cybersecurity. Businesses who hired interns also received a bonus if the students earned qualified industry-recognized credentials during the program.

69 students were placed in tech internships

Innovative Workforce Incentive Program

In November, Lt. Governor Husted announced awards to 54 Ohio school districts through the Innovative Workforce Incentive Program. These grants, totaling $13.5 million, will help districts establish new programs for students to earn industry-recognized credentials in priority industry sectors. The credentials serve as an important tool to provide students with in-demand skills that can lead to a high-wage job.

The 54 school districts are located around Ohio and will offer a variety of industry-recognized credentials to students. In order to develop and implement quality programs that meet the needs of priority industry sectors, schools can use this funding to invest in resources such as equipment, instructional materials, facilities and operational costs.
ApprenticeOhio

Apprenticeships are one of many pathways to earn industry-recognized credentials and college credit while working a full-time job. Ohio offers apprenticeship opportunities in traditional fields like construction and manufacturing and non-traditional apprenticeship fields like IT and healthcare.

On average, apprentices in Ohio earn $60,000 a year without racking up student loan debt. More than 19,000 registered apprentices are currently working in Ohio, in over 200 different occupations.

Pre-Apprenticeships are designed to prepare individuals to enter and succeed in a Registered Apprenticeship Program (RAP). Many successful Pre-Apprenticeship programs are housed at high schools and community colleges because they offer hands-on learning opportunities for students.

There are currently 120 pre-apprenticeship programs at Ohio high schools and career centers.

Ohio To Work

Ohio To Work brings together employers, industry organizations, and educators/training providers to help reach job seekers and connect them to long-term career opportunities. The goal is to connect displaced workers to job opportunities in advanced manufacturing, healthcare, and technology.

Governor DeWine, Lt. Governor Husted, JobsOhio, and the Ohio Department of Job and Family Services launched the first pilot in September 2020 in Cleveland – Cuyahoga County. Ohio To Work continues to unify partners and helps amplify the great work being done by providing a mix of new tools and resources with a concerted effort to complement existing programs.

In September 2021, Governor DeWine, Lt. Governor Husted, and JobsOhio President and CEO J.P. Nauseef announced the expansion of the initiative into Columbus, Toledo, Cincinnati/Dayton, and the Mahoning Valley.

“By expanding this innovative, partnerships-based program, we’ll be able to give more Ohioans access to the tools and supports they need to find meaningful employment and support Ohio’s rapid and equitable economic resurgence.”

– Governor DeWine

Career resources provided to **20,424 Ohioans**

1,683 Ohioans are being reskilled for a new career

2,757 job seekers have received job offers
Choose Ohio First

On October 26, 2021, Chancellor Randy Gardner announced a new Request for Proposal (RFP) that will provide funding through Ohio’s Choose Ohio First program to support scholarship programs in the science (including health professions), technology, engineering, and mathematics (STEM) fields.

The funding will boost Ohio’s efforts to strengthen the state’s workforce in STEM fields while supporting more than 4,500 Ohio college students of all ages. The state anticipates awarding $43 million over the next five years.

The RFP implemented a number of changes to strengthen the Choose Ohio First scholarship program. These changes will focus on meeting the needs of Ohio businesses by requiring work-based learning opportunities for students. They will also help more students complete programs and certificates and in turn, increase Ohio’s STEM talent pipeline.

The Choose Ohio First scholarship program began as a way to increase the number of Ohio students enrolling in, and successfully completing, STEM programs at Ohio’s public and independent colleges and universities. This latest round of funding is part of a focused strategy to increase enrollment and completion across Ohio in the STEM fields.

Learn more about Choose Ohio First at: OhioHigherEd.org/COF.

Over $15.1 million was awarded and disbursed to 3,989 COF scholars in 2020-2021
41,899 STEM degrees awarded at Ohio’s public colleges and universities in 2020-2021

TopJobs

Every other year, the Governor’s Office of Workforce Transformation distributes the In-Demand Jobs Survey to gather business input in preparation to update the In-Demand Jobs list.

The Critical Jobs list was also updated to reflect emerging needs within occupations that directly serve the health and well-being of Ohioans, their families, and communities.

Ohio’s Top Jobs List plays an important function as it directs 85 percent of federal job training funds offered through OhioMeansJobs Centers.

View the updated list at TopJobs.Ohio.gov.

“There are many opportunities here in Ohio for those who are ready to begin their careers or are looking to learn something new. Our updated Top Jobs List outlines the most in-demand and critical professions for 2022.”
– Governor DeWine.
Lt. Governor Husted is a proponent of expanded opportunities for every young Ohioan. Through his role as Director of the Governor's Office of Workforce Transformation, he has worked to raise awareness for the many options available to students in Ohio as they graduate high school and move to the next phase in life.

For some, that will mean a traditional college education, but that is not the only option. Others may choose to pursue an industry-recognized credential or attend a short-term training program. It is also important to emphasize that students can enter the workforce and start a career right after high school by earning a credential while still in school or joining an apprenticeship program after graduation.

Ohio offers a variety of options to help Ohioans go to college or earn an industry-recognized credential at no cost, both of which will help individuals gain the skills and education needed to get a job that pays well and has long-term potential.

Lt. Governor Husted has prioritized traveling around the state to visit career-tech schools, colleges, and training programs, all to support and promote the wide variety of opportunities available. From high school to adult learners, Ohio has an option for every citizen.
Looking Forward

The Governor’s Office of Workforce Transformation will continue to focus on creating opportunities for more Ohioans to earn the skills and credentials needed to get a high-wage job and succeed in a technology-infused economy. No matter the industry, there is no better time to enter the workforce than now.

Contact Us

Twitter: @OhioOWT
Facebook: @OhioOWT
LinkedIn: Ohio Governor’s Office of Workforce Transformation
Website: Workforce.Ohio.gov
Email: Workforce@OWT.Ohio.gov
STRENGTHENING OHIO’S BROADBAND & 5G WORKFORCE

Ohio Governor’s Office of Workforce Transformation

BroadbandOhio
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Even prior to the COVID-19 health crisis, Ohio had significant gaps in broadband coverage—an issue the DeWine-Husted Administration began addressing immediately upon taking office. The issues created by this gap became more evident at the start of the pandemic when millions of Ohioans had to stay home to work and learn remotely. The internet speeds needed for bandwidth-intensive applications, like video conferencing—sometimes on multiple devices—showed how speeds below the broadband threshold left far too many Ohioans behind and unable to effectively participate in the modern economy, education system, and healthcare system.

To address the digital divide, the DeWine-Husted Administration proposed significant investments in broadband expansion—approximately $500 million between state and federal dollars, which will create 1,250 direct construction jobs that will need to be filled, compounding the current labor shortage. The deployment of 5G in Ohio is estimated to create 32,000 jobs solely in network infrastructure. Ohio needs a strategic plan to address these workforce issues so the buildout of broadband and 5G infrastructure can happen quickly.

In response to this workforce shortage, the Governor’s Office of Workforce Transformation and BroadbandOhio drafted a strategic plan that outlines a detailed framework and roadmap to address three main issues: lack of industry career awareness, lack of education and training programs, and lack of awareness of existing state and federal funding programs. Ensuring Ohio has universal broadband access and a mature 5G network is a top priority for this administration. The ultimate goal of this strategic plan is to make Ohio a prime destination for new, innovative technology companies to form and utilize the next generation of wired and wireless communications. Reaching that goal requires a skilled workforce.
To help bridge the digital divide, the DeWine-Husted Administration proposed, and the legislature funded, significant state investments in broadband expansion as part of the Governor’s 2022-2023 Executive Budget, “Investing in Ohio’s Future.” These state investments are in addition to federal dollars allocated to close the broadband gap. Between state and federal dollars, Ohio expects an infusion of approximately $500 million for broadband expansion. A significant portion of these dollars will be deployed over fiscal years 2022-2023.

This large capital infusion means the demand for skilled labor to physically build broadband infrastructure will increase exponentially. Based on estimated funding, broadband infrastructure build-out in Ohio will create 1,250 direct construction jobs that will need filled to expand access. A $500 million investment in broadband infrastructure will also increase Ohio’s GDP by $751 million. Additionally, the United States, including Ohio, has begun deploying 5G – the next generation of wireless communication technology, which pulls from the same general labor pool. In Ohio, 5G will create approximately 107,000 new jobs in the state, while increasing Ohio’s GDP by $36.4 billion. Approximately 32,000 of these new 5G jobs will be directly tied to the deployment of 5G infrastructure.

The Governor’s Office of Workforce Transformation and BroadbandOhio have commissioned the Strengthening Ohio’s Broadband & 5G Workforce analysis to evaluate the broadband and 5G workforce, identify gaps in workforce supply, and propose strategies to mitigate these gaps. Success on this will allow proposed broadband and 5G infrastructure projects to proceed with minimal disruption due to labor shortages and will infuse industry-oriented curriculum in our education system.

To ensure Ohio conducted a thorough analysis, the Governor’s Office of Workforce Transformation and BroadbandOhio engaged stakeholders across the broadband and 5G spectrum from telecom, construction subcontracting, industry associations, trade groups, rural electric co-ops, nonprofits, career-technical education providers, Ohio Technical Centers, and two- and four-year colleges and universities. Over a four week period, the state used a total of 10 stakeholder meetings to ensure it was accurately tracking the preliminary issues identified and to solicit feedback on what Ohio should do to address the broadband and 5G workforce shortage. The meetings created positive collaboration between industry and education on identifying ways to build the broadband workforce needed in Ohio.

The broadband industry was facing a labor pool crunch before the COVID-19 pandemic. The Federal Communications Commission (FCC) created a working group within its Broadband Deployment Advisory Committee (BDAC) that began examining the broadband industry’s workforce challenges in 2019. The BDAC report was an extensive, fifteen-month process that looked at the broadband industry’s workforce challenges at the national level. The Co-Chair of the FCC BDAC report, Dr. Rikin Thakker, who currently serves as the Chief Technology Officer at the Wireless Infrastructure Association (WIA), was an active participant in Ohio’s broadband workforce analysis, using his national expertise to assist the state in identifying the key challenges for Ohio to address. The BDAC report and discussions with stakeholders clarified the need for the state to focus on a few key issue areas: broadband industry career awareness, education and training programs, and awareness of state and federal funding for training programs.
**Broadband Industry Career Awareness:**

A recurring theme throughout the analysis was a lack of awareness of the viable career paths offered within the broadband industry. The BDAC report specified that "without a clear identity of the broadband industry, the skills gap will likely only grow."15 Educational institutions lack awareness of employer needs, the general public is unaware of job opportunities in the broadband industry, and workers within the industry often do not realize that there are opportunities for advancement. Additionally, employers lose out from high turnover because employees tend to transition jobs for minimal compensation increases without realizing the possible career and salary advancement paths.16 To illustrate that point, stakeholder meeting participants stated that broadband infrastructure talent often move into power and electric utility subcontracting because those industries have a higher base rate of pay.

In the stakeholder meetings, which included Ohio-based companies, a consistent theme in relation to career awareness was the need to create middle and high school-level programs to expose students to the broadband industry. Industry representatives thought a multi-pronged approach would have the greatest impact on developing the next generation of broadband workers. Introducing curricula in middle and high school alongside existing STEM programs, internships, preapprenticeships, and apprenticeships should be part of attracting and retaining Ohio’s best talent.

**Establishing and Scaling Education and Training Programs:**

Facilitating the establishment and scaling of education and training programs for the broadband industry is another key issue to address. The industry has repeatedly stated, even prior to COVID-19, that attracting and retaining skilled talent is "among the biggest chokepoints in deployments."17 The skills gap and labor crunch in the broadband and 5G space have become so severe that construction companies have turned away work because of the shortage of labor.18 This labor crunch affects equipment manufacturers as well because there is not enough talent to operate the machines needed for broadband and 5G infrastructure build-out.19

To meet the increasing demand for broadband and 5G infrastructure, the industry needs to recruit significantly more workers. These workers must be educated and trained, but the United States does not have many broadband or 5G specific programs. One reason is the lack of industry standardization for the credentialing of particular occupations.20 Registered apprenticeship programs are one solution to this challenge, but are somewhat new for the telecom industry and need more funding support to expand. The lack of standardization has led to incumbent workers with very individualized skillsets, making it difficult for industry to communicate to educational providers the grouping of skills needed to establish education and training programs for broadband occupations.21

This trend has begun to shift as the industry begins to standardize its training. In 2020, the U.S. Department of Labor awarded WIA a $6 million grant to expand apprenticeship in the telecommunications industry.22 Currently, WIA administers 11 occupations through the Telecommunications Industry Registered Apprenticeship Program (TIRAP).23 These 11 occupations represent a significant number of the most critical broadband and 5G industry occupations including tower and wireless technicians, fiber optic technicians, and utility construction technicians. More occupations with engineering skillsets are being designed now. In addition to the TIRAP model, both WIA’s Telecommunications Education Center (TEC) and NATE: The Communications Infrastructure Contractors Association (NATE) informed the state they have each designed, and are in the process of designing, plug-and-play curriculum models that training providers can stand up to begin scaling training efforts. TEC has a catalog of over 30 courses that were designed with the help of subject matter experts (SMEs) from industry and academia to address 5G training needs.

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15. Id.
16. Id.
17. Testimony of Lisa Youngers, President & CEO of Fiber Broadband Association, “The 5G Workforce and Obstacles to Broadband Deployment” (U.S. Senate Testimony before Committee on Commerce, Science, and Transportation, 2020)
18. Id.
19. Id.
21. Id.
22. [https://wia.org/wia-awarded-6-million-dol-grant-to-train-5g-workforce/](https://wia.org/wia-awarded-6-million-dol-grant-to-train-5g-workforce/)
23. [https://www.tirap.org/what-apprenticeships-is-tirap-administering/](https://www.tirap.org/what-apprenticeships-is-tirap-administering/)
NATE’s Tower Technician 1 curriculum is estimated to be ready for a fall 2021 launch. The issue now is how Ohio can scale these efforts to ensure the state has the training capacity to produce the level of talent needed for broadband and 5G infrastructure build-out.

**Awareness of State and Federal Funding for Training Programs:**

There is both a lack of funding and awareness of funding for training programs to upskill and reskill workers for the broadband industry from a national perspective.\(^\text{24}\) However, in Ohio, it is not a lack of funding, but a lack of awareness of the funding available to Ohioans, employers, and training providers. During the stakeholder meeting process, multiple Ohio-based companies were unaware of the TechCred program, which assists employers in upskilling or reskilling their workforce with technology-focused, short-term credentials.\(^\text{25}\) The program reimburses employers up to $2,000 per credential and $30,000 per application period for eligible credentials completed in less than one year.\(^\text{26}\) In addition to TechCred, the Individual Microcredential Assistance Program (IMAP) helps Ohioans who are low income, partially unemployed, or totally unemployed participate in a training program to receive a credential at no cost to the student.\(^\text{27}\) This program reimburses training providers up to $3,000 per credential when an Ohioan earns a qualifying technology-focused credential.

Both TechCred and IMAP, among other workforce training programs, can serve as funding vehicles for a significant portion of the initial workforce deployment needed to build out broadband and 5G infrastructure in Ohio. For example, the Tower Technician 1 program designed by NATE, which takes approximately eight to ten weeks to complete, is estimated to cost $3,000. TechCred would cover two-thirds of the cost, and IMAP would cover 100 percent of the cost. A first-year Tower Technician can make $45,000 to $75,000 per year: a great outcome for both the student and the state.\(^\text{28}\) At the regional level, Ohio’s 20 local workforce development boards (LWDBs) provide services under the Workforce Innovation and Opportunity Act (WIOA), which will pay for training that leads to post-secondary credentials for eligible adults, dislocated workers, and youth. WIOA may also pay for on-the-job training (OJT) to reimburse an employer’s costs of training a hired participant in the workplace.
5 Strategies

To continue efforts for broadband expansion, it’s important to take a system-wide approach to the workforce needs of broadband and 5G development. Investments made in workforce development will ensure broadband and 5G infrastructure projects are built on time. Any delay in infrastructure build-out means delays in broadband access and GDP growth. For 5G, every 1 percent shortfall (roughly 1,070 workers) in talent supply, including direct and indirect talent, could mean missing out on $546 million in potential GDP benefits for Ohio from 2020-2030.29 The strategies laid out below were developed in partnership with industry and education stakeholders. These strategies include short, medium, and long-term objectives that seek to ensure both broadband and 5G deployment will be supported by a workforce capable of building and maintaining it.

Ohio Broadband and 5G Sector Partnership

Similar to the FCC BDAC, an entity should be established that will implement the statewide strategy to produce the right talent, at the right capacity, and at the right time. The creation of a Broadband and 5G Sector Partnership (“Sector Partnership”) would accomplish that objective. Forming a central convening entity will help reduce duplicative efforts among regions and allow regional partnerships to be forged. Doing so will allow regions to complement strengths and mitigate weaknesses, share assets and burdens, and distribute best practices to stakeholders across Ohio. This proposed Sector Partnership would be led by an industry intermediary that understands the industry, education, and government – and the mandate to remain technology-neutral. The industry intermediary would be supported by the Governor’s Office of Workforce Transformation and BroadbandOhio to ensure the Sector Partnership meets the policy goals of the administration.

Broadband Industry Career Awareness

Industry stakeholders believe there is a significant need for high school students to be exposed to the industry. Curriculum in middle and high schools combined with internships are the key to that exposure, and a focus should be placed on curriculum development, internship, preapprenticeship, and apprenticeship opportunities. An important component of curriculum development would be the initial first step of identifying broadband occupations along the educational continuum and further defining the essential skills necessary to be successful in those occupations. This information would be assembled into a career pathway model to easily showcase to stakeholders the various entry and exit points of broadband careers.

In the short term, internships could quickly be implemented by significantly expanding the High School Tech Internship Pilot Program, a competitive opportunity for employers to hire high school interns and receive reimbursement for their wages. The High School Tech Internship program provides a quick-to-market, structured model for students to get exposure to the broadband and 5G industry while earning a wage. Additionally, this program structure will ensure students are going through a work-based learning model that outlines the job duties, learning outcomes, and role of the business during the experiences. Ohio’s Comprehensive Case Management and Employment Program (CCMEP) also funds internships as a work experience for eligible youth, most of whom are out of school or on public assistance.

Linking employers with the CCMEP provider in each county could lead to a steady pipeline of motivated youth into broadband careers.

In the medium-to-long term, efforts should include working with the industry intermediary to develop elective and AP classes, using the identified career pathway model, in traditional and career technical education settings in Spectrum, Wi-Fi, Telecom, Wireless, and Fiber technologies. These opportunities will give students exposure to the industry, the opportunity to explore career paths within the industry, and the ability to earn credit in high school and credit for their postsecondary education.

Establishing and Scaling Education and Training Programs

One of the most significant barriers to large-scale broadband and 5G infrastructure deployment is lack of labor, thus creating the need for education and training programs in Ohio. Currently, Ohio has few broadband or 5G-specific training programs. However, one such program is located at Terra State Community College in Fremont. This program is new and had its initial cohort in the spring of 2021. The industry has developed and continues to develop plug-and-play curriculum models that could be scaled for use in Ohio. In addition, there are many education and training programs throughout the state that have similar components to what is needed for broadband and 5G but need modifications to meet the industry’s need.

In the short term, institutions and training providers should be identified to be partners with the telecom industry. From there, identify plug-and-play, non-degree curriculum models that could be implemented quickly at these organizations to start addressing the labor crunch. For example, through the stakeholder engagement process, the state learned that NATE’s plug-and-play Tower Technician 1 curriculum model is designed to be established as a credit or noncredit program that can be brought to market in a matter of weeks and costs approximately $200,000 for initial capital expenses. The program is designed to be short, lasting approximately eight to ten weeks. It gives students the skills needed to sit for the National Wireless Safety Alliance (NWSA) exam to be a Tower Technician 1 – an industry-recognized portable certification. For a student, the program cost would be $3,000, leading to a job that pays $45,000 to $75,000 in their first year of employment. Dr. Gemma Frock, who is facilitating a team of SMEs to design the plug-and-play Tower Technician 1 program for NATE, previously developed the first of its kind program at Aiken Technical College in South Carolina, which had 100 percent placement rates for students who completed the certification. TEC’s “5G Readiness Program” is another program that can be plugged in as a 10-weekend certificate program at a community college or 4-year degree institution. Most of the content can be delivered online and students get to learn practical aspects of broadband and 5G through field trips to live-cell sites at the end of the program.

In the medium-term, the proposed Sector Partnership would establish a framework to create a “Broadband & 5G Connectivity Center” (“Connectivity Center”) housed at a large university with smaller nodes in select regions of the state. This Connectivity Center will be led by the industry intermediary and work to execute the statewide strategy set by the Sector Partnership. This is where secondary and postsecondary education stakeholders, in partnership with industry, will map out the process to create a seamless ecosystem of curriculum and training programs geared for careers in the broadband and 5G industry that are implemented strategically at the smaller nodes. The first mission of the Connectivity Center will be to map all postsecondary programs in the state and identify which can be modified quickly to integrate broadband and 5G plug-and-play curriculum developed or distributed by the Connectivity Center.

In the long-term, in addition to developing secondary education curriculum (electives and AP classes) that result in an industry-recognized credential, the Connectivity Center would begin developing and implementing industry-centered registered apprenticeships, majors, and degree programs at the postsecondary level geared toward the broadband and 5G industry. At a more granular level, it would include the rollout of registered apprenticeships, the creation of new in-demand occupations for 5G and broadband, the creation of two-year associate degree
programs, the creation of a major in Cellular/Wireless Infrastructure for four-year degree programs, the creation of an Interdisciplinary Professional Master’s Program in Telecommunications for in-career workers, and the creation of an “Executive Certificate on Broadband and 5G Strategies” for executives at various business schools in the state. This A-to-Z approach will help Ohio have the workforce to physically build the infrastructure, maintain it, and capitalize on the economic benefits of broadband connectivity and the first mature 5G network in the region.

Capitalizing on State and Federal Funding Programs

Ohio has multiple state funding programs that could be used to quickly bring to market the talent supply needed for the broadband and 5G industry. With TechCred receiving increased funding in fiscal years 2022-2023, it is a prime vehicle for broadband and 5G industry employers to upskill or reskill incumbent workers or potential employees they would hire if they had additional skills. To complement TechCred, IMAP will add a focus on broadband and 5G industry career paths, providing Ohioans who are unemployed or underemployed the opportunity to go through training at no cost to earn a credential that will qualify them for an entry-level job in the industry. An example of a potential broadband and 5G IMAP program is NATE’s Tower Technician 1 curriculum. From there, TechCred could be used to assist employers in financing additional skill development for these new employees – further increasing their skills and earnings.

In carrying out the WIOA program, the business-led LWDBs interact with employers in their local area to identify hiring needs to meet area employer demand.

6 Conclusion

Through this analysis, Ohio has identified stakeholders in broadband and 5G infrastructure build-out, evaluated existing research, and convened meetings with stakeholders to discuss what is needed for the broadband and 5G industry’s workforce. The findings are clear, both from the literature and from stakeholder engagement: there is a broadband industry workforce shortage. In Ohio, specifically, state and federal investments in broadband will create roughly 1,250 direct construction jobs. The deployment of 5G will create approximately 32,000 jobs from network infrastructure deployment and another 75,000 indirect jobs from new and improved business use cases across industries. To address this workforce shortage, a strategy should involve (1) working with industry and education stakeholders to increase broadband industry career awareness, (2) establishing and scaling education and training programs to build workforce capacity, and (3) capitalizing on existing state and federal funding programs to finance this undertaking in partnership with the industry.

Ohio has the potential to lead the United States in developing a highly skilled broadband and 5G workforce that will close digital equity gaps and propel our state’s economic engines into the next generation of wireless technology. Expanded broadband access will allow unserved and underserved Ohioans to participate in the modern economy by allowing access to quality healthcare through telehealth, access to quality education through remote learning, and access to remote employment opportunities. The deployment of 4G allowed the app ecosystem to flourish – establishing players like Uber, Lyft, Airbnb, and others. Efforts to enhance and expand broadband, along with other innovation initiatives, will help solidify Ohio’s position as the most innovative, creative, and entrepreneurial state in the Midwest.

34 Appendix 1

Strengthening Ohio’s Broadband & 5G Workforce 9
Introduction

This is a case study of the potential impacts of broadband expansion on Ohio’s employment. This analysis uses an approach similar to the 2021 Brookings report, *How federal infrastructure investment can put America to work* (Escobari et al., 2021). In the process we can say something about potential occupations that might be impacted by broadband expansion, and the supply of workers in these occupations and (as Brookings calls them) adjacent occupations. However, we use industry-level employment for this study. Ohio does not collect occupation as part of its Unemployment Insurance Wage system, occupation indicators are only available for workers who are unemployed, and these indicators are not sufficiently detailed to estimate the stocks and flows of individuals who are unemployed and available for work. We do make some educated attempts to illustrate the potential occupational impacts of these investments by using existing Ohio occupational data.

Assumptions

- There is a $500 million investment in Broadband employment that occurs in a single year (year 1).
- The investment generates 2.5 jobs per $1 million investment, for a total number of 1,250 jobs directly generated by the investment. This is hard wired into the report from Brookings.
- The employment directly generated is produced in one of six NAICS (industry) codes as follows, with the 2.5 new jobs per $1 million distributed across six industries according to the weights noted in parentheses; for example, out of 2.5 jobs created, half of a job is created in the Wired Telecom industry for each $1 million investment. These weights are reapplied from the Brookings report.
  - 237130 - Power & Com. Line and Related Structures Construction (0.625)
  - 335921 - Fiber Optic Cable Manufacturing (0.25)
  - 335999 - Misc. Electric Equipment and Component Manufacturing (0.375)
  - 515210 - Cable and Other Sub. Prog. (0.25)
  - 517311 - Wired Telecom (0.50)
  - 517312 - Wireless Telecom (0.50)

Industry mix

The industry codes used to estimate employment are taken from the Brookings report, and mapped to IMPLAN classification. The industry weights are as follows:

- 237130 - Power & Com. Line and Related Structures Construction (25%)
- 335921 - Fiber Optic Cable Manufacturing (10%)
- 335999 – Misc. Electric Equipment and Component Manufacturing (15%)
Using these weights we examine employment by industry code. The trend of employment in these NAICS codes is taken from the six digit codes in the Quarterly Census of Employment and Wages for 2018-2020 (by month). These numbers are used to help understand the relative impact of these investments above on the jobs.

Total employment in the six broadband impacted NAICS codes has varied on a monthly basis since 2018. Monthly employment in the six codes peaked in the summer of 2018 at 29,111 (July 2018) and experienced a low in summer of 2020 (24,607 in June 2020). The largest number of jobs in this group of NAICS codes occurs in the Wired Telecommunications industry. The smallest monthly employment is seen in the Cable and Other Sub. Programming.

**Estimated Jobs Created by Industry Code**

The following lists total number of estimated new jobs in direct employment, indirect employment and induced employment overall.

<table>
<thead>
<tr>
<th>Impact Summary</th>
<th>Impact Type</th>
<th>Employment</th>
<th>Labor Income</th>
<th>Total Value Added</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct Effect</td>
<td>1,250</td>
<td>$97,536,241</td>
<td>$385,707,202</td>
<td>$925,763,639</td>
</tr>
<tr>
<td></td>
<td>Indirect Effect</td>
<td>2,567</td>
<td>$141,568,619</td>
<td>$230,515,181</td>
<td>$446,222,203</td>
</tr>
</tbody>
</table>
There is an estimate of 1,250 jobs created directly from the $500 million investment in Broadband. In addition, there are approximately 4,000 jobs that will be created indirectly or through increased spending. Please note that the Brookings report limited job creation to the direct effects. The initial $500 million investment in Broadband leads to a $751 million increase in the state’s GDP (e.g., value added) in year one. It also leads a total of $1.6 billion in economic output; however, value added is a more important measure as it captures contribution to state GDP.

We predict that the estimated 5,300 new jobs will be in a range of industry sectors. The largest number of jobs is in Employment Services, which covers a wide range of industries including temporary staffing. Much of the direct effect of investment in Broadband is in Telecommunications and Construction, although there are also some impacts on employment in Leisure or Hospitality based on increased spending.

<table>
<thead>
<tr>
<th>Top Ten for Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
</tr>
<tr>
<td>472</td>
</tr>
<tr>
<td>433</td>
</tr>
<tr>
<td>52</td>
</tr>
<tr>
<td>434</td>
</tr>
<tr>
<td>447</td>
</tr>
<tr>
<td>339</td>
</tr>
<tr>
<td>497</td>
</tr>
<tr>
<td>509</td>
</tr>
<tr>
<td>432</td>
</tr>
<tr>
<td>335</td>
</tr>
</tbody>
</table>

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Occupational Impacts

At this point, we are not able to measure directly the distribution of jobs by occupation based on these industries. The crosswalks from Ohio are not available using the EMSI data at this time, although we expect to be able to get access for future work. However, we would note that for some of these industries there are occupations that appear on the 2018-2028 “30 fastest growing occupations” list issued by the Ohio Department of Job and Family Services, Bureau of Labor Market Information in January 2021. For example, SOC Code 2371 “Utility System Construction” is likely an occupation that would map to the industry “237130 - Power & Com. Line and Related Structures Construction.” This occupation is predicted to grow by 15.6% over this time period. Moreover, other construction occupations, such as “2382 – Building Equipment Contractors” are projected to gain the most new jobs (8,185 between 2018 and 2028).

Clearly, each of the industry codes listed here would be represented in the occupational list. If we simply took the SOC codes from the Brookings report and assumed that Ohio’s occupational structure of the six industry codes is the same as the national report, we would see the following possible growth in the corresponding occupations.

<table>
<thead>
<tr>
<th>Direct Employment by Occupation Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Code (SOC)</td>
</tr>
<tr>
<td>49-2022</td>
</tr>
<tr>
<td>49-9052</td>
</tr>
<tr>
<td>41-3091</td>
</tr>
<tr>
<td>43-4051</td>
</tr>
<tr>
<td>47-2061</td>
</tr>
<tr>
<td>49-9051</td>
</tr>
<tr>
<td>13-1198</td>
</tr>
<tr>
<td>49-1011</td>
</tr>
<tr>
<td>17-2072</td>
</tr>
</tbody>
</table>

Based on this list (which is essentially a guess that Ohio’s occupational structure is the same as the national structure for broadband employment) we conclude that the 1,250 direct jobs created by the $500 million investment is primarily in volume in the largest measure in telecommunications related fields. These occupations tend to have relatively small numbers of people employed, and therefore, a modest increase in the total number of jobs created can lead to a very large percentage increase in the
total jobs created annually. For many occupations, however, the growth will be relatively modest in terms of a percentage increase in the volume of hiring expected in a normal year.

The following chart provides some additional information about the job qualifications and pay of the specific occupations.

<table>
<thead>
<tr>
<th>Code</th>
<th>Occupational Title</th>
<th>Employment 2018 Annual</th>
<th>2028 Projected</th>
<th>Change in Employment 2018-2028</th>
<th>Annual Openings</th>
<th>Exits</th>
<th>Transfers</th>
<th>Total</th>
<th>Median Wage May 2019</th>
<th>Typical Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>49-2022</td>
<td>Telecommunications Equipment Installers and Repairers, Except Line Installers</td>
<td>8,475</td>
<td>7,898</td>
<td>-577</td>
<td>-6.8%</td>
<td>.58</td>
<td>228</td>
<td>674</td>
<td>844</td>
<td>$25.20</td>
</tr>
<tr>
<td>49-9052</td>
<td>Telecommunications Line Installers and Repairers</td>
<td>3,704</td>
<td>3,863</td>
<td>159</td>
<td>4.3%</td>
<td>16</td>
<td>88</td>
<td>334</td>
<td>438</td>
<td>$20.45</td>
</tr>
<tr>
<td>41-3091</td>
<td>Sales Representatives, Services, All Other</td>
<td>35,749</td>
<td>37,236</td>
<td>1,487</td>
<td>4.2%</td>
<td>149</td>
<td>1,077</td>
<td>3,543</td>
<td>4,769</td>
<td>$25.02</td>
</tr>
<tr>
<td>43-4052</td>
<td>Customer Service Representatives</td>
<td>100,806</td>
<td>96,357</td>
<td>-4,449</td>
<td>-4.4%</td>
<td>-445</td>
<td>4,734</td>
<td>8,404</td>
<td>12,693</td>
<td>$16.70</td>
</tr>
<tr>
<td>47-2061</td>
<td>Construction Laborers</td>
<td>47,997</td>
<td>52,887</td>
<td>4,890</td>
<td>10.2%</td>
<td>489</td>
<td>1,687</td>
<td>3,923</td>
<td>6,099</td>
<td>$20.04</td>
</tr>
<tr>
<td>49-9051</td>
<td>Electrical Power-Line Installers and Repairers</td>
<td>3,076</td>
<td>3,251</td>
<td>175</td>
<td>5.7%</td>
<td>18</td>
<td>77</td>
<td>189</td>
<td>284</td>
<td>$34.89</td>
</tr>
<tr>
<td>13-1198</td>
<td>Business Operations Specialists, All Other</td>
<td>37,895</td>
<td>39,560</td>
<td>1,665</td>
<td>4.4%</td>
<td>166</td>
<td>1,052</td>
<td>2,666</td>
<td>3,884</td>
<td>$53.81</td>
</tr>
<tr>
<td>49-1011</td>
<td>First-Line Supervisors of Mechanics, Installers, and Repairers</td>
<td>16,631</td>
<td>17,002</td>
<td>371</td>
<td>2.2%</td>
<td>37</td>
<td>526</td>
<td>1,016</td>
<td>1,579</td>
<td>$50.99</td>
</tr>
<tr>
<td>17-2072</td>
<td>Electronics Engineers, Except Computer</td>
<td>3,657</td>
<td>3,677</td>
<td>20</td>
<td>0.5%</td>
<td>2</td>
<td>74</td>
<td>168</td>
<td>244</td>
<td>$46.26</td>
</tr>
</tbody>
</table>

Lastly, it is worth noting that these impact numbers do not capture any catalytic effects from increased Broadband access, such as improvement in educational outcomes, increase in employment opportunities, access to new markets, etc.

Reference

The 5G Economy will have a significant impact on America's cities and towns, large and small. Over the next ten years, we will see benefits across the country, including 4.6M new jobs and $1.7T in economic growth.

### GDP Growth Statewide

<table>
<thead>
<tr>
<th>Metro Areas</th>
<th>GDP Growth</th>
<th>New Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akron, OH</td>
<td>2.0B</td>
<td>6.2K</td>
</tr>
<tr>
<td>Cincinnati, OH-KY-IN</td>
<td>8.3B</td>
<td>26.3K</td>
</tr>
<tr>
<td>Cleveland-Elyria, OH</td>
<td>6.5B</td>
<td>19.6K</td>
</tr>
<tr>
<td>Columbus, OH</td>
<td>8.2B</td>
<td>25.0K</td>
</tr>
<tr>
<td>Dayton-Kettering, OH</td>
<td>2.4B</td>
<td>6.7K</td>
</tr>
<tr>
<td>Toledo, OH</td>
<td>2.0B</td>
<td>6.1K</td>
</tr>
</tbody>
</table>

### New Jobs Statewide

<table>
<thead>
<tr>
<th>Congressional Districts</th>
<th>GDP Growth</th>
<th>New Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 01</td>
<td>4.3B</td>
<td>12.0K</td>
</tr>
<tr>
<td>District 02</td>
<td>2.2B</td>
<td>6.4K</td>
</tr>
<tr>
<td>District 03</td>
<td>2.9B</td>
<td>8.2K</td>
</tr>
</tbody>
</table>
## Appendix 2

<table>
<thead>
<tr>
<th>Congressional Districts</th>
<th>GDP Growth</th>
<th>New Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 04</td>
<td>1.8B</td>
<td>5.6K</td>
</tr>
<tr>
<td>District 05</td>
<td>2.5B</td>
<td>7.5K</td>
</tr>
<tr>
<td>District 06</td>
<td>1.2B</td>
<td>3.9K</td>
</tr>
<tr>
<td>District 07</td>
<td>1.6B</td>
<td>5.3K</td>
</tr>
<tr>
<td>District 08</td>
<td>2.0B</td>
<td>5.9K</td>
</tr>
<tr>
<td>District 09</td>
<td>1.5B</td>
<td>4.1K</td>
</tr>
<tr>
<td>District 10</td>
<td>2.4B</td>
<td>6.6K</td>
</tr>
<tr>
<td>District 11</td>
<td>2.3B</td>
<td>6.2K</td>
</tr>
<tr>
<td>District 12</td>
<td>2.6B</td>
<td>7.6K</td>
</tr>
<tr>
<td>District 13</td>
<td>885.2M</td>
<td>2.7K</td>
</tr>
<tr>
<td>District 14</td>
<td>2.6B</td>
<td>7.9K</td>
</tr>
<tr>
<td>District 15</td>
<td>3.2B</td>
<td>9.8K</td>
</tr>
<tr>
<td>District 16</td>
<td>2.5B</td>
<td>7.1K</td>
</tr>
</tbody>
</table>