INFORMATION TECHNOLOGY

Region 4
Talent Pathways Initiative
June 2025

GO VIRGINIA

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"On behalf of Brightpoint Community College, I want to sincerely thank the Go Virginia Region 4 Council for the opportunity to lead the Talent Pathways Initiative Planning for Advanced Pharmaceutical Manufacturing and Information Technology. No one group can do it alone, and I am especially thankful for the expansive network of representatives from the public, private, and nonprofit sectors whose valuable insights and support were fundamental to the preparation of these reports. Strong regional planning and collaborations lead to the growth of in-demand industries and sustained socioeconomic vitality, and Brightpoint is proud to be an active partner in the Central Virginia region's vibrant ecosystem."

—DR. BILL FIEGE, President, Brightpoint Community College

ACKNOWLEDGMENTS

This report was produced through the collaborative efforts of numerous organizations and individuals dedicated to strengthening the workforce and economic opportunities in GO Virginia Region 4. The research, analysis and findings presented in this report were developed as part of the GO Virginia Talent Pathways Initiative and reflect the invaluable input of stakeholders from education, industry and the economic development sectors.

We extend our sincere appreciation to the Region 4 Talent Pathways Initiative Advisory Board and partners for their insights and guidance throughout this process:

- Brightpoint Community College
- ChamberRVA
- Chesterfield County Economic Development
- City of Hopewell
- City of Petersburg
- City of Richmond Department of Economic Development
- CodeRVA Regional High School
- Commonwealth Center for Advanced Manufacturing
- Community College Workforce Alliance (CCWA)
- Community Foundation for a greater Richmond
- County of Prince George
- Dinwiddie County
- Grow Capital Jobs Foundation
- Greensville County
- Hanover County Economic Development
- Henrico County Economic Development
- J. Sargeant Reynolds Community College
- Maxx Potential
- Richmond Technology Council (RVA Tech)
- Virginia Gateway Region

This work would not have been possible without the time, expertise and perspectives shared by business leaders, education providers and workforce professionals who participated in interviews, roundtable discussions and data-collection efforts. Their contributions provided valuable context and helped shape the findings and recommendations in this report.

Finally, we recognize the dedicated efforts of all those involved in fostering a thriving talent ecosystem in GO Virginia Region 4. Through continued collaboration, we can build sustainable pathways that align workforce development with the evolving needs of the advanced pharmaceutical manufacturing and information-technology sectors.

SPECIAL THANKS

This project was funded in part by GO VIRGINIA, a state-funded initiative administered by the Virginia Department of Housing and Community Development (DHCD) that strengthens and diversifies Virginia's economy and fosters the creation of higher wage jobs in strategic industries.

We extend our deepest appreciation to the organizations that provided generous financial support for this initiative. Their investment in the future of workforce development and regional economic growth has made this work possible.

We are especially grateful to GO Virginia for its leadership and commitment to advancing talent development across the commonwealth. Additional financial support was provided by the Commonwealth Center for Advanced Manufacturing, the Community Foundation for a greater Richmond, ChamberRVA, Chesterfield County Economic Development, City of Richmond Department of Economic Development, Henrico County Economic Development, Hanover County Economic Development and Brightpoint Community College.

Their contributions reflect a shared dedication to building a strong, resilient and forward-looking GO Virginia Region 4 workforce.

METHODOLOGY

The Talent Pathways Initiative Report was completed in two phases, each addressing specific deliverables essential to understanding and supporting the regional IT workforce.

Phase One

The first phase focuses on gathering foundational data and insights, structured around four primary deliverables:

- A situational analysis of the region's IT employers and workforce needs.
- An asset map of the region's IT training resources, including career and technical education, workforce certifications and degree programs.
- An analysis of the occupational, skills and training gaps that could hinder growth in the IT sector.
- A development plan for the IT Talent Pipeline.

To meet these deliverables, an experienced external consultant with a background in workforce and education strategy conducted research. The approach included online research, surveys, stakeholder interviews and community discussions. Engagements involved diverse stakeholders, such as community members, economic-development professionals, industry representatives, employers, educators and the general public, and took place through individual interviews, small group sessions and professional meetings. These interactions informed the research direction and ensured a broad range of IT-related perspectives. This phase culminated in a draft report synthesizing the findings aligned with each project deliverable.

Phase Two

In the second phase, findings from phase one will be further refined through additional engagement with the IT community. This phase will invite stakeholders to review, provide feedback and contribute additional insights, ensuring comprehensive coverage of all relevant viewpoints and priorities. This collaborative review will also help to identify any overlooked gaps and allow for a reassessment and reprioritization of critical findings.

Given the broad scope of skills, talents and technological developments encompassed by the IT field, this methodology prioritizes inclusivity and thoroughness to create a report that accurately reflects the region's unique characteristics and workforce dynamics.

Community Contributions

This report reflects the generous contributions of insight and experience from numerous GO Virginia Region 4 stakeholders. With the support of Smart Resources Consultants, the Talent Pathways Initiative engaged a wide range of participants from the information technology sector, including business leaders, mid-level managers and end users. These voices were essential in shaping the findings and recommendations of this report.

In winter 2025, ChamberRVA and the Emporia-Greensville Chamber of Commerce helped reach an audience for a second survey. This expanded outreach helped ensure that our findings reflected the diversity of IT activity and regional workforce needs.

More than 80 individuals representing over 60 companies contributed through interviews, surveys and focus groups. While a full list of participating companies is typically expected in a report of this nature, many contributors, particularly those in mid-level roles, participated in an individual capacity rather than as formal representatives of their organizations. Several people in leadership roles requested anonymity due to internal company policies requiring legal or marketing review for external attribution. Due to these concerns, we have chosen not to include company names in this publication. We have requested and received input from many of those companies listed within the regional Chambers of Commerce.

We remain deeply grateful for the candor and engagement of all who shared their perspectives. An array of business leaders, educators, students and workforce professionals from across the region provided invaluable input that offered a broad and meaningful perspective of the IT talent landscape.

EXECUTIVE SUMMARY

Information Technology as an Educational Pathway and Economic Driver in GO Virginia Region 4

This report, developed through the GO Virginia Region 4 Talent Pathways Initiative (TPI), comprehensively analyzes the IT sector within the Greater Richmond region. It highlights workforce needs, educational assets and critical gaps that must be addressed to foster sustainable IT industry growth. The findings result from extensive stakeholder engagement, data analysis and regional economic and workforce research. They offer actionable recommendations for strengthening the region's IT talent pipeline.

Key Findings

1. Situational Analysis of the IT Workforce and Industry Needs

The IT sector in Greater Richmond is a vital economic driver, providing essential digital infrastructure, cybersecurity and software-development services across multiple industries, including finance, telecommunications and health care. Richmond has been identified as a top 50 tech talent market, with over 28,290 IT professionals and 2,355 annual IT graduates. However, despite these strengths, the region faces notable challenges:

- There is a significant split in the demand for supportive IT and computer science/high-tech roles within the workforce. This leads to an abundant workforce in some areas, but some specific roles lack a qualified and experienced workforce.
- A growing emphasis on artificial intelligence (AI), cloud computing and automation necessitates curriculum adjustments at educational institutions. Many businesses also want to blend in additional content including business, health care or finance.
- Employers prioritize experience and practical skills over formal degrees, with many hiring individuals from nontraditional IT backgrounds.

2. Asset Mapping of IT Training and Educational Resources

The region has a well-established educational ecosystem that supports IT workforce development, including community colleges, four-year universities, certification programs and specialized training initiatives. Notable assets include:

- Dual-enrollment programs and industry-recognized certifications in secondary education provide quick pathways for students still in high school.
- CCWA training programs provide rapid upskilling opportunities, and community colleges offer certificates, associate degrees and pathways for 2+2 program options. These programs include a range of IT-related offerings, such as cybersecurity, networking, programming and data analytics, designed in collaboration with industry to align with local workforce needs.
- Virginia's Tech Talent Investment Program aims to expand the IT workforce by producing 32,000 additional graduates in computer science and related fields over 20 years.

"Building a strong and sustainable talent pipeline is essential to fueling the long-term growth opportunities in biotechnology and IT. By fostering partnerships between business, education, and workforce development, we can align skills with industry needs and create pathways to meaningful, future-ready careers."

—DR. LORI J. DWYER,
Vice President of Academic Affairs,
Reynolds Community College

Despite these strengths, barriers to educational access persist, particularly in work-based learning experiences and the integration of AI and cloud-computing technologies into curricula.

3. Occupational, Skills and Training Gaps

Employers across the region report gaps in both technical and soft skills:

- Technical Gaps: Artificial Intelligence, cloud infrastructure, cybersecurity (including AI-driven security measures), modern software development frameworks and business IT automation.
- Soft Skills Gaps: Communication, critical thinking, adaptability and project management.
- Work-Based Learning Challenges: Many businesses struggle to offer meaningful internships and apprenticeships due to logistical constraints and onboarding complexities. These gaps highlight the need for education-industry collaboration to ensure students gain the skills required for the evolving job market.

4. IT Talent Pipeline Development Plan

To address the identified gaps and maximize economic opportunities in IT, the report recommends a regional IT Talent Pipeline Development Plan focusing on three key areas:

- Governance: Establish a centralized IT workforce coalition to align stakeholders, coordinate industry-education partnerships and advocate for funding.
- Education and Training: Expand K–12 IT integration, enhance community college IT offerings and develop stackable credentials to support lifelong learning.
- Experiential Learning and Workforce Alignment: Strengthen apprenticeship and internship models, incentivize employer participation and increase student access to real-world IT projects.

The region can secure its position as a leading IT hub by implementing a coordinated talent-development strategy that fosters collaboration between educational institutions and employers and embraces emerging technologies such as AI and cloud computing.

The Greater Richmond region stands at a critical juncture in IT workforce development. While the area boasts a strong foundation in IT education and industry presence, significant challenges must be addressed to ensure continued growth and global competitiveness. The region can secure its position as a leading IT hub by implementing a coordinated talent-development strategy that fosters collaboration between educational institutions and employers and embraces emerging technologies such as AI and cloud computing.

This report serves as a roadmap for policymakers, educators and industry leaders to create a robust, inclusive and forward-thinking IT workforce ecosystem that meets businesses' evolving needs and sustains regional economic prosperity.

INTRODUCTION

This report is the product of a regional partnership led by Brightpoint and Reynolds Community colleges and the CCWA and made possible by a GO Virginia Region 4 Talent Pathways Initiative grant. Additional support from regional civic and economic partners and advisers ensured the initiative's success. This report will explore the IT industry cluster in the Capital Region, identifying the talent gaps and the best pathway to leveraging various business, community and economic partners. The key foci for this report include:

- Situational analysis of the region's IT employers and workforce needs (TPI#1)
- Asset map of the region's IT training resources, including career and technical education, workforce, certifications and degrees (TPI#2)
- Analysis of the occupational, skills and training gaps that could hinder industry growth (TPI#3)
- Information Technology Talent Pipeline Development Plan (TPI#4)

What is Information Technology?

This document will look at several elements within IT. It will examine the entire sector, from supportive services and financial technology to high-tech and theoretical development. The region is, however, split into two main categories of IT. Supportive services, or supportive IT, includes many businesses that use technology in their daily operations, including finance, insurance, marketing and sales. On the computer science/high-tech side, there is development in data centers, creation and application of AI, and support for large businesses, which may require more coding, software development and cybersecurity.

This report will document IT's differentiation in one of two ways. Supportive services and applications of IT, including low-code and no-code enterprise business software, will be documented as supportive IT. When the document references the inclusion of high technology and theoretical applications, it will be referenced as computer science/high tech.

Supportive IT as an Educational Pathway and Industry Cluster

Supportive IT, an educational pathway that is distinct from computer science, provides a structured academic program to prepare students for careers in the supportive IT industry. This pathway covers a wide range of disciplines integral to computing and information systems, including:

- Computer Programming: Teaching programming languages and software development methodologies.
- Networking: Instruction on designing, implementing and managing computer networks.
- Cybersecurity: Training on methods to safeguard systems and data from cyber threats.
- Database Management: Providing skills to store, retrieve and manage data efficiently.
- Information Systems Analysis and Design: Developing abilities to assess business needs and design IT solutions.
- Emerging Technologies: Exploring areas such as AI, cloud computing and the Internet of Things.

Students in this pathway benefit from a blend of theoretical learning and practical experiences, including labs, internships and projects, to build critical thinking, problem-solving abilities and technical skills. Within GO Virginia Region 4, students often envision careers in IT sectors, such as finance, marketing, software development, consulting and data management.

As an industry cluster, supportive IT represents a geographically concentrated network of interconnected companies, suppliers, service providers and associated institutions within the IT sector. This cluster comprises diverse organizations, including:

- Software Development Firms: Creating applications, systems software and middleware.
- Hardware Manufacturers: Producing essential physical components such as computers, servers and networking equipment.
- IT Consulting and Services: Offering IT strategy, implementation and maintenance expertise.
- Finance and Data-Focused Businesses: Providing support for the flow of data within a business.
- Telecommunications Companies: Providing internet, phone and data communication services.
- Cybersecurity Firms: Specializing in the protection of information assets and risk management.
- Data Centers and Cloud Service Providers: Supplying infrastructure for data storage and cloud-computing services.

The supportive IT sector thrives on shared expertise, access to specialized suppliers, a skilled workforce, and collaborative innovation. This creates a competitive environment that drives technological advancement, productivity and economic growth. Governments and economic agencies often support IT clusters to stimulate investment, job creation and global competitiveness.

As this IT landscape evolves, there is a growing demand for specialists who integrate IT into core business functions, particularly for small and medium-sized businesses adopting low-code or no-code solutions. This change redefines IT from a supportive role to a strategic business asset.

With many regional students interested in enterprise software, expanding educational programs aligned with these interests is crucial. This would open pathways into emerging IT fields and reinforce the sector's role in economic development and digital transformation.

In some communities, this pathway may also be referred to as FinTech or InsurTech[1].

Computer Science as an Educational Pathway and Industry Cluster

The computer science educational pathway provides a rigorous academic foundation to develop expertise in computational problem-solving, software engineering and theoretical principles of computing. Unlike supportive IT, which often emphasizes practical application in business, computer science focuses on the core algorithms, logic and mathematical structures underlying computing systems. Students pursuing this pathway gain a deep understanding of both the theoretical and practical aspects of computer science, encompassing:

- **Algorithms and Data Structures:** Learning to organize and manipulate data to solve complex computational problems efficiently.
- **Software Engineering:** Covering the entire software development life cycle, from requirements gathering to design, coding and testing.
- **Operating Systems:** Studying how operating systems manage hardware, software resources and support applications.
- **Theory of Computation:** Exploring the mathematical foundations of computation, including logic, automata theory and computational complexity.
- **AI and Machine Learning:** Examining the tools and methodologies that enable machines to learn, adapt and perform intelligent tasks.

1 "Insurance Topics | Insurtech | NAIC."

- **Cybersecurity:** Focusing on the principles of secure system design, cryptography and methods to protect data integrity and privacy.
- **Emerging Technologies:** Exploring advancements in quantum computing, computer graphics and bioinformatics.

Computer science students are encouraged to engage in theoretical studies, hands-on projects, internships and research opportunities. This combination fosters critical thinking, analytical skills and technical expertise, equipping graduates to tackle complex problems and contribute to innovations across industries. In GO Virginia Region 4, computer science students are often interested in software development, data science, research and development, AI and cybersecurity.

As an industry cluster, computer science represents a concentrated ecosystem of interconnected organizations, research institutions, suppliers and service providers at the forefront of technology and computational science. The cluster includes a range of specialized entities, including:

- Software Development and Engineering Firms: Focused on creating and optimizing software for applications, operating systems and complex computational systems.
- Research and Development Labs: Corporate and academic labs dedicated to exploring cutting-edge fields such as AI, machine learning, quantum computing and computational biology.
- High-Performance Computing and Cloud Infrastructure Providers: Offering large-scale computing resources that enable data-intensive research, simulations and innovations. These efforts include regional work on mainframe systems for local businesses and security research. Cloud infrastructure can tie back to supportive IT as the industry evolves in storage and data transfer.
- Cybersecurity Firms: Specializing in advanced cybersecurity technologies, cryptographic solutions and secure system design to protect against sophisticated digital threats.
- AI and Machine Learning Companies: Developing tools and applications for AI-driven processes, predictive analytics and intelligent systems in industries such as health care, finance and manufacturing.

The computer science cluster thrives on shared expertise, a specialized workforce and collaborative R&D, fostering a competitive environment that drives technological advancement, productivity and economic growth. Recognizing its significance, governments and economic agencies often support this cluster through funding, incentives and policies that attract investment, create jobs and enhance global competitiveness.

As both an educational pathway and industry cluster, computer science is pivotal in driving technological progress, digital transformation and high-skilled employment. This network of businesses, academic institutions and government fosters a collaborative environment where technology advances to address global challenges.

With the industry's demand for specialists skilled in technical proficiency, interdisciplinary collaboration and computational applications, supporting educational pathways aligned with these needs is essential. Many regional students aspire to work in advanced computing environments, such as those at VCU with IBM Z16. Expanding access to fields such as AI, quantum computing and data science will strengthen the cluster's role in economic growth and technological innovation.

GO VIRGINIA REGION 4 — SITUATIONAL ANALYSIS FOR INFORMATION TECHNOLOGY

TPI#1: Situational analysis of the region's information technology employers and workforce needs

The Greater Richmond Region's IT and computer science sectors are broad, vibrant and rapidly expanding, positioning Richmond as a significant hub for tech-driven innovation and support across various industries. Richmond's IT and computer science industries provide critical support to companies large and small as they embrace digital transformation, encompassing a wide array of fields, including finance, telecommunications, marketing, internet publishing, data processing and media. As emerging fields like AI and virtual environments expand, Richmond's IT and computer science sectors will be essential to supporting and advancing these innovations.

Information Technology in Greater Richmond

Richmond's Information Technology sector is extensive and interwoven with the region's economic fabric, with IT roles frequently focused on providing supportive services to enhance operational efficiency across other industries. Major areas within the IT cluster include:

- Finance and IT Consulting: The finance industry is a key player in Richmond, with institutions such as Capital One leading the way in digital finance, risk management and data analytics. IT consulting firms support businesses with strategy, system implementation and IT maintenance, creating a tech-forward environment that drives success for regional companies.
- Telecommunications and Data Processing: Telecommunications providers, internet services and data-processing firms form another vital component of Richmond's IT cluster, ensuring that businesses stay connected, data remains accessible and communication channels are secure. This infrastructure supports the region's economic growth and is essential for service centers, data warehouses and cloud-computing facilities.
- Cybersecurity: Richmond's IT sector also includes specialized cybersecurity firms focused on securing sensitive information and managing security risks for organizations in the region. These firms are instrumental in protecting companies from digital threats, ensuring data privacy and safeguarding critical assets — a demand that is only growing as the region's digital footprint expands.
- Data Centers and Cloud Services: Richmond is also home to data centers and cloud-service providers that support the data storage and processing needs of industries in finance, retail and beyond. As companies expand their digital operations and data needs, these providers are crucial in maintaining smooth and secure information flow.[2]

The Greater Richmond region is emerging as an attractive location for data centers, driven by its strategic position along the East Coast and proximity to vital deep-sea fiber-optic cables that enhance connectivity. Data centers are known for their significant contributions to local tax revenues, which can bolster economic development and public services in host localities. This potential influx of revenue positions the region as a competitive site for large-scale technological infrastructure investment.

2 Tozzi, "Why Communities Are Protesting Data Centers — And How the Industry Can Respond."

However, the development of data centers also presents notable challenges. These facilities require substantial land and resources, including electricity and water, which can strain local infrastructure and raise environmental concerns. Additionally, while data centers provide significant economic benefits during construction, they generate relatively few permanent jobs once operational, leading some to question their long-term impact on workforce development.

Local opposition is another critical concern. Known as the Not In My Back Yard (NIMBY) phenomenon, this resistance stems from perceptions of construction-related disruptions, ambient noise from cooling systems and the visual impact of large industrial buildings. Balancing the economic advantages with community concerns will be essential as the region considers policies to attract and regulate data center development. Titled "Why Communities Are Protesting Data Centers — And How the Industry Can Respond"[3] by DataCenter Knowledge.

The Greater Richmond region can leverage its competitive advantages while fostering sustainable and community-supported growth by proactively addressing data center benefits and concerns.

Computer Science in Greater Richmond

Richmond's computer science sector is equally dynamic, marked by innovation and research and development (R&D) in emerging fields. In contrast to the applied focus of IT, computer science in Richmond often emphasizes foundational computing research and development, supporting innovations that influence sectors far beyond the region. Core areas within the computer science cluster include:

- Software Development and Engineering: Companies across Richmond are engaged in software development, creating applications, systems, and platforms that drive digital transformation. Firms like CarMax leverage software engineering to enhance business processes, from inventory management to customer experience, positioning Richmond as a significant player in software innovation.
- AI and Machine Learning: AI and machine learning companies contribute to Richmond's tech ecosystem by developing intelligent systems and data-driven applications. These companies support innovations like predictive analytics, automation and customer insights, enabling industries to gain a competitive edge. Groups such as AI in RVA are trying to establish the Richmond region as an AI hub

The Greater Richmond region is emerging as an attractive location for data centers, driven by its strategic position along the East Coast and proximity to vital deep-sea fiber-optic cables that enhance connectivity.

3 Tozzi.

- Cybersecurity and Cryptography: Richmond is also home to cybersecurity firms specializing in advanced data protection and secure system design, which are essential to safeguarding organizations across sectors, including health care, finance and government. Companies such as Dominion Power work to ensure that cyber threats do not pose a risk to energy needs within the region; others secure various forms of financial data, including Capital One.
- High-Performance Computing and Cloud Infrastructure: Richmond's high-performance computing and cloud infrastructure providers enable companies to perform data-intensive tasks and complex simulations, serving as the backbone for industries that rely on massive data-processing capabilities. Several companies working on projects such as this may use a local data center such as the QTS Data Center to host their computers and access the internet pipelines that run through Virginia.

Growth Opportunities and the Future

The Greater Richmond Region's tech sector is well-positioned to embrace growth opportunities in cybersecurity, data centers, customer service and support centers. The rise of virtual and AI technologies promise additional demand for skilled professionals and support services within IT and computer science, underscoring the region's potential to be a leader in digital transformation and innovation.

By defining Richmond's IT and computer science clusters as foundational to the local economy, it's clear that these industries are more than just supportive — they drive employment, economic growth and technological advancement across the region. As Richmond continues to attract tech talent and investments, the interconnectedness of these sectors will remain crucial to its success in the rapidly evolving digital landscape.

Regional Reports, Partner Data Sets and Inputs

Real estate firm CBRE published a report titled "Which are the top-ranked Tech Talent Markets?,"[4] which lists the Greater Richmond region in 2024 as a top-50 tech-talent market and home to more than 28,290 tech professionals. During the 2022-23 school year, the region graduated 2,355 IT students, according to the Virginia Office of Education Economics (VOEE)[5] trained in information technology, which includes advanced computer and IT skills from seven regional higher-education institutions. The 2,355 IT graduates listed are those who went through a State Council of Higher Education (SCHEV) reporting institution; there are others who graduated from private institutions, hold career studies certificates (143)[6] or passed certification tests on their own before procuring a terminal degree. Richmond Economic Development Office's reporting[7] also states that 44% of the region's tech talent identify as nonwhite. City and county economic development offices promote various incentives and innovation practices, helping grow tech-related businesses.

The Computing Technology Industry Association (CompTIA) Report "State of the Tech Workforce"[8] states that Virginia is in the top 10 of states by net tech employment job gains, second behind Florida in the number of new tech business establishments, number seven in tech economic impact and third for job postings for tech openings. Regarding the highest concentration of tech workers relative to overall employment in a region, Virginia is the third highest (8.9%) relative to other industry sectors. Looking at median tech occupation wages, Virginia is 146% higher than the median state wage.

4 "Scoring Tech Talent 2024."
5 "Virginia Post-Secondary Completion Dashboard — The Virginia Office of Education Economics."
6 "VA Education and Workforce Alignment Dashboard in IT — GOVA 4."
7 "Richmond Information Technology."
8 "State of the Tech Workforce Nationwide, State, Metro Area."

Brookings Workforce of the Future provides the Smart Growth Strategies: Industry Report for the Richmond MSA[9], which lists several potential areas for growth, including IT sectors. Their recommendations to ensure growth in the region within the IT market include areas in which the region may need to grow its tech-talent pathways. Their numbers are not the same as some of the data presented by VOEE, but they still represent a comparable set of data regarding growth in the sector. The five categories below represent jobs they identified as essential to tech growth and their predicted change over the next 10 years.

- Computer Programmers — 31
- Software Developers, Software Quality Assurance Analysts and Testers — 1,714
- Computer Network Architects — 112
- Computer Systems Analysts — 507
- Web Developers and Digital Interface Designers — 132

Brookings lists all of these roles as requiring a bachelor's degree.

According to the 33rd Annual Corporate Survey & the 15th Annual Consultants Survey[10], the No. 1 factor in the location decision considered "very important" or "important" by more than 90% of respondents is the availability of skilled labor. As a result, Virginia developed the Virginia Tech Talent Investment program as part of its bid to attract Amazon to the state for its second headquarters facility.

Virginia's Tech Talent Investment Program (initiated in 2018)[11] has a significant influence, although it is not exclusive to GO Virginia Region 4. The commonwealth of Virginia, donors and corporate partners are investing more than $2 billion to expand Virginia's tech-talent pipeline. This program supports pathways from community colleges through universities, including bachelor's and graduate degrees. It also supports the growth of internship programs, all aimed at graduating 32,000 additional students in computer science and related fields. The goal was to double the number of graduates in these programs each year.[12]

The support for the Tech Talent Investment Program comes from various sources; however, there is a wealth of companies within Virginia could contribute and support the initiatives to drive this ambitious goal and support internship opportunities for students choosing this pathway.

The Greater Richmond Partnership (GRP) is the regional economic development organization for the city of Richmond and Chesterfield, Hanover and Henrico counties. The GRP has worked to collect numbers that successfully represent the region's IT landscape and potential for growth in the sector[13].

- Richmond's metro region employs 660,000 people and 24,000 computer workers.
- 2,430 IT-related firms are in the greater Richmond region.
- Colleges produce over 33,800 computer and IT graduates annually within 150 miles of the region.
- The Interconnection hub on the eastern seaboard offers direct low-latency connectivity from four subsea cables (MAREA, BRUSA, SAEx, and Dunant).
- Electric service rates for industrial customers are 8 percent below the national average.
- The average annual wages for computer and mathematical occupations are about 17% lower than in Washington, DC.

9 "Smart Growth Strategies."
10 "33rd Annual Corporate Survey & the 15th Annual Consultants Survey."
11 "§ 23.1-1240. Tech Talent Investment Fund Created."
12 Harder and Wright, "Virginia's Big Bet on Tech Talent Is Working. Other Regions Are Watching Closely and Taking Notes."
13 "IT Industry | Greater Richmond Partnership | Virginia | USA."

Regional Economic Development Authorities and the Virginia Innovation Partnership Corp. present the region as ready to support IT-related businesses and expand to include growth and new businesses. Wages within the region and the IT industry sector are below national averages14. Average annual wages for computer and mathematical occupations are about 17% lower than in Washington, D.C. according to 2019 Chmura data reported in Greater Richmond Partnership documentation on Information Technology[14]. This could be a draw for new businesses and provide a range for growth.

One point about many jobs and wage averages is that as people advance through career pathways, many diverge from the Bureau of Labor Statistics classifications of a role, such as computer science, and may move more into a management role. This potential change in classification impacts all jobs/career pathways and will influence roles seen as middle and upper management within IT.

The Global Internet Hub (GIH)[15] is an initiative of RVA757 Connects16, a 501(c)(3) organization focused on advancing economic prosperity. By defining this joint venture between the RVA and 757 (the Hampton Roads area, which uses the area code 757) regions as a megaregion, it becomes more competitive. The GIH Council is responsible for implementing RVA757 Connects' Global Internet Hub Strategic Plan. Its work is to collect data for the collective region of Richmond and Hampton Roads. Combining the regions will make the RVA757 more competitive with other large national regions, the council contends. A megaregion that includes both the Greater Richmond and Hampton Roads regions can create additional growth opportunities in space, industrial support and educational pathways. It also puts the region in line with other larger potential competitors in terms of population and capacity to meet more considerable technology growth. This megaregion effort has identified that the Richmond/Hampton region's 10-year annual IT growth rate is below that of direct competitors and the national average.

The rise of virtual and AI technologies promise additional demand for skilled professionals and support services within IT and computer science, underscoring the region's potential to be a leader in digital transformation and innovation.

14 "IT Industry | Greater Richmond Partnership | Virginia | USA"
15 "Global Internet Hub."
16 "RVA757 Connects."

The Interstate Highway 64 Innovation Corridor, comprising the Greater Richmond area and Greater Hampton Roads region, projected that the number of new IT jobs over 10 years would be 5,599. If you include those leaving the workforce (11,226) and those moving beyond a particular role (19,629) over the next 10 years, the Richmond/Hampton region will need to fill 36,454 positions

The tech demand assumes that businesses will continue to grow in the region. Given the growth and support within the IT sector statewide, Richmond is poised to see increased development. The region's comparable markets have started to see this growth, and they lack Richmond's proximity to the transatlantic cables, existing technological industry growth in Data Centers and investments such as the Virginia Tech Talent Investment Program17.

The following two charts are either from the Virginia Office of Education Economics (High Demand Occupations Dashboard) or have been redeveloped using data from the dashboard18,19. The data is based on historical inputs and includes supportive IT and computer science/high-tech roles, which are included in the IT Career Cluster. Full IT inclusion could potentially conflict with some of the data presented by JobsEQ and Lightcast as well as GIH research findings. Their data does not include all of the roles listed within VOEE datasets (which includes more supportive IT roles).

Statewide Information Technology High-Demand Jobs with Five-Year Projections

Current View
(●) 2024 High Demand
( ) All Virginia Occupations

Select Additional Filters

Region Type	Region Name	VOEE Career Cluster	VOEE Career Pathway	Typical Entry-level Education
Statewide	All	Information Technology	All	All
High Demand Occupations	**FastForward (FF) Funding Eligibility**	**G3 Funding Eligibility**	**STEM Occupations**	**Active Registered Apprenticeship**
All	All	All	All	All

2024 High Demand: 361 Occupations

Occupation (SOC Code and Occupation Description)	High Demand	Funding FF	Funding G3	STEM Occupations	Registered Apprenticeship	▲ Workforce ▼ Current Year	▲ Avg. Annual Openings ▼ 5 Yr Projection	▲ Workforce Change ▼ 5 Yr Projection (●) # ( ) %	▲ Median Earnings ▼ Current Year
15-1252 Software Developers	✓	✓	✓	S&E	✓	90,021	7,975	8,681	$130,899
13-1161 Market Research Analysts and Marketing Special..	✓					25,414	3,191	2,841	$67,641
13-1082 Project Management Specialists	✓	✓	✓		✓	32,750	2,994	1,409	$102,747
15-1232 Computer User Support Specialists	✓	✓	✓	S&E	✓	24,206	2,213	1,346	$60,461
15-1211 Computer Systems Analysts	✓	✓	✓	S&E		25,561	2,081	1,091	$105,948
15-1212 Information Security Analysts	✓	✓	✓	S&E	✓	19,150	1,889	2,150	$130,091
15-1299 Computer Occupations, All Other	✓	✓	✓	S&E	✓	16,895	1,516	1,275	$119,547
15-1244 Network and Computer Systems Administrators	✓	✓	✓	S&E	✓	16,738	1,243	240	$103,698
15-1253 Software Quality Assurance Analysts and Testers	✓	✓	✓	S&E		8,627	782	707	$105,558
15-1231 Computer Network Support Specialists	✓	✓	✓	S&E	✓	7,110	637	317	$78,088
15-2051 Data Scientists	✓			S&E		5,089	577	928	$131,978
15-1254 Web Developers	✓	✓	✓	S&E		5,499	521	478	$97,333
15-1243 Database Architects	✓	✓	✓	S&E		6,856	511	99	$127,151
15-1255 Web and Digital Interface Designers	✓	✓	✓	S&E		4,175	457	456	$74,197
15-1242 Database Administrators	✓	✓	✓	S&E	✓	5,681	433	142	$99,170

17 "§ 23.1-1240. Tech Talent Investment Fund Created."
18 "High Demand Occupations for IT — State Level."
19 "High Demand Occupations in IT — Richmond MSA."

In Virginia, workforce change during the next five years in the top 15 high-demand jobs within the VOEE Career Cluster of Information Technology, could equal 27,020 annual job openings and 22,160 new positions.

The following chart includes all IT jobs for the Richmond MSA. The two roles listed that are not considered in high demand are computer network architects and computer programmers.

Richmond Virginia MSA Information Technology Jobs with Five-Year Projections

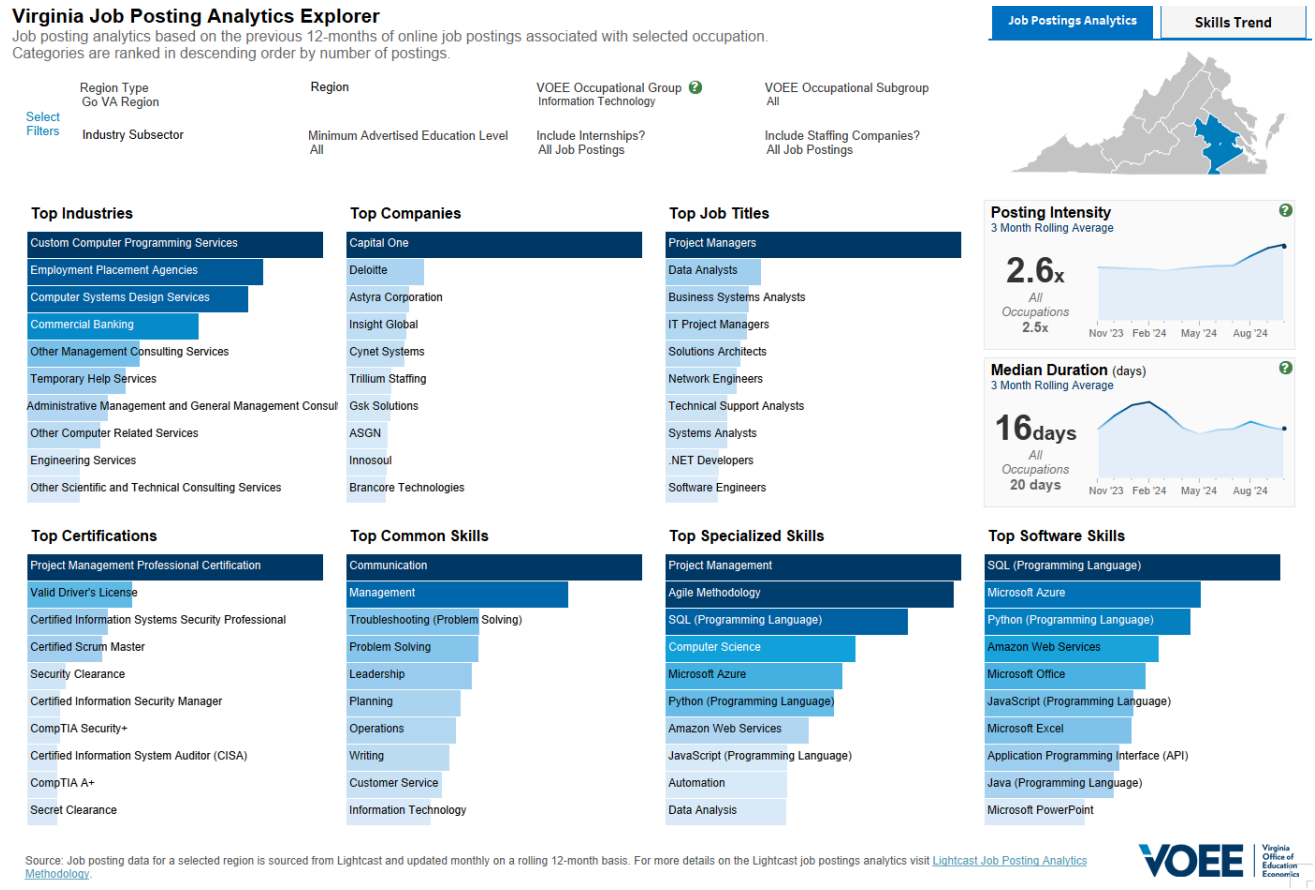
Virginia 2024 High Demand Occupations Dashboard - including all VOEE Information Technology Career Cluster Roles				RVA MSA				
SOC Code	SOC Name	Typical Entry Level Education	VOEE Career Pathway	Average Annual Openings Next 5 Yrs	Workforce Change 5 Year Projection	Workforce % Change 5 Year Projection	Workforce Current Year	Median Annual Earnings
15-1252	Software Developers	Bachelor's degree	Programming and Software Development	684	637	7.8%	8,154	$122,322
13-1161	Market Research Analysts and Marketing Specialists	Bachelor's degree	Information Support and Services	517	394	9.2%	4,276	$64,099
13-1082	Project Management Specialists	Bachelor's degree	Information Support and Services	410	171	3.7%	4,589	$87,071
15-1232	Computer User Support Specialists	Some college, no degree	Information Support and Services	264	59	1.9%	3,188	$54,052
15-1211	Computer Systems Analysts	Bachelor's degree	Programming and Software Development	250	39	1.2%	3,348	$101,814
15-1244	Network and Computer Systems Administrators	Bachelor's degree	Network Systems	131	-5	-0.3%	1,851	$95,322
15-1212	Information Security Analysts	Bachelor's degree	Network Systems	129	127	9.2%	1,386	$112,539
15-1299	Computer Occupations, All Other	Bachelor's degree	Information Support and Services	123	95	6.7%	1,416	$89,058
15-1231	Computer Network Support Specialists	Associate's degree	Network Systems	78	12	1.3%	937	$68,430
15-2051	Data Scientists	Bachelor's degree	Information Support and Services	75	104	14.5%	719	$119,781
15-1253	Software Quality Assurance Analysts and Testers	Bachelor's degree	Information Support and Services	68	52	6.6%	790	$98,029
			Programming and Software Development	68	52	6.6%	790	$98,029
15-1241	Computer Network Architects*	Bachelor's degree	Network Systems	59	-12	-1.3%	894	$121,560
15-1254	Web Developers	Bachelor's degree	Web and Digital Communications	55	48	8.0%	592	$86,296
15-1255	Web and Digital Interface Designers	Bachelor's degree	Information Support and Services	55	51	9.9%	513	$75,271
			Web and Digital Communications	55	51	9.9%	513	$75,271
15-1242	Database Administrators	Bachelor's degree	Network Systems	45	4	0.7%	613	$94,592
15-1243	Database Architects	Bachelor's degree	Information Support and Services	42	-1	-0.1%	580	$135,698
			Network Systems	42	-1	-0.1%	580	$135,698
15-1251	Computer Programmers*	Bachelor's degree	Programming and Software Development	32	-13	-2.9%	438	$95,208
Totals				3,182				
	* Not listed as High Demand, but within the Career Cluster							

- In the Richmond MSA, the current IT-related workforce is 36,168, with an expected average annual opening of 3,182[20].
- Richmond's expected annual openings in IT (3,182) nearly reflect the numbers shared by JobsEQ and Lightcast projections, with RVA 757Connects at 3,645[21]. This should also include the Hampton MSA. The difference is that the VOEE data includes a broader range of roles and covers supportive IT (IT more focused on business development, insurance, finance and marketing). The field is growing, not just in high tech, but also in supportive IT.

20 "High Demand Occupations in IT — Richmond MSA."
21 "Tech Job Education Pipeline vs Demand."

Job Posting Analytics — who is hiring and what skills are they seeking

GO Virginia Region 4 Job Posting Analytics



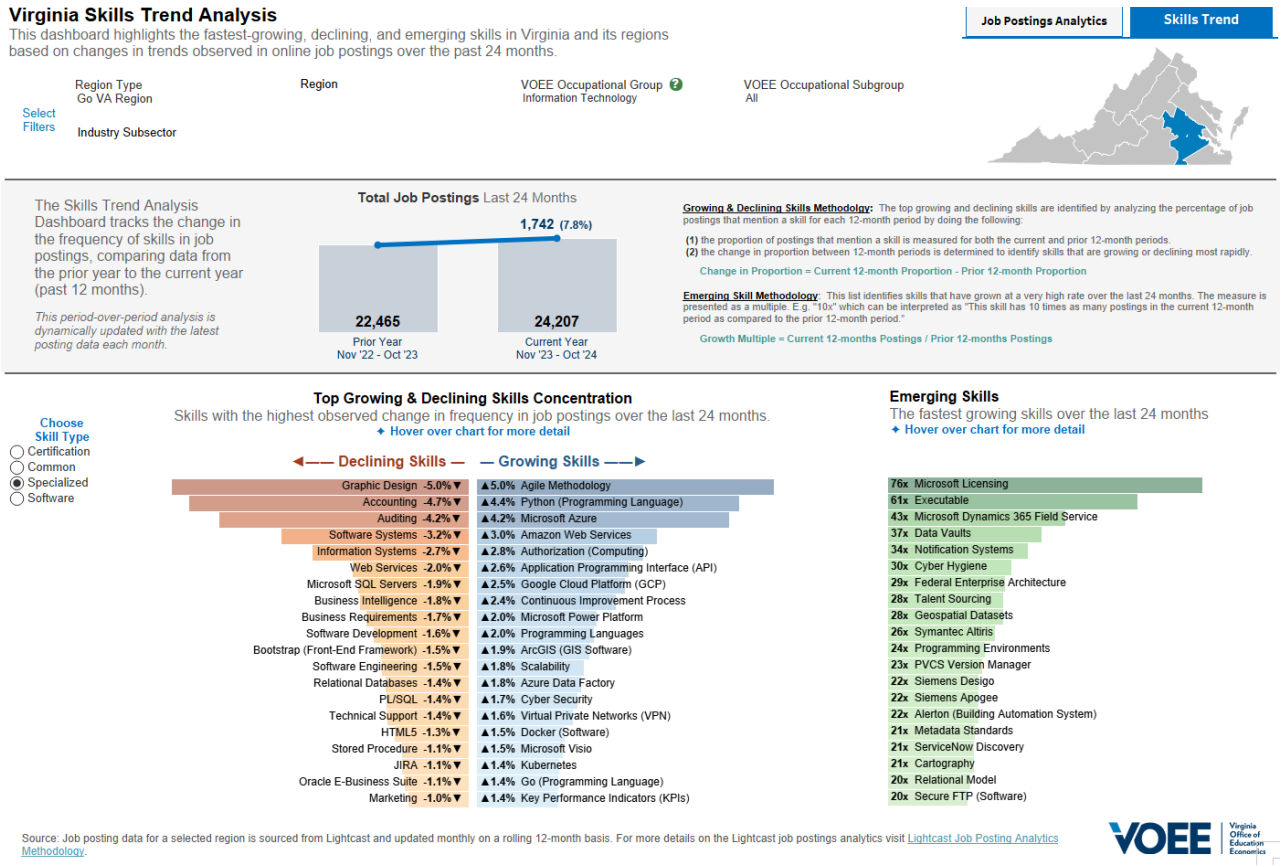
According to analytics information[22], most requirements are beyond an associate degree (e.g., in project management), which means that educational institutions need to prepare students for 2+2 programs or help them develop valuable work experiences that would assist them in garnering the necessary skills to successfully apply for these positions. The region has identified a need for experienced IT staff to fill many of these roles, a point reiterated in a majority of surveys and interviews.

According to CompTIA data[23] on the Richmond MSA, the region is more open to hiring individuals who don't possess a four-year degree. This is in contrast to VOEE Job analytics information that suggests most positions could require a bachelor's or greater.

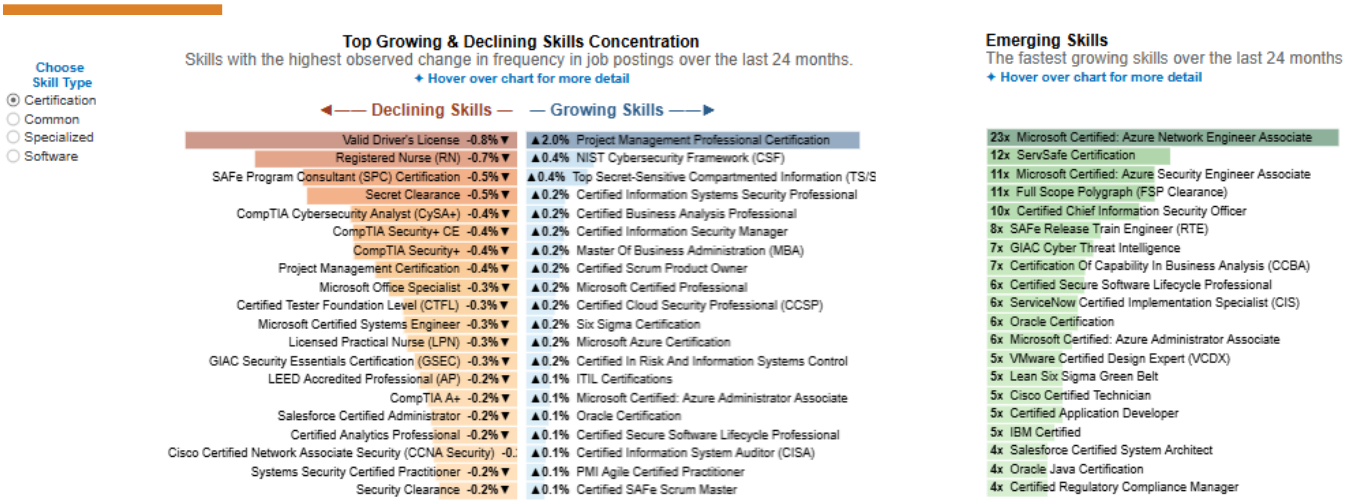
In interviews and surveys, many businesses claim that experience or "fit" for their community or office culture is more important than having a four-year degree; however, the competition is significant. Many IT-related and non-IT university graduates are filling first-time computer-oriented positions. *More details are provided in the report on page 30.*

22 "VA Job Posting Analytics Explorer on IT — GOVA 4."
23 "State of the Tech Workforce Nationwide, State, Metro Area."

GO Virginia Region 4 Job Postings Skills Trends



The VOEE Skills Trends chart[24] represent a change in the skills needed for newer roles being advertised. The chart will help educational institutions maintain pathways for students who meet the needs of regional businesses. Exploring the dashboard[25] further will provide a more detailed exploration of certifications or software changes within the marketplace.



24 "VA Skills Trend Analysis in IT – GOVA 4."
25 "VA Skills Trends Top Growing and Declining Skills in IT – GOVA 4."

Looking at Virginia-wide data, the SCHEV report (from February 2024) on *Progress in Meeting Degree Production in Data Science & Technology, Education, Healthcare, and Science & Engineering*[26] (below) shows growth in data science and technology. The IT career pathways are all listed within the data science and tech category. In the Expected Annual Change Over Base Year 2017 chart, not all graduation goals are being met; however, degrees in the more traditional IT sector are. The Total Degrees Awarded chart shows the number of degrees awarded statewide between 2017 and 2023, and includes the two-digit CIP codes, which help define data science and tech as the category most relevant to this report's pathways research. The Annual Degrees Awarded by Area chart indicates consistent growth for data science and tech sector degrees, statewide.

Total Degree Awarded between 2017 and 2023

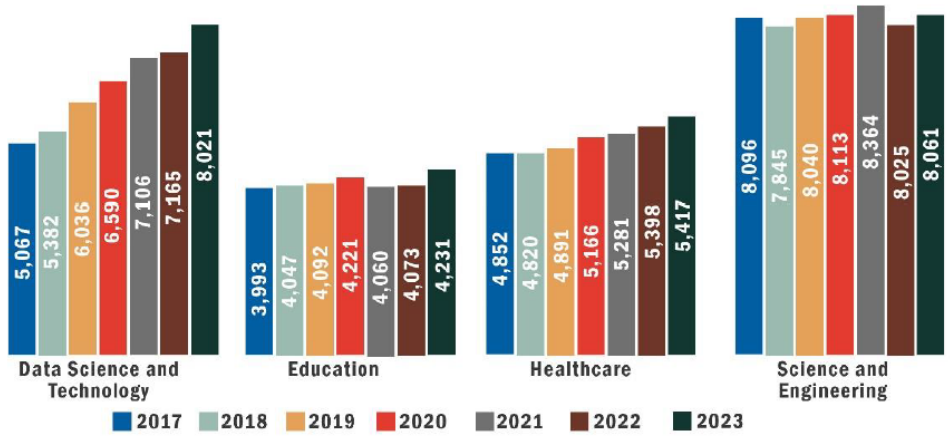
Table 1. Total Degrees Awarded between 2017 and 2023

Area (2 Digit CIP Code)	2017	2018	2019	2020	2021	2022	2023
Data Science and Tech (11,14,27,52)	5,067	5,382	6,036	6,590	7,106	7,165	8,021
Education (13)	3,993	4,047	4,092	4,221	4,060	4,073	4,231
Healthcare (51)	4,852	4,820	4,891	5,197	5,329	5,466	5,417
Science and Engineering (14*)	8,099	7,847	8,043	8,114	8,365	8,027	8,061
Grand Total	**22,011**	**22,096**	**23,062**	**24,122**	**24,860**	**24,731**	**25,730**

*Excludes CIP 14.0901, 14.0903, and 14.1001 as they are reported as data science and technology degrees.

Annual Degrees Awarded by Area

Chart 1: Annual degrees awarded by area

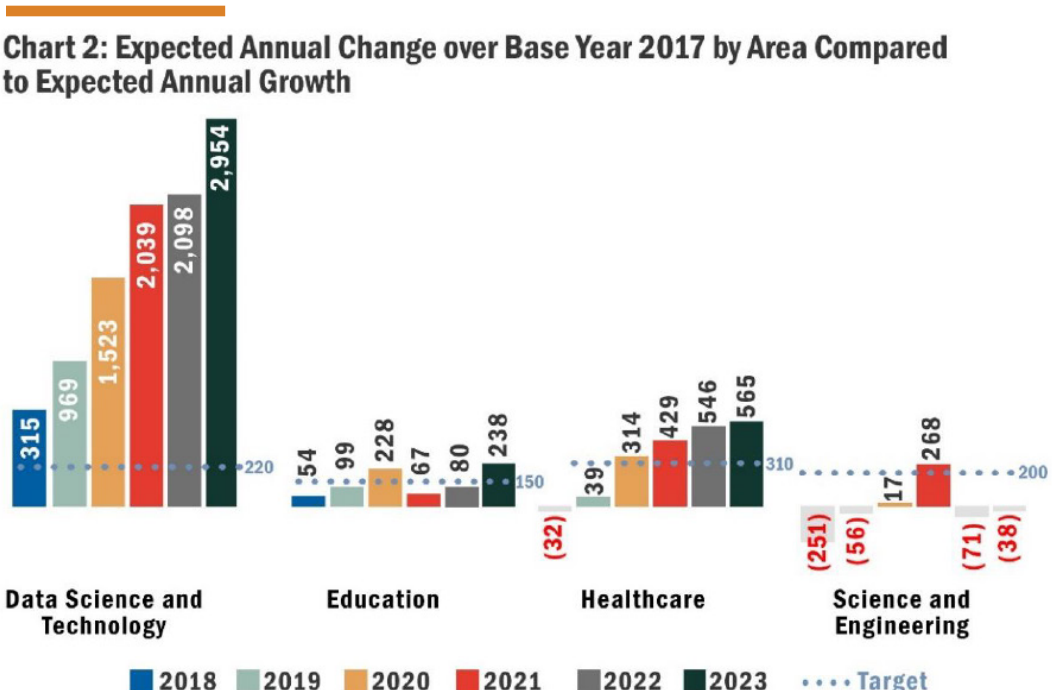


*Excludes CIP 14.0901, 14.0903, and 14.1001 as they are reported as data science and technology degrees.

26 "Progress in Meeting Degree Production in Data Science & Technology, Education, Healthcare and Science & Engineering."

The following chart (Expected Annual Change Over Base Year 2017 by Area Compared to Expected Annual Growth) shows expected growth versus the growth that has occurred since the base year of 2017. The growth in data science and tech has met and exceeded original expectations.

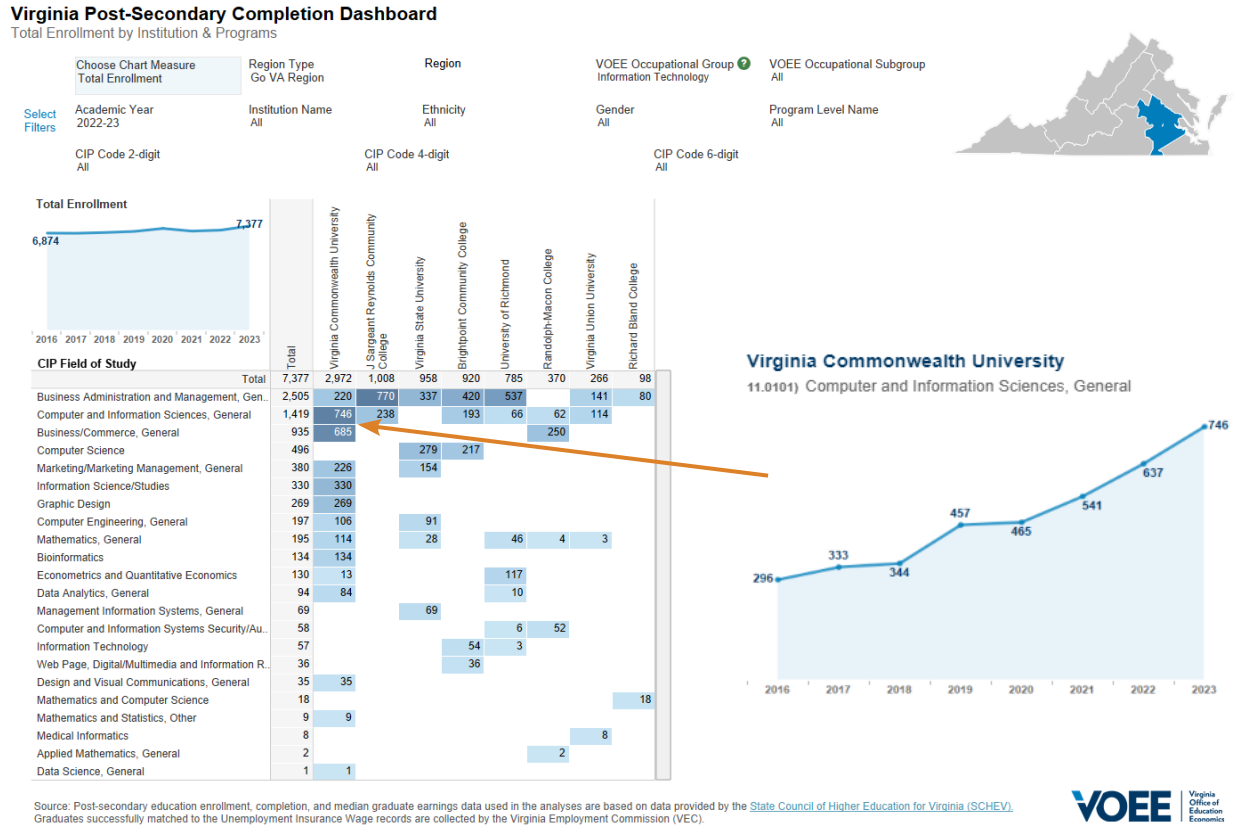
Expected Annual Change Over Base Year 2017 by Area Compared to Expected Annual Growth



Data from the Virginia Office for Educational Economics – Postsecondary Completion Dashboard, indicates that VCU is seeing growth in computer and information sciences enrollment (296 in 2016 versus 746 in 2023)[27]. *[VCU was used as an example, since it was the largest IT-related educational pathway within the region].* The results could be partly due to a couple of factors. The Virginia Tech Talent Investment Program may have influenced this change, but the data dovetails with the announcement that Amazon was seeking a second headquarters. In 2017, Amazon announced its opening for bids on the HQ2 facility, and Virginia won the bid in 2018; it opened in 2023. The Amazon announcements were considered a factor when students were looking into potential career pathways, and this may have swayed some students to consider IT as a field within the state, especially since it looked as if the job market was going to expand, not only with Amazon but related and supporting businesses.

27 "VA Post-Secondary Completion Dashboard for IT (Enrollment) — GOVA 4."

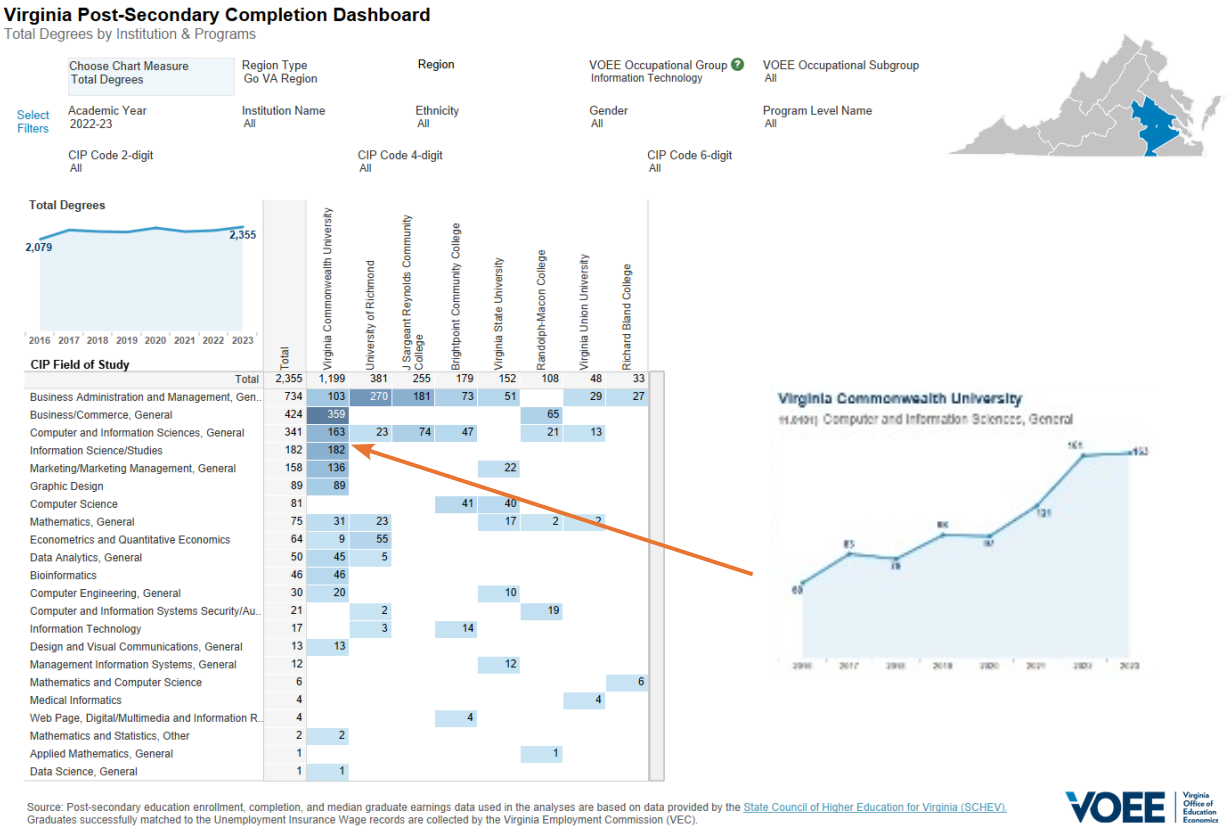
GO Virginia Region 4 Post-Secondary Completion for Information Technology
(first chart showing enrollment, second chart showing total degrees)



The chart shows an enrollment growth from 296 students in 2016 to 746 students in 2023 — a 252% growth. The same dashboard can be used to show degrees offered instead of enrollment[28]. It shows a successful climb in degrees offered, from 60 in 2016 to 163 in 2023 — a 271% growth.

The chart shows an enrollment growth from 296 students in 2016 to 746 students in 2023 — a 252% growth.

28 "VA Post-Secondary Completion Dashboard for IT (Degrees) — GOVA 4."



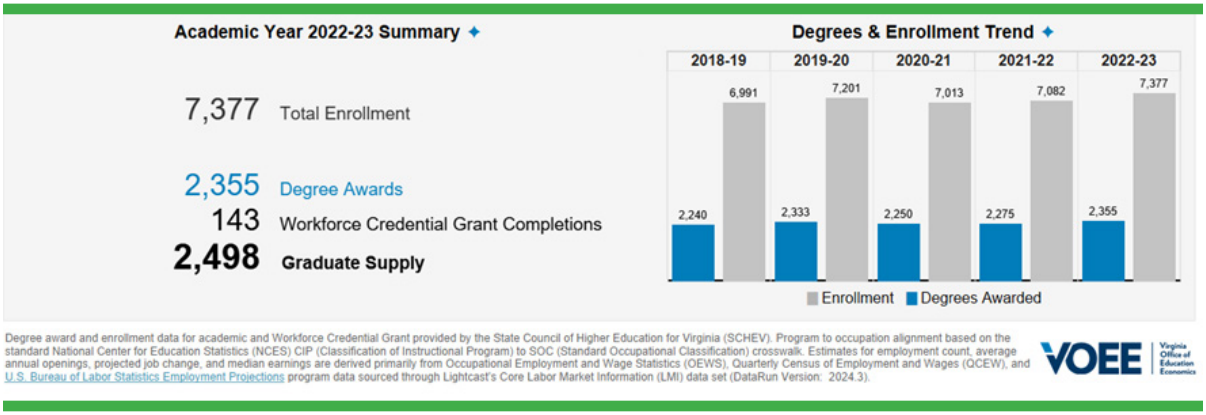
The chart above shows that the SCHEV reporting institutions had 2,355 graduates in an IT-related field during the 2022-23 school year.

The chart above shows that the SCHEV reporting institutions had 2,355 graduates in an IT-related field during the 2022-23 school year. The degrees account for the range of terminal degrees from associate through graduate school. It also includes the full range of IT-related degrees categorized under VOEE's IT occupational group from GO Virginia Region 4 institutions. It does not include people who may immigrate. It also does not include several other regional IT training options, including community college certification programs (143 students during the 2022-23 school year), training/apprenticeship programs such as Maxx Potential and other online or bootcamp options.

"Students need opportunities to apply the skills and talents that they have developed in the classroom. We value our relationships with external partners who can help provide experiential learning opportunities for our students including internships, class projects, and extracurricular activities."

-DR. PAUL BROOKS,
Department Chair and Professor,
Information Systems, VCU School of Business

A comparison of enrollment versus degrees (for all levels of a terminal degree measured by SCHEV) can be found in the VOEE Education and Workforce Alignment Dashboard.[29]



The numbers above also do not represent programs such as the Community College Workforce Alliance, which offers additional programs and certifications within the IT field. More enrollees complete the program than earn a full credential, which requires passing the certification exam. Over 90% of students enrolled in IT-related programs complete the program, but only about a fifth receive the full credential. The VOEE data above counts credential completers as those who finish the course and pass the exam. Many completers (not credentialed) enrollees successfully find entry-level work in their field.

29 "VA Education and Workforce Alignment Dashboard in IT — GOVA 4."

The VOEE Chart below includes a broad range of IT-related degrees. This chart is a compilation of two SCHEV reports (E01[30], C01A2[31]) on enrollment and completion, pulled together to represent the GO Virginia Region 4 post-secondary institutions that provide program options more directly tied to IT's computer science and high-tech program options. It also eliminated some of the data on VOEE IT that include business and marketing.

The data shows that there were 779 completers/graduates in the 2023-24 school year. According to the VOEE High Demand Dashboard, the largest annual hiring at this higher-tech level will be for software developers, with average annual openings predicted to be 684. Project management is the next highest high-tech opening, at 410. Annual average hiring predictions by VOEE can be found on page 18.

Information Technology Enrollment (all enrolled by Fall 2023) and Completion (2023-24 SY)

GO Virginia Region 4 Institutions

Institution	Program	Cert Enroll	Cert Award	Assoc. Enroll	Assoc. Deg.	Bach. Enroll	Bach. Deg.	Post Bach. Enroll	Post Bach. Deg.	Masters Enroll	Masters Deg.	Dr. Enroll	Dr. Deg.	Total Enroll	Total Deg.
All Students															
RMC	Computer and Information Sciences, General, (11.0101)	0	0	0	0	71	14	0	0	0	0	0	0	71	14
RMC	Computer and Information Systems Security/Auditing/Information Assurance, (11.1003)	0	0	0	0	64	15	0	0	0	0	0	0	64	15
UofR	Computer and Information Sciences, General, (11.0101)	0	0	0	0	86	36	0	0	0	0	0	0	86	36
UofR	Computer and Information Systems Security/Auditing/Information Assurance, (11.1003)	1	1	0	0	15	5	0	0	0	0	0	0	16	6
UofR	Data Analytics, General., (30.7101)	11	7	0	0	4	2	0	0	0	0	0	0	15	9
UofR	Information Technology, (11.0103)	0	0	0	0	8	1	0	0	0	0	0	0	8	1
VCU	Computer and Information Sciences, General, (11.0101)	0	0	0	0	887	133	21	33	31	16	29	5	968	187
VCU	Computer Engineering, General, (14.0901)	0	0	0	0	150	22	0	0	0	0	0	0	150	22
VCU	Data Analytics, General., (30.7101)	0	0	0	0	0	0	0	0	84	47	0	0	84	47
VCU	Information Science/Studies, (11.0401)	0	0	0	0	306	135	6	1	57	29	0	0	369	165
VSU	Computer Engineering, General, (14.0901)	0	0	0	0	120	9	0	0	0	0	0	0	120	9
VSU	Computer Science, (11.0701)	0	0	0	0	306	24	0	0	21	7	0	0	327	31
VUU	Computer and Information Sciences, General, (11.0101)	0	0	0	0	101	19	0	0	0	0	0	0	101	19
Southside CC	Computer and Information Sciences, General, (11.0101)	14	29	74	10	0	0	0	0	0	0	0	0	88	39
Reynolds CC	Computer and Information Sciences, General, (11.0101)	96	37	212	38	0	0	0	0	0	0	0	0	308	75
Brightpoint CC	Computer and Information Sciences, General, (11.0101)	47	11	201	36	0	0	0	0	0	0	0	0	248	47
Brightpoint CC	Computer Science, (11.0701)	0	0	217	41	0	0	0	0	0	0	0	0	217	41
Brightpoint CC	Information Technology, (11.0103)	0	0	64	16	0	0	0	0	0	0	0	0	64	16
		169	**85**	768	**141**	2118	**415**	27	**34**	193	**99**	29	**5**	3304	**779**

(This is more refined look at more specific high-tech IT degrees)

30 "E01."
31 "C01A2."

The data presented outlines the enrollment and completion rates for IT-related programs across GO Virginia Region 4 institutions, as reported by the SCHEV. These programs include:

- Computer and Information Sciences, General (11.0101)
- Information Technology (11.0103)
- Information Science/Studies (11.0401)
- Computer Science (11.0701)
- Computer and Information Systems Security/Auditing/Information Assurance (11.1003)
- Computer Engineering, General (14.0901)
- Data Analytics, General (30.7101)

Key Definitions:

1. Enrollment: The total number of students enrolled in a program as of fall 2023, spanning all levels (e.g., certificate, associate, bachelor's, master's, doctorate).

2. Completion: The number of students who completed a program and received a degree or certificate by the end of the 2023-24 academic year.

Important Considerations:

- Cohort Variation: Enrollment figures include students across multiple academic years. For example, a bachelor's program typically spans four years, so fall 2023 enrollment encompasses students from different cohorts (first-year to senior level). This means that annual completions will naturally represent a fraction of total enrollments.
- Program Differences: Some programs, such as associate degrees or certificates, may allow enrollment at specific academic stages (e.g., sophomore or junior year). Others might cater to working professionals seeking specific courses or certifications without pursuing a full degree.
- External Factors: Various factors influence completion rates, including student decisions to pursue employment, changes in academic focus or opting for certifications instead of completing a degree.
- Potential Dropout Rates: Enrollment figures reveal a notable discrepancy compared to completion rates, which may reflect significant dropout rates. While not certain, this possibility highlights an area where additional support may be needed to ensure more students not only enroll but persist through their programs to graduation.

Example:

> At VCU, the computer and information systems program had 887 students enrolled as of fall 2023. By the end of the 2023-24 academic year, 133 students graduated with degrees, representing just under 15% of total enrollment. However, considering the typical four-year duration of the program, an annual graduation rate of 25% would be expected if all students graduated on time and remained enrolled. This data combined students at the bachelor's, master's and doctoral levels at VCU.

Implications:

The data provides valuable insights into the region's student interest and program demand. However, the gap between enrollment and completion underscores a potential challenge in retention. Supporting students through targeted interventions, such as enhanced advising, mentorship programs and academic resources, may help reduce dropout rates and ensure that a higher proportion of enrolled students successfully graduate. These efforts will be vital to addressing workforce needs and maximizing the region's talent pipeline.

When compared to state-level data, the graduation percentage is consistent, showing no significant variances; however, the numbers enrolled differ, showing some institutions drawing more potential students to specific programs, especially at the doctoral level. Hence, some candidates are drawn away from GO Virginia Region 4.

Not included in the data above was Richard Bland College, which offers a mathematics and computer science joint program (30.0801). The program had 66 enrollees and five completers in the 2023-24 school year. The program number did not match the other programs, so it was not included in the chart above, but it is worth mentioning its role in the educational pathway.

Understanding College Dropout Rates: Insights and Implications for IT/Computer Science Programs

Dropping out of college is a multifaceted issue affecting students across various disciplines[32,33,] including those studying IT and computer science[34,35]. Nationally, computer science is the program most often dropped[36]. According to Mission Graduate,[37] as of 2025, approximately 32.9% of college students drop out each year. Computer science had the highest dropout rate, with 10.7% (nationally); the second highest, at 7.7%, was advertising. General reasons for college attrition often intersect with specific challenges faced by IT/computer science students, creating a compound risk for dropout.

Key Reasons for College Dropout:

1. Financial Challenges: High tuition and living expenses force many students, especially first-generation and low-income individuals, to leave college prematurely.
2. Time Constraints: Balancing academics, work and personal responsibilities can be overwhelming, leading to burnout and disengagement.
3. Academic Difficulties: Students often struggle to meet rigorous academic demands, particularly when lacking adequate preparation.
4. Mental Health Issues: Stress, anxiety and other mental health challenges are increasingly cited as reasons for students discontinuing their studies.
5. Lack of Support: Limited emotional and academic support from family, friends or the institution can exacerbate feelings of isolation.

32 Mowreader, "Report."
33 "5 Reasons College Students Dropout... and How We Help!"
34 "Why Are so Many CS Majors Dropping Out...?"
35 "Why Is Computer Science the MOST DROPPED MAJOR?"
36 Kilroy, "What Is the Highest Dropout Rate by Major?"
37 Winograd, "College Dropout Rates 2025 (Statistics & Facts)."

Unique Challenges in IT/Computer Science Programs:

1. Misaligned Expectations: Many students enter IT/computer programs with misconceptions about the field, expecting hands-on programming rather than the heavy theoretical and mathematical focus these degrees often entail.
2. High Academic Rigor: The demanding curriculum, including advanced mathematics and complex programming assignments, can discourage students unprepared for the workload.
3. Assignment Fatigue: The intensive coursework and external pressures often lead to burnout.
4. Initial Unpreparedness: Some students struggle to adapt because they lack exposure to logic, programming or advanced mathematics before college.

Recommendations from the same articles include:

- Improve pre-enrollment counseling to align students' expectations with the realities of the program.
- Offer academic support tailored to IT/computer science, such as tutoring in programming and mathematics.
- Foster a supportive environment through mentorship programs, peer networks and mental health resources.
- Provide flexible learning options, such as part-time programs or online modules, to accommodate students with work or family obligations.

Pandemic Variables

Over the last five years, several academic programs have changed at regional institutions, but according to a SCHEV report,[38] general enrollment prepandemic and postpandemic is similar. Several higher education institutions, such as Brightpoint Community College, have shown a significant enrollment increase over the last couple of years, meeting and exceeding prepandemic numbers.

Migration Data

The Virginia Economic Development Partnership (VEDP) noted the net migration of 25- to 54-year-olds with bachelor's degrees. Net migration is determined by the difference between the number of people who moved to Virginia minus the number who moved out. VEDP found that in 2019, 7,271 people moved out of the state. The margin of error shows that the number could be as high as plus 3,063 (move in) or as low as minus 17,605 (move out). VEDP's analysis is at the 90% confidence interval. A higher confidence interval would produce a wider variation between the upper and lower estimates. (This comes from a 2021 SCHEV titled "Is Virginia Exporting More College Graduates That Importing?")[39]

Regional numbers show that 73% (plus or minus 20% unknown) of computer and IT support services graduates stay in Virginia. The state average in the same category shows a 65% (plus or minus 24% unknown) retention.

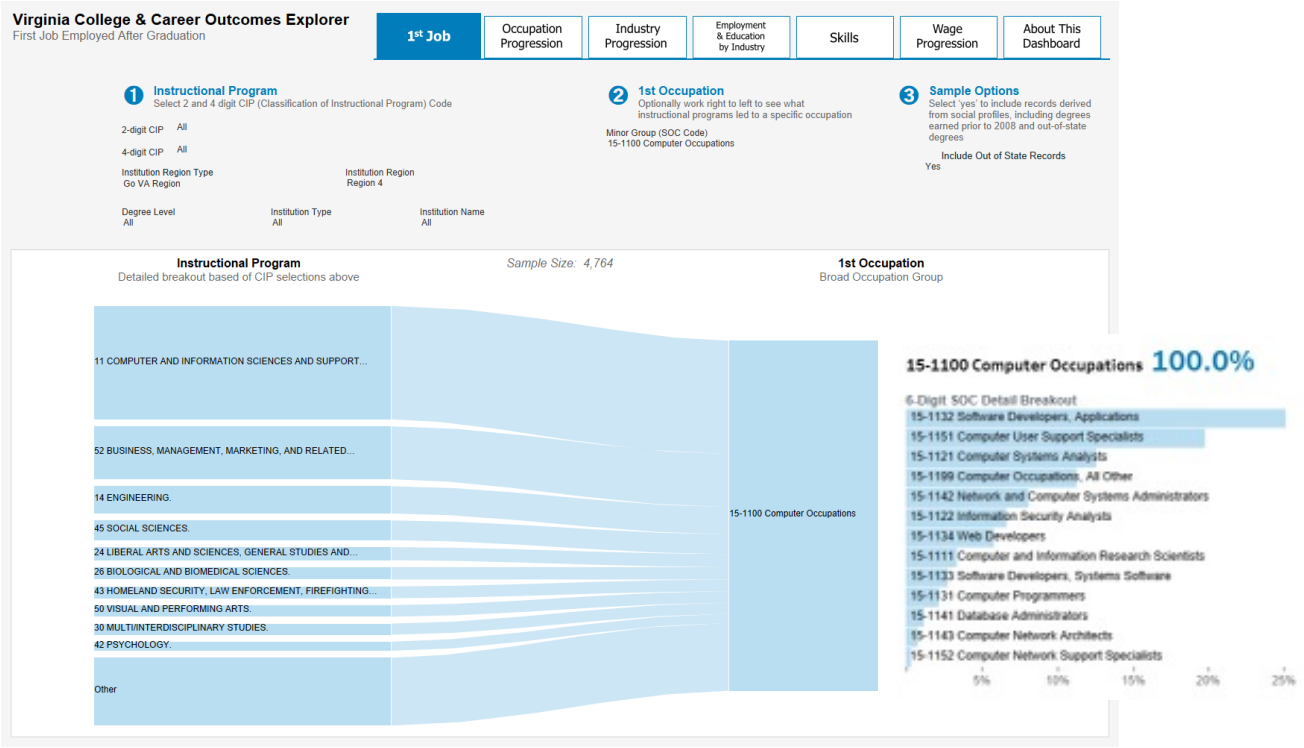
Projections for Enrollment — General Enrollment across all Postsecondary Institutions

According to the Weldon-Cooper Center projections, regional enrollment in postsecondary education will increase 10 years, 20 years and 30 years out. These numbers for GO Virginia Region 4 exceed state averages but fall behind Northern Virginia.[40] (https://research.schev.edu///rdPage.aspx?rdReport=Projections.GoVirginiaRegions).

38 Allison, "Enrollment Returns to Pre-Pandemic Levels."
39 Allison and Hankins, "Is Virginia Exporting More College Graduates Than Importing?"
40 "Regional Population Projections."

First Occupation Data Including Workforce Demand

The following chart shows the educational attainment of people whose first occupation is in IT (computer occupations)[41]. It shows where IT employees come from, which may impact how we view IT education.



Instructional Program (Background)	Percent of 1st Occupation (IT)
• Computer and Information Services and Support	32.4%
• Business, Management, Marketing and related	15.1%
• Engineering	7.8%
• Social Services	5.6%
• Liberal Arts and Science, General Studies	3.7%
• Biological and Biomedical Sciences	3.5%
• Homeland Security, Law Enforcement, Firefighting	3.4%
• Visual and Performing Arts	3.3%
• Multidisciplinary Studies	3.2%
• Psychology	2.6%
• Other	19.4%

41 "VA College & Career Outcomes Explorer in IT – GOVA 4."

The data from this chart shows that only 32.4% of those first entering the workforce in computer occupations were trained in computer and information sciences. Combining computer and information services, business management, marketing and engineering graduates, the total percentage of those entering the computer occupations workforce still comprises 55.3%. Nearly half of all people entering the occupations have followed other pathways.

Data from the VOEE indicates that the Richmond MSA has 3,182 annual job openings in the IT career cluster, while the region produces 2,355 IT-related graduates each year. Migration data shows that approximately 73% (plus or minus 20%) of these graduates remain in Virginia. This highlights a critical need to enhance training programs and support systems to retain students within their chosen educational pathways and the region.

A deeper analysis of entry-level roles in computer occupations reveals that only 32.4% of these positions are filled by individuals with computer or IT degrees. An additional 22.9% of roles are filled by those with degrees in related fields such as business, marketing or engineering. Combined, this accounts for 55.3% of the workforce in entry-level computer occupations. The remaining 44.7% of roles are filled by individuals without formal IT-related educational credentials (within a SCHEV reporting institution geographically located in GO Virginia Region 4), amounting to 1,422 positions annually. This leaves 1,760 open positions for 2,355 IT-related regional graduates, leaving 595 IT graduates seeking work outside of the estimated annual IT job openings in the Richmond MSA.

This data reveals a concerning trend: While the region meets workforce demand, it relies heavily on individuals from non-IT educational pathways. Furthermore, some IT graduates remain unemployed within the area, potentially indicating a mismatch between the skills taught in training programs and those sought by employers. This could be an opportunity to help “on-ramp” people within IT-related programs move their academic pathway towards a more rigorous program, providing them more employment options.

The gap between education and hiring practices is a common concern among businesses interviewed. Businesses state that soft skills are a significant issue. Many said they would instead hire an individual who fits the company culture and environment, shows drive and ambition and fits within the business team. Soft skills are a common issue across industries, but they seem more common within entry-level IT fields. The other common concern was experience; however, businesses interpreted experience very broadly.

Again, these numbers do not account for the estimated 143 IT program completers from community colleges and completers from other nonterminal degree offering options.

The following chart, part of the VA Post-Secondary Completion Dashboard, shows where most IT-related degrees come from and the average annual openings for IT-related positions. There is a heavy emphasis on business preparation for IT graduates and a high hiring rate within the marketing sector, which also seeks these skills.

This dashboard section shows that many students in IT-related educational programs are graduating with a business administration or business/commerce degree, with marketing also being in the top five; however, software developers are listed at the top for annual occupational openings within the field. The second largest yearly opening is in marketing. The roles between supportive IT and computer science/high tech are significant enough to see a need for division within the datasets.

Community Input

TPI staff and Smart Resources (smartva.net), a regional consulting agency, pulled together community input in fall 2024. Collectively, we reached out to over 600 people through emails, calls and LinkedIn. We had a response rate of nearly 10%, which is above the average rate for cold calls/contacts. The engagement included email surveys, interviews and four facilitated in-person sessions. When the second round of surveys in winter 2025 was created and delivered, with the help of TPI partners, ChamberRVA, and the Emporia-Greensville Chamber of Commerce, the total contacts exceeded 230 separate companies, with responses from over 90 companies. We have received multiple respondents from the same business in several cases, but 90 separate businesses have responded to the TPI inquiries.

> *Fall 2024 community input shows some strong bias, stating that many students are unprepared for the workforce; more IT jobs are being posted than filled by IT graduates. There was a greater number of interviewees from enterprise businesses and postsecondary programs working more closely with business-related technical programs, so there may be a tendency for the results to lean toward supportive IT.*

Based on a review of community input, four primary themes emerged regarding the education and employment gaps in the region's IT and computer science sectors. These insights reflect evolving industry demands and highlight areas where current educational pathways could better align with employer expectations.

1. The Decline of Traditional IT as a Specialized Field

Participants observed a gradual decline in IT as a standalone field, particularly in supportive IT roles, noting that traditional IT services are increasingly viewed as outdated. The term IT has evolved; as general IT literacy rises and AI and chatbots begin to handle basic support functions, traditional IT roles are perceived as diminishing. This evolution is causing fewer students in regional IT programs to secure employment directly tied to their field, as they often compete with graduates from varied academic backgrounds who can be trained in IT. This shift calls for adapting educational programs to meet the changing landscape of what is required in IT-related roles. One interview included a placement company where the owner stated that the company was behind if the candidates did not know how to use AI effectively.

2. Emphasis on Experience Over Formal Education

There was a strong consensus on the importance of practical experience, often viewed as more valuable than formal education alone. Participants stressed that IT professionals seeking employment need to highlight tangible experiences, such as developing a personal app, working on projects for civic organizations or contributing within a related field. However, the current internship model received mixed reviews, with many employers finding it burdensome, due to the short duration and onboarding requirements*. Internships are seen as valuable but often need more longevity to benefit both the intern and the organization effectively. This suggests exploring alternative experiential learning models, such as extended apprenticeships or co-op programs, that better serve students and employers.

* In one case, a person commented on the difficulty in getting work-based learning experiences for high school students and the difficulty for anyone under 18 meeting workplace guidelines. Employing a felon could prevent a minor from working at that organization. Several businesses stated that by the time security/background checks and job training were completed, the internship was almost over, limiting its value.

3. Demand for Business Acumen and Soft Skills

Nearly all participants, especially those involved in supportive IT, emphasized the need for IT professionals to possess business and soft skills. Beyond technical expertise, IT employees must understand how to apply their skills effectively within a business context. Proficiency with enterprise software (such as low-code or no-code platforms) and the ability to support office workflows are seen as critical. Soft skills, such as active listening, clear communication and the ability to present technical solutions persuasively, were cited as essential. Feedback from major businesses reinforced this point, noting that high-tech fields often prioritize candidates with proven business skills and are usually hired due to a positive consulting experience. Other businesses stated that it is easier to teach and support tech skills than it is to teach soft skills. This feedback underscores the importance of integrating business acumen and interpersonal skills into IT curricula.

4. Shift Toward Consulting Skills and the Consulting Mindset

As IT roles increasingly move toward a consulting model, graduates must enter the workforce with a consultant mindset. Employers in the region stressed that many IT professionals begin their careers in consulting, where they hone their technical and business skills through project-based work and certification pursuits. This pathway requires students to view their skills as marketable assets, positioning themselves as valuable contributors to larger project bids. It is essential to prepare students to work in teams, contribute specialized skills and understand their role within broader organizational goals. This shift could be particularly beneficial in helping students recognize their skillsets as integral parts of larger, interdisciplinary projects, enhancing their readiness for dynamic, consulting-based career paths.

These findings indicate a shift in regional workforce needs, calling for an evolution of IT and computer science education. Educational programs must reconsider how they prepare students for an industry that increasingly values experience, practical business skills, consulting capabilities and a dynamic approach to applying technology. By aligning curricula with these emerging demands, regional institutions can play a critical role in bridging education-employment gaps and ensuring that graduates are well-prepared for the future workforce.

Building on the insights from community participants regarding education and employment gaps, the analysis also reveals distinct technical and soft skills gaps that impact graduates' job readiness. These gaps suggest that while foundational IT skills are often present, specialized technical knowledge and essential soft skills require further development to align graduates with industry expectations.

Technical Skills Gaps

1. Cloud and Hybrid Infrastructure

   Employers identified a pressing need for graduates proficient in hybrid and cloud-based infrastructure management, specifically in cloud automation, orchestration and containerization. Educators also acknowledged this gap, emphasizing the importance of hands-on experience with cloud environments as an area where graduate preparedness often needs to improve.

2. Software Development Frameworks

   Competency in modern software development frameworks, such as .NET Core and full-stack development, was a recurrent theme among employers. Businesses seek graduates who can confidently work within contemporary development platforms, highlighting the demand for a curriculum with up-to-date programming frameworks and real-world applications.

3. Cybersecurity

   Cybersecurity skills, especially those integrating AI applications, are increasingly critical. Employers underscored the importance of knowledge in areas such as data classification, identity management and AI-driven security tools. As cyber threats evolve, understanding fundamental cybersecurity protocols and newer AI applications is essential for protecting digital assets.

4. Automation and AI Integration

   Automation and AI integration are becoming core competencies within IT roles. Several businesses have identified AI as an entry-level skill that assists their work, whether IT support, coding or communications, and a lack of AI knowledge sets an applicant back.

5. Enterprise Needs

   Graduates often need more knowledge to implement low-code/no-code solutions in business contexts effectively. This gap points to a need for education in practical automation techniques and business applications that can streamline and enhance operational efficiency. Graduates also need to use these skills to help bridge older technology to newer technology.

   Tied to both points 4 and 5 — one middle-sized company provided some insight into AI and its enterprise needs. This interviewee commented on their belief that AI will help their hiring needs because they can go after non-IT candidates based on their fit with company culture, drive and ambition and use AI to help with the technical aspects of their role. The same person also recalled his need for people with experience in niche programs called middleware tech (or software glue). He did not feel the need for training designed to teach these programs, especially since many would be phased out, but that an opportunity to learn and use some of the programs in an experiential setting would help.

Soft Skills Gaps

1. Communication and Collaboration

Communication and collaboration emerged as the top soft skill gaps. Employers emphasized the need for graduates who can adapt their communication styles to suit diverse audiences and translate technical concepts into understandable terms for stakeholders across various functions. Educators echoed this, observing that students often need more practice in effective interpersonal communication and teamwork.

2. Critical Thinking and Initiative

Graduates are often expected to demonstrate critical thinking, problem-solving abilities and the initiative to tackle complex challenges independently. However, these skills need to be developed more among recent graduates. Employers value candidates who can approach problems analytically and proactively, identifying solutions without constant direction.

3. Adaptability and Continuous Learning

The rapid evolution of technology demands that IT professionals continuously adapt to new tools and frameworks. Employers stressed the importance of a mindset oriented toward continuous learning and professional growth. Graduates who can swiftly learn and adapt to technological changes bring a distinct advantage, reflecting the industry's need for agility and lifelong learning.

Lifelong learning emerged from a discussion about cyber security. One business stated that it wasn't sufficient for a person to have a cyber security certificate if they did not also keep up with changing security issues or technology. They wanted to know if the applicant was part of a professional learning community or regularly listened to podcasts or videos from other current professionals.

This analysis underscores the need to address these skill gaps within educational curricula, focusing on specialized technical skills and essential soft skills such as communication, adaptability and initiative. Bridging these gaps would significantly enhance graduates' preparedness and equip them with the comprehensive skillset needed to succeed in the modern IT and computer science workforce.

"Partnerships between business, education, and workforce development are vital to nurture and strengthen a talent pipeline for IT. When businesses provide information about their needs to education, education can tailor curriculum to ensure students are being trained for the future of the workforce. Additionally, regional talent partnerships can leverage limited resources and connections, enabling larger-scale initiatives that benefit both businesses and the workforce."

-DR. KATYBETH LEE, ASSISTANT DEAN, STUDENT SUCCESS,
VCU SCHOOL OF BUSINESS

Winter 2025 IT Survey Report

TPI created a new survey with a deeper focus on some of the region's hiring practices within GO Virginia Region 4. This was a follow up to prior questions that more specifically focused on skills (both technical and soft). The survey aimed to gather insights on three key areas:

1. Whether the region provides a favorable environment for IT careers.
2. The primary challenges organizations face in recruiting IT professionals.
3. The extent to which companies employ individuals without technical backgrounds for IT positions.

The collected responses provide an analysis of key trends and insights to guide workforce development strategies.

The survey involved responses from various stakeholders in the Richmond metro region, representing industries such as logistics, education, finance, construction and chambers of commerce, down Interstate Highway 95, and including businesses in the Emporia–Greensville region. Data was collected through interviews and email correspondence through TPI, ChamberRVA, the Emporia-Greensville Chamber and supporting partners.

Question 1: Do you believe the Richmond metro region has a favorable hiring environment for tech jobs that do not require a four-year degree?

Most respondents expressed confidence in the Richmond metro region as a favorable environment for IT growth. Key themes that emerged include:

- Positive Perception: Several respondents believe the region has a healthy mix of skilled professionals and growing opportunities. One interviewee stated that cybersecurity was an example of a career that would benefit more from a two-year degree than a four-year degree because of the technical nature of the degree and the rapid pace at which the cybersecurity environment is changing.
- Educational Alignment Issues: A few participants highlighted concerns with gaps between educational offerings and industry needs, suggesting room for improvement in aligning training programs with practical skills required by the industry.
- Talent Retention: Retaining experienced talent remains challenging despite the favorable job market.

Overall, there was general optimism regarding the IT environment, but respondents emphasized the need for continuous improvement in training and education.

Question 2: What challenges, if any, do you face in recruiting for tech job roles in the region? (e.g., skill shortages, competition, insufficient experience or not enough job seekers)

Recruitment challenges were a recurring theme across responses, with the following issues identified:

- Insufficient Practical Experience: Many respondents noted a lack of hands-on experience among candidates, particularly for entry-level positions.
- Remote Work Preferences: Several companies face difficulties filling on-site roles due to candidates' preferences for remote work.
- Background and Financial Clearances: Some positions require stringent background checks, which limit the pool of eligible candidates.
- Skill Shortages: There is a notable deficit of candidates with advanced IT skills, especially for mid-level and senior roles.

Organizations emphasized the importance of developing partnerships with educational institutions to bridge these gaps and improve candidate readiness.

Question 3: Do you employ individuals without technical backgrounds and provide training to fill tech job roles? Is this due to the lack of tech-skilled job seekers or your interest in bringing in different skill sets and providing a technical background afterward?
Responses to this question were mixed, reflecting diverse organizational strategies:

- Aptitude-Based Hiring: Several organizations are open to hiring individuals without formal technical backgrounds if they demonstrate strong aptitude, problem-solving skills and a willingness to learn. These companies focus on internal training and upskilling.
- Strict Technical Requirements: Others require formal technical education or experience for all positions beyond entry-level roles. A couple of companies stated they would not consider a candidate without a four-year degree.
- Internal Upskilling: Some respondents highlighted initiatives to train and cross skill internal employees from nontechnical backgrounds into IT roles. In a follow up, they identified a need to outsource their training. They could send somebody to a training program, or if the need was large enough, they could hire a consultant. This answer came from a middle-sized business that was not using community colleges or the CCWA for their training needs.

The findings suggest a growing recognition of the value of transferable skills and on-the-job training in IT, though more traditional organizations remain cautious about this.

Conclusion: The survey results indicate that the Richmond metro region is generally perceived as a favorable environment for IT careers. However, challenges in recruitment and skill alignment persist. Addressing these challenges will require a coordinated effort.

In February 2025, a focus group provided additional insight that was not as prevalent in earlier surveys and interviews: the impact of AI and AI adoptions. The impact of AI is quickly impacting the IT workforce market, especially for people looking for entry-level employment. The two pieces this group adds to the report include:

1. Many employers expect entry-level applicants to have experience with AI at the supportive IT and computer science/high-tech levels. These roles need to understand AI, its applications and how to implement AI effectively into their work. This means having experience utilizing AI, effectively checking over the outcomes, refining prompts and plugging it into their work. If an entry-level person does not have some of these skills, they may be unprepared for the tasks expected within the workforce.
2. AI needs to be included in education from the K-12 level through college and nonterminal degree programs. It should be taught as a tool, including its ethical and practical uses. This curricular shift must include IT-specific programs and integrate AI into all educational programming since it will be used across disciplinary settings.

GO VIRGINIA REGION 4 — ASSET MAPPING FOR INFORMATION TECHNOLOGY

TPI#2: Asset map of the region's information technology training resources, including career and technical education, workforce, certifications and degrees

Information technology education is offered at nearly every educational institution within the region, at varying levels.

Integration of IT as a tool for education is common, with many public Pre-K—12 schools within the region offering a computer to every student to do their work. Whereas IT is presented as a career pathway option through all regional schools, it is also clear that the integration of IT within the curriculum is inconsistent. Educational research and policy discussions have focused on integrating IT into public education curricula. Studies indicate that while significant strides have been made in incorporating IT into classrooms, challenges persist in achieving comprehensive and practical integration

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IT integration also needs to go beyond computer applications to the effective use of IT and computer science tools within the content setting. This means working past using computers as a replacement for text and paper, including coding opportunities in a classroom setting, utilizing programmable resources and implementing emerging technology. It elevates the IT in a school setting to a more active IT/computer science lesson rather than the basics of keyboarding and communications.

Current State of IT Integration

According to the National Center for Education Statistics (NCES) at the Institute of Education Sciences[42], many public schools have adopted various IT tools to enhance instruction. A 2019–20 report published by NCES reported that nearly half of educators were given training that focused on how to use a computer or software (moderately, 36%, large extent, 11%), and a similar percentage reported training on how to use that technology for teaching and learning (moderately, 40%; large extent ,13%). The same report claimed that roughly half (49%) of schools strongly agreed that teachers in their schools want to use technology for teaching. Rates of strong agreement were lower when schools were asked whether they agreed that teachers are sufficiently trained in how to use technology (18%), that teachers have enough training to use technology for teaching (18%) and that technical support for technology in the school is good enough (34%).

Challenges in IT Integration

Despite these advancements, several obstacles hinder full integration:

- Resource Limitations: Schools often need more support in funding, infrastructure and access to up-to-date technology, which can impede the effective use of IT in education.
- Teacher Training and Support: Adequate professional development is crucial for teachers to incorporate IT into their teaching practices effectively. A study on educators' perceptions revealed that many feel unprepared to integrate technology due to insufficient training and support.[43]
- Curriculum Alignment: Aligning IT integration with existing curricula poses challenges as educators strive to incorporate technology to enhance learning outcomes without detracting from core content. A literature review emphasized the need for strategic planning to ensure that IT integration aligns with educational goals.[44]

IT as a Career Pathway within Pre-K–12 schools: Middle and High School

Middle School

Information Technology (including computer science) is offered in most, if not all, middle schools as a career investigation or pathway exploration course. This exploration course often provides students with various potential career pathways, exposing students to various skills, talents and career path expectations. The IT section of these courses can last one quarter (nine weeks) or a full semester (18 weeks), depending on the school. Often, but not always, these classes are supported by an educator through the school district's career and technology education programming. In some cases, programs such as GO TEC® are used to help provide students with hands-on experience and exposure to career pathways in high tech, from coding and computer science to manufacturing.

42 Gray and Lewis, "Use of Educational Technology for Instruction in Public Schools."
43 Hartman, Townsend, and Jackson, "Educators' Perceptions of Technology Integration into the Classroom."
44 Seenivasan, "ICT in Education."

Other IT-related offerings may include App Creators, Automation and Robotics, Coding, Computer Science, Engineering and Science of Technology, all of which come in various formats and distinctions. Some examples of the variations include Introduction to Coding and Game Design or Business Skills with Technology.

Separate entities also offer IT exploration opportunities or extracurricular options, such as Code-VA and Maxx Potential Career Lab, two different approaches to learning about coding, data and analytics, networking, cybersecurity and even AI. Some of these programs start at the elementary level. First Robotics is another example that is common in Virginia; however, it is only available to some students, and there are sometimes barriers that prevent student participation (e.g., high costs to sponsor a team or identify committed adult leadership).

High School

Information Technology, Coding, Computer Science, Digital Media and related courses offer a variety of ways to offer IT education in all high school settings, including the career and technology centers. These courses are offered as regular-credit courses and, in different locations, can be honors courses. At some places and through Virtual Virginia (online courses), Advanced Placement (AP) offerings in computer science (Computer Science A and Computer Science Principles) are available. Many schools offer dual-credit options tied to information technology; however, the number of students participating is low. Brightpoint Community College, which works within a broad region of GO Virginia Region 4, only had 16 students with dual enrollment with computer science during fall 2024.

Information Technology, Coding, Computer Science, Digital Media and related courses offer a variety of ways to offer IT education in all high school settings, including the career and technology centers.

Currently, students in the region cannot earn an associate degree in information technology or computer science while in high school. IT staff at the community college setting have commented that it may be easier for students to work toward a nationally recognized certification through their high school programs, because that experience provides them with more hands-on time in a classroom setting to best prepare them.

AP courses supported by the College Board also show a fair amount of engagement. We can identify how many test takers* there were in 2024 and their scores for the entire State of Virginia.

- Computer Science A — 3,888 — 67% scored 3 or higher (passing)
- Computer Science Principles — 4,145 — 69% scored 3 or higher (passing)

*The number of test takers does not indicate the number that had taken the course.

**Virginia is on average for national pass rates in Computer Science A (67.2%) and above national average in Computer Science Principles (64%).

Virginia has a high rate of youth who take certification tests through its Career Technology Education Centers. If you look at all tests related to information technology (which is very broad), 23,608 certification tests were taken by high school youth in the 2023–24 school year, and 69% of those students passed. These tests include anything from CompTIA to Adobe, IT Specialists certifications to Microsoft Office Suite & Fundamentals.

External programs also provide high school students with a broad range of program options, from private bootcamps, First Robotics and Maxx Potential's Internship Simulator.

Homeschooling in Virginia accounts for nearly 5% of the student population45. It is higher in rural areas. When asked, The Home Educators Association of Virginia (HEAV)46 and other interviewees stated that many students within the homeschool system have various levels of IT training and support; however, when it comes to college and career pathways exploration, it often falls to regional networks of homeschool youth or statewide conferences and events where students have the opportunity to engage with postsecondary and career options. The GO Virginia Region 4 area effectively engages homeschooled youth, with Brightpoint and Reynolds Community colleges graduating 127 homeschooled students in 2024.

In a couple of interviews with community college staff within and outside GO Virginia Region 4, comments were made about technology use. In several cases, it was mentioned that high schools may have a more universal adoption of technology and integration of technology into the classroom setting than do community colleges. This comment led to more than one faculty member stating that students within their programs who may still see a faculty member using older technology make it look like the community college is less technical and may be less capable of sharing effective technology. In one case, a student stated that they felt they were going back in time when they arrived at a community college campus. *This information came from a community college representative outside of GO Virginia Region 4.*

For those considering a career in IT, understanding the options for education, training and hands-on experience is key to choosing the right path.

Branching Pathways for IT Education

IT can seem daunting due to the vast array of specializations and skills needed. However, the field offers many accessible pathways that accommodate diverse educational backgrounds, certifications and practical experiences. For those considering a career in IT, understanding the options for education, training and hands-on experience is key to choosing the right path. Below is an overview of the most common and effective pathways for entering the IT industry. Most of the paths below are post high school. However, vocational/career and technology centers remain on the list because, in some locations, they are still a viable option for continued education, even after high school.

1. Formal Education Pathways

A traditional route into IT often involves a structured educational background, such as degrees from colleges and universities. These pathways offer a comprehensive foundation in computer science and information technology, covering a wide range of related and emerging subjects.

a. Technical and Vocational Schools
   For individuals looking to enter the workforce quickly, vocational or technical schools offer targeted training programs focusing on skills such as coding, network administration or IT support. These programs often take fewer than two years to complete and focus on practical, hands-on learning.
   - Advantages: Fast-track option for acquiring technical skills, often with hands-on experience.
   - Typical Jobs: IT support specialist, web developer, network technician.

b. Associate Degree in IT
   An associate degree is typically a two-year program that focuses on the fundamentals of IT, providing practical skills that are often sufficient for entry-level roles such as help desk support or junior system administrators.

45 South, "Across Cultural Lines, Home Schooling Has Boomed since COVID-19 Hit," Virginia Mercury.
46 "Virginia Homeschool | Home Educators Association Of Virginia."

- Courses: Basic programming, database management, network fundamentals and operating systems.
- Advantages: It is shorter and more affordable than a bachelor's degree, offering a quicker entry into the job market or cost-effective lead into a four-year program.
- Typical Jobs: Help desk technician, junior network administrator, IT support specialist.

c. Bachelor's Degree in IT or Computer Science
A bachelor's degree offers a broader and deeper knowledge of IT systems, software development and networking. Mid-level and more specialized positions may require a four-year degree, and several larger companies require it.
- Courses: Advanced programming, algorithms, database management, cybersecurity, cloud computing, software engineering.
- Advantages: Provides a solid foundation in multiple areas of IT and enhances job prospects for higher-level positions.
- Typical Jobs: Network administrator, junior software developer, database administrator, cybersecurity analyst.

2. Certification-Based Pathways

For those who prefer a more direct approach to specific IT roles, certifications offer a targeted and often quicker route into the industry. Certifications validate an individual's skills and knowledge in a particular area and are highly valued by employers, especially in specialized roles.

a. Entry-Level IT Certifications
Many entry-level certifications prepare candidates for their first IT role by covering foundational skills. These certifications are often accessible to those with little to no prior experience and can be a great way to demonstrate competence to employers.
- CompTIA A+: A widely recognized certification that covers fundamental IT skills such as hardware, networking, mobile devices and troubleshooting. It is an excellent starting point for help desk or IT support roles.
- CompTIA Network+: This certification focuses on networking concepts, including network configuration, management and troubleshooting. It is ideal for aspiring network administrators or support technicians.
- CompTIA Security+: This course focuses on the basics of cybersecurity and network security practices. It's a good starting point for individuals interested in cybersecurity roles.

Certifications validate an individual's skills and knowledge in a particular area and are highly valued by employers, especially in specialized roles.

b. Specialized Certifications
For individuals who know their desired specialization, more targeted certifications are available in areas such as cloud computing, cybersecurity or systems administration. These can help demonstrate expertise in specific technologies or platforms.
- Cisco Certified Network Associate: Focuses on networking technologies, including routing and switching. This is ideal for aspiring network engineers or administrators.
- AWS Certified Solutions Architect (Associate): Focuses on cloud computing with Amazon Web Services, an essential skill as many businesses move to cloud-based infrastructures.
- Certified Ethical Hacker: Provides knowledge of hacking techniques used to test and improve cybersecurity systems, an essential skill for those pursuing careers in cybersecurity.

c. Benefits of Certifications
   - Certifications can be earned faster than degrees, allowing quicker entry into the workforce.
   - Certifications provide practical skills tailored to specific roles, which can immediately meet employer needs.
   - Certifications are often less expensive than degrees and can be renewed or upgraded as technologies change.

   The CCWA helps students looking to enter the IT workforce through shorter training programs. Many students complete the training but do not complete their certification as a result of not taking or not passing nationally recognized certification exams. They are still completers and often meet the requirements of the role they may be pursuing; however, they do not receive the full certification. This is still a success for CCWA and many students as well as employers looking for entry-level employees.

3. Experience-Based Pathways

For many employers, hands-on experience is as valuable, if not more so, than formal education or certifications. Practical experience in IT can be gained through various avenues, allowing individuals to build a portfolio of work and develop in-demand skills.

a. Internships
   Internships provide invaluable hands-on experience in a real-world IT environment. Many organizations, including IT firms, large corporations and government agencies, offer internships that allow aspiring IT professionals to learn on the job.
   - Benefits: Exposure to practical tasks, mentorship from experienced professionals and the opportunity to apply classroom knowledge to real-life situations.
   - Typical Jobs After Completion: Help desk technician, junior IT administrator, network support technician.

b. Apprenticeships
   Apprenticeships combine on-the-job training with classroom instruction and are a great way for students to earn while they learn. Government initiatives or industry partnerships support many IT apprenticeships and can lead directly to full-time positions.
   - Benefits: Provides paid, hands-on experience while earning certifications or completing courses.
   - Typical Jobs After Completion: Junior network engineer, IT support technician, systems administrator.

c. Freelancing or Project-Based Work
   For those who are more entrepreneurial or independent, freelancing in IT can be a viable entry point. Many aspiring web developers, network technicians and IT support specialists build their portfolios by taking on freelance projects or working on small, personal projects.
   - Platforms: Websites such as Upwork, Fiverr and Freelancer.com allow IT professionals to find project-based work.
   - Benefits: Freelancing allows individuals to build a portfolio of real-world work, often leading to full-time employment or entrepreneurship.
   - Typical Jobs After Freelancing: Web developer, database administrator, technical support consultant.

Many aspiring web developers, network technicians and IT support specialists build their portfolios by taking on freelance projects or working on small, personal projects.

4. Bootcamps and Short-Term Training Programs

Bootcamps have become a popular alternative to traditional education in the tech field, offering intensive, short-term training programs. They often focus on one specific area, such as web development, cybersecurity or cloud computing, and aim to equip students with job-ready skills in just a few months.

a. Coding Bootcamps
   Coding bootcamps such as General Assembly, Flatiron School, Le Wagon and, locally, Nucamp Coding Bootcamp, offer immersive training in software development, teaching languages such as JavaScript, Python and Ruby in a few months.
   - Advantages: Bootcamps are intensive and focused, making them ideal for individuals who want to start their IT careers quickly.
   - Typical Jobs After Bootcamp: Web developer, front-end developer, software engineer.

b. Cybersecurity Bootcamps
   Programs such as Springboard/Nucamp Coding Bootcamps and Fullstack Academy offer focused training on cybersecurity fundamentals, network security and ethical hacking.
   - Advantages: Short-term, often online and part-time, practical training that prepares students for cybersecurity certifications and real-world challenges.
   - Typical Jobs After Bootcamp: Junior cybersecurity analyst, information security technician, ethical hacker.

c. Cloud Computing Bootcamps
   Cloud computing bootcamps, such as those offered by AWS or Google Cloud, provide hands-on training in cloud architecture, migration and management.
   - Advantages: Fast-track training to meet the demand for cloud professionals.
   - Typical Jobs After Bootcamp: Cloud architect, cloud support specialist, DevOps engineer.

5. Self-Learning and Online Courses

For individuals who prefer a self-directed learning approach, numerous free and paid online resources allow aspiring IT professionals to learn at their own pace. Platforms such as Coursera, edX, Udemy and LinkedIn Learning offer courses on various IT topics.

- Advantages: Flexible learning that allows individuals to study in their own time, often at a lower cost.
- Recommended Platforms: Coursera (for degrees and certifications), Udemy (for specific skills), freeCodeCamp (for coding), Khan Academy (for fundamentals).
- Typical Jobs After Self-Learning: Web developer, junior programmer, IT support specialist.

6. Networking and Job Market Preparation

Regardless of the educational pathway, networking is crucial in the IT field. Attending industry events, joining professional organizations and participating in online IT communities can provide valuable connections and insights into job opportunities.

- Professional Organizations: Joining groups such CompTIA, the Association for Computing Machinery or the Information Systems Security Association can provide networking opportunities and resource access.
- Job Fairs and Career Events: Attending IT job fairs or virtual career events can help candidates meet potential employers and learn about open positions.
- LinkedIn: Building a strong LinkedIn profile and connecting with IT professionals is a great way to tap into job opportunities.

Regional Efforts in Education

To effectively revitalize its IT programs, the region must recognize and differentiate among the diverse pathways leading to high-paying IT careers. By aligning educational offerings with industry demands and fostering unique experiences, the region can enhance its appeal to prospective students and employers. Current regional key strategies include:

1. **Integrating Emerging Technologies into Curricula**
   - AI Education: VCU introduced an AI minor, in fall 2024, to equip students with AI competencies.47
   - Community College Initiatives: The Virginia Community College System established an AI Task Force48 to explore the incorporation of AI into community college programs, reflecting a statewide commitment to advanced technology education.
2. **Emphasizing Practical Skills and Real-World Applications**
   - Hands-On Learning Projects: Henrico Career and Technical Education (CTE) students actively participate in the renovation of the CTE and adult education facilities at Regency Mall, gaining experience in networking, security and computer systems.
   - Hackathons and Competitions: Regional entities have organized hackathons that challenge participants to develop both defensive and offensive cybersecurity strategies, fostering critical thinking and practical problem-solving skills.
3. **Providing Flexible and Accessible Learning Options**
   - Mentorship-Based Apprenticeships: Maxx Potential offers paid apprenticeship programs that combine mentorship with practical training, simultaneously addressing client needs and cultivating a tech-savvy workforce. They also offer online apprenticeship models in which colleges or programs can pay to have participants experience online apprenticeship work experiences. These are unpaid apprenticeships.
   - Accelerated Certification Programs: Programs such as Nucamp Coding Bootcamp offer accelerated courses designed to prepare students for accredited certifications in various technical disciplines, catering to diverse learning preferences.
4. **Promoting Interdisciplinary Studies and Soft Skills Development**
   - Consulting-Focused Education: James Madison University (JMU)* has implemented a program that prepares IT students for consulting roles by integrating a 12-credit curriculum with internships, enabling students to work in small consulting groups. Over two years, numerous firms have collaborated with these groups, enhancing both student experience and company growth. Many students have been hired by these supporting companies or other consulting firms across the state as a result.
     *JMU is outside of the GO Virginia Region 4; however, JMU's unique model for its IT programs is worth sharing.
5. **Encouraging Continuous Learning to Keep Pace with Technological Advancements**
   - Professional Development Networks: RVATech, the regional technology council, facilitates the growth of the technology sector through networking events and conferences aimed at continuous learning. While not a formal advisory board, RVATech serves as a collective voice for IT and related fields in the region.

These local strategies are unique opportunities that create distinctive and effective pathways into the IT sector. They align educational programs with industry needs.

47 Porter, "VCU Launches New Minors in Artificial Intelligence and in Mixed and Immersive Reality."
48 "Governor Glenn Youngkin Announces a New Artificial Intelligence Task Force."

What the Region Offers in IT (both Supportive IT and Computer Science)

The following institutions all report through the SCHEV. This list does not contain the numerous camps and private centers and online programs in which IT related degrees are offered. Brightpoint, Reynolds and Southside Virginia Community colleges, Richard Bland College, and the CCWA have supported numerous transfer associate degrees, associate of applied science degrees and certifications in the IT-related space. The options prepare most graduates for two pathways: entry-level work or continuation to further advance the student's education.

Universities, such as Virginia Commonwealth University, Virginia State University, Virginia Union University, the University of Richmond and colleges such as Randolph-Macon offer a variety of majors and minors in IT and computer science. Some have options through both their business and engineering colleges.

Several of these institutions also offer a variety of bootcamps and programs aimed at general support and education in these areas, often to draw more people to consider these career pathways. One example would be the Coding Bootcamp offered through the University of Richmond, aimed at beginners. This program offers a certificate of completion as a credential.

Short Term and Two-Year Institutions

CCWA

- Short Term Training
  - AWS Certified Solutions Architect (Associate)
  - AWS Cloud Practitioner
  - CompTIA A+
  - CompTIA Linux+
  - CompTIA Network+
  - CompTIA Security+
  - PCAP – Certified Associate in Python Programming

Brightpoint Community College

- Associate Degree
  - Information Technology, Associate of Science (AS)
  - Computer Science, AS
  - Web Design, Associate of Applied Science (AAS)
  - Career and Technical Degrees and Certificates
  - Cisco Network Administration, Cisco Career Studies Certificate (CSC)
  - Cloud Computing, CSC
  - Computer Programming, CSC
  - Cybersecurity, CSC
  - Information Systems Technology, AAS
  - Network Security and Support, CSC

Reynolds Community College

- Associate Degree
  - Computer Science, AS
  - Information Systems Technology, AAS
- Certificates
  - Cloud Computing Concentration, CSC
  - Computer Applications Concentration, CSC
  - Computer Applications Fundamentals, CSC
  - Computer Programmer Concentration, CSC
  - Cyber Security Concentration, CSC
  - Network Fundamentals, CSC
  - Web Development Concentration, CSC

Richard Bland College

- Associate Degree
  - Math/Computer Science, AS

Southside Community College

- Associate Degree
  - Information Systems Technology, AAS
  - Information Systems Technology: Networking Specialization, AAS
- Certificates
  - Application Software Specialist, CSC
  - Computer and Office Basics, CSC
  - Computer and Office Basics: Design Track, CSC
  - Cybersecurity Advanced and Cloud Computing, CSC
  - Cybersecurity and Networking Foundations CSC
  - Information Systems Technology

Several of these institutions also offer a variety of bootcamps and programs aimed at general support and education in these areas, often to draw more people to consider these career pathways.

Four-Year and Graduate Institutions

Randolph-Macon College

- Undergraduate
  - Computer Science
  - Cybersecurity

University of Richmond

- Undergraduate
  - Computer Science, Bachelor of Science (BS) and Bachelor of Arts (BA)

Virginia Commonwealth University

- Certificate Options
  - Computer Science
  - Cyber Security
  - Data Science
  - Information Systems
- Undergraduate
  - Bioinformatics
  - Computer Engineering
  - Computer Science
  - Information Systems
- Master's
  - Bioinformatics
  - Computer and Information Systems Security
  - Computer Science
  - Data Science
  - Information Systems
- Doctorate
  - Computer Science

By aligning educational offerings with industry demands and fostering unique experiences, the region can enhance its appeal to prospective students and employers.

Virginia State University

- Undergraduate
  - Computer Engineering, BS
  - Information Logistics Technology, BS
- Master's
  - Data Analytics, Master of Science (MS)
- Doctorate

Virginia Union University

- Undergraduate
  - Business Analytics, BS
  - Computer Information Systems, BS
  - Cyber Security, BS
- Master's
  - Data Analytics, MS

Many regional, national and even international groups offer information technology and computer science programs and degrees for people in the region. ECPI University provides programs locally in cyber and information security and engineering technology, and South University offers a Master of Science in information systems.

Common online programs include Arizona State University, National University, Southern New Hampshire University, University of Buffalo, University of Phoenix and Western Governors University. These, plus many more, offer IT-related programs, often with flexible scheduling.

VCU Tech Talent Pathways Community thoughts in K–12 Education — and updated responses

In 2020 and 2021 VCU's Tech-Talent Pathways[49] surveyed community members about the technology pathways for regional workforce and businesses. VCU successfully worked with regional groups to build a report that made many recommendations on how to improve the pathway to tech-oriented degrees and careers. Their recommendations, while logical and supported by peers within the industry and community, have run against some obstacles to implementation. When provided the opportunity, TPI talked with some people in various roles about whether or not some of these recommendations were in motion, obtainable or would run across continued obstacles preventing their inclusion. The points commented on are not a complete list from Tech-Talent Pathways but are selected points on which comments were made. Many of their recommendations are still valid; however, it would take more effort to identify ways to expand and implement them.

Supporting Incumbent Teachers

The VCU Tech-Talent Pathway report lists suggestions for empowering educators (solid bullet points). Updated information from TPI interviews has been included (hollow bullet points).

- There is a critical shortage of tech-ed teachers. Train current faculty as opposed to adding new faculty.
  - The Joint Legislative Audit and Review Commission (JLARC) issued a report titled "Virginia's K-12 Teacher Pipeline,"[50] stating that 4.5% of teaching positions were vacant at the start of the 2023–24 school year, up from 3.9% in the prior school year (and less than 1% in years before the pandemic); 16% of Virginia's teachers were not fully licensed or not teaching in the field in 2022–23, up from 14% in the prior school year (and 6% a decade ago). As a result, additional training appears challenging to implement.
    - The Virginia Department of Education does provide resources and support to help educators with IT integration and also provides standards of learning for both digital learning integration and computer science
- Provide and encourage professional development opportunities for teachers.
  - There have been challenges for professional development opportunities outside the school district's internal professional development offerings. Many school divisions select professional development options for their employees, eliminating many content-specific options. Some teachers have claimed business fatigue for lack of optional participation. The Virginia ED Strategies CHOICE Award provides educators with free professional development, but it struggles to fill available spots and has had to extend its grant program.
    - Various professional organizations exist to provide educators with professional development in the application and effective implementation of IT and teaching information technology.

49 "Tech-Talent Pathways."
50 "JLARC | Pandemic Impact on K-12 Public Education."

- Encourage internships and externship opportunities for educators.
  - When asked, several teachers said they would take advantage of internships or externships; however, many claimed they need more time and financial support. Many educators have summer employment, take the time to work on projects or spend time with family — things they feel they can't do through the school year, especially if they have extra responsibilities such as coaching, tutoring or club sponsorships.

Creating Student Opportunities

The same VCU Tech-Talent Pathways report reached the following conclusions regarding student preparation for IT pathways:

- Identify early learning opportunities for students to creatively apply engineering skills, problem solving, collaboration and critical thinking.
  - Many of these methods of teaching engineering, problem-solving collaboration and critical thinking were introduced through statewide STEM efforts, but the common language around integrative STEM was never finalized, and many programs turned into arts and crafts programs under STEAM. There is a new STEM initiative being supported by the Virginia Department of Education, which will start in spring 2025.

- Connect students with community organizations that advance tech education within the community in order to increase awareness, hands-on learning opportunities, participation and competency level.
  - These options are only available in some places and tend to focus on urban or suburban areas. These programs are inconsistently delivered or marketed; however, they do exist. The buildup of regional Makerspaces, including at many libraries, has initiated some high-tech options with mixed results. Higher education also has created engagement opportunities through programs such as the VCU da Vinci Center for Innovation.

- Focus on year-to-year growth on students' technical skills as they progress through their K–12 STEM curriculum.
  - None of the people interviewed could recall a way in which students' technical skills are measured or quantified within their school districts.

- Create a region-by-region virtual clearinghouse for internships, externships and experiential learning opportunities for K–12 students.
  - As of the writing of this report, RVATech has been working to create a unified online location for internship/externship possibilities, as well as the growing efforts with the Virginia Talent + Opportunity Partnership.

Creating Meaningful Pathways

In the report, the VCU Tech-Talent Pathways community members had some additional suggestions for workforce development, communications and information sharing:

- Provide equitable and meaningful internship opportunities for high school students.
  - Virginia has worked towards creating HS internship programs[51]; however, many of these programs compete with the same or similar opportunities for college students. The access to these opportunities is locally determined, by access, transportation and employer engagement. There are also many limitations on where students may intern.
- Invest in mentorship opportunities from business and industry organizations to provide engineering, computer engineering and digital tech employees the time, flexibility and opportunity to serve as mentors.
  - The region has various levels of mentor inclusion, primarily through third-party mediators, such as the Boys & Girls Club, YMCA and Communities in Schools programs. Schools lacked the time to coordinate some of these efforts, so community partners have helped arrange experiences for certain affiliated schools. This effort requires a company willing to share time and expertise and a mentor who is trained and prepared to work effectively with youth. These efforts, currently found in schools typically listed as Title I (high poverty, risk of failing to meet standards), often meet the needs of a business looking to provide community support.
- Increase support for entry-level rotational programs that help college graduates transition to early careers.
  - The support programs for transitional students have been growing. Many postsecondary institutions have worked to develop programs that provide these supports, whether academic, social or environmental.
- Provide career switchers with incentives to join key fields.
  - Career switchers' recruitment needs to be more consistent. Several groups compete for some of these candidates; however, the marketing is varied in different communities and career pathways. Creating a forward-facing map of competencies and where to gain them would help potential career changers or those wishing to upskill to make themselves more eligible for a promotion.

51 "Postsecondary Opportunities for High School Students."

- Develop and deliver training programs with public and private partners that define employer needs, develop and test training and education solutions to meet these needs and scale solutions that work throughout the Richmond region.
  - Is there a standard (other than recognized certifications) for credentialing upheld by regional businesses? In larger companies, this tends to be internal, but a regional advisory board could collect interests and needs and help ensure that provided professional and continued learning opportunities meet those measures of success.
- Identify stakeholders in order to develop communication strategies.
  - Currently, communication is fractured among various separate groups. There needs to be a consistent voice among IT and computer science professional communities — the communications split between various social efforts, within the nuanced narrow foci of IT and between corporations. A strong regional convener is needed to pull together a wide-reaching advisory group.
- Identify tools to communicate with parents, students, educators and businesses about tech-talent pathways and careers.
  - Parents receive a lot of information, especially at the high school level. How does information technology create something, with marketing, to lift the information above the regular white noise of communications? It may need to be a centralized repository of resources, programs, mapping and support that can help bring together the regional schools and community rather than try to reach each entity independently.
- Develop a strategy to present engineering, computer science and technology, ensuring a broader base for STEM literacy.
  - This effort should be aligned with the state's STEM networks, which are growing but may not consider including IT/computer science. This would be a good time to ensure that the industry inserts itself and supports an expansion of the regional STEM efforts.

GO VIRGINIA REGION 4 — ADDITIONAL IMPACTS/ANALYSIS ON REGIONAL INFORMATION TECHNOLOGY

TPI#3: Analysis of the occupational, skills and training gaps that could hinder industry growth

The various potential hindrances or gaps within the IT/computer science industry sector can extend across a broad range. The following information, though broad in scope, all impacts the occupational and training gaps that may impede IT growth in the region. Most of the gaps identified deal directly with IT; however, several gaps deal with regional support for the community and attracting talent. These gaps are still worth exploring, as they still have an impact that may influence regional IT industry development.

TPI's research and efforts identified many gaps that may help the community, businesses and, especially, the talent and workforce pathways. All of the gaps identified can directly or indirectly impact the success of business growth, hiring rates and community connectedness to IT as a career pathway. Some are more directly tied to how we can best prepare a workforce capable, competent and responsive to the needs of IT-related businesses. Other gaps, marked with an asterisk (*) and in orange, are worth mentioning but do not deal as directly with the intent of the Talent Pathways efforts and will not be a focus within the recommendations.

Education Gaps

A strong and well-aligned educational system is essential for developing a robust IT workforce, yet multiple gaps hinder students from effectively pursuing and succeeding in IT careers. These gaps emerge across various stages of the education pipeline, from early exposure in K–12 to postsecondary training and career transitions. Limited integration of IT concepts in early education, outdated curricula, inconsistent access to hands-on learning opportunities and financial barriers all contribute to an uneven and often exclusionary pathway into IT fields. Additionally, disparities in outreach and engagement leave underrepresented populations — such as women, minorities and economically disadvantaged students — at a significant disadvantage. Even where IT programs exist, misalignment between industry needs and educational training, unclear career pathways and insufficient mentorship create further obstacles. Addressing these challenges requires a multi-faceted approach that includes curriculum modernization, enhanced career guidance, expanded access to certifications and structured support systems to help students persist in IT training programs and transition successfully into the workforce. The following eight sections outline key education gaps that must be addressed to strengthen the IT talent pipeline and better align education with industry demands.

1. Early IT Education and Career Awareness

- *Limited Integration of IT in K–12 Curricula:* IT concepts are often absent or minimally represented in K–12 education, which deprives students of early exposure to foundational skills and career awareness. This limits the pipeline of future IT professionals.
- *Access through Electives:* Many students can access IT-related courses; however, they are electives, which means students have to opt in to take these classes. This leaves many students out who may otherwise identify themselves as tech-interested and capable students. These options may not be available to students who are behind academically.

- *Overexposure to Pathways:* IT is an important pathway, and there needs to be a concerted effort to attract students to IT's career opportunities. The region has several initiatives to coax educators to direct their students toward various career pathways that include nursing, aviation, general contracting (electrician, plumber, masonry, carpenter) and submarine construction/fabrication jobs. There is a heavy push to get schools, educators and students to consider these career pathways, while IT (and advanced pharmaceutical management) are trying to attract students to their occupations. If the IT outreach is not separated from the other options, it can become overwhelming to the individuals we are trying to reach.
- *Extracurricular options are inconsistent:* Programs outside of the school setting are excellent ways for students to learn about career pathways and interests such as IT; however, in many locations, the variety and quality of options are not available, preventing many students from having these opportunities.
- *Insufficient Engagement with Diverse Populations:* Women, minorities and economically disadvantaged students remain underrepresented in IT due to insufficient outreach and inclusive programming, restricting the potential workforce and diversity within the field.

2. Considerations in Secondary and Postsecondary IT Training

- *Outdated Curriculum Content:* Rapid technological advancements outpace curriculum updates, leaving many high school and postsecondary students without training in high-demand areas such as AI, cybersecurity, cloud computing and data analytics. This may also lead to a misalignment of expectations for those who select an IT pathway as a postsecondary option. The outdated curriculum also includes the time required to approve courses covering new content.
- *Lack of Practical, Hands-On Experience:* Many students graduate without hands-on experience due to limited access to labs, internships or project-based learning, reducing job readiness and increasing employer training burdens.
- *Inconsistent Technology Integration:* Even where technology resources exist, their integration into relevant IT/computer science lessons is absent or, at best, uneven. Professional development for educators on incorporating IT into their lesson plans, beyond computer applications, would ensure consistent exposure to relevant technologies.
- *Dropout Rates:* The GO Virginia Region 4 follows the country in having a high dropout rate for the study of computer science. The reasons mentioned earlier include anything from unexpected rigor and math requirements to a mismatch in academic expectations. Many schools, including local ones, have implemented various support services to help individuals stick with the more rigorous computer science/high-tech pathway. These need to be more thoroughly measured for success, and additional options may need to be considered.
- *On-Ramp Options:* Many students begin their education in an IT-related program, such as IT support, technical certifications or general information systems. However, they may lack the confidence, preparation or academic foundation to transition into more rigorous fields such as computer science, software development or cybersecurity. These students may either drop out of their program or remain in lower-level IT tracks, limiting their long-term career growth and earning potential.

  Many students are initially interested in advanced IT disciplines but may struggle with foundational concepts, mathematical rigor or the perceived difficulty of higher-level coursework. Without clear, accessible support systems, such as structured tutoring, bridge courses and mentoring, these students are often left without viable options for progression, helping to drive the talent shortage in critical IT fields.

  As the demand for highly skilled IT professionals continues to grow in areas such as AI, cybersecurity and software engineering, failing to address this gap will result in lost opportunities to cultivate a stronger regional workforce. Establishing well-defined on-ramp pathways is essential to helping more students successfully transition into high-tech careers, ensuring they are not left behind due to academic challenges.

Addressing these challenges requires a multifaceted approach that includes curriculum modernization, enhanced career guidance, expanded access to certifications and structured support systems to help students persist in IT training programs and transition successfully into the workforce.

3. **Inconsistent Technology Integration in K–12 Education**

- *Varied Technology Use by Educators:* Although technology tools are available, integration varies significantly across districts and classrooms. The educators' confidence levels or time constraints often contribute to the varying integration of computer science skills. This can easily lead to inconsistent digital literacy and skills development. Even where technology resources exist, their integration into relevant IT/computer science lessons is absent or, at best, uneven. Professional development for educators on incorporating IT beyond computer applications into their teaching would ensure consistent exposure to relevant technologies.
- *Limited Access to Qualified Educators:* High turnover in teaching positions impacts the availability of qualified IT and computer science educators, as those with industry-relevant skills may find higher-paying opportunities outside education.

4. **Barriers in Career Pathways and Transition Support**

- *Unclear Pathways to IT Careers:* Students often need more guidance on IT career pathways and may struggle to understand the steps that lead from education to employment. A clear, consistent voice (using outreach/marketing tools) can promote educational options, pathways for career advancement and job openings/future projections. This would help educators, guidance counselors and potential workforce entrants, providing a forward-facing map that anyone could use to help identify IT-roles, expected job openings, skills needed and where to obtain those skills within the region.

- *Challenges in Choosing Appropriate Training Options:* The variety of educational options available — from community colleges and universities to private programs, coding bootcamps to online courses — can be assets as well as challenges for students. Without clear guidance on each pathway's merits and career outcomes, students may struggle to make informed decisions that align with their IT career goals. Ensuring students have access to reliable information on training options and career pathways will help them make better-aligned choices and reduce It program dropout rates.
- *Challenges in Transition Points:* Transitions from high school to college or from graduation to entry-level roles are vulnerable stages. Limited access to structured mentorship, advising and internships reduces students' momentum in pursuing IT careers. A growing number of regional bridge programs may change this postsecondary pipeline "leak."

5. **Financial and Accessibility Barriers**

- *High Costs of Certifications:* Essential industry certifications such as in cloud computing and cybersecurity are costly, creating financial barriers for students and restricting access to IT careers. Certifications are cheaper than a degree but still pose a financial burden.
- *Resource Inequities Across Regions:* Students in low-income or rural areas often need access to high-speed internet, modern equipment and IT resources, which limits their preparation and reinforces regional skills gaps.

6. Misalignment Between Training and Industry Needs

- *Mismatch of Academic Training and Industry Skills:* Educational institutions need help to align programs with evolving industry demands — graduates often need additional training to be workforce-ready. This mismatch can range from business acumen to understanding modern cybersecurity issues or the application and use of AI.
- *Advisory Boards:* Most, if not all, SCHEV/VCCS-related IT programs meet with an advisory board to help align educational programming with industry needs. These boards need continuous evaluation and incorporate fresh perspectives and experiences. These boards can help, but if stagnant, they can hurt more than assist in the evolving IT field. Many board representatives do not provide internships nor hire from the institutions they advise, so schools may need to be selective about who they invite to join their boards, choosing members who will ensure appropriate support.
- *Lack of Soft Skills Training:* IT programs often need to emphasize crucial soft skills, such as communication and teamwork, which are essential in collaborative environments and client-facing roles. Embedding soft skills training into technical education programs, combined with employer-led workshops or mentoring initiatives, could better prepare students for the workplace.

This is a universal problem, across job sectors and geographical boundaries. Extensive research underscores the critical role of soft skills, such as communication, teamwork, problem-solving and adaptability, in hiring processes across the United States. Employers increasingly prioritize these competencies, recognizing their profound impact on workplace efficiency and employee retention.

A study highlighted by Reuters[52] reveals that mentored individuals earn 15% more than their nonmentored peers. This emphasizes the value of soft skills such as confidence and teamwork, which are often lacking in young recruits. This finding suggests that enhancing soft skills can significantly improve workplace readiness and productivity.

Further, research published in the International Journal of Educational Technology in Higher Education[53] indicates a discernible demand for soft skills, such as critical and analytical thinking, problem-solving, communication skills and flexible creativity, especially within technologically driven domains. The study analyzed job postings from 19,000 organizations over five years, revealing that employers frequently seek these competencies even in technology-focused fields.

The U.S. Department of Labor also emphasizes that while technical skills are fundamental, employers view soft skills, such as professionalism, communication, teamwork and problem-solving, as even more crucial to work readiness.

Forbes[54] found that 84% of 90% of men and 80% of women acknowledge the value of soft skills in the workplace. This consensus among employees highlights the universal importance of soft skills in professional settings.

The U.S. Department of Labor also emphasizes that while technical skills are fundamental, employers view soft skills, such as professionalism, communication, teamwork and problem-solving, as even more crucial to work readiness.

52 Balch, "Brand Watch."
53 Poláková et al., "Soft Skills and Their Importance in the Labour Market under the Conditions of Industry 5.0."
54 Robinson, "84% Of Workforce Insists Job Candidates Must Demonstrate Soft Skills, New Study Finds."

7. **Support for Lifelong Learning and Skills Adaptation**

- *Inadequate Professional Development Infrastructure:* Continuous skills development is essential for IT professionals, but many employers need more resources to support ongoing training. Long-term skills gaps are a result. Educational institutions within the region can develop programs to meet the need. However, there should be a cohesive voice in determining how to create a collaborative effort that will support multiple IT-related businesses or provide IT support for businesses that do not identify as IT companies. This problem was more prevalent with smaller-sized businesses.
- *High Turnover Due to Burnout:* Rapid reskilling demands contribute to burnout and high turnover, underscoring the need for sustainable career management and support systems.

8. **Challenges in Postsecondary IT Education**

- *High Competition Among Academic Institutions:* The focus on degree completion creates competition among educational institutions. The disparity between IT enrollments and graduation rates highlights the need for systems to retain students within IT career pathways. This competition can be external or internal, and it can be within a college or university competing for students.
- *Impact of Online and Hybrid Learning Models:* The shift toward distance learning, with 70.2% of VCCS offerings including an online option[55], raises concerns about reduced hands-on engagement and instructor interaction. These are vital for technical skill development. Higher education faculty have commented on the impact this has on providing hands-on experience that uses tools and technology associated with some courses. This appears to have some impact on student confidence.

Strengthening internships, refining hiring criteria and fostering alternative entry points into IT careers will be crucial to building a more inclusive and sustainable IT workforce.

Business and Community Gaps

The successful development of an IT workforce depends not only on education but also on the alignment between businesses, community resources and workforce pipelines. However, several gaps hinder the seamless transition from education to employment, ultimately affecting industry growth, economic development and workforce readiness. Key challenges include an oversupply of IT graduates relative to local job opportunities, inconsistent hiring practices, a lack of standardized technical terminology and limited structured support for apprenticeships and internships. Additionally, disparities in employer expectations, misalignment between industry needs and academic training, and an absence of clear pathways for nontraditional IT job entrants create significant barriers to workforce integration.

Further complicating these challenges, the perception of the Richmond region as a support hub for IT — rather than a center for innovation and cutting-edge technology — affects recruitment and retention. Many businesses prioritize hiring candidates based on cultural fit and broad competencies rather than technical skills alone, with AI playing a growing role in redefining skill expectations. Meanwhile, younger workers increasingly seek careers that align with their values, emphasizing work-life balance, societal impact and environmental responsibility. This creates new pressures for IT employers.

55 "VCCS Fast Facts."

Addressing these business and community gaps requires a coordinated approach, including the development of a regional advisory board, greater industry-education collaboration, and improved transparency in career pathways. Strengthening internships, refining hiring criteria and fostering alternative entry points into IT careers will be crucial to building a more inclusive and sustainable IT workforce. The following eight sections outline key challenges and potential solutions for bridging these gaps and ensuring that IT talent is effectively nurtured, retained and integrated into the workforce.

1. **Lack of Sufficient Job Opportunities for IT Graduates**

- Supply Exceeds Demand in Entry-Level IT Roles: VOEE shows there were 3,182 annual IT career cluster openings in the Richmond MSA and 2,355 regional IT-related graduates per year. Including the percentage of individuals filling entry-level roles in computer occupations, only 32.4% of those roles represent people from the computer and IT degree pathways. Another 22.9% come from business/marketing or engineering pathways (totaling 55.3%). A total of 44.7% of people entering entry-level computer-related occupations are from non-IT educational pathways. That means that 1,760 roles are being filled by individuals with IT-related degrees, and 1,422 positions are being filled by individuals without IT degrees from a SCHEV reporting institution. There are nearly 600 IT-related graduates who will not find IT jobs regionally.
- Richmond Region IT Optics: The region is not seen as high tech and supportive of developing new technology and designing and building supercomputers, but rather as an IT industry that supports many small- and medium-sized companies. Even the more prominent companies focused on business, marketing or data, including Capital One, CoStar, Bon Secours and CarMax, want to fit technology into their business plans.

2. **Mismatch Between Hiring Practices and IT Graduate Skills**

- Hiring Trends in Entry-Level IT Roles: Nearly 44.7% of entry-level IT positions are filled by individuals without IT-related degrees, indicating a disconnect between industry needs and educational outcomes. Employers often recruit from other fields, suggesting that IT graduates may only partially meet job requirements or that non-IT candidates bring skills valued by employers.
- AI influence on hiring: It has been mentioned that AI will help non-IT skilled employees gain those skills or identify ways to support their IT needs. Even the more prominent companies focused on business, marketing, finance or health care — including Capital One, CoStar, Carmax and Bon Secours fit technology into their business plans.

3. **Inconsistent Hiring Criteria and "Unwritten" Requirements**

- Variable Standards Across Employers: Some IT businesses rely on informal or unwritten hiring criteria, creating ambiguity for applicants and challenging educational institutions to align curricula with industry expectations. Regional conversations revealed a disparity between the qualifications that IT professionals recommend and those often prioritized by human resources. This disconnect may stem from an abundance of bachelor's-degree graduates, which can disadvantage capable candidates with associate degrees or certifications. CompTIA states the region is open to hiring people with less than a bachelor's degree; however, there is a pool of IT-related bachelor's degreed people to compete with, so it makes hiring somebody with less than a four-year degree highly competitive.

4. **Lack of Common Language for Technical Skills and Roles**

**Inconsistent Terminology Across the Industry*: Without a standardized language for technical skills and job roles, job descriptions are frequently misinterpreted, leading to mismatches between candidate qualifications and employer needs. This inconsistency in terminology complicates workforce alignment and poses challenges for curriculum development.

IT-related occupational and educational codes (including NAICS) do not match modern IT terminology. This includes a lack of codes for cyber security and AI. This can result in confusion when collecting data, since it is difficult to parse out roles, educational expectations and, at some point, more detailed competencies.

- *Lack of Standardized Language (within the region):* Variations in job titles, skills descriptions and qualifications hinder alignment between education programs and industry needs. Developing an IT-specific skills and job taxonomy, supported by a regional advisory board, would streamline workforce alignment and curriculum design. Developing this common language would also help create a map of various IT-related roles and the competencies needed to apply to or fulfill the needs of these roles. This competency map would help interested individuals to identify the most straightforward educational/experiential pathway to their career.

5. **Insufficient Support for Apprenticeships and Internships**

- *Limited Access to Early Career Development Opportunities:* Internships and apprenticeships are vital for practical skill-building, but more coordinated support is needed for these programs. A shortage of structured, accessible opportunities leaves students unprepared for the workforce and burdens employers with training. This includes efforts to support Virginia's High-Quality Work-Based Learning (HQWBL) program.
- *Program Duration and Security Clearance Delays:* Concerns include the lengthy background check/clearance processes in some internship programs, which can consume a significant portion of the internship duration, limiting time for learning and productivity. High school students cannot intern at a business where felons are on staff.
- *Fragmented Access to Internships and Apprenticeships:* Students (and educational institutions) face high competition for limited opportunities across various platforms. A centralized repository would streamline access, promote equity and reduce barriers to student and postsecondary institutional competition. RVATech is working to pull this together for the Greater Richmond region.

- *Limitations of Unpaid Internships:* Unpaid internships create significant barriers to participation, especially for students who rely on income to support their educational goals or family obligations. Financial need restricts access to valuable career-building experiences, disproportionately affecting students from lower-income backgrounds and limiting the diversity of talent entering the workforce.

6. **Need for a Regional Advisory Board for Industry and Education Alignment**

- *Enhancing Communication and Coordination:* A regional advisory board could align industry and education sectors by standardizing terminology, setting skills expectations and advising on curriculum development. This board could also manage a centralized internship and apprenticeship program and offer guidance on emerging industry trends to keep academic programs relevant. For sustainability, this board would need a convener responsible for communications, agenda-setting, success metrics and organizational support.
- *Mapping of IT Careers and Skills:* A clear and tangible universal pathway for IT careers is needed. Individuals looking for a pathway will receive a multitude of answers and advice. Individuals could more easily decipher the pathways to meet their goals if there was a means to identify the career paths and skills required.

7. **Outdated and Inconsistent Curriculum in Educational Institutions**

- *Curriculum Lagging Behind Industry Standards:* Rapid technological changes outpace many academic curricula, resulting in graduates who may need more current, high-demand skills. Regular input from an advisory board could help institutions update programs to better match industry needs. This is not just within SCHEV/VCCS reporting institutions but all educational support pathways.

8. **Limited Pathways for Nontraditional Entrants into IT Careers**

- *Underutilization of Alternative Pathways:* Given the industry's talent demand, increased support for nontraditional pathways, such as boot camps, certifications and accelerated programs, is needed. A lack of clear pathways restricts workforce growth and diversity in the field.[56]

  In many parts of Europe, technical or IT certifications are recognized as terminal credentials for career entry and advancement and often are valued more than traditional degrees. Cisco's certified Cisco network associate, Microsoft's Microsoft certified professional and CompTIA's Security+ credentials validate expertise and serve as industry standards.

  European employers prioritize practical skills over formal degrees, often collaborating with vocational programs, apprenticeships and certification providers to align training with industry needs. Countries such as Germany have robust systems that integrate certifications with career pathways, enabling professionals to achieve high-level positions without university degrees. This skills-based approach emphasizes practical experience and provides a viable alternative to degree-focused models.

56 "Credit for Industry Standard Certifications | UMGC Europe."

9. Change in Workforce Focus

- *Cultural shift for work/life balance:* Younger professionals increasingly seek careers that offer more than just a paycheck; they desire positions that provide a sense of fulfillment through positive community impact, environmental stewardship and societal contribution.

  Recent research indicates a significant shift among younger workers, particularly Generation Z and millennials, who prioritize employment that aligns with their personal values over traditional financial incentives. The 2024 Deloitte Global Gen Z and Millennial Survey reveals that nearly all respondents desire purposeful work, with many willing to decline assignments or reject employers that conflict with their ethical beliefs, including concerns about environmental impact and social inequality. This trend underscores a growing demand for roles that contribute positively to society and the environment.[57]

  Further emphasizing this shift, a study by the multinational health insurance and health care company Bupa found that two-thirds of Gen Z individuals experience anxiety related to environmental issues, with 64% considering an employer's environmental actions crucial when evaluating job opportunities. Notably, 31% would refuse roles at companies lacking strong ecological, social and governance commitments, and over half are willing to accept a pay cut to work for organizations that reflect their ethical values.[58]

  The good news is that IT exists in many (if not all) businesses, and there are various opportunities to apply IT skills within a business that support efforts that match the core values some candidates seek.

Recent research indicates a significant shift among younger workers, particularly Generation Z and millennials, who prioritize employment that aligns with their personal values over traditional financial incentives.

Regional and Economic Barriers to IT Workforce Growth

Beyond educational and business-related deficiencies, broader regional and economic factors significantly impact the ability to attract, develop and retain a skilled IT workforce in the greater Richmond area. High housing costs relative to IT wages create financial challenges for early-career professionals, making the region less competitive in attracting top IT talent. Additionally, disparities in access to technology, mentorship and essential career resources hinder opportunities for individuals, particularly in lower-income and rural areas, to pursue IT careers.

Poverty-related barriers further restrict access to training, with tuition costs, transportation challenges and child care responsibilities limiting participation in IT education and career development. At the same time, an aging workforce and rising retirement rates create an urgent demand for new IT professionals to sustain industry growth. This challenge is exacerbated by the increasing competition for talent across multiple sectors in Virginia, particularly in aerospace, aviation and the growing submarine construction industry, all of which aggressively recruit from the same workforce pool.

To ensure the long-term sustainability of the IT workforce, it is critical to address these regional and economic barriers through targeted initiatives, such as improving access to affordable housing, expanding mentorship programs and creating financial and logistical support systems for IT training. The following sections outline the key challenges that must be addressed to strengthen workforce development and sustain IT sector growth in the region.

57 "The Deloitte Global 2024 Gen Z and Millennial Survey."
58 "Gen Z Seek Ethical Workplaces as Environ-Mental Health Burden Bites."

1. **High Housing Costs and Lower-Than-Average IT Wages**

- **Cost of Living vs. Earnings:* Housing costs in the Greater Richmond Area[59] are below the national average, but so are IT wages[60]. According to DATA USA[61] "The median property value in Richmond was $308,300 in 2022, which is 1.09 times larger than the national average of $281,900. Between 2021 and 2022, the median property value increased from $263,000 to $308,300, a 17.2% increase." There are a couple of years' difference between the reports; however, the comparison does show a fluctuating market that puts Richmond in a high-cost housing market with close, but lower than average wages.

  The cost of living impacts the capacity for new talent to consider the region and makes attracting and retaining IT talent challenging, particularly for early-career professionals who may struggle to afford housing on entry-level salaries.

2. **Limited Access to Equipment, Resources and Mentorship**

- *Gaps in Essential Technology Access:* Limited access to computers, high-speed internet and other critical resources can restrict individuals from exploring IT as a career pathway, especially in lower-income and rural areas. The lack of consistent mentoring support further compounds this issue, as many potential IT professionals need more guidance on the resources, tools and training they need to prepare for a career in IT.

3. **Poverty-Related Barriers to Training and Career Development**

- *Financial Constraints:* Poverty creates significant barriers to entering the IT sector. Concerns related to tuition costs, transportation and child care limit individuals' ability to pursue necessary training or gain relevant experience. This economic disparity reduces the talent pool and restricts access to IT career pathways, especially for those from economically disadvantaged backgrounds.

As more experienced workers retire, the need for younger talent equipped with up-to-date skills to sustain industry growth intensifies.

4. **Aging Workforce, Impending Retirements and Industrial Competition**

- *Urgent Need for Workforce Renewal:* The region's aging workforce and rising retirement rates underscore an imminent demand for skilled IT professionals to fill vacated roles. As more experienced workers retire, the need for younger talent equipped with up-to-date skills to sustain industry growth intensifies. This demographic shift pressures the region to cultivate a robust and sustainable talent pipeline to meet evolving workforce demands and support continued innovation in the IT sector.

- Intensifying Competition for Available Workers: Multiple industries in Virginia, including the shipyards in Hampton Roads and sectors such as aerospace, aviation and construction, are aggressively recruiting talent. A substantial submarine construction project62 aims to hire 100,000 to 150,000 jobs in the next 10 years to help meet the nation's submarine-construction goals. There is a national search for talent; however, much of the work and potential employees may come from the Hampton Roads region. The aerospace, aviation and general contracting sectors are also expanding their workforce. This intense hiring competition creates challenges for the IT sector, as it must vie for the same pool of potential employees, requiring strategic efforts to attract and retain talent amidst heightened demand across various industries.

59 "Richmond MSA Cost of Living Shrinks to Pre-Pandemic Levels."
60 "Average Wages (2019)."
61 "Richmond, VA | Data USA."
62 "The Mission | Building the U.S. Naval Submarine Fleet."

Community Input — Regional Research Identifies Gaps in Career Pipeline

The Talent Pathways Initiative collection of regional community interviews, surveys and focus group data identified six main issues that hinder the IT pathway. The topics and comments below align with 20 gaps that compromise achieving a successful IT workforce pipeline.

1. **Gaps in Early IT Education and Career Awareness**

- Limited Integration of IT in K–12 Curricula: Early exposure to IT is essential for building a strong workforce pipeline. However, IT concepts are often underrepresented or not integrated into K–12 core curricula. Without early education, students miss critical foundational skills and career awareness, ultimately limiting the pool of individuals pursuing IT careers.
- Insufficient Engagement with Diverse Student Populations: IT suffers from underrepresentation among women, minorities and students from economically disadvantaged backgrounds. Without intentional outreach and inclusion efforts, a significant portion of the potential workforce remains untapped, further limiting industry growth. This arose as an equity issue between school districts, especially those that prefer to focus more on test-assigned topics (reading, writing, math), leaving little room for exploration into additional pathways, including IT.

2. **Skills Gaps in Secondary and Postsecondary IT Training**

- Outdated Curriculum Content: Technology advances faster than educational programs can adapt. High school and postsecondary programs struggle to keep IT curricula aligned with industry needs, leading to graduates who may lack skills in high-demand areas such as cloud computing, cybersecurity and data analytics. The Virginia Department of Education reevaluates its standards every six years, and new programs within higher education take more than an academic year to obtain approvals.
- Lack of Practical, Hands-on Experience: IT is a field where practical skills are crucial, yet many students graduate without significant hands-on experience due to a lack of labs, internship opportunities or project-based learning. This gap limits the readiness of new graduates and increases the burden on employers to provide additional training. This concern was highlighted by a career and technology center staff person who said the need to meet specific content objectives inhibited their capacity to get their students more hands-on IT experience. At a community college, staff lamented lacking time to engage students in hands-on experiences. They claimed that the timeline and the hybrid nature of some classes prevented many activities that would have been hands-on.

3. **Gaps in Career Pathways and Transition Support**

- Unclear Pathways to IT Careers: Many students and professionals need clearer guidance on navigating career pathways within IT. Without defined educational and training pathways, from K–12 through postsecondary education to entry-level jobs, students struggle to understand the steps needed to enter and progress in the IT industry. This may include the separation of IT and computer science and the need for additional content support to help students within the IT sector.
- Challenges in the High School-to-College-to-Career Transition: Transition points, such as moving from high school to higher education or into entry-level positions, are particularly vulnerable stages where students may lose momentum. A lack of structured support, such as mentorships, advising or internship opportunities, hinders building a stable IT workforce.

4. **Financial Barriers and Accessibility Challenges**

- High Costs of Advanced Certifications: While industry certifications are critical for many IT roles, the cost of obtaining certifications in fields such as cloud computing or security creates a significant barrier, especially given the difficulty of the exams and significant failure rate. Many individuals need help to afford these costs, which restricts access to IT careers and limits the industry's capacity to meet demand. Several programs are offering or looking to offer ways to cover some of these certification tests costs.
- Resource Inequities Across Regions: In lower-income and rural areas, access to advanced IT resources, high-speed internet and updated equipment is limited. This disparity prevents these students from gaining an adequate level of preparation, reinforcing regional skills gaps that hinder industry growth. Several colleges offer laptop programs; however, this problem persists everywhere, from computer access to high-speed internet. Because of cultural or community inequities, students' may lack the tools and resources that advance continued learning.

5. **Alignment Between Skills Training and Industry Needs**

- Mismatch Between Academic Training and Industry Skills: Rapid technological change outpaces traditional curriculum development timelines, resulting in a gap between the skills taught in educational institutions and those required in the workforce. This misalignment limits industry growth by producing graduates who need further training to meet current job requirements. Advisory boards need to be periodically refreshed so that members remain engaged and offer fresh perspectives and voices.
- Lack of Soft Skills Training: While technical expertise is foundational in IT, industry growth also depends on professionals with soft skills, including communication, problem-solving and teamwork. These skills are crucial in collaborative work environments, especially in consulting and client-facing roles, yet they often need to be emphasized more in IT programs. This emphasis is a common recommendation and requires a range of skills, from active listening to professional awareness to working with people in a community environment.

6. **Insufficient Support for Lifelong Learning and Skills Adaptation**

- Inadequate Infrastructure for Ongoing Professional Development: IT professionals require continuous skills development to stay relevant as technology evolves. However, many businesses need more resources or incentives to support ongoing learning for their employees. Long-term skills gaps affect the industry's growth potential. Additionally, universally accepted professional development must be offered to a broader range of potential business clients. Professional development can be offered through several educational entities; however, a regional advisory board may help certify priorities and ensure a common expectation, as well as coursework requirements and regional certifications, if the goal is less than an industry-recognized certification.
- High Turnover Due to Burnout and Lack of Career Sustainability: The pace of required IT reskilling can lead to burnout, contributing to high turnover rates. Retaining IT talent requires businesses and educational institutions to support professionals in managing career demands, upskilling and adapting to new technologies. A concern about employees aging out also arose in discussions. Many people in the workforce are getting older and, at some point, that will impact the current pool of IT employees[63].

63 Howard, "Aging Boomers Solve a Labor Market Puzzle."

PIPELINE PLANNING — IMPLEMENTATION RECOMMENDATIONS FOR IT

TPI#4: IT Talent Pipeline Development Plan

This section offers a series of targeted recommendations to foster a sustainable and expanding IT sector within the region. In discussions, GO Virginia representatives and other community stakeholders strongly emphasized the need for practical steps for IT growth. The recommendations represent an initial strategic roadmap that may be refined as broader community input is incorporated.

A Region for IT Growth

The Richmond-Petersburg area has the potential to become a strong hub for IT innovation and workforce development. While the region is home to several major employers, including those in finance, health care and data analytics, IT-specific industry growth has been hindered by a lack of cohesive workforce alignment, educational gaps and a need for clearer career pathways.

One of the challenges identified in this analysis is the blurring of lines between two distinct IT workforce tracks:

1. Supportive IT — Includes IT infrastructure, network administration, cybersecurity, technical support enterprise software and cloud computing.
2. Computer science/high-tech IT — Encompasses software development, AI, machine learning, advanced cybersecurity, high-performance computing and data science.

These two IT career tracks have different workforce demands, training needs and career pathways, yet they are often grouped under a single IT umbrella. This lack of distinction creates misalignment between employer expectations, workforce training programs and student career exploration.

By establishing clearer distinctions between supportive IT and computer science/high-tech IT, this workforce plan will ensure better alignment between education, training and industry needs, allowing students, workers and employers to engage with pathways tailored to their specific goals.

Focus Areas for Advancement/Development

I. Governance: Establishing a Unified Voice
II. Education: Preparing the Next Generation
III. Education: Professional Development and Continued Learning

These focus areas serve as a strategic roadmap, guiding stakeholders, including industry leaders, educational institutions, workforce development organizations and policymakers, toward collaborative, targeted actions that will strengthen IT workforce pathways and ensure a sustainable, skilled talent pool in GO Virginia Region 4.

I. Establishing a Regional Governing Organization

GO Virginia Region 4's IT workforce ecosystem consists of various stakeholders, including educational institutions, employers, workforce development organizations and economic- development agencies. However, these efforts often operate independently, resulting in fragmented initiatives and a lack of coordinated action. The lack of a unified workforce strategy has led to fragmented training efforts, gaps in employer-education alignment and a shortage of workers with the right skills for the jobs. A regional IT workforce strategy will ensure that training programs, certifications and career pathways reflect the distinct needs of both supportive IT and high-tech IT.

By leveraging existing resources such as RVATech and the Virginia Talent + Opportunity Partnership, this governing body would be a convener for workforce development efforts, ensuring alignment with employer needs and supporting regional IT growth.

Key Areas of Focus:

1. Champion/Convener Role
2. Bridging Education, Workforce and Business: Need for a Competency Mapping Tool
3. Partnership Alignment: Education, Workforce and Business

1. Champion/Convener Role

A dedicated champion or convener is essential to ensuring that regional IT workforce development remains coordinated, strategic and sustainable. This individual or entity would act as a central point of leadership, bringing together employers, educators, workforce development organizations and policymakers to align efforts, drive innovation and address workforce challenges proactively. The convener would help build a responsive and resilient IT talent pipeline by maintaining ongoing engagement and ensuring collaborative decision making.

- Serve as the primary liaison among employers, educational institutions, workforce development organizations and policymakers to better align training programs with industry needs and ensure effective communication between stakeholders.

- Establish clear performance metrics to track progress, measure impact and ensure accountability in IT workforce initiatives, including metrics related to job placements, program completion rates and industry engagement.
- Advocate for local, state and federal policy changes and funding to support IT workforce initiatives. This would ensure sustained investment in training, education and talent development.
- Conduct regular industry-needs assessments to identify gaps in training and employment opportunities and ensure that education and workforce programs remain aligned with evolving IT and high-tech workforce demands.
- Facilitate regional workforce collaborations by organizing task forces, advisory councils and industry-education roundtables to address emerging challenges and drive continuous improvement.

2. Bridging Education, Workforce and Business: Need for a Competency Mapping Tool

The region lacks a structured competency mapping tool that clearly aligns educational pathways with industry needs, making it difficult for students, job seekers and educators to navigate career progression in IT. A well-designed competency mapping tool would provide clarity and transparency, ensuring that both supportive IT roles (e.g., IT support, network administration) and high-tech IT roles (e.g., software development, cybersecurity, AI/machine learning) are well-defined and mapped to relevant training and employment opportunities. This tool would guide individuals and organizations looking to understand career progression, required skills and training options within the IT sector.

Key elements of this initiative include:

- Defining core competencies required for various IT roles, outlining skills, experience levels and career progression for both supportive IT and high-tech IT careers. Given the field's rapid evolution, this would require a continuous effort to update competencies as industry demands shift.
- Aligning educational programs with employer expectations to ensure workforce readiness, incorporating coursework, hands-on experience, certifications and internships that best prepare students for industry demands.
- Developing a public-facing resource that provides real-time data on job openings, projected workforce demand and available training options that make it easier for individuals to explore career opportunities and plan their educational pathways.
- Establishing a common language for IT roles, skills and job postings to improve alignment among employers, educators and workforce agencies, reducing confusion in job descriptions and better matching candidates with the right opportunities.

3. Partnership Alignment: Education, Workforce and Business

A coordinated, strategic effort is essential to bridge the gap between educational institutions, employers and workforce development agencies in the IT sector. Strengthening these connections will ensure that students receive relevant training, businesses can access a skilled workforce and workforce agencies can effectively support career development. The region can create a more efficient and responsive IT talent pipeline by fostering collaboration among these stakeholders.

- Establishing a formal advisory board comprising industry representatives, educational leaders and workforce professionals from various IT pathways, ensuring continuous dialogue and alignment between employer needs and academic offerings.
- Expanding structured internship and apprenticeship opportunities to provide students real-world, hands-on experiences that strengthen their technical and professional skills before entering the workforce.

- Ensuring curriculum alignment by actively integrating employer feedback into program development, adjusting both supportive IT (e.g., network administration, IT support, cybersecurity) and computer science/high-tech IT (e.g., software development, AI, cloud computing) pathways to reflect evolving industry needs.
- Facilitating industry-education partnerships that encourage employers to codevelop coursework, provide guest lectures and participate in career mentorship programs, ensuring that students receive up-to-date knowledge and exposure to emerging technologies.
- Leveraging workforce development agencies to connect training programs with funding opportunities, career counseling and job placement services, making IT career pathways more accessible and inclusive.

The regional advanced pharmaceutical manufacturing industry leaders and organizers are researching and considering a federated alliance model. IT should consider emulating their efforts. A federated alliance model is a structured yet decentralized approach to collaboration. Multiple independent entities, such as businesses, educational institutions, workforce development agencies and government bodies, work together under a shared framework while maintaining their autonomy. This model balances regional coordination with local flexibility, allowing members to align efforts, share resources and pursue common goals without requiring a single governing authority to control operations. Another option would be working with existing entities, such as RVA Rising. (More information regarding this organization can be found in Appendix under Leveraging RVA Rising as a Regional IT Governance Convener.)

II. Education: Preparing the Next Generation

A strong K–12 and postsecondary education system is essential to building a robust IT workforce pipeline. However, several challenges, including inconsistent technology integration, outdated curricula and a lack of early career exposure, must be addressed to improve IT education and workforce alignment. It is also important to help students understand the differences within supportive IT and computer science or computer engineering pathways.

Key Areas of Focus:

1. Integrating IT Concepts into Classroom Content
2. High-quality Educational Experiences for Educators and Students
3. Stronger Connections with Community Colleges
4. Enhanced Support for Student Transitions
5. Expanding Work-Based Learning and Internships

1. Integrating IT Concepts into Classroom Content

Many students do not receive meaningful exposure to IT-related content until late in their academic careers, limiting early interest and career exploration. While students frequently use computers and applications in the classroom, integrating IT and computer science concepts remains minimal. Expanding IT exposure earlier in K–12 education will help build foundational skills, foster curiosity and create clearer pathways into IT careers.

- Introducing IT-focused coursework earlier in Pre-K–12 education ensures that students develop computational thinking, problem solving and digital literacy skills from an early age.
- Expanding entry-level IT engagement opportunities by incorporating diverse technology pathways such as business-information systems, cybersecurity, software development and data analytics, allowing students to explore various career options within IT.
- Developing IT-focused curriculum modules that can be integrated into core subjects like math and science. By providing hands-on applications (e.g., coding simulations for data analysis, algorithm-based problem-solving or cybersecurity challenges) learning will be more engaging and industry relevant.
- Leveraging industry partnerships to bring real-world IT applications into classrooms, such as guest speakers, project-based learning initiatives and hands-on coding challenges, connecting students to modern technology careers.
- Encouraging interdisciplinary IT integration across subjects such as history, economics and the arts, demonstrating how technology is used across industries to solve problems, improve efficiency and drive innovation.

2. High-Quality Educational Experiences for Educators and Students

To ensure that students develop the skills needed for IT careers, educators must have access to ongoing professional development and provide students with hands-on learning experiences that mirror real-world industry challenges. Strengthening IT education requires a dual focus on empowering teachers with up-to-date industry knowledge and expanding student experiential learning opportunities.

- Providing professional development workshops for teachers on emerging IT topics, such as AI, cybersecurity and cloud computing. These workshops should cover technical advancements and equip educators with effective ways to introduce students to diverse IT career pathways and emerging industry trends.
    - AI integration: Businesses emphasize that AI literacy is increasingly valuable for potential employees. Higher education should explore how to incorporate AI as a tool beyond IT-specific programs while developing AI-focused courses and training programs to ensure students understand how to program, apply and use AI productively within IT fields. Given AI's rapid growth, proactively embedding AI education will help meet future workforce demands.

- Strengthening the pipeline of qualified IT instructors by addressing recruitment and retention challenges, particularly the pay disparity between IT educators and industry professionals.
    - Pay parity concerns: A significant wage gap exists between IT educators — at the high school and college levels — and industry professionals with comparable skills. This disparity makes it difficult to attract and retain qualified educators, leading to high turnover rates and outdated curricula. Without competitive compensation, many skilled IT professionals opt for higher-paying industry jobs instead of teaching, limiting students' exposure to real-world expertise.

      Potential solutions include exploring industry partnerships, adjunct teaching models, financial incentives and pathways for professionals to transition into teaching roles without a significant financial sacrifice. (More information is in the Appendix under Pay Parity Concerns.)
- Expanding access to technology labs and hands-on learning experiences that actively engage both students and educators in real-world problem solving.
- Encouraging the development of structured mentorship programs that connect students with industry professionals across a diverse range of companies and career pathways.

3. Stronger Connections with Community Colleges

Community colleges play a critical role in IT workforce development, but stronger alignment with high school programs and employer expectations is needed.

- Expand dual-enrollment IT programs to allow high school students to earn college credit. This effort would also align with the VCCS's strategic plan, "Opportunity 2027," which aims to achieve equity in access, learning outcomes and student success. Expanding dual-enrollment opportunities is a key component of this plan, particularly in rural communities with limited access to higher education.
- Develop structured pathways from community college programs to bachelor's degrees and industry certifications. This could include pathways to supportive IT, as well as encouragement and support to consider more rigorous pathways into computer science and high-tech occupations. Community colleges could also provide support for those who wish to matriculate into more rigorous programs.
- Enhance collaboration between community colleges and local employers to ensure academic programs align with current and emerging industry needs. This includes revitalizing and actively engaging advisory boards comprising business leaders, workforce development experts and educators to provide ongoing feedback on curriculum relevance. Community colleges can better prepare students with the technical and professional competencies required for success in the modern workforce by fostering continuous dialogue between education and industry.

4. Enhanced Support for Student Transitions

Many students face challenges transitioning from high school to college or from graduation to the workforce due to a lack of clear career guidance, structured pathways and support services. Strengthening these transition points will help students navigate their educational and career journeys more effectively.

- Develop structured bridge programs that provide foundational training and support for students entering IT education and training programs, ensuring they are prepared for more advanced coursework. Bridge programs are used in several regional institutions; the success metrics should be monitored and potentially scaled up to support current successes.
- Expand targeted career counseling and mentorship to help students understand the full range of IT career pathways, industry expectations and opportunities for skill development.
- Enhance academic support services, including tutoring, peer mentorship and skills workshops, to address critical gaps in math, programming and technical competencies that may hinder student progress.
- Establish clear on-ramping opportunities for individuals already working in IT-related fields, enabling them to transition into more advanced roles or pursue higher-level training in computer science, cybersecurity and other high-tech programs.
- Strengthen partnerships with employers to facilitate internships, apprenticeships and job placement programs, ensuring students gain hands-on experience and a smoother transition into the workforce.

5. Expanding Work-Based Learning and Internships

Internships and apprenticeships play a crucial role in IT workforce development, providing students with practical experience, industry exposure and pathways to employment. However, access to these opportunities remains limited, often due to employer hesitancy, financial constraints and security clearance requirements. Expanding work-based learning will require targeted efforts to increase employer engagement and remove barriers to participation.

- Addressing financial and logistical challenges could increase employer participation in internship and apprenticeship programs. This could include offering stipends, tax incentives or grant-funded opportunities to encourage businesses, especially small and mid-sized companies, to host interns.
- Expand partnerships with Virginia's HQWBL program to create new experiential learning opportunities, such as job shadowing, project-based internships and cooperative education programs that align with industry needs.
- Address security clearance barriers that limit access to internships in data privacy, cybersecurity and government-contracted businesses by working with employers, educational institutions and policymakers to explore preclearance programs, background check support or alternative pathways to help students gain experience in these high-demand fields.
- Develop structured internship pathways that allow students to progress from short-term, introductory experiences to longer, more advanced work placements, ensuring consistent skill building and industry exposure.
- Foster mentorship and professional networking opportunities within work-based learning programs, connecting students with industry professionals who can provide guidance, career insights and support as they transition into the workforce.

III. Education: Professional Development and Continued Learning

IT is a rapidly evolving field, and ongoing professional development is essential to maintaining a competitive workforce. Many employers lack the resources to support continuous training, creating long-term skills gaps.

Key Areas of Focus:

1. Building a Regional Training Network
2. Addressing the Cost and Accessibility of Certifications
3. Developing a Lifelong Learning Culture

1. Building a Regional Training Network

A coordinated, region-wide approach to professional development will help IT professionals stay current with evolving industry trends and meet the technical needs of businesses, particularly small and medium-sized enterprises (SMEs) that may lack in-house training resources. Establishing a regional IT training network will enhance workforce agility, ensuring professionals can continually upskill and adapt to emerging technologies.

- Establish a regional IT training consortium that brings together community colleges, universities, workforce development agencies and employers to collaborate on curriculum development, resource sharing and industry alignment. This could function within a broader governance model to ensure sustained coordination.
- Develop flexible, accessible training models, including online, hybrid and modular programs, to accommodate working professionals and those transitioning into IT careers. These programs should include microcredentials and stackable certifications to allow learners to build competencies at their own pace.
- Expand Virginia's workforce retraining initiatives by aligning IT upskilling programs with state and regional workforce priorities, ensuring professionals can access targeted training in high-demand areas such as cybersecurity, cloud computing, data analytics and AI applications.
- Encourage employer-supported training partnerships where businesses collaborate with educational institutions to provide on-the-job training, tuition reimbursement programs or customized workforce development initiatives tailored to industry needs.
- Leverage existing funding and grant opportunities to support affordable training options for SMEs, ensuring businesses of all sizes can access high-quality IT workforce development resources.

2. Addressing the Cost and Accessibility of Certifications

Industry certifications are critical credentials for IT professionals, often serving as key qualifiers for employment and career advancement. However, the high cost of certification exams and training can create barriers, particularly for those seeking to enter or advance within the field. While certification-support programs exist, many businesses are unaware of opportunities through community colleges and workforce development organizations such as the CCWA. Expanding awareness, affordability and accessibility will ensure a more inclusive and well-prepared IT workforce.

- Partner with employers to subsidize certification costs for students, job seekers and incumbent workers by leveraging tuition-assistance programs, employer-funded training initiatives and public-private partnerships to reduce financial barriers.
- Integrate certification preparation into community college and university programs to ensure students receive structured training that aligns with industry-recognized credentials such as CompTIA, AWS, Cisco, Microsoft and cybersecurity certifications.
    - Develop microcredential and stackable credential programs in collaboration with industry partners to provide flexible, career-relevant training that meets regional IT workforce needs. This model enables professionals to gain specialized skills in short, competency-based courses that mesh with industry certifications or degree pathways.
    - Microcredentials can serve as standalone learning experiences or be incorporated into higher-level credentials in cybersecurity, cloud computing, data analytics and AI applications.
- Expand scholarship and financial-assistance programs for IT certification exams by partnering with government agencies, workforce development boards and nonprofit organizations to provide grants, vouchers or low-cost training opportunities for underserved populations.

3. Developing a Lifelong Learning Culture

To retain and grow the IT workforce, the region must foster a culture of continuous learning that encourages ongoing skill development and career progression. As technology evolves rapidly, professionals must have access to structured learning opportunities to remain competitive in the industry. Establishing lifelong learning pathways will ensure that new and experienced IT professionals can adapt, innovate and advance in their careers.

- Promote employer-sponsored training initiatives that provide structured career- growth opportunities, including tuition-reimbursement programs, upskilling workshops and in-house technical trainings that align with industry needs.
- Expand IT boot camps and short-term training programs to support career transitions and workforce mobility by offering intensive, skills-focused training in high-demand specializations such as software development, cloud computing, data science and cybersecurity.
- Establish mentorship networks that connect early-career professionals with experienced IT leaders, creating opportunities for career guidance, knowledge sharing and professional growth. These networks can be formal (company-sponsored programs) or informal (regional meetups, virtual mentorship and professional association partnerships, such as RVATech).
- Encourage professional development through industry certifications, microcredentials, and continuing education programs to help IT workers stay current with emerging technologies and advance within their career pathways.
- Leverage regional partnerships among educational institutions, employers and workforce-development organizations to ensure that lifelong learning opportunities are accessible, affordable and aligned with industry needs.

High-Level Budget Estimate for IT Workforce Development (Three to Five Years)

(Estimated Range: $16.5 million to $29 million over five years)

This budget is designed to establish a strong, sustainable workforce development initiative for supportive IT and high-tech IT careers in GO Virginia Region 4. It includes program development, personnel, infrastructure and industry alignment costs, ensuring that the region has a cohesive and well-funded strategy to develop IT talent pipelines.

I. Governance: Establishing a Regional IT Workforce Strategy

Estimated Cost: $4.5 million to $8 million over five years

Justification:

A Regional IT Workforce Strategy is essential to aligning education, workforce training and employer needs. A dedicated entity will coordinate efforts, track progress and ensure industry alignment.

- Convener staff and operations ($2 million to $3 million): three to four full-time staff (executive director, workforce coordinator, industry liaison, administrative support).
- Competency mapping tool development and maintenance ($1.5 million to $2.5 million): A public-facing resource that maps career pathways in supportive IT and high-tech IT.
- IT industry advisory board and employer engagement ($1 million to $2.5 million): Regular employer engagement, strategy summits and business-academic partnerships.

Potential Funding Sources:

- GO Virginia funding
- Private sector sponsorships
- State/federal workforce development grants

II. Education: Preparing the Next Generation

Estimated Cost: $7 million to $12 million over five years

Justification:

Early engagement is critical to building a robust IT talent pipeline. Investments in K–12, community colleges and student transitions ensure a well-prepared workforce.

- K–12 curriculum and career exploration ($2 million to $3.5 million): Introduce IT pathways early, ensuring students understand the difference between supportive IT and high-tech IT.
- Hands-on learning and outreach (tech labs, project-based learning, site visits) ($1.5 million to $3 million): Expand technology labs, mobile outreach and employer-sponsored site visits.
- Dual enrollment and community college partnerships ($2 million to $3 million): Strengthen dual-enrollment pathways and align curricula with industry needs.
- Student transition support (mentorship, career counseling, soft-skills development) ($1.5 million to $2.5 million): Career-awareness programs, IT mentorships and structured industry engagement.

Potential Funding Sources:

- Virginia Department of Education
- Workforce Innovation and Opportunity Act grants
- Industry-supported education initiatives

III. Education: Professional Development and Continued Learning

Estimated Cost: $5 million to $9 million over five years

Justification:

Ongoing reskilling and upskilling are required to maintain a competitive IT workforce. A regional training network will support professionals in supportive IT and high-tech IT careers.

- Regional IT training network ($2 million to $4 million): Establish a consortium of employers, universities and community colleges to provide advanced IT training.
- Industry certifications and workforce upskilling ($2 million to $3 million): Subsidized IT certifications (CompTIA, AWS, AI, cybersecurity) and employer-driven workforce training.
- Mentorship & Career Advancement Programs ($1 million to $2 million): Connect early-career IT professionals with mentors, leadership training and employer-sponsored upskilling.

Potential Funding Sources:

- U.S. Economic Development Administration grants
- Employer investment in upskilling programs
- Public-private workforce partnerships

Summary Budget Estimate (Over Five Years)

Category	Low Estimate ($ million)	High Estimate ($ million)
Governance: Establishing a Unified Voice	4.5	8.0
Education: Preparing the Next Generation	7.0	12.0
Education: Professional Development & Continued Learning	5.0	9.0
Total Estimate (Three to Five Years)	**$16.5 million**	**$29 million**

Why This Budget Matters

- Addresses the full workforce pipeline, from K–12 education to mid-career workforce upskilling, ensuring a steady flow of IT talent.
- Aligns with industry growth needs, reducing IT talent shortages, improving workforce readiness and supporting regional industry growth.
- Creates a competitive regional advantage, strengthening Go Virginia Region 4's position as an emerging IT workforce hub.
- Leverages public and private funding, using state, federal and private funding sources to ensure sustainability.

Next Steps

1. Identify key funding sources (GO Virginia, private investment, state/federal workforce grants).
2. Establish a regional governing body to oversee implementation.
3. Engage employers and educational partners to refine workforce programs.
4. Launch pilot programs for competency mapping, K–12 curriculum development and industry certification expansion.

Conclusion: Building a Stronger, More Sustainable IT Workforce

The Information Technology Talent Pipeline Development Plan for GO Virginia Region 4 presents a strategic and actionable framework to address current workforce challenges and ensure the region's IT sector remains competitive and sustainable. By implementing the key recommendations outlined in this report, educational institutions, industry leaders and workforce development organizations can work together to strengthen IT career pathways, expand access to training and align education with industry demands.

Through enhanced collaboration, structured governance and strategic investment in workforce development, the region can:

- Establish a unified regional IT workforce strategy, ensuring alignment between training programs and employer needs.
- Strengthen IT education, K–12, through postsecondary institutions, integrating hands-on learning, industry exposure and early career exploration.
- Expand work-based learning opportunities, increasing internships, apprenticeships and mentorship connections to bridge the gap between education and employment.
- Improve accessibility to IT certifications and upskilling programs, ensuring affordability and industry relevance for students and professionals.
- Foster a lifelong learning culture, supporting career advancement and continuous professional development.

A coordinated, data-driven approach will help develop a highly skilled IT workforce and make GO Virginia Region 4 a more attractive destination for IT employers, ensuring long-term economic growth and opportunity. With sustained collaboration and investment, the region can solidify its position as a leading IT innovation hub, providing clear career pathways and high-quality job opportunities for its workforce.

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Appendix: A

GLOSSARY

A

- **Artificial Intelligence (AI):** The simulation of human intelligence processes by machines, especially computer systems, enabling them to perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making and language translation.
- **Associate of Applied Science (AAS):** A vocational degree that provides students with the skills and knowledge necessary to enter the workforce immediately after graduation, focusing on practical and technical skills.
- **Associate of Science (AS):** An academic degree focusing on science and mathematics courses, often intended for students planning to transfer to a four-year institution to pursue a bachelor's degree.
- **Augmented Reality (AR):** An enhanced version of the real physical world achieved through the use of digital visual elements, sound or other sensory stimuli delivered via technology.

B

- **Brookings Institution:** A nonprofit public-policy organization based in Washington, D.C., conducting in-depth research that leads to new ideas for solving problems facing society at the local, national and global levels.
- **Business Analytics:** The practice of iterative, methodical exploration of an organization's data with an emphasis on statistical analysis to drive decision making.

C

- **Career and Technical Education (CTE):** Educational programs that specialize in skilled trades, applied sciences, modern technologies and career preparation.
- **Cloud Computing:** The delivery of computing services — including servers, storage, databases, networking, software, analytics and intelligence — through the internet ("the cloud") to offer faster innovation, flexible resources and economies of scale.
- **CompTIA (Computing Technology Industry Association):** A leading provider of vendor-neutral IT certifications and a nonprofit trade association issuing professional certifications for the IT industry.
- **Cybersecurity:** The practice of protecting systems, networks and programs from digital attacks, which are usually aimed at accessing, changing or destroying sensitive information or interrupting normal business processes.

D

- **Data Analytics:** The science of analyzing raw data to make conclusions about that information, often using specialized systems and software.
- **Dual Enrollment:** A program allowing high school students to enroll in college courses for credit prior to high school graduation.

E

- **Economic Development Authority (EDA):** An organization or government agency responsible for promoting economic growth and development within a specific area.
- Enterprise Software: Large-scale software aimed at supporting or solving the problems of an entire organization, often involving complex systems such as databases and cloud services.

G

- **GO Virginia (Growth and Opportunity for Virginia):** A state-funded initiative to promote economic growth and diversification across the Commonwealth of Virginia through regional collaboration.

H

- **High-Quality Work-Based Learning (HQWBL):** Educational strategies that provide students with real-life work experiences where they can apply academic and technical skills and develop employability.

I

- **Information Technology (IT):** The use of computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data.
- **Internship Simulator:** A program designed to mimic the experience of an internship, providing practical, hands-on experience in a controlled environment.

J

- **JobsEQ:** A labor market data-analysis tool that provides insights into employment trends, wages and other workforce metrics.

L

- **Location Quotient (LQ):** A measure used to analyze the concentration of a particular industry, cluster, occupation or demographic group in a region compared to a larger reference area.

M

- **Maxx Potential:** A technology talent-development company offering apprenticeship-style programs to help individuals gain IT experience while providing services to clients.

N

- **NAICS (North American Industry Classification System):** The standard used by federal statistical agencies to classify business establishments for collecting, analyzing and publishing statistical data related to the U.S. economy.

O

- **Occupational Codes (SOC Codes):** Standard Occupational Classification codes used to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data.

P

- **Pre-K–12 Education:** An abbreviation for the sum of primary and secondary education, covering from prekindergarten through 12th grade.

R

- **Regional Advisory Board:** A group comprising industry leaders, educators and stakeholders that provides guidance and support to align educational programs with industry needs within a region.

S

- **SCHEV (State Council of Higher Education for Virginia):** The commonwealth's coordinating body for higher education, responsible for higher education policy planning and advancement.
- **STEM (Science, Technology, Engineering and Mathematics):** An interdisciplinary approach to learning in which academic concepts are coupled with real-world lessons as students apply science, technology, engineering and mathematics in contexts that make connections between school, community and work.
- **Supportive Information Technology:** IT roles and services that focus on supporting other businesses and industries by enhancing operational efficiency, such as IT consulting, networking, and systems administration.

T

- **Talent Pathways Initiative (TPI):** A strategic framework under GO Virginia that aims to enhance workforce development, promote industry growth and foster regional collaboration in key industry sectors.

V

- **Virginia Community College System (VCCS):** A system comprising 23 community colleges across Virginia, providing accessible and affordable education and training.
- **Virginia Office of Education Economics (VOEE):** An office that provides data, analysis and insights on education and workforce outcomes to support policy and decision making in Virginia.
- **Virtual Virginia:** An online program offering flexible options for the provision of instruction to students across the commonwealth, supplementing the course offerings of schools to meet their students' needs.

W

- **Workforce Development:** Programs and initiatives designed to improve the skills of the workforce, enhancing employability and meeting the needs of employers.

Appendix: B

COMPARATIVE ANALYSIS: COMPARABLE MARKETS TO GO VIRGINIA REGION 4/ GREATER RICHMOND

The GO Virginia Region 4/Greater Richmond area has established itself as a growing hub for IT and related industries. However, to remain competitive in an increasingly globalized and technology-driven economy, it is crucial to benchmark against other comparable markets. This analysis examines three regions — Northern Virginia, Raleigh-Durham and Austin — known for their strong IT ecosystems. It also identifies insights and strategies that Region 4 can adopt to enhance its competitive edge.

Comparable Markets

1. Northern Virginia

- Overview: Northern Virginia is a leading IT and cybersecurity hub, hosting federal agencies, defense contractors and major tech firms such as Amazon Web Services. The region's proximity to Washington, D.C., and robust fiber-optics infrastructure have made it a global leader in data centers, earning it the nickname Data Center Alley.
- Strengths:
  - High concentration of IT jobs (approximately 25% of the workforce is tech related).
  - Strong educational pipeline with institutions such George Mason University and Virginia Tech's Innovation Campus.
  - Dense presence of government contracts, driving growth in cybersecurity and cloud computing.
- Lessons for Region 4:
  - Data Center Incentives: Position Richmond as a cost-effective alternative for data-center expansions, leveraging its competitive utility rates and proximity to major transatlantic cables.
  - Cybersecurity Training: Partner with regional universities to replicate Northern Virginia's focus on cybersecurity certifications and programs to address workforce gaps.
  - Marketing Strategy: Enhance national branding efforts by promoting Richmond as a secondary hub for federal IT contractors seeking lower costs.

2. Raleigh-Durham, N.C. (Research Triangle)

- Overview: The Research Triangle is a global leader in IT innovation, research and development. With three top-tier universities (Duke, UNC–Chapel Hill and NC State), the region benefits from a steady pipeline of talent and a culture of entrepreneurship.
- Strengths:
  - Home to tech giants such as Cisco, IBM and Red Hat.
  - Strong startup ecosystem supported by venture capital and incubators.
  - Collaborative initiatives between academia, industry and government (e.g., Research Triangle Park).
- Lessons for Region 4:
  - Startup Ecosystem: Expand incubators and accelerators in Region 4 to attract and nurture tech startups, modeled after Research Triangle Park.

- University Partnerships: Strengthen partnerships between Richmond's universities (e.g., VCU, VSU, University of Richmond) and local businesses to create joint research opportunities and talent pipelines.
- Venture Capital: Collaborate with investors to create a regional tech investment fund to support innovation.

3. **Austin, Texas**

- Overview: Known as Silicon Hills, Austin has emerged as a vibrant tech hub attracting both startups and established tech firms. The city offers a thriving quality of life, strong cultural appeal and significant investment in tech infrastructure.
- Strengths:
  - Diverse tech ecosystem, hosting companies such as Dell, Tesla and Oracle.
  - Consistently ranks high for job growth and economic resilience.
  - Low taxes and a business-friendly regulatory environment.
- Lessons for Region 4:
  - Talent Retention: Austin invests heavily in quality-of-life factors to retain tech talent, such as affordable housing, cultural events and outdoor amenities. Richmond could enhance its appeal by addressing rising housing costs and promoting lifestyle benefits.
  - Event Strategy: Host high-profile tech conferences and festivals, similar to Austin's SXSW, to attract global attention and showcase local innovation.
  - Public-Private Collaboration: Increase collaboration between public agencies and private companies to codevelop infrastructure and tech hubs.

Key Benchmarks and Regional Strengths

Metric	Northern Virginia	Raleigh-Durham	Austin	Greater Richmond
IT Workforce Size	300,000+	100,000+	85,000+	36,000+
Median IT Wages	$120,000+	$105,000+	$110,000+	$95,000
Cost of Living	High	Moderate	Moderate	Moderate
University Influence	High (Virginia Tech, GMU)	High (UNC, Duke, NCSU)	Moderate (UT Austin)	Moderate (VCU, VSU, UR)
Startup Ecosystem	Emerging	Strong	Strong	Developing
Data Center Presence	Global Leader	Moderate	Moderate	Emerging

Strategic Insights for Region 4

1. **Positioning Richmond as a Cost-Effective Alternative:**

- Promote Region 4's lower costs compared to Northern Virginia's while emphasizing proximity to the same federal and commercial opportunities.

2. **Enhancing Talent Development:**

- Create a regional flagship initiative akin to Virginia's Tech Talent Investment Program to increase the output of IT graduates and skilled workers.

3. **Investing in Quality of Life:**

- Follow Austin's example by promoting regional lifestyle benefits, including cultural amenities, outdoor recreation and family-friendly initiatives, to attract and retain talent.

4. **Building Regional Branding:**
- Launch a focused campaign showcasing Region 4 as a rising IT hub, emphasizing its connectivity, affordability and innovation ecosystem.

5. **Encouraging Collaboration:**
- Develop programs that foster collaboration between universities, startups, and large firms, modeled after Raleigh-Durham's Research Triangle Park approach.

6. **Expanding Infrastructure for Innovation:**
- Incentivize the creation of innovation districts, shared coworking spaces and advanced research facilities to spur growth in emerging tech sectors such as AI and cybersecurity.

By leveraging these insights and learning from successful models in Northern Virginia, Raleigh-Durham, and Austin, Region 4 can position itself as a competitive and attractive destination for IT talent and businesses, fostering sustained economic growth and innovation.

Appendix: C

PAY PARITY CONCERNS BETWEEN IT EDUCATORS AND INDUSTRY PROFESSIONALS

A major challenge in IT workforce development is the significant pay disparity between educators in PK–12 and higher education institutions and their counterparts in the private sector. IT professionals with in-demand skills — such as cybersecurity, software development and artificial intelligence— can often earn considerably higher salaries in industry roles than they would as teachers or professors. This wage gap has several adverse effects on education and workforce readiness.

Key Impacts of Pay Disparities

1. **Difficulty in Attracting and Retaining IT Educators**
   - Many educational institutions struggle to hire instructors with industry experience due to noncompetitive salaries.
   - High turnover rates occur when educators leave teaching for better-paying industry positions, disrupting student learning and program stability.
2. **Declining Quality of IT Education**
   - Without competitive pay, fewer qualified professionals enter teaching, leading to outdated curricula that do not align with evolving industry standards.
   - Schools and colleges may rely on educators who lack real-world IT experience, which limits students' exposure to current trends and best practices.
3. **Inconsistencies in Pay Within Education**
   - Despite covering similar foundational content, high school IT teachers often earn significantly less than college-level instructors.
   - Community college faculty salaries lag behind four-year institutions' despite their critical role in workforce-aligned IT training.
4. **Broader Workforce Implications**
   - If students do not receive instruction from industry-aligned educators, they may graduate without the skills employers need, widening the skills gap.
   - Employers may turn to alternative sources, such as coding bootcamps or self-taught professionals, bypassing traditional educational institutions.

Potential Strategies to Address the Issue

- Industry-Education Partnerships — Businesses could provide funding, guest lecturers or faculty sponsorships to supplement educator salaries.
- Incentive Programs — States and institutions could offer retention bonuses, professional development stipends or competitive salary adjustments to IT educators.
- Hybrid Teaching Models — Encouraging part-time teaching from active industry professionals can bring real-world experience into classrooms.
- Public Investment in IT Educators — Workforce development grants or state-funded salary enhancements could support IT faculty recruitment and retention.

Addressing pay disparities is critical to ensuring that IT programs remain competitive, relevant and capable of preparing students for the evolving demands of the workforce. Strengthening compensation structures and leveraging industry collaborations can help bridge this gap, benefiting students and employers.

Appendix: D

LEVERAGING RVA RISING AS A REGIONAL IT GOVERNANCE CONVENER

In response to discussions from an April 2025 GO Virginia Region 4 Board meeting and suggestions from community leaders, RVA Rising presents itself as a strategic partner for fostering collaboration and governance around Information Technology (IT) in the Richmond region.

RVA Rising's Mission and Structure

RVA Rising is a long-term, collaborative initiative aimed at ensuring that every individual in the Richmond region can thrive. Driven by data and community input, RVA Rising brings together people and institutions to pursue strategies that create systemic change and increase economic mobility for all. The initiative operates through a collective impact framework, emphasizing community engagement, data-driven strategies, and systemic change across five pillars: Opportunity-Rich & Inclusive Neighborhoods, High-Quality Education, Rewarding Work, Healthy Environment & Access to Good Health Care, and Responsive & Just Governance. (https://planrva.org/wp-content/uploads/RVA-Rising.pdf)

Alignment with IT Governance Objectives

RVA Rising's emphasis on equitable access, community engagement, and systemic change aligns seamlessly with the principles of responsible IT governance. The initiative's collaborative approach and established networks position it as an ideal convener for regional IT discussions, ensuring that IT deployment and policies are inclusive and beneficial to all community segments.

Recommendations

1. **Formal Collaboration:**
   Establish a partnership between TPI IT and RVA Rising to co-develop IT governance frameworks prioritizing equity, accessibility, and community engagement.
2. **Shared Data Infrastructure:**
   Leverage RVA Rising's data-driven approach to create a shared IT infrastructure that supports regional planning, service delivery, and performance monitoring.
3. **Community Engagement:**
   Utilize RVA Rising's established community engagement channels to involve diverse stakeholders in IT decision-making processes, ensuring that policies and initiatives reflect the needs and perspectives of all community members.
4. **Capacity Building:**
   Collaborate on training and development programs to build IT capacity within local organizations and communities, fostering a more inclusive and skilled IT workforce.

By aligning with RVA Rising, TPI IT can enhance its efforts to create a more equitable and collaborative IT governance structure in the Richmond region.