RAMSEY COUNTY WORKFORCE SOLUTIONS

Information Technology
Challenges and Opportunities

RealTime Talent

370 Wabasha Street, Suite 900
St. Paul, MN 55104

Erin Olson, Director, Strategic Research
Erin@realtimetalentmn.org
Brooke Dirtzu, Research Analyst
Brooke@realtimetalentmn.org

RealTime Talent
Using data to build the
world's best workforce

RAMSEY COUNTY

Ramsey County Rising Together
Report Overview

This report represents an ongoing partnership between RealTime Talent and Ramsey County Workforce Solutions to understand and address the workforce opportunities and challenges present in Ramsey County.

In 2021, RealTime Talent and Ramsey County Workforce Solutions will explore four main activity and outcome areas, including:
- Opportunities in Early Childhood Education
- Youth Employment Trends
- Ramsey County Local Plan Labor Market Report
- Opportunities in the IT and Hospitality/Services Sectors
- Opportunities and challenges in suburban Ramsey County and St. Paul's East Side

This report explores the following research questions:
- What employment, wage, and unemployment trends were observed in Information Technology over the past five years by career pathway, with particular attention to 2020?
- What Information Technology jobs are employers struggling most to fill, as evidenced by job posting data?
- What skills, certifications, and experience are currently in demand for Information Technology talent in Ramsey County, by career pathway?
- Where is the region (and Ramsey County) underproducing Information Technology postsecondary talent?
- What are the local Information Technology training programs offered to youth and in the workforce system?
- What are the barriers for entry into Information Technology careers?

Why this Report Matters

As we look to the future and work to build an economy that works for everyone, we must start with local insights and community voices. This report is a place to begin the conversations that will spark our collective next steps. To learn more about what Ramsey County Workforce Solutions is doing with these findings and to get involved in Reimagining Ramsey County, visit www.ramseycountymeansbusiness.com.

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Introduction: Information Technology and the Pandemic

The COVID-19 pandemic has highlighted our society's reliance on technology and its power to help businesses innovate and respond to rapid market shifts. Still, it has also surfaced greater disparities for students studying in computer fields. According to Code Savvy, computing is the number one source of all new wages in our economy, but the ecosystem for education and training of Information Technology talent is fractured and uneven nationwide. The Information Technology sector faces unique talent challenges in the face of COVID-19, including the potential for rapidly increasing demand for talent outpacing local supply in the MSP Metro and uneven access to technology, training, and computer science education. Just prior to the pandemic, RealTime Talent estimated that Minnesota would face a shortage of around 20,000 Information Technology professionals through 2022, concentrated around metro areas but also growing into rural communities. Over the next five years, Information Technology careers are forecast to grow by at least 0.5% annually on average in Ramsey County–at a lower rate and volume than the neighboring tech hub Hennepin County, but still well beyond what the existing talent pool can easily supply.

Information Technology roles remain an area of robust local career opportunities with forecasted increasing demand and relatively low unemployment despite the impacts of the pandemic. From March 16, 2020, to February 23, 2021, just 1,691 workers in computer occupations applied for unemployment insurance in Ramsey County, representing 1.6% of the County's total unemployment insurance applications.[1] Across all Information Technology occupations, unemployment was estimated at 2.4% as of the third quarter of 2020. Metro-wide, postsecondary institutions are underproducing Information Technology talent compared to national benchmarks, making it challenging for Ramsey County employers to find highly qualified local Information Technology talent. The largest award gap is in programs for Software Developers, and women, Black, and Hispanic talent are particularly underrepresented in both graduate counts and the existing workforce. [2] These indicators point to a severely tight talent market for employers seeking tech talent and highlight the imperative of driving cross-sector strategies that target diversification of Information Technology occupations.

Information Technology talent is in demand across nearly every industry; a broad range of Ramsey County employers–from insurance providers to elementary schools–seek tech solutions to innovate and require tech talent to implement that technology. The majority of local positions still require a Bachelor's degree, according to the current workforce's level of education and the requirements advertised in local job postings. Higher entry-level education requirements may be a barrier for individuals with certificates, bootcamp experiences, or 2-year degrees who would otherwise have the skills necessary to do the job. Addressing hiring requirements and recruitment strategies is a necessary component for Ramsey County employers to increase tech talent diversity.

Ramsey County Workforce Development is leading the creation of a comprehensive economic development strategy centered around equitable growth and strengthening economic

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[1] Unemployment Insurance Application counts are collected by the Minnesota Department of Employment and Economic Development and aggregated at the minor group level or three-digit level.
[2] https://www.cio.com/article/3516012/women-in-tech-statistics-the-hard-truths-of-an-uphill-battle.html

competitiveness.[3] The Economic Competitiveness and Inclusion Plan indicates ways that COVID-19 has massively disrupted the Ramsey County economy and elaborates on how communities of color have been disproportionately impacted by the virus and economic loss–including job losses. This report provides sector-specific evidence in support of the Economic Competitiveness and Inclusion Plan that will help target the most promising career pathways, skillsets, and strategies for talent development in Information Technology.

# Significant Misalignments Threaten Future Sector Growth

COMPUTER SCIENCE IS MISSING FROM MANY MINNESOTA SCHOOLS

Computer Science education is one of the most important early talent pipeline interventions necessary for building a strong Information Technology talent pool. Although the MSP Metro has strong Information Technology bootcamps and experiential opportunities aimed at youth and young adults, Minnesota is one of the few states that does not have a state plan, rigorous standards, or set-aside funding for Information Technology and Computer Science education. Minnesota also does not require high schools to offer Computer Science and IT education or offer Computer Science as a core graduation credit. Only 19% of Minnesota K-12 public schools currently offer foundational Computer Science courses as of 2019, compared to 47% of public schools nationwide. This places Minnesota dead last across all 50 states across all measures, including in breadth of access to Computer Science coursework.[4] Schools in urban areas are less likely to offer Computer Science courses (15%) than rural Minnesota schools (22%).
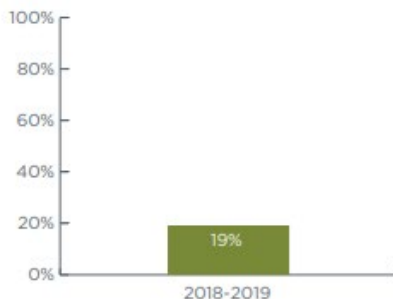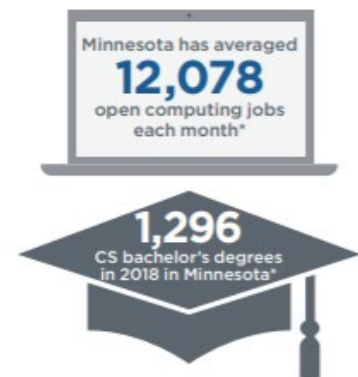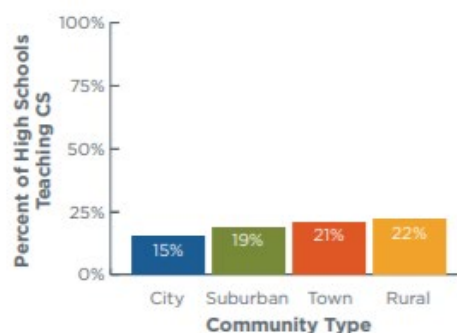
Code Savvy 2020 State of Computer Science. Accessed 4/1/2021 at https://advocacy.code.org/state_handouts/Minnesota.pdf

Disparities in access to Computer Science courses are bleak and contribute significantly to future postsecondary award gaps and employment disparities. Native American/Alaskan students are three times less likely than their White and Asian peers to attend a school that offers Advanced Placement (AP) Computer Science, and two times less likely to take an AP Computer Science exam when they attend a school that offers it. Hispanic/Latinx students are 2.6 times less likely, and Black/African American students are three times less likely than their White and Asian peers to take an AP Computer Science exam when they attend a school that offers it.

[3] https://www.ramseycountymeansbusiness.com/about/ecip
[4] https://advocacy.code.org/stateofcs

Race/Ethnicity and Access to Computer Science

Income Level and Access to CS

AP CS Participation by Race/Ethnicity and Gender

AP CS Student Participation
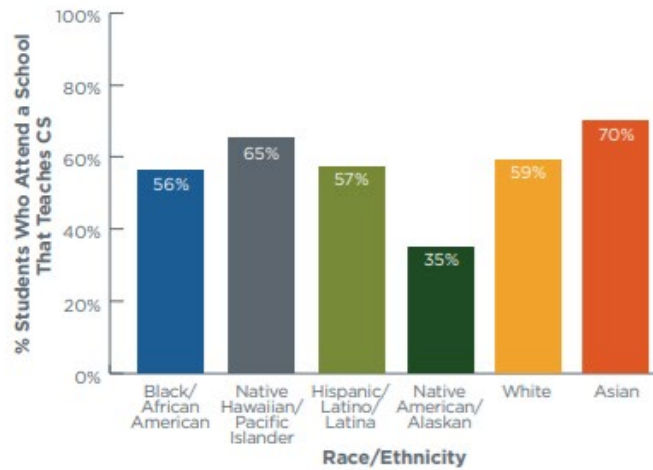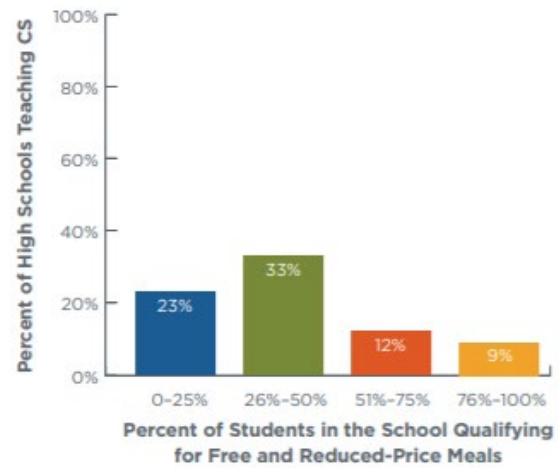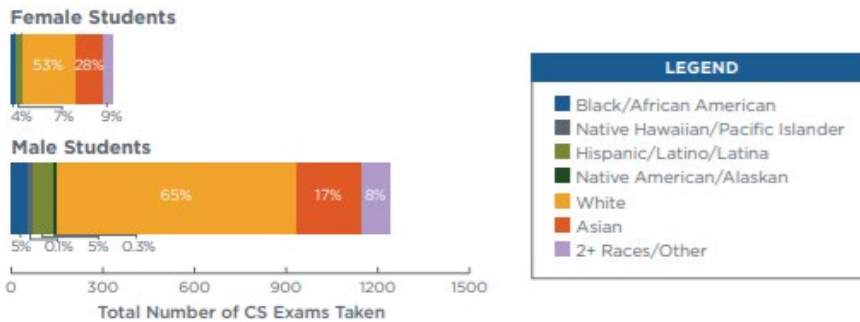

Code Savvy 2020 State of Computer Science. Accessed 4/1/2021 at https://advocacy.code.org/state_handouts/Minnesota.pdf

Minnesota also lacks a reliable pipeline of educators qualified to teach Computer Science. Officially, there was not one single graduate in Minnesota certified to teach Computer Science at the K-12 level in the past five years. According to Code Savvy's 2020 State of Computer Science, Minnesota "does not yet have clear certification pathways for Computer Science teachers," resulting in a lack of qualified teachers that hampers the expansion of K-12 Computer Science education. This shortage could begin to be addressed by exposing more preservice teachers to Computer Science during their required coursework or creating specific pathways for Computer Science teachers.

A common response to the current situation described above is for industry and community leaders to argue that Minnesota should set Computer Science academic content standards, graduation requirements, and teacher licensure standards statewide to drive schools toward expanding offerings. However, doing so is not as easy as it may seem and could lead to several unintended consequences. Minnesota is a "local control" state, meaning that the state does not set sweeping standards in most cases but relies on decentralized decision-making at the school district levels for many decisions. Currently, the Minnesota Department of Education is in the process of integrating Computer Science standards into all content areas–from the Arts to Math. This process will be spaced out over several years and with run-up time before the standards are tested. The Minnesota Department of Education's Academic Standards department intends to work hands-on with schools to demonstrate what teaching these new standards looks like so teachers can create their own content. By embedding Computer Science into learning benchmarks across multiple disciplines, a baseline of understanding will be

established statewide, and the cross-sector importance of tech skillsets will be taught to all students, not just within the confines of a Computer Science course. Business and community leaders can support these efforts by commenting on content standards as they are being revised, supporting programs that provide students with exposure to Information Technology careers, and championing the importance of tech skills for all students–not just those going into Information Technology career pathways.

In addition to officially addressing standards, organizations like Code Savvy and Computer Science for All are focused on ensuring equitable participation and experience for all students to grow in conjunction with access to Computer Science programming. They use the CAPE Framework (Capacity, Access, Participation, and Experience) as an approach to expand student exposure to Information Technology skills and careers in partnership with schools. Pursuing a CAPE agenda to K-12 Computer Science offers local government and policymakers an opportunity to address equity, workforce, and education issues simultaneously on a largely bipartisan basis.

THE GAP BETWEEN TALENT AND JOB REQUIREMENTS

There is a severe shortage of qualified tech talent in Ramsey County. Current talent employed in Information Technology has higher educational attainment than required for local jobs, which creates a challenging landscape for individuals with certificates, bootcamp experience, or 2-year degrees to stand out and be competitive despite having the skills necessary to do the job. Some potential explanations for this educational mismatch include an oversaturation of low-skilled graduates in the job market,[5] underemployment in the pathway, individual choice, or trends in "upskilling," in which worker's educational attainment increases over time to meet occupational or employer demands.[6] In short, employer needs and expectations do not match up with the current talent pool in Ramsey County.

Potential solutions to close this gap and better meet Ramsey County's local demand for tech talent could include:
- Improve the alignment between K-12 schools, workforce development programming, and employer needs to train potential talent with greater precision and decrease the barriers to entry to high shortage tech positions.
- Identify positions where the substance of the work does not require a bachelor's degree and reevaluate position requirements.
- In the case where increased skill requirements are necessary for the role, increasing the volume of bachelor's degree Information Technology Talent. Some postsecondary strategies here include (but is not limited to):
  o Increase the capacity of postsecondary programming to allow for a greater volume of graduates annually.
  o Invest in a variety of opportunities for high school students to obtain credentials and college credits for learning in Information Technology.
  o Expand the use of Credit for Prior Learning (CPL) among students to help them advance their degrees faster and at a reduced cost (Credit for Life Work, CLEP, AP, IB, Tech Prep/Articulated Credit, and more).[7]

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[5] https://techbeacon.com/app-dev-testing/bootcamps-wont-make-you-coder-heres-what-will-0
[6] https://www.bls.gov/emp/documentation/education/tech.htm
[7] https://www.minnstate.edu/admissions/cpl.html

- o Grow the volume and variety of education funding options available to students of all backgrounds–from earn-and-learn models to scholarships to income-share agreements (ISAs).
- Dig deeper into inequities in the Information Technology industry that influence recruitment and retention. Gaps–beyond the established employment and credential gaps–that require a deep investigation are workplace culture, retention, representation, pay, and leadership gaps.

THE DIGITAL DIVIDE

There are stark differences in access to the internet and technology along racial, ethnic, and income lines. This digital divide has broad community impacts on educational and economic advancement, particularly affecting historically marginalized groups.[8] The COVID-19 pandemic has made remote work and distance learning common practice, accentuating the digital divide–the gap between individuals who do not have access to technology devices, high-speed internet, and digital literacy skills.[9] Expressly, not having access to digital innovations could limit the ability to study or work in Information Technology. For instance, current developers who get Computer Science degrees say that they are largely self-taught using the range of free and low-cost resources available to learn programming online, per the 2016 Stack Overflow Developer Survey.[10] To summarize, in an industry that requires rapid upskilling and reskilling to keep pace with sector innovation, digital inclusion is necessary to obtain a tech job and keep it.

Communities in Ramsey County have been disparately impacted by the lack of access to digital tools and skills. In the maps below, higher impacted areas are shaded in dark purple. According to the American Community Survey, in Ramsey County, a range of 1% to 45% of households in each census tract do not have access to the internet, and 0% to 33% of these households do not have access to computer devices.[11]

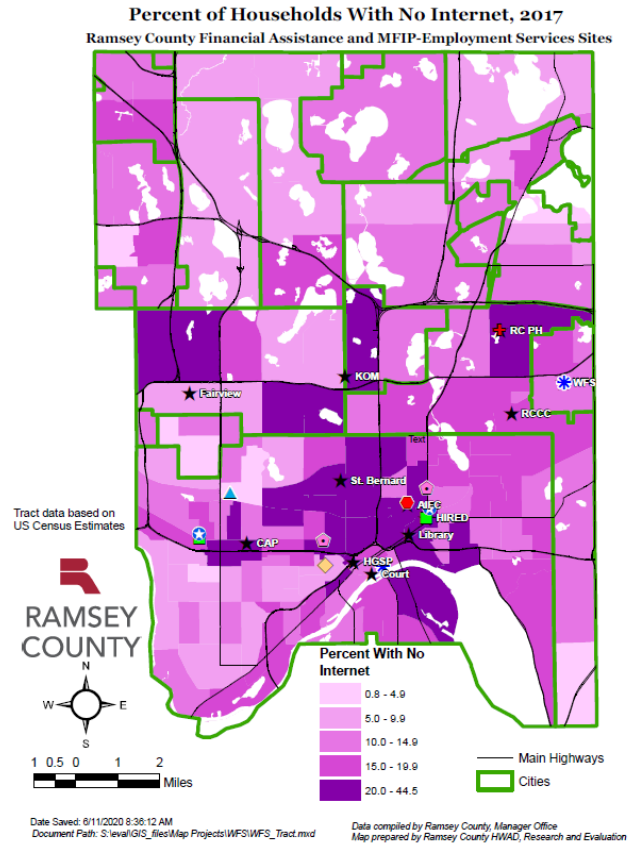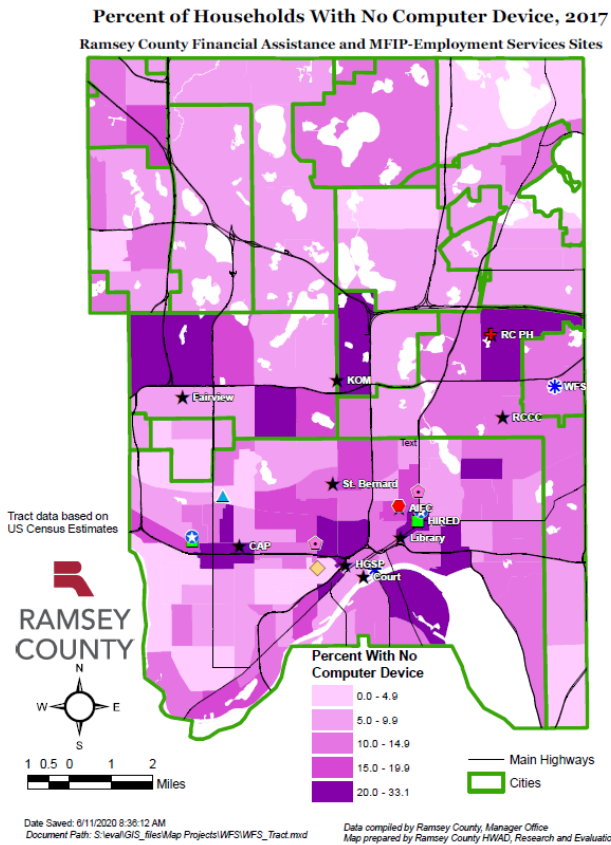[8] https://www.sdfoundation.org/news-events/sdf-news/what-is-the-digital-divide/
[9] https://www.literacymn.org/digital-equity
[10] https://techbeacon.com/app-dev-testing/bootcamps-wont-make-you-coder-heres-what-will-0
[11] American Community Survey, 2017

Percent of Households With No Computer Device, 2017
Ramsey County Financial Assistance and MFIP-Employment Services Sites

Percent of Households With No Internet, 2017
Ramsey County Financial Assistance and MFIP-Employment Services Sites

Access to Internet & Technology by Ramsey County Subregions

	Percent of Households with no Internet (range)	Percent of Households with no Computer Device (range)
Midtown, Downtown, and Northern St. Paul	1% - 45%	0% - 33%
Southern St. Paul	5% - 19%	0% - 16%
St. Paul's East Side	3% - 34%	4% - 25%
St. Paul's West Side	6% - 28%	4% - 24%
Suburban Ramsey County	3% - 23%	0% - 24%
Ramsey County Overall	**1% - 45%**	**0% - 33%**

American Community Survey, 2017.

This report explores some of the implications of social and structural inequities accentuated by the digital divide through two intersectional areas of this issue: employment gaps and credential gaps by gender, race, and ethnicity. Inequities resulting from the digital divide were likely exacerbated when many employers transitioned their workforce to remote work to meet stay-at-home orders and workers in non-remote positions were laid off.

THE RAPID PACE OF CHANGE

Information Technology employers quickly transitioned their workforce to remote work arrangements keeping the U.S. economy afloat during the COVID-19 pandemic. In a recent study, a University of Minnesota economist, Egor Malkov, found that the occupation composition within a household impacts the level of exposure to health and economic risks leaving some individuals harder hit by the economic downturn in the short- and long-term. [12]

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[12] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3643287

Many workers laid off from non-remote positions due to the COVID-19 pandemic may be contemplating a career transition to remote work. For instance, in a recent Strada Education Network survey, 14% of respondents interested in changing job fields said they would likely transition into the Information Technology field, the second top field of interest. [13] This type of transition would mean reskilling. Using job posting data from September 2014 to September 2018, Malkov found occupations that are more likely to allow remote work typically require higher levels of education and experience, in addition to advanced computer skills. This finding is particularly salient for Information Technology positions. The recently unemployed may not have developed the digital skills needed to work remotely in previous jobs.

The existing skill mismatch could inform future workforce training programs for the recently unemployed, making it critical to identify hard skills, like basic computer skills, that can be acquired through short trainings. In the Employer Demand for Talent section of this report, we explore the education and experience requirements, top skills, and top certifications in demand through Information Technology job ads. In the Postsecondary Education in Information Technology portion of the report, we offer insights on degrees and certificates offered in Ramsey County and beyond. Finally, in the Skills Transferability section, we analyze occupations related to Computer User Support Specialists, a common entry point into an Information Technology career.

[13] https://cci.stradaeducation.org/pv-release-a-template-copy-2/

The Information Technology Sector

This section details the high-level employment, wage, and unemployment trends recently observed in Information Technology over the past five years in Ramsey County, setting the stage for the exploration of critical occupation, award, and skill gaps in the sections that follow.

Sector Overview

HISTORICAL EMPLOYMENT AND WAGES

As of the third quarter of 2020, an estimated 12,689 people work in Ramsey County in Information Technology roles such as Software Developers, Computer Systems Analysts, Network Administrators, Database Administrators, and Information Security Analysts, representing about 4% of all employment in the County. Unemployment in Ramsey County Information Technology roles sits at about 2.4%, compared to 6% across all positions as of the third quarter of 2020. This low unemployment rate indicates that Ramsey County currently does not enough local tech talent to meet employer needs. The local average annual wage in Information Technology careers is about $97,600, ranging from a low average of $57,700 for Computer User Support Specialists up to an annual average of $151,900 for Computer and Information Systems Managers.

Over the past five years, Ramsey County employment in Information Technology roles has decreased by about 0.8% annually on average, with the greatest growth among Information Security Analysts (2.9% annual growth). Information Technology careers are somewhat more highly concentrated in Ramsey County than in a typical community of its size, with a Location Quotient of 1.18. However, this Location Quotient is dwarfed by the high concentration of Information Technology careers in neighboring Hennepin County, where the Location Quotient for Information Technology occupations is 1.70.

Information Technology Employment in Ramsey County, 2020Q3

SOC	Occupation	Current						5-Year History	
		Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	3,537	$105,300	1.11	61	2.0%	529	35	0.2%
15-1211	Computer Systems Analysts	2,393	$97,200	1.79	40	2.0%	111	-67	-0.6%
15-1232	Computer User Support Specialists	1,568	$57,700	1.08	41	3.6%	252	-12	-0.2%
11-3021	Computer and Information Systems Managers	1,266	$151,900	1.29	23	2.2%	42	38	0.6%
15-1244	Network and Computer Systems Administrators	883	$89,700	1.12	19	3.1%	117	-90	-1.9%
15-1299	Computer Occupations, All Other	664	$88,000	0.75	15	2.7%	195	-39	-1.1%
15-1231	Computer Network Support Specialists	522	$67,000	1.28	11	3.5%	n/a	-8	-0.3%
15-1251	Computer Programmers	468	$83,700	1.03	13	3.3%	n/a	-352	-10.6%
15-1241	Computer Network Architects	366	$113,900	1.07	3	1.1%	n/a	-20	-1.1%
15-1257	Web Developers and Digital Interface Designers	364	$83,700	0.96	8	2.9%	29	9	0.5%
15-1245	Database Administrators and Architects	350	$99,800	1.26	5	1.8%	32	-33	-1.8%
15-1212	Information Security Analysts	307	$102,100	1.11	8	3.1%	74	41	2.9%
	Information Technology	12,689	$97,600	1.18	246	2.4%	1,384	-499	-0.8%
	Total - All Occupations	**334,772**	**$60,300**	**1.00**	**17,722**	**6.0%**	**16,326**	**-8,518**	**-0.5%**

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.

1. Data based on a four-quarter moving average unless noted otherwise.

2. Wage data are as of 2019 and represent the average for all Covered Employment
3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).

INDUSTRY DISTRIBUTION OF OCCUPATIONAL EMPLOYMENT

Ramsey County employers from all industries seek tech solutions to innovate. The diverse mix of industries highlighted in the chart below exemplifies the broad-based demand for tech talent across industries. By industry, nearly 20% of all Information Technology talent is employed in Management of Companies and Enterprises; Computer Systems Design and Related Services follow second at 14% of all occupational employment. These two sub-industries also represent the largest share of future demand anticipated over the next ten years. The highest average wages are offered by Other Information Services (NAICS 5191) and Software Publishers (NAICS 5112).

About 2% of all Ramsey County talent employed in Information Technology roles are self-employed (of those reporting taxable income), 86% work for private employers, and 12% work for local (4%), state (8%), or federal government (0.6%).

Top Industry Employment of Information Technology Talent in Ramsey County, 2020Q3 with 10-Year Demand under a COVID-19 Forecast Model

NAICS Code	Industry Title	CURRENT			10-YEAR DEMAND			
		% of Occ Empl	Empl	Avg Ann Wages	Exits	Transfers	Empl Growth	Total Demand
5511	Management of Companies and Enterprises	19.2%	2,431	$100,000	419	1,423	107	1,949
5415	Computer Systems Design and Related Services	13.9%	1,764	$98,800	313	1,097	345	1,755
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	8.2%	1,040	$109,400	160	595	11	766
5241	Insurance Carriers	5.7%	719	$96,800	118	399	-21	497
5112	Software Publishers	4.7%	590	$110,400	99	365	96	560
5221	Depository Credit Intermediation	4.1%	524	$99,100	86	295	-6	376
6113	Colleges, Universities, and Professional Schools	3.9%	497	$92,200	86	288	0	373
5173	Wired and Wireless Telecommunications Carriers	2.5%	311	$93,000	46	163	-64	145
9211	Executive, Legislative, and Other General Government Support	2.3%	291	$92,500	50	164	-14	200
5182	Data Processing, Hosting, and Related Services	2.2%	284	$97,200	48	169	23	241
5413	Architectural, Engineering, and Related Services	2.1%	267	$100,900	42	149	-6	186
9231	Administration of Human Resource Programs	2.1%	266	$92,400	44	146	-21	170
5613	Employment Services	2.0%	258	$90,600	46	161	21	228
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	1.6%	207	$91,900	32	115	-17	131
6221	General Medical and Surgical Hospitals	1.6%	198	$95,400	34	110	-8	135
5416	Management, Scientific, and Technical Consulting Services	1.5%	190	$100,300	34	117	32	182
5191	Other Information Services	1.4%	182	$115,100	30	110	18	158
9221	Justice, Public Order, and Safety Activities	1.1%	144	$92,800	24	80	-8	96
6111	Elementary and Secondary Schools	1.1%	138	$80,900	26	87	11	124
9261	Administration of Economic Program	0.9%	120	$92,300	20	66	-10	76
n/a	All Others	17.9%	2,267	n/a	389	1,332	59	1,780

Source: JobsEQ®
Data as of 2020Q3 except wages which are as of 2019. Note that occupation-by-industry wages represent adjusted national data and may not be consistent with regional, all-industry occupation wages shown elsewhere in JobsEQ.
Note: Figures may not sum due to rounding.

UNEMPLOYMENT TRENDS

In Ramsey County and across the MSP Metro, tech unemployment remains relatively low despite the economic challenges induced by the COVID-19 pandemic, adding stability in an uneasy labor market. From March 16, 2020, to February 23, 2021, 1,691 workers in computer occupations applied for unemployment insurance (UI) in Ramsey County, representing 1.6% of the County's unemployment insurance applications.[14] Similar impacts were observed across the MSP Metro. According to employment data, as of the third quarter of 2020, about 8,989 people were employed in Ramsey County's computer occupations. In this occupation group, 1,691 people applied for UI in the County during the pandemic. Therefore, the number of UI applicants from computer occupations represents about 18% of those who were previously employed in the County in those same occupations.

[14] Unemployment Insurance Application counts are collected by the Minnesota Department of Employment and Economic Development and aggregated at the minor group level or three-digit level.

Cumulative Unemployment Insurance Applicants for Computer Occupations in MSP Metro from March 16, 2020 – February 23, 2021
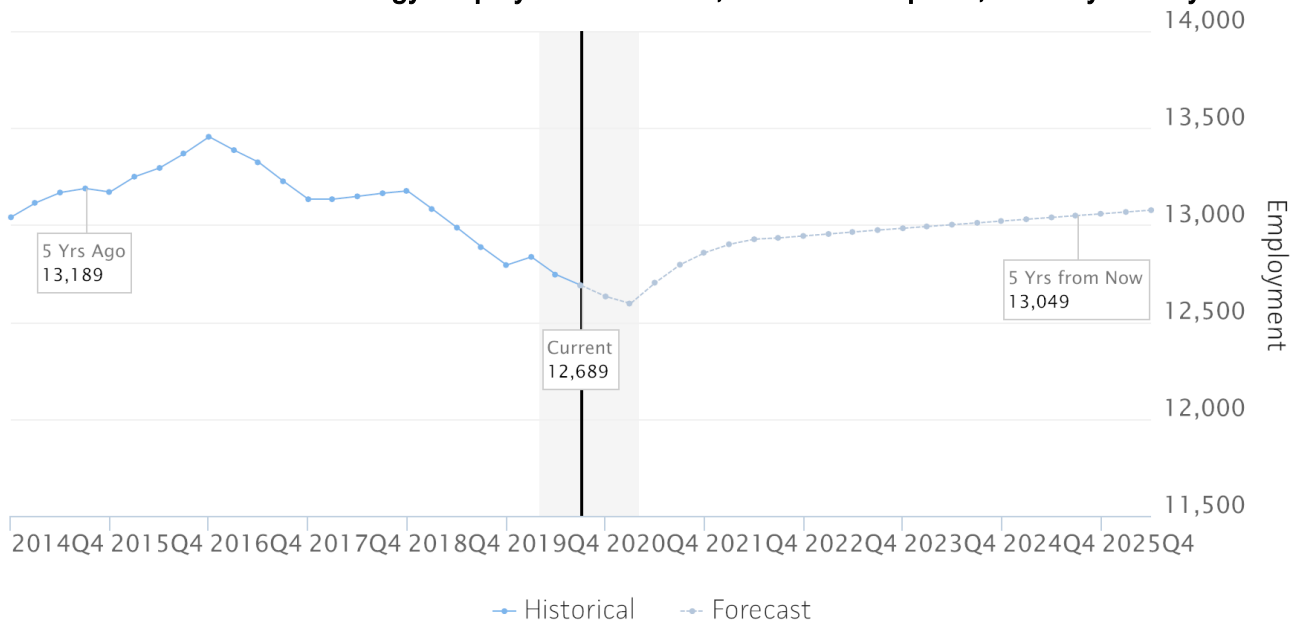
| County | Computer Occupations (SOC 151) | | | |
	UI Application Counts	% of Total UI Applicants[1]	Employment (Place of Residence)	% of Total Local Employment[2] (Place of Residence)
Ramsey	1,691	1.6%	8,989	3.2%
Anoka	1,232	1.6%	4,434	2.3%
Carver	471	2.6%	2,999	5.1%
Dakota	1,862	2.2%	8,936	3.9%
Hennepin	5,462	2.1%	34,705	5.1%
Scott	697	2.3%	2,806	3.4%
Washington	767	1.6%	4,863	3.6%
MSP Metro Total	**12,182**	**2.0%**	**67,732**	**4.1%**

SOURCE: 1. DEED Unemployment Insurance Claims Statistics, updated February 3rd 2. 2015-2019 American Community Survey (ACS) 5-Year Estimates, Employment by Place of Residence.

EMPLOYMENT FORECAST

As Ramsey County looks toward economic recovery from the pandemic, forecasts made today may look very different from realities seen in years to come. Information Technology careers anticipate a 0.5% annual growth overall for the next five years, less than a one percentage point lower than all occupational growth forecasted in the County. The largest expansion in employment is for Information Security Analysts roles (2.2% annual growth). Software Developers and Software Quality Assurance Analysts and Testers roles have the second-largest forecasted annual growth (1.3%) in addition to a forecasted high volume of demand for employment.

Information Technology Employment Forecast, COVID-19 Impacts, Ramsey County

5 Yrs Ago 13,189
Current 12,689
5 Yrs from Now 13,049

Historical   Forecast

Source: JobsEQ®,Data as of 2020Q3,The shaded areas of the graph represent national recessions.

Information Technology Employment in Ramsey County – COVID Forecast, 2020Q3

SOC	Occupation	Current						5-Year History		5-Year Forecast				
		Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann% Growth
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	3,537	$105,300	1.11	61	2.0%	534	35	0.2%	1,567	261	1,064	241	1.3%
15-1211	Computer Systems Analysts	2,393	$97,200	1.79	40	2.0%	115	-67	-0.6%	872	227	634	12	0.1%
15-1232	Computer User Support Specialists	1,568	$57,700	1.08	41	3.6%	248	-12	-0.2%	673	142	506	25	0.3%
11-3021	Computer and Information Systems Managers	1,266	$151,900	1.29	23	2.2%	45	38	0.6%	538	110	394	35	0.5%
15-1244	Network and Computer Systems Administrators	883	$89,700	1.12	19	3.1%	117	-90	-1.9%	311	75	234	3	0.1%
15-1299	Computer Occupations, All Other	664	$88,000	0.75	15	2.7%	189	-39	-1.1%	267	62	195	9	0.3%
15-1231	Computer Network Support Specialists	522	$67,000	1.28	11	3.5%	n/a	-8	-0.3%	223	47	168	8	0.3%
15-1251	Computer Programmers	468	$83,700	1.03	13	3.3%	1	-352	-10.6%	117	35	118	-35	-1.6%
15-1241	Computer Network Architects	366	$113,900	1.07	3	1.1%	n/a	-20	-1.1%	125	24	102	-1	0.0%
15-1257	Web Developers and Digital Interface Designers	364	$83,700	0.96	8	2.9%	34	9	0.5%	151	31	109	10	0.5%
15-1245	Database Administrators and Architects	350	$99,800	1.26	5	1.8%	32	-33	-1.8%	137	34	93	10	0.6%
15-1212	Information Security Analysts	307	$102,100	1.11	8	3.1%	78	41	2.9%	154	24	96	35	2.2%
	Information Technology	12,689	$97,600	1.18	246	2.4%	1,395	-499	-0.8%	5,136	1,073	3,712	351	0.5%
	Total - All Occupations	**334,772**	**$60,300**	**1.00**	**17,722**	**6.0%**	**15,057**	**-8,518**	**-0.5%**	**204,662**	**73,587**	**117,369**	**13,706**	**0.8%**

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.

1. Data based on a four-quarter moving average unless noted otherwise.

2. Wage data are as of 2019 and represent the average for all Covered Employment

3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).

Information Support and Services Pathway

EMPLOYMENT FORECAST

Similar to the forecast for all Information Technology employment in Ramsey County, employment in the Information Support and Services pathway is forecast to rebound by the first quarter of 2021. Employment in this pathway is anticipated to remain relatively flat after the initial recovery, with 0.0% average annual growth overall for the next five years. The largest expansion in employment in this pathway is for Computer User Support Specialists (0.3% annual growth). This pathway's average annual wage is $60,000–about $37,600 less than for all Information Technology employment in Ramsey County. Among all Information Technology pathways, Information Support and Services careers have the highest concentration of talent with lower educational attainment.

Information Support and Services Employment Forecast, COVID-19 Impacts, Ramsey County
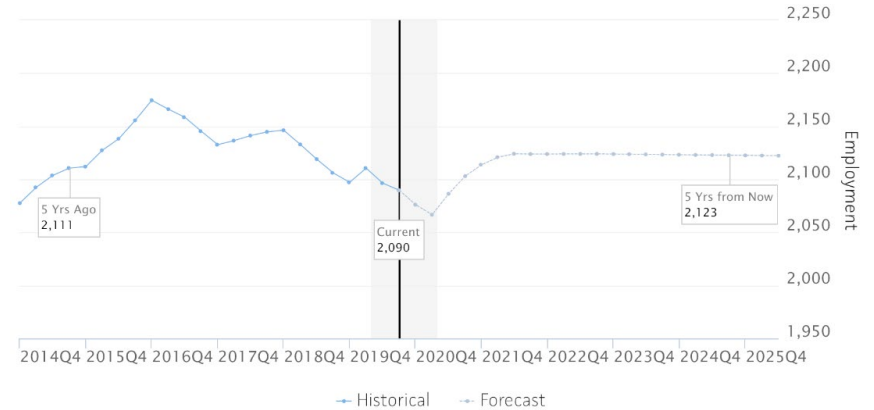
Source: JobsEQ®,Data as of 2020Q3,The shaded areas of the graph represent national recessions.

Information Support and Services Employment in Ramsey County – COVID Forecast, 2020Q3

| SOC | Occupation | Current | | | | | | 5-Year History | | 5-Year Forecast | | | | |
		Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann% Growth
15-1232	Computer User Support Specialists	1,568	$57,700	1.08	41	3.6%	248	-12	-0.2%	673	142	506	25	0.3%
15-1231	Computer Network Support Specialists	522	$67,000	1.28	11	3.5%	n/a	-8	-0.3%	212	47	166	-1	0.0%
	IT - Information Support & Services Pathway (CTE)	2,090	$60,000	1.12	51	3.6%	245	-21	-0.2%	851	187	666	-2	0.0%
	Information Technology	12,689	$97,600	1.18	246	2.4%	1,395	-499	-0.8%	5,136	1,073	3,712	351	0.5%
	Total - All Occupations	334,772	$60,300	1.00	17,722	6.0%	15,057	-8,518	-0.5%	204,662	73,587	117,369	13,706	0.8%

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.
1. Data based on a four-quarter moving average unless noted otherwise.
2. Wage data are as of 2019 and represent the average for all Covered Employment
3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).
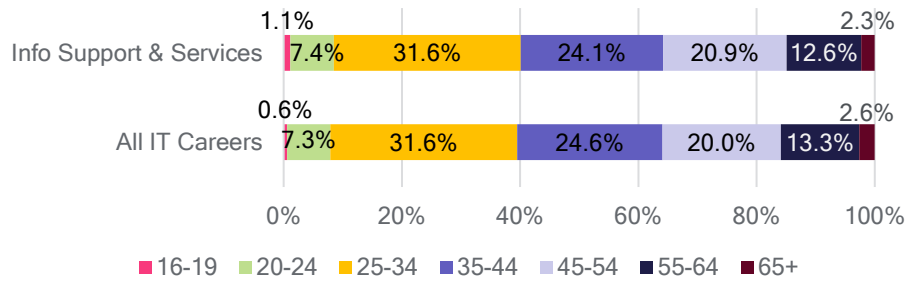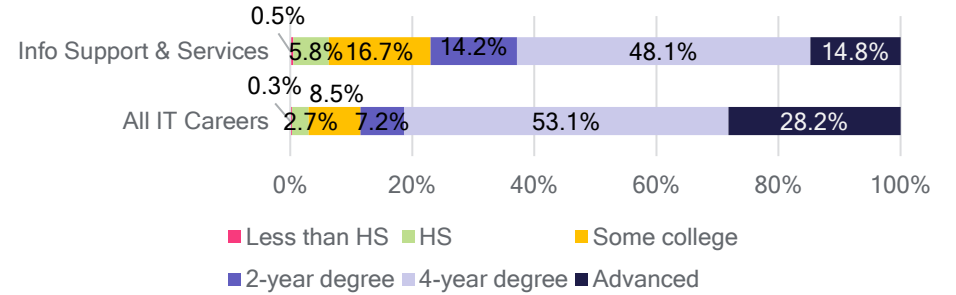
Information Support and Services Pathway

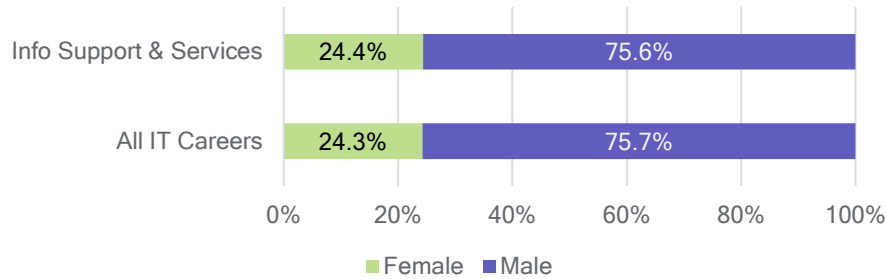RAMSEY COUNTY WORKFORCE DEMOGRAPHICS

N = 1,384

Local Workforce Age

Info Support & Services: 1.1% | 7.4% | 31.6% | 24.1% | 20.9% | 12.6% | 2.3%

All IT Careers: 0.6% | 7.3% | 31.6% | 24.6% | 20.0% | 13.3% | 2.6%

■16-19 ■20-24 ■25-34 ■35-44 ■45-54 ■55-64 ■65+

Local Workforce Educational Attainment, Age 25 - 64

Info Support & Services: 0.5% | 5.8% | 16.7% | 14.2% | 48.1% | 14.8%

All IT Careers: 0.3% | 2.7% | 8.5% | 7.2% | 53.1% | 28.2%

■Less than HS ■HS ■Some college ■2-year degree ■4-year degree ■Advanced

Local Workforce Age Gender

Info Support & Services: 24.4% | 75.6%

All IT Careers: 24.3% | 75.7%

■Female ■Male

Local Workforce Race, All Ages

Info Support & Services: 73.2% | 6.4% | 0.3% | 17.6% | 2.5%

All IT Careers: 66.7% | 5.2% | 0.2% | 25.6% | 2.3%

■White ■Black ■American Indian ■Asian ■Two or More Races

Local Workforce Ethnicity, All Ages

Info Support & Services: 3.4% | 96.6%

All IT Careers: 2.2% | 97.8%

■Hispanic ■Non-Hispanic White
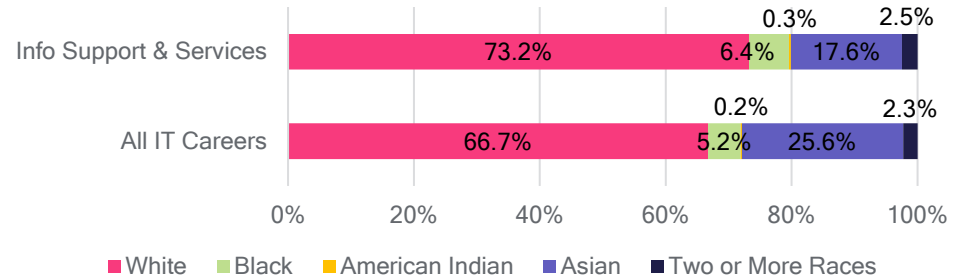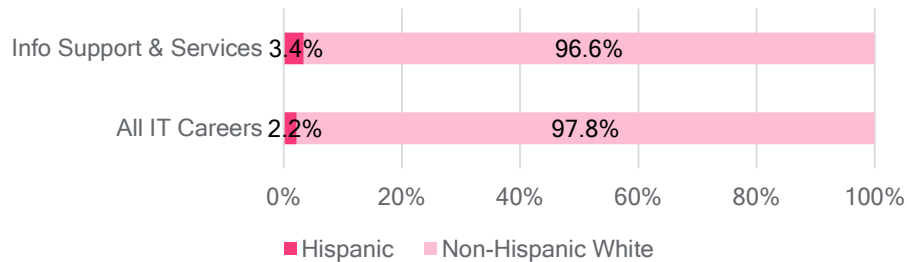
SOURCE: American Community Survey 2015-2019.

Network Systems Pathway
EMPLOYMENT FORECAST

Network Systems career pathway employment in Ramsey County is forecast to begin recovering by the first quarter of 2021. Similar to the overall sector forecast, employment in this pathway is anticipated to increase sharply and then remain relatively flat, with 0.3% average annual growth overall for the next five years. The largest expansion in employment is for Information Security Analysts (2.2% annual growth). The average annual wage for this pathway is on par with overall Information Technology employment in Ramsey County at $97,600 annually. Network Systems talent is 30.2% female, making it the pathway with the highest level of gender diversity. This share of female talent is still 19.6-percentage points lower than the overall female employment in Ramsey County.

Network Systems Employment Forecast, COVID-19 Impacts, Ramsey County
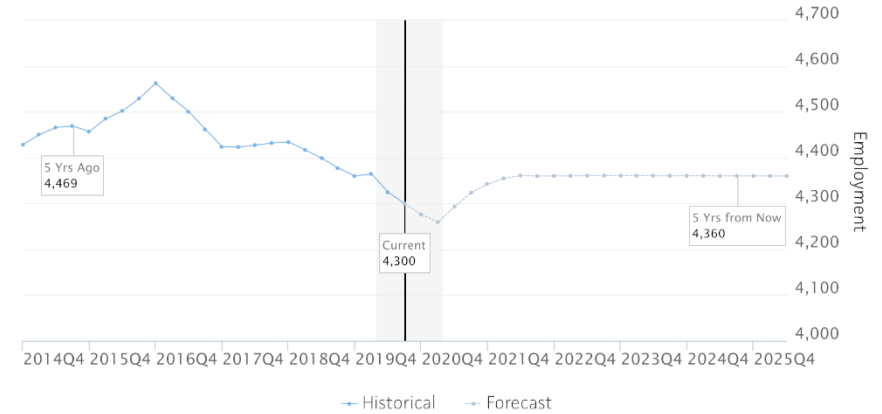
Source: JobsEQ®,Data as of 2020Q3,The shaded areas of the graph represent national recessions.

Network Systems Employment in Ramsey County - COVID Forecast, 2020Q3

SOC	Occupation	Current						5-Year History		5-Year Forecast				
		Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann% Growth
15-1211	Computer Systems Analysts	2,393	$97,200	1.79	40	2.0%	117	-67	-0.6%	872	227	634	12	0.1%
15-1244	Network and Computer Systems Administrators	883	$89,700	1.12	19	3.1%	117	-90	-1.9%	311	75	234	3	0.1%
15-1241	Computer Network Architects	366	$113,900	1.07	3	1.1%	1	-20	-1.1%	125	24	102	-1	0.0%
15-1245	Database Administrators and Architects	350	$99,800	1.26	5	1.8%	36	-33	-1.8%	137	34	93	10	0.6%
15-1212	Information Security Analysts	307	$102,100	1.11	8	3.1%	76	41	2.9%	154	24	96	35	2.2%
	IT – Network Systems Pathway (CTE)	**4,300**	**$97,600**	**1.42**	**74**	**2.2%**	**348**	**-169**	**-0.8%**	**1,600**	**383**	**1,158**	**59**	**0.3%**
	Information Technology	**12,689**	**$97,600**	**1.18**	**246**	**2.4%**	**1,395**	**-499**	**-0.8%**	**5,136**	**1,073**	**3,712**	**351**	**0.5%**
	Total - All Occupations	**334,772**	**$60,300**	**1.00**	**17,722**	**6.0%**	**15,057**	**-8,518**	**-0.5%**	**204,662**	**73,587**	**117,369**	**13,706**	**0.8%**

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.
1. Data based on a four-quarter moving average unless noted otherwise.
2. Wage data are as of 2019 and represent the average for all Covered Employment
3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).

Network Systems Pathway

WORKFORCE DEMOGRAPHICS
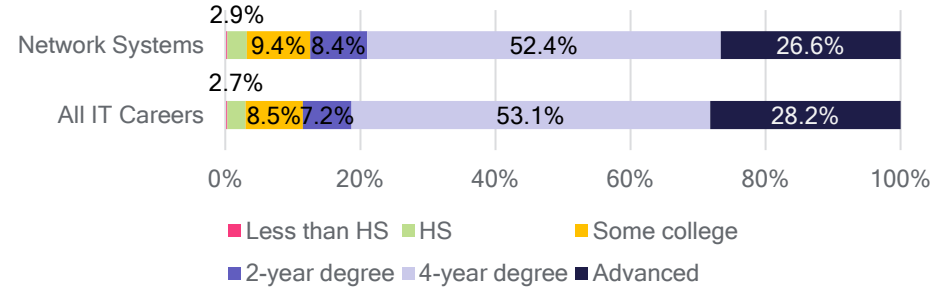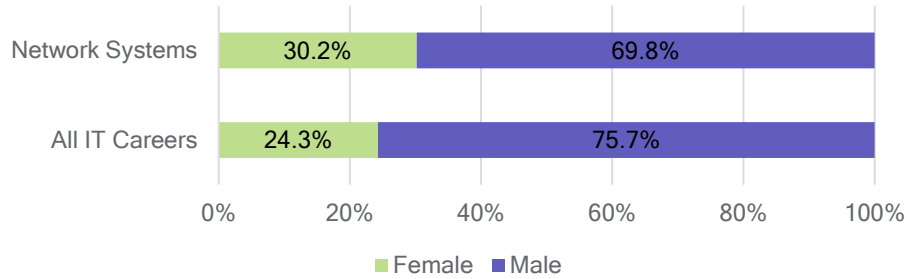
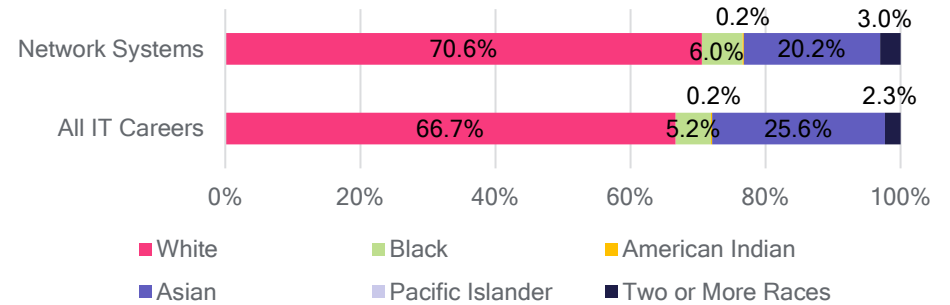N = 3,277

Local Workforce Age

Network Systems	0.2% 8.8% 29.6% 25.2% 19.8% 14.2%	2.2%
All IT Careers	0.6% 7.3% 31.6% 24.6% 20.0% 13.3%	2.6%

0% 20% 40% 60% 80% 100%

■16-19 ■20-24 ■25-34 ■35-44 ■45-54 ■55-64 ■65+

Local Workforce Educational Attainment, Age 25 - 64

Network Systems	2.9% 9.4% 8.4% 52.4% 26.6%
All IT Careers	2.7% 8.5% 7.2% 53.1% 28.2%

0% 20% 40% 60% 80% 100%

■Less than HS ■HS ■Some college
■2-year degree ■4-year degree ■Advanced

Local Workforce Age Gender

Network Systems	30.2% 69.8%
All IT Careers	24.3% 75.7%

0% 20% 40% 60% 80% 100%

■Female ■Male

Local Workforce Race, All Ages

Network Systems	70.6% 6.0% 0.2% 20.2% 3.0%
All IT Careers	66.7% 5.2% 0.2% 25.6% 2.3%

0% 20% 40% 60% 80% 100%

■White ■Black ■American Indian
■Asian ■Pacific Islander ■Two or More Races

Local Workforce Ethnicity, All Ages

Network Systems	2.6% 97.4%
All IT Careers	2.2% 97.8%

0% 20% 40% 60% 80% 100%

■Hispanic ■Non-Hispanic White

SOURCE: American Community Survey 2015-2019.

Programming and Software Development Pathway
EMPLOYMENT FORECAST

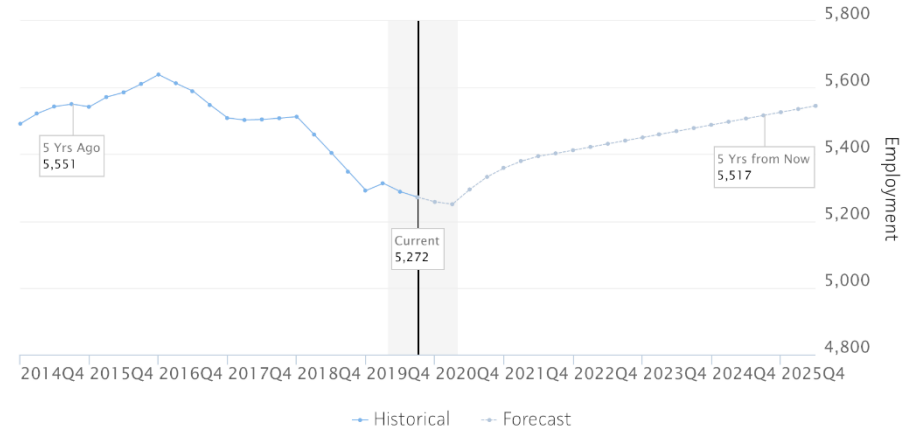Programming and Software Development employment in Ramsey County is forecast to begin recovering by the first quarter of 2021. Unlike the overall IT forecast, after an initial sharp increase, employment in this pathway is anticipated to continuously increase over the next five years, with 0.9% average annual growth anticipated. The largest employment expansion is for Software Developers and Software Quality Assurance Analysts and Testers (1.3% average annual growth). The average annual wage for this pathway is $114,600–about $17,000 higher than overall Information Technology employment in Ramsey County. Among all Information Technology pathways, Programming and Software positions have the highest concentration of talent that is male (80.8%), have advanced degrees (34.5%), and identify as Asian (34.0%).

Programming and Software Development Employment Forecast, COVID-19 Impacts, Ramsey County

5 Yrs Ago 5,551 · Current 5,272 · 5 Yrs from Now 5,517

Source: JobsEQ®,Data as of 2020Q3,The shaded areas of the graph represent national recessions.

Programming and Software Development Employment in Ramsey County – COVID Forecast, 2020Q3

		Current						5-Year History		5-Year Forecast				
SOC	Occupation	Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann% Growth
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	3,537	$105,300	1.11	61	2.0%	542	35	0.2%	1,567	261	1,064	241	1.3%
11-3021	Computer and Information Systems Managers	1,266	$151,900	1.29	23	2.2%	44	38	0.6%	538	110	394	35	0.5%
15-1251	Computer Programmers	468	$83,700	1.03	13	3.3%	1	-352	-10.6%	117	35	118	-35	-1.6%
	IT – Programming and Software Development (CTE)	5,272	$114,600	1.14	97	2.1%	587	-279	-1.0%	2,222	406	1,575	241	0.9%
	Information Technology	12,689	$97,600	1.18	246	2.4%	1,395	-499	-0.8%	5,136	1,073	3,712	351	0.5%
	Total - All Occupations	334,772	$60,300	1.00	17,722	6.0%	15,057	-8,518	-0.5%	204,662	73,587	117,369	13,706	0.8%

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.
1. Data based on a four-quarter moving average unless noted otherwise.
2. Wage data are as of 2019 and represent the average for all Covered Employment
3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).

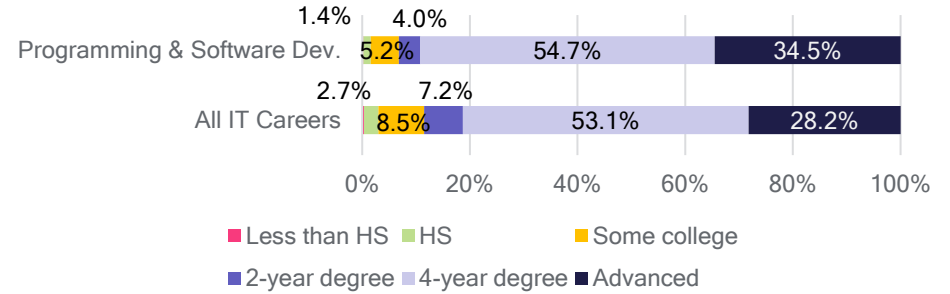# Programming and Software Development Pathway
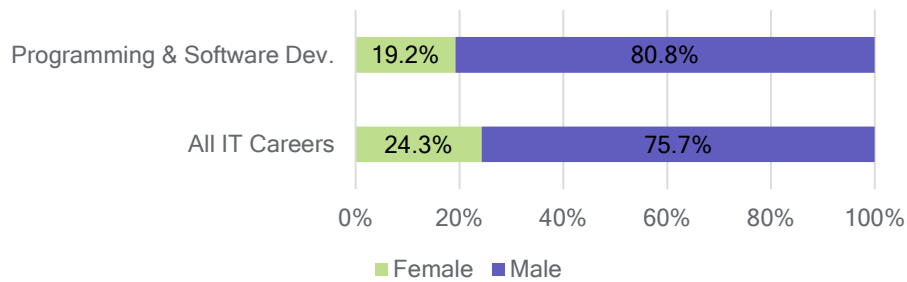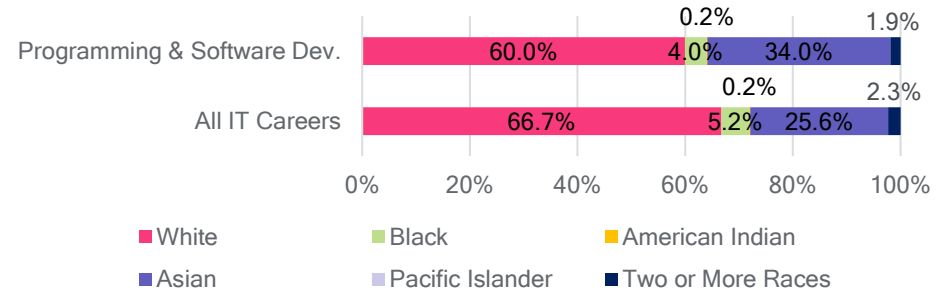## WORKFORCE DEMOGRAPHICS
N= 4,488

Local Workforce Age

Programming & Software Dev. 0.2% | 5.9% | 33.6% | 24.7% | 19.9% | 12.9% | 2.8%

All IT Careers 0.6% | 7.3% | 31.6% | 24.6% | 20.0% | 13.3% | 2.6%

0% 20% 40% 60% 80% 100%

■16-19 ■20-24 ■25-34 ■35-44 ■45-54 ■55-64 ■65+

Local Workforce Educational Attainment, Age 25 - 64

Programming & Software Dev. 1.4% | 4.0% | 5.2% | 54.7% | 34.5%

All IT Careers 2.7% | 7.2% | 8.5% | 53.1% | 28.2%

0% 20% 40% 60% 80% 100%

■Less than HS ■HS ■Some college
■2-year degree ■4-year degree ■Advanced

Local Workforce Age Gender

Programming & Software Dev. 19.2% | 80.8%

All IT Careers 24.3% | 75.7%

0% 20% 40% 60% 80% 100%

■Female ■Male

Local Workforce Race, All Ages

Programming & Software Dev. 60.0% | 4.0% | 34.0% | 0.2% | 1.9%

All IT Careers 66.7% | 5.2% | 25.6% | 0.2% | 2.3%

0% 20% 40% 60% 80% 100%

■White ■Black ■American Indian
■Asian ■Pacific Islander ■Two or More Races

Local Workforce Ethnicity, All Ages

Programming & Software Dev. 1.5% | 98.5%

All IT Careers 2.2% | 97.8%

0% 20% 40% 60% 80% 100%

■Hispanic ■Non-Hispanic White

SOURCE: American Community Survey 2015-2019

Web and Digital Communication Pathway

EMPLOYMENT FORECAST

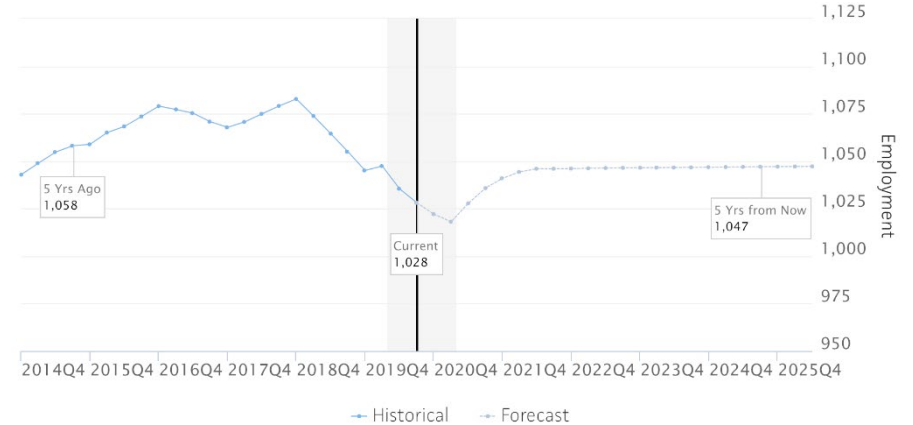Web and Digital Communication Pathway employment in Ramsey County is anticipated to pick up in the first quarter of 2021. After an initial climb, employment in this pathway is forecast to be relatively flat over the next five years, with 0.4% average annual growth anticipated. Web Developers and Digital Interface Designers are expected to see the largest growth in employment in this pathway with 0.5% average annual growth. This pathway's average annual wage is $86,500–about $11,100 higher than overall sector employment in the County. Among all Information Technology pathways, the Web and Digital Communication Pathway has the highest concentration of young talent; about 12% of roles are currently filled by workers between the ages of 16 to 24.

Web and Digital Communication Employment Forecast, COVID-19 Impacts, Ramsey County

Source: JobsEQ®, Data as of 2020Q3, The shaded areas of the graph represent national recessions.

Programming and Software Development Employment in Ramsey County - COVID Forecast, 2020Q3

SOC	Occupation	Current						5-Year History		5-Year Forecast				
		Empl 2020Q3	Mean Ann Wages[2]	LQ	Unempl	Unempl Rate	Online Job Ads[3]	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann% Growth
15-1299	Computer Occupations, All Other	664	$88,000	0.75	15	2.7%	187	-39	-1.1%	267	62	195	9	0.3%
15-1257	Web Developers and Digital Interface Designers	364	$83,700	0.96	8	2.9%	32	9	0.5%	151	31	109	10	0.5%
	IT – Web & Digital Communication (CTE)	1,028	$86,500	0.81	24	2.8%	220	-30	-0.6%	417	94	304	19	0.4%
	Information Technology	12,689	$97,600	1.18	246	2.4%	1,395	-499	-0.8%	5,136	1,073	3,712	351	0.5%
	Total - All Occupations	334,772	$60,300	1.00	17,722	6.0%	15,057	-8,518	-0.5%	204,662	73,587	117,369	13,706	0.8%

Source: JobsEQ® Data as of 2020Q3 unless noted otherwise. Note: Figures may not sum due to rounding.
1. Data based on a four-quarter moving average unless noted otherwise.
2. Wage data are as of 2019 and represent the average for all Covered Employment
3. Data represent found online ads active within the last thirty days in the selected region; data represents a sampling rather than the complete universe of postings. Ads lacking zip code information but designating a place (city, town, etc.) may be assigned to the zip code with greatest employment in that place for queries in this analytic. Due to alternative county-assignment algorithms, ad counts in this analytic may not match that shown in RTI (nor in the popup window ad list).

Web and Digital Communication Pathway
WORKFORCE DEMOGRAPHICS
N= 832

Local Workforce Age
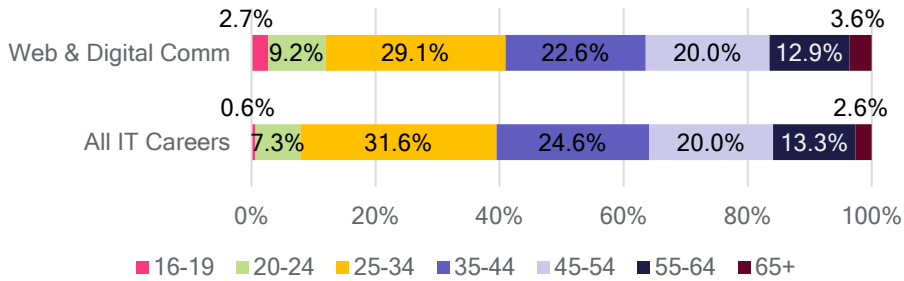
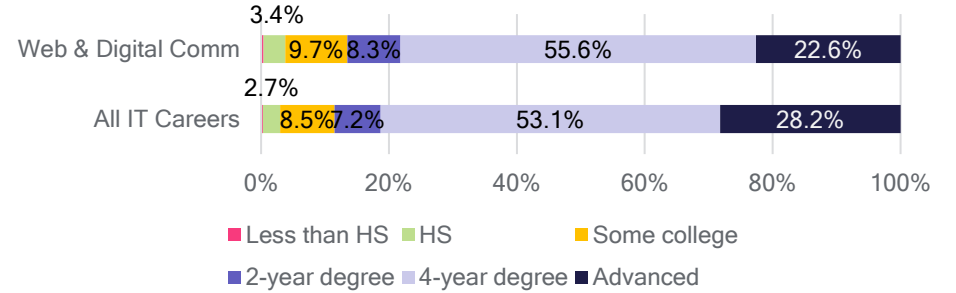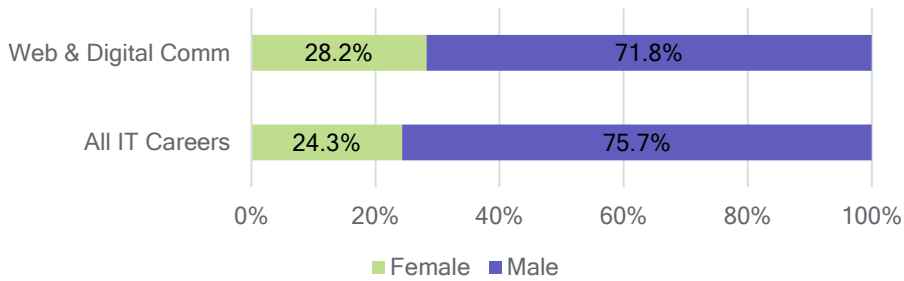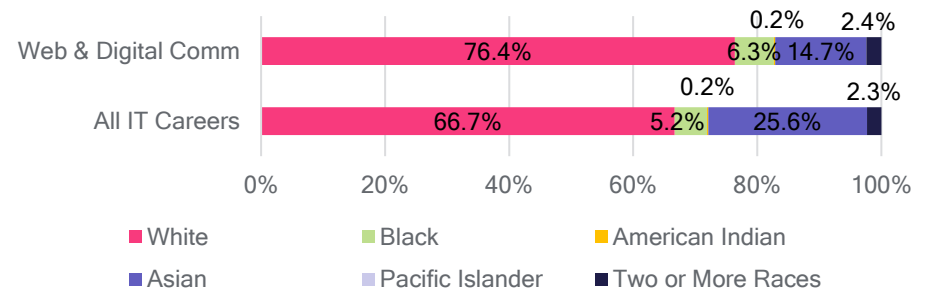|	16-19	20-24	25-34	35-44	45-54	55-64	65+
Web & Digital Comm	2.7%	9.2%	29.1%	22.6%	20.0%	12.9%	3.6%
All IT Careers	0.6%	7.3%	31.6%	24.6%	20.0%	13.3%	2.6%

Local Workforce Educational Attainment, Age 25 - 64

	Less than HS	HS	Some college	2-year degree	4-year degree	Advanced
Web & Digital Comm	3.4%	9.7%	8.3%		55.6%	22.6%
All IT Careers	2.7%	8.5%	7.2%		53.1%	28.2%

Local Workforce Age Gender

	Female	Male
Web & Digital Comm	28.2%	71.8%
All IT Careers	24.3%	75.7%

Local Workforce Race, All Ages

	White	Black	American Indian	Asian	Pacific Islander	Two or More Races
Web & Digital Comm	76.4%	6.3%		14.7%	0.2%	2.4%
All IT Careers	66.7%	5.2%		25.6%	0.2%	2.3%

Local Workforce Ethnicity, All Ages

	Hispanic	Non-Hispanic White
Web & Digital Comm	2.4%	97.6%
All IT Careers	2.2%	97.8%
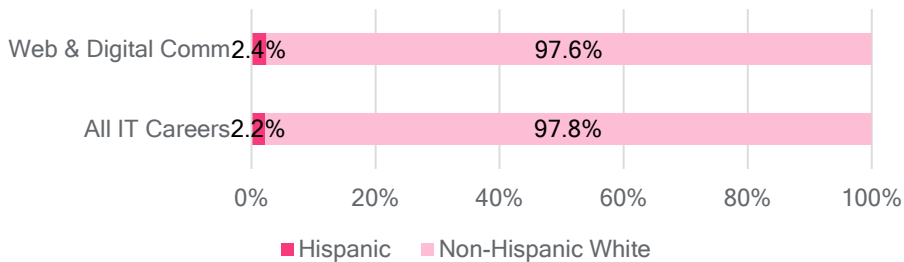
SOURCE: American Community Survey 2015-2019

WORKFORCE DEMOGRAPHICS

In Ramsey County, Information Technology careers have a higher concentration of talent between the ages of 25 to 44 than in overall employment across all occupations. Among the four Information Technology career pathways, Web and Digital Communications Pathway careers have the highest concentration of talent between the ages of 16 and 19 years old (despite also having the highest share of talent with 4-year degrees). Youth consistently show high interest in web development and communications, and there is often a high frequency of youth in social media roles and internships.

Information Technology roles have a higher share of workers with a Bachelor's degree or higher than what is observed in employment across all occupations in the County. The Information Support and Services Pathway includes the youth-friendly Computer User Support Specialists occupation (requiring 0-2 years of experience and a high school diploma or less).

Similar to the lack of gender diversity seen in national tech employment trends, women are underrepresented in Ramsey County's Information Technology careers.[15] Women make up 49.8% of workers in all occupations across Ramsey County, but they hold 24.3% of local Information Technology roles. In contrast, male talent assumes the majority of Information Technology positions, representing about 76% of the workers in these occupations – about 25 percentage points higher than the frequency seen in all occupations in the County. The local employment gap between male and female workers is widest in three of the Information Technology occupations with particularly high average annual wages: Computer Network Architects (91.8% male/$113,900), Information Security Analysts (84.8% male/$102,100), and Software Developers (83.1% male/$105,300).

Across the Information Technology occupations in Ramsey County, there are higher numbers of Asian workers than expected by their local employment rate, particularly in the Programming and Software Development Pathway.

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[15] https://www.cio.com/article/3516012/women-in-tech-statistics-the-hard-truths-of-an-uphill-battle.html

Information Technology Demographics in Ramsey County by Career Pathway, Minnesota, 2020Q3*

	Information Technology Career Pathways					
	Information Support and Services	Network Systems	Programming and Software Development	Web and Digital Communications	All Information Technology Careers	Total - All Occupations (00-0000)
Average Annual Wage	$60,000	$97,600	$114,600	$86,500	$97,600	$60,300
Age Group						
65+	2.3%	2.2%	2.8%	3.6%	2.6%	4.7%
55-64	12.6%	14.2%	12.9%	12.9%	13.3%	16.0%
45-54	20.9%	19.8%	19.9%	20.0%	20.0%	18.5%
35-44	24.1%	25.2%	24.7%	22.6%	24.6%	19.1%
25-34	31.6%	29.6%	33.6%	29.1%	31.6%	26.5%
20-24	7.4%	8.8%	5.9%	9.2%	7.3%	10.9%
16-19	1.1%	0.2%	0.2%	2.7%	0.6%	4.3%
Education Attainment						
Advanced	14.8%	26.6%	34.5%	22.6%	28.2%	16.6%
4-year degree	48.1%	52.4%	54.7%	55.6%	53.1%	29.4%
2-year degree	14.2%	8.4%	4.0%	8.3%	7.2%	9.9%
Some college	16.7%	9.4%	5.2%	9.7%	8.5%	16.9%
HS	5.8%	2.9%	1.4%	3.4%	2.7%	19.7%
Less than HS	0.5%	0.3%	0.2%	0.4%	0.3%	7.4%
Gender						
Female	24.4%	30.2%	19.2%	28.2%	24.3%	49.8%
Male	75.6%	69.8%	80.8%	71.8%	75.7%	50.2%
Race and Ethnicity						
White	73.2%	70.6%	60.0%	76.4%	66.7%	73.2%
Black	6.4%	6.0%	4.0%	6.3%	5.2%	10.6%
American Indian	0.3%	0.2%	0.2%	0.2%	0.2%	0.6%
Asian	17.6%	20.2%	34.0%	14.7%	25.6%	12.7%
Pacific Islander	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Two or More Races	2.5%	3.0%	1.9%	2.4%	2.3%	2.9%
Hispanic	3.4%	2.6%	1.5%	2.4%	2.2%	7.0%
Non-Hispanic White	96.6%	97.4%	98.5%	97.6%	97.8%	93.0%
Total Employment	1,384	3,277	4,488	832	9,981	277,359

Source: JobsEQ®, Data as of 2020Q3 unless noted otherwise
Note: Figures may not sum due to rounding
1. "Overall occupation" characteristics refer to attributes across all individuals in those occupations, not just those limited to the demographic categories shown in this table.
*Green highlighting indicates an overrepresentation of 2% or more compared to all occupations in Ramsey County.

Employer Demand for Talent

In Ramsey County, Information Technology roles pay an average annual salary of $97,600 compared to $60,300 across all local employment. Overall, Information Technology positions in Ramsey County are forecast to grow by an average of 0.3% annually over the next five years, about 0.2 percentage points higher than the overall expected average employment growth in the community.

Nine out of the twelve Information Technology occupations analyzed in this report require a Bachelor's degree for typical entry-level education requirements. These education requirements may be a barrier for individuals with certificates, bootcamp experiences, or 2-year degrees who would otherwise have the skills necessary to do the job.

Wages, Forecast, and Experience Requirements of Information Technology Occupations and Place of Residence in Ramsey County, 2020Q3

SOC	Occupation	Avg Ann Wages	Forecast Ann Growth	Typical Entry-Level Education	Previous Work Experience	Typical On-the-Job Training
11-3021	Computer and Information Systems Managers	$151,900	0.3%	Bachelor's degree	5 years or more	None
15-1211	Computer Systems Analysts	$97,200	-0.1%	Bachelor's degree	None	None
15-1212	Information Security Analysts	$102,100	1.9%	Bachelor's degree	Less than 5 years	None
15-1231	Computer Network Support Specialists	$67,000	0.0%	Associate's degree	None	None
15-1232	Computer User Support Specialists	$57,700	0.0%	Some college, no degree	None	None
15-1241	Computer Network Architects	$113,900	-0.4%	Bachelor's degree	5 years or more	None
15-1244	Network and Computer Systems Administrators	$89,700	-0.3%	Bachelor's degree	None	None
15-1245	Database Administrators and Architects	$99,800	0.3%	Bachelor's degree	None	None
15-1251	Computer Programmers	$83,700	-1.8%	Bachelor's degree	None	None
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	$105,300	1.1%	Bachelor's degree	None	None
15-1257	Web Developers and Digital Interface Designers	$83,700	0.1%	Associate's degree	None	None
15-1299	Computer Occupations, All Other	$88,000	0.0%	Bachelor's degree	None	None
	Information Technology All	$97,600	0.3%			
	Total - All Occupations	**$60,300**	**0.1%**			

Online job posting data can reveal a lot about employer demand for certain skills, certifications, qualifications, and occupational competencies. There is rich data available by city, county, and even by a specific employer. Data in this section focuses on Information Technology jobs newly advertised between January 1, 2020, and December 31, 2020, across Ramsey County. All data in this section comes from Gartner TalentNeuron. Overall, there were 9,705 new Information Technology jobs advertised in Ramsey County in 2020.

Amidst government stay home orders, new job postings for Information Technology occupations decreased to 618 postings in April 2020, a drop of about 30% from the prior year. Despite the pandemic's significant impacts on employer recruitment and hiring, Information Technology careers rebounded by June 2020 and finished the year higher than volumes seen at the end of 2019. Across the entire year, job postings in Information Technology were only about 9.6% lower in 2020 compared to 2019 in Ramsey County.

New Information Technology Job Postings Advertised in Ramsey County, 2017-2021

Direct employers posted the majority of the new Information Technology job ads, but staffing and temp agencies did account for about 29% of all jobs posted in 2020. Three out of the four career pathways showed an increase in new job ads posted by direct employers. All career pathways have a cross-posting rate of three posts per job opening. However, positions in the Programming and Software Development and Web and Digital Communications pathways are particularly in high demand in Ramsey County.

New Information Technology Job Postings Advertised in Ramsey County by Employer Type (includes anonymous postings), 2020

29%

71%
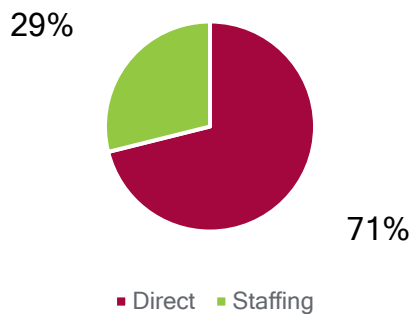
■ Direct   ■ Staffing

Occupations by Volume of Job Postings in 2020, with Change from Prior Year

| Career Pathways	Direct (% change prior year)	Direct and Staffing (% change prior year)	Direct, Staffing with Duplicates (% change prior year)
Information Support and Services	1,043 (-25.7)	1,490 (-30.5%)	4,904 (-19.8%)
Network Systems	3,509 (+2.8%)	4,958 (-5.1%)	15,257 (+6.4%)
Programming and Software Development	1,764 (+16.9%)	2,317 (+6.4%)	6,845 (+23.9%)
Web and Digital Communications	3,649 (+16.6%)	5,080 (+6.0%)	15,452 (+25.1%)
Information Technology (All Careers)	6,901 (-1.9%)	9,705 (-9.6%)	29,660 (+2.8%)

Median Wages Offered Across Information Technology Job Postings Advertised in Ramsey County, February 2021
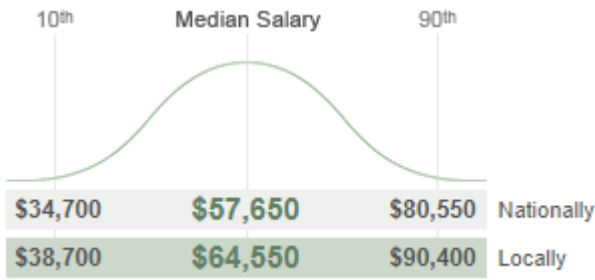
Information Support & Services: $60,400 ($52,950 nationally)

Network Systems: $125,900 ($109,200 nationally)

Programming & Software Development: $135,150 ($122,800 nationally)

Web & Digital Communications: $133,950 ($122,800 nationally)

Based on local recruitment patterns and an estimated regional potential candidate pool of about 65,000 trained or experienced Information Technology talent, the difficulty of finding and hiring talent in these occupations locally is comparable to the difficultly level nationally. MSP Metro and Rochester area counties are struggling more than Greater Minnesota in recruitment and hiring, according to an analysis of candidate pool volumes and job posting data.

## Hiring Difficulty for Information Technology Talent, February 2021
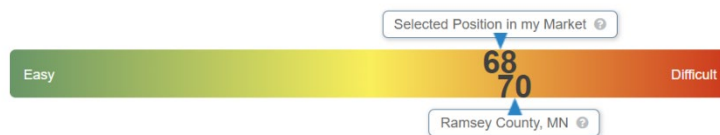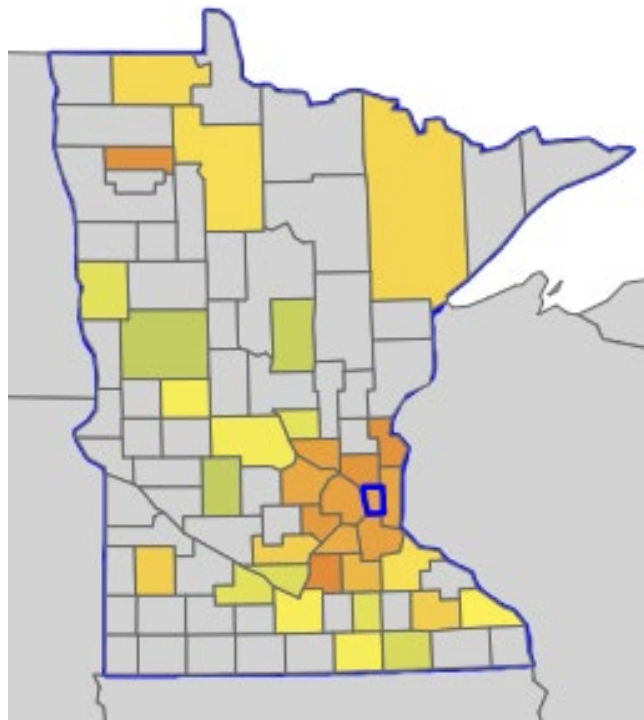
Employers may be inflating their requested experience level with the idea that there is a large pool of candidates due to increased unemployment. Between January 1, 2020, and December 31, 2020, senior experience level (8+ years) job postings for Information Technology positions in Ramsey County had the highest volume, representing 42% of new job ads among these occupations. The

senior experience level job postings for all tech careers saw an increase in demand in most pathways, except for the Information Support and Services pathway.

The mid-level (3-7 years of experience) new job ads represent 33% of all new Information Technology jobs posted in 2020, declining by 22.1% from the prior year. At this mid-level experience, new Information Security Analysts job ads increased by 14.3%, and Computer Network Support Specialists increased by 100%, while postings for all other roles at this level decreased.

Jobs requiring a junior level of experience (0-2 years) account for 20% of new Information Technology job ads in Ramsey County in 2020. Forty-six percent of new job postings in the Information Support and Services pathway were for junior-level talent. Junior-level job postings for all tech careers also saw growth in demand in most pathways, except the Information Support and Services pathway. At this level, the two positions with the highest increase in the volume of new postings from 2019 were Computer and Information Systems Managers (+112%) and Information Security Analysts (59.5%).

### Percent of Job Postings by Experience Level, 2020
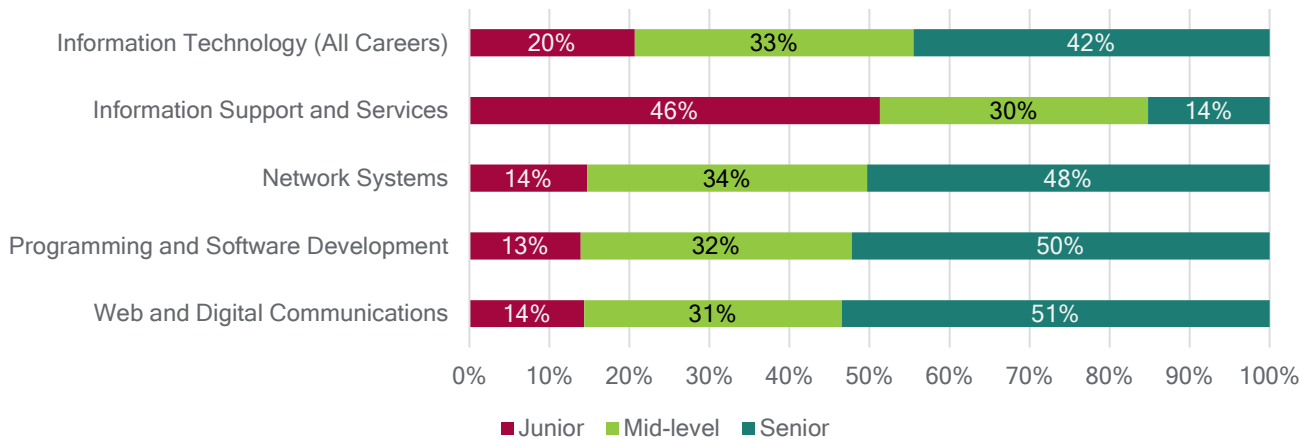
Career Pathways	Junior (% change prior year)	Mid-level (% change prior year)	Senior (% change prior year)	All Exp Levels (% change prior year)
Information Support and Services	689 (-22.4%)	450 (-37.5%)	204 (-39.8%)	1,490 (-30.5%)
Network Systems	699 (+1.9%)	1,662 (-19.2%)	2391 (+10.8%)	4,958 (-5.1%)
Programming and Software Development	308 (+0.7%)	751 (-7.9%)	1,157 (+26.2%)	2,317 (+6.4%)
Web and Digital Communications	697 (+3.7%)	1,565 (-14.0%)	2,599 (+28.0%)	5,080 (+6.0%)
Information Technology (All Careers)	1,901 (-8.2%)	3,204 (-22.1%)	4,093 (+7.4%)	9,705 (-9.6%)

In Ramsey County, there is better alignment between the education requirements of Information Technology jobs and the credentials that current employees have than what is observed statewide. Approximately 81% of current positions require a Bachelor's degree or higher, 81.3% of the current Information Technology workforce holds a Bachelor's degree or higher, and 82% of job postings advertise these same requirements. Still, data indicates that a sizeable share of Ramsey County Information Technology talent may be underemployed. A large number of positions that require a Bachelor's degree are likely employing individuals with Master's or Ph.D. backgrounds (28%), as illustrated below.

In the Information Support and Services career pathway, about 39% of jobs posted in 2020 required a Bachelor's degree or higher; however, about 62.9% of Information Support and Services pathway employees hold a Bachelor's degree or higher. The existing workforce having higher educational attainment than posted requirements may make it hard for individuals with certificates, bootcamp experience, or 2-year degrees to stand out and be competitive despite having the skills necessary to do the job. Further study could reveal a range of explanations from an oversaturation of low-skilled graduates in the job market,[16] underemployment in the pathway, individual choice, or trends in "upskilling," in which worker's educational attainment increases over time.[17]

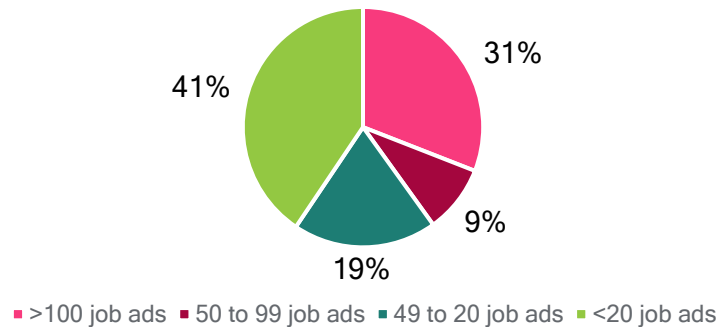### Percent of Job Postings by Required Education Level, 2020
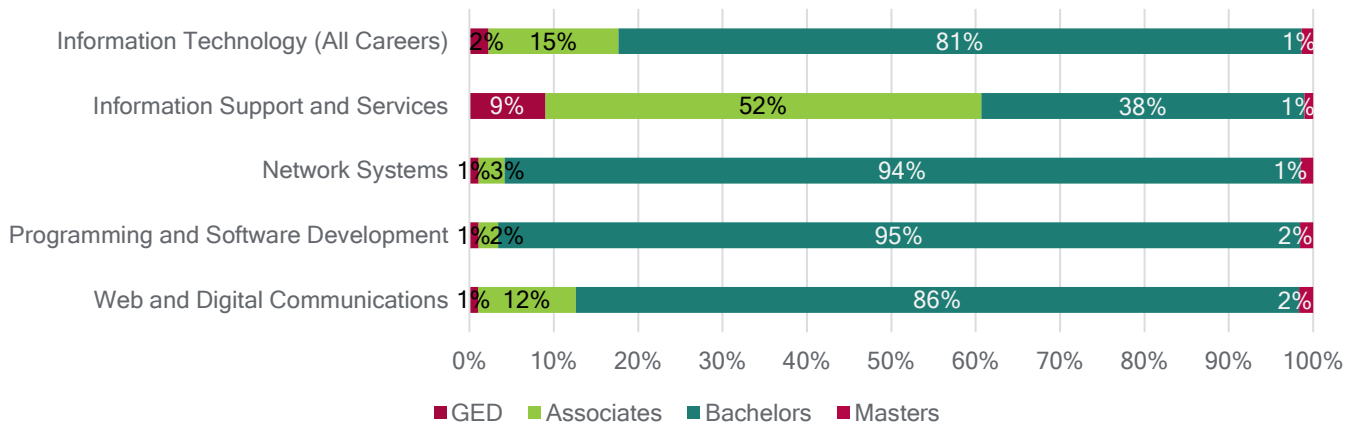
Career Pathways	GED (% change prior year)	Associates (% change prior year)	Bachelors (% change prior year)	Masters (% change prior year)	All Edu Level (% change prior year)
Information Support and Services	134 (-37.1%)	769 (-26.5%)	570 (-34.8%)	15 (+50.0%)	1,490 (-30.5%)
Network Systems	54 (-12.9%)	152 (+19.7%)	4,673 (-6.2%)	74 (+60.9%)	4,958 (-5.1%)
Programming and Software Development	25 (-13.8)	54 (+134.8%)	2,201 (+5.5%)	36 (-10.0%)	2,317 (+6.4%)
Web and Digital Communications	51 (+0.0%)	589 (-24.5%)	4,347 (+11.4%)	85 (+51.8%)	5,080 (+6.0%)
Information Technology (All Careers)	220 (-29.0%)	1,493 (-22.1%)	7,851 (-6.4%)	134 (+15.5%)	9,705 (-9.6%)

In Ramsey County, 98 employers posted 9,705 new Information Technology job ads in 2020. Employers with less than 20 job ads account for the highest share of postings with 41% of local Information Technology job ads. Employers with more than 100 jobs ads had the second-highest share of local tech job ads with 31%. This illustrates broad demand for tech talent across industries and in businesses of every size the Ramsey County.

[16] https://techbeacon.com/app-dev-testing/bootcamps-wont-make-you-coder-heres-what-will-0
[17] https://www.bls.gov/emp/documentation/education/tech.htm

Top Employers by Volume of New Job Postings in Ramsey County, 2020
n= 9,705

- 31%
- 9%
- 19%
- 41%

■ >100 job ads ■ 50 to 99 job ads ■ 49 to 20 job ads ■ <20 job ads

Top Employers by Volume of New Information Technology Job Postings in Ramsey County in 2020, Change from Prior Year
1. Oracle: 683 (+88.7%)
2. Medtronic: 525 (+69.9%)
3. State of Minnesota: 365 (-53.2%)
4. Robert Half International: 225 (-10.0%)
5. Wells Fargo: 215 (-25.6%)
6. 3M: 215 (+86.9%)
7. Apex Systems, Inc.: 164 (-35.2%)
8. Deluxe Corporation: 139 (+34.9%)
9. Manpower: 131 (+15.9%)
10. Genesis10: 115 (-44.4%)

Communication (5,429), analysis (4,683), and testing (3,714) are among the top skills by volume of Information Technology jobs advertised in 2020. Five out of the top ten Information Technology skills are not directly related to tech but are human or business enabler skills. The Information Support and Services pathway has the highest number of unique top skills not observed in other Information Technology pathways, represented by purple shading in the chart below.

Top Hard and Soft Skills by Volume of New Information Technology Job Postings in Ramsey County in 2020, Change from Prior Year
1. Communication: 5,429 (-9.4%)
2. Analysis: 4,683 (-3.9%)
3. Testing: 3,714 (-8.3%)
4. Collaboration: 3,694 (+3.3%)
5. Innovation: 3,118 (+16.8%)
6. Dedication: 3,008 (-9.8%)
7. Operations: 2982 (+3.9%)
8. Monitoring: 2,906 (+1.9%)
9. Leadership: 2,827 (+7.9%)
10. Troubleshooting: 2,738 (-9.7%)

Top Skills by Volume of New Information Technology Job Postings in Ramsey County in 2020

Information Technology (All Careers)	Information Support and Services	Network Systems	Programming and Software Development	Web and Digital Communications
Communication	Communication	Communication	Testing	Communication
Analysis	Troubleshooting	Analysis	Communication	Analysis
Testing	Customer service	Configuring	Leadership	Collaboration
Collaboration	Technical support	Collaboration	Analysis	Leadership
Innovation	Dedication	Testing	Collaboration	Testing
Dedication	Hardware	Monitoring	Innovation	Innovation
Operations	Problem solving	Operations	Planning	Project management
Monitoring	Analysis	Innovation	Automation	Planning
Leadership	Verbal communications	Dedication	Agile	Agile
Troubleshooting	Configuring	Troubleshooting	Writing	Dedication

The top required tech certifications by volume in all 2020 Ramsey County Information Technology job postings are Certified Information Systems Security Professional (559), Certified Information Security Manager (219), and Certified Information Systems Auditor (206). The Information Support and Services pathway has the highest number of unique top certifications not observed in other Information Technology pathways, represented by purple shading in the chart below.

Top Certifications by Volume of New Job Postings in Ramsey County in 2020,
Change from Prior Year
1. Certified Information Systems Security Professional: 559 (+40.5%)
2. Driver's License: 238 (-20.4%)
3. Security Clearance: 222 (-14.3%)
4. Certified Information Security Manager: 219 (+26.6%)
5. Certified Information Systems Auditor: 206 (+15.7%)
6. Cisco Certified Network Associate: 172 (-15.7%)
7. Certified Ethical Hacker: 125 (+32.9%)
8. ITIL Foundation certification (v3): 106 (-27.4%)
9. Global Information Assurance Certification: 106 (+41.3%)
10. Cisco Certified Network Professional: 99 (+11.2%)

Top Certifications by Volume of New Job Postings in Ramsey County in 2020

Information Technology (All Careers)	Information Support and Services	Network Systems	Programming and Software Development	Web and Digital Communications
Certified Information Systems Security Professional	Driver's License	Certified Information Systems Security Professional	Certified Information Systems Security Professional	Certified Scrum Master
Driver's License	A+ certification	Certified Information Security Manager	Certified Information Security Manager	Project Management Institute
Security clearance	Security clearance	Security clearance	Driver's License	Certified Information Systems Security Professional
Certified Information Security Manager	ITIL Foundation certification (v3)	Certified Information Systems Auditor	Society of Quality Assurance	Security clearance
Certified Information Systems Auditor	Microsoft Certified Systems Engineer	Cisco Certified Network Associate	Certified Information Systems Auditor	Society of Quality Assurance
Cisco Certified Network Associate	Cisco Certified Network Associate	Certified Ethical Hacker	Certified Records Manager	Enterprise Project Management
Certified Ethical Hacker	Certified Crestron Programmer	Global Information Assurance Certification	Certified Software Quality Engineer	Driver's License
ITIL Foundation certification (v3)	Microsoft Certified Systems Administrator	Cisco Certified Network Professional	Occupational Safety & Health Administration Certification	Avaya Certified Specialist
Global Information Assurance Certification	Occupational Safety & Health Administration Certification	GIAC Certified Incident Handler	American Society for Quality	Design for Six Sigma
Cisco Certified Network Professional	Secret security clearance	Distinguished Logistics Professional	Project Management Institute	ITIL Foundation certification (v3)

Opportunities to work remotely have grown and, likely, will be sustained after the pandemic subsides. One of the top certifications by volume of job postings in all Information Technology occupations is Driver's License (238). In many job posts, driving was not an essential duty of the position, or having reliable transportation is not likely a concern because the position was remote. Having a blanket requirement to hold a Driver's License comes with the risk of discouraging talent from applying and potentially creating inadvertent discrimination. For example, individuals may have a disability that prevents them from obtaining a Driver's License but could perform the job requirements for an Information Technology role. These individuals may forego applying to positions with a Driver's License requirement.

Retooling and Reimagining Work
Youth and K-12 Education in Information Technology

Improved alignment between K-12 schools, youth training programs, and employer needs could create a more efficient pipeline for future talent to enter a tech occupation or postsecondary program. Below are the larger programs with significant offerings in Ramsey County. As the demand for skilled tech workers is high and continues to grow, providing early exposure to the Information Technology field can build up the talent pipeline. There are various opportunities for youth inside and outside of the local K-12 education systems in the Information Technology field; however, these options are not available to all youth across Ramsey County.

Computer Science in Schools

As established earlier, Minnesota does not have a centralized state plan, rigorous standards, or set-aside funding for Information Technology and Computer Science education. Each K-12 public school and school district has its own definition of computer science and sequences of courses related to computer science. There are multiple options within K-12 schools that allow students to take rigorous Information Technology-related courses within the school setting. Some of these programs include but are not limited to Advanced Placement (AP), Career and Technical Education (CTE), Project Lead the Way (PLTW), Postsecondary Enrollment Options (PSEO), Independent Study Projects, Early College Articulation Programs, and concurrent enrollment. This section of the report highlights options to study Information Technology in AP and CTE programs.

One way to identify schools that offer Computer Science coursework is through Advanced Placement (AP) computer science courses at the high school level. Advanced Placement (AP) courses prepare students to take exams offered by the College Board to receive college credit. Out of the 187 Advanced Placement (AP) courses are offered at high schools within Ramsey County in the 2020-21 school year, 14 or 7% were Information Technology courses.

Advanced Placement (AP) Courses by High Schools in Ramsey County, School Year 2020 - 2021

School District	High School	Grades	Total AP Courses offered	Information Technology AP Courses	Links
ISD 282 - Saint Anthony-New Brighton School District	St. Anthony Village High School	9-12	13	- AP Digital Art	https://savhs.isd282.org/academics/apcispseo
ISD 621 - Mounds View Area School District	Irondale High School*	9-12	28	- Computer Science A - Computer Science Principles	
	Mounds View High School*	9-12	38	- Computer Science A - Computer Science Principles (2)	
ISD 622 - North Saint Paul-Maplewood-Oakdale School District	North High School	9-12	15	- Computer Science	https://www.isd622.org/site/Default.aspx?PageID=10830
	Tartan High School	9-12	15	- Computer Science - Computer Science Principles	https://www.isd622.org/site/Default.aspx?PageID=10830
ISD 623 - Roseville Area School District	Roseville Area High School	9-12	16	- Computer Science	https://www.isd623.org/schools/secondary/roseville-area-high-school/counseling/ap-courses-and-tests
ISD 624 - White Bear Lake Area School District	White Bear Lake Area High School - South Campus	9-12	20	- Computer Science A - Computer Science Principles	
ISD 625 - Saint Paul School District	Washington Technology Magnet School*	6-12	2	N/A	
	Creative Arts*	6-12	5	N/A	
	Johnson Sr. High*	9-12	0	N/A	
	Como Park Sr.*	9-12	22	N/A	
	LEAP High School*	9-12	0	N/A	
	Gordon Parks*	9-12	0	N/A	
	AGAPE*		0	N/A	
	Central High School*	9-12	2	N/A	
	Journeys*	9-12	0	N/A	
	Bridgeview Focus Beyond*	K-12	0	N/A	
	Highland Park Sr*	9-12	0	N/A	
	Harding Sr. High*	9-12	0	N/A	
	Open World*	6-12	8	- Computer Science A	
	Humboldt High School*	6-12	3	- Computer Science Principles	
Total			**187**	**14**	

*AP Course Ledger was used to search lists of secondary school courses offered by schools within Ramsey County that are authorized to include either AP or Pre-AP designations when listed on students' transcripts. https://apcourseaudit.inflexion.org/ledger/

Career and Technical Education (CTE) programs are integrated into the K-12 education systems locally and nationally. These programs are a sequence of courses that combines academic knowledge with technical and occupational knowledge and skills that follows a career pathway to postsecondary education and careers. The Arts, Communications, and Information Systems Career Field's Information Technology Cluster includes all four career pathways highlighted in this report. CTE Consortia are led in partnership between secondary school districts supported by the Minnesota Department of Education and postsecondary partners supported by Minnesota State Colleges and Universities. Two consortia serve Ramsey County youth: the Saint Paul Consortium and the Northeast Metro Consortium.

The Saint Paul Consortium served 9,926 secondary students within St. Paul Public Schools during the 2019-2020 school year, per the Consortium's Performance report. About two-thirds (66%) of the consortium's high school CTE concentrators enrolled postsecondary for further education and career development.[18] Regarding Information Technology, the Saint Paul consortium offers a Web and Digital Communications pathway at Humboldt Secondary School that aligns with CTE programming at Saint Paul College.[19]

During the 2019-2020 school year, the Northeast Metro Consortium served 23,612 secondary students within seventeen public school districts within and outside of Ramsey County.[20] Over two-thirds (68%) of the consortium's high school, CTE concentrators enrolled postsecondary for further education and career development.[21] The Northeast Metro Consortium offers a Computer Hardware/Software & Game Design pathway.[22]

Youth Tech Trainings
Youth Tech training programs in Ramsey County are abundant and range from, but are not limited to, one-time competitions, summer camps, in-school and extended day classes, after school or out-of-school intensive trainings, paid internships, workshops, and apprenticeships. Many programs seek to increase digital inclusion for youth in underrepresented communities while creating a pipeline to get young people into innovative tech careers.

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[18] https://www.minnstate.edu/system/cte/perkins-consortia.html
[19] https://www.minnstate.edu/system/cte/consortium_resources/applications/FY20-Applications/Saint-Paul-Consortium-Application.pdf
[20] https://www.minnstate.edu/system/cte/documents/performance-indicators/Indicator-Performance_Northeast-Metro.pdf
[21] https://www.minnstate.edu/system/cte/documents/performance-indicators/Indicator-Performance_Northeast-Metro.pdf
[22] https://careertech.916schools.org/programs/arts-communication-information-systems

Youth Tech Trainings, MSP Metro

Offered by	Program Description	Population Served	Skills	Time commitment	Cost
Genesys Works	Genesys Works serves high school students in underserved communities to start a career pathway in a high-demand occupation through "skills training, counseling and coaching, paid internships for high school seniors who live in underserved communities."	MSP Metro-wide High School students in underserved communities in the *1,418 students in the MSP Metro in 2019[23]	- Help Desk Support - Quality Assurance Testing - Computer Setup & Deployment - Web Development - Database Management - Project Coordination	8 weeks intensive training + yearlong paid internship	Students are paid to learn at the internship at a partner company. *Students earned a total of $4.04 million in 2019 through paid internships.
Hmong American Partnership Youth Job Skills	This program offers help to clients in: - Career navigation - Paid internships/apprentice - Budgeting and financial literacy - School completion Along with industry/sector training and job placement	St. Paul based Ages 16 – 24 At-risk youth who have been involved in juvenile justice system, did not complete high school, are young parents, MFIP recipients, or are otherwise unable to engage in education and career tracks.	- IT and Technology - Construction - Healthcare	Six months to a year	
New Vision Foundation – School based Coding Class	This program offers school-based coding classes leading to opportunities in college and career readiness. While earning certifications in tools, students connect online with peers in overseas communities.	Statewide Ages 16 -30 Grades 6-8 and 9-12 Core customers are disadvantaged youth and young adults, and the communities working to engage them as part of larger education, employment, and economic development strategies.	Middle School Skills -Basic Computer Skills: Mouse, Sequencing & Order, Parallelization, Event Listeners, Loops/Nested Loops, Variables and Conditionals High School Introduction to HTML & CSS, Website Layout, Advanced CSS Variables and Conditionals in JavaScript, Loops in JavaScript, Final Project	12-week subject units	Tuition based

[23] https://impact.genesysworks.org/2019/twin-cities/

Youth Tech Trainings, MSP Metro (Continued)

Offered by	Program Description	Population Served	Skills	Time commitment	Cost
Minnesota Computers for Schools	Focused on equal access to tech and tech skills, MCFS works to equip schools and education nonprofits with technology. In addition, they offer CORE:IT a free technology workforce training program. Graduates of the CORE:IT program have the opportunity for a 6-month paid internship. The CORE:IT program is part of the MSP Tech Hire Initiative. The Tech for Teens program are an in-school and extended day classes or summer camps for at-risk youth.	Humboldt High School, St. Paul & Neighborhood House, St. Paul Adult and Youth programs	CORE: IT: General computer literacy skills and credentials that lead to careers in networking, security, software technology, or hardware support. Tech for Teens: Game Coding and Design, Web Design and Development, and App Design.	Course lengths vary. 6-months paid internships.	CORE: IT program is free
Code Savvy	The focus of Code Savvy is to develop opportunities for youth to engage in coding activities. Mentors provide support and encouragement for youth ages 8-17 in a variety of environments, including the Technovation Challenge, Coder Dojos, Code Clubs, Code Camps, and the Digital Empowerment Academy (for residents in North Minneapolis).	Statewide and MSP Metro Youth ages 8-17	Technovation Challenge: Coding and Entrepreneurship (Young women ages 12 -18) Coder Dojo Twin Cities: Web and app design, gaming, systems, and electronics (Youth ages 8 -16) Rebecca Coder Dojo: Scratch, App Inventor, Python, and Arduino (young women ages 8 -16)	12-week Technovation Challenge One-time events ongoing clubs	Coder Dojos are free
Science Museum - Kitty Andersen Youth Science Center	The KAYSC Design Team is explores STEM (science, technology, engineering, and math) through hands-on projects. Participants receive a free yearly family membership to the Science Museum. High school students work with the KAYSC and learn leadership and STEM skills while mentoring middle school KAYSC members.	Ramsey County Youth in Middle School and High School from underrepresented communities *75% of participants are from low-income families; 60% are girls; 90% are youth of color.	Middle School Program, Design Team: leadership, communications, science, technology, engineering, and math High School Program: Biological Sciences and Public Health, Media and Technology, Environmental Sciences and Sustainability, Engineering and Design	Ongoing	High School students are paid to learn to work at the KAYSC

Youth Tech Trainings, MSP Metro (Continued)

MN STEM Partnership	The purpose of the Virtual Drone Racing league is to inspire youth towards options in aviation and future workforce demand in agriculture, parcel delivery, entertainment, and medical, and many other emerging industry careers. Monthly STEM Information Exchange are events to build interest in STEM. Robotics Competition League & Virtual Workshops are focused on teams of students to learn about robotics.	MSP Metro K- Postsecondary	Virtual Drone Racing: basic drone flight including FAA drone pilot license. (4-12 grades) Robotics Competition League & Virtual Workshops: Robotics and team building (K- Postsecondary)	One-time and monthly events	Free
High Tech Kids	This program delivers fun, hands-on science, engineering, and technology programs and events to inspire the next generation of engineers, scientists, computer programmers, technicians, policy makers and project managers to the challenge and promise of STEM. Through these programs we train, teach and empower student teams, coaches and volunteers.	Statewide Grades K-12 *High Tech Kids now serves over 7,500 kids across Minnesota each year. Since our inception in 1999 we have helped over 67,000 students discover the fun in science and technology.	FIRST ® LEGO® League Explore: Building Motorized Models (Grades K-4) FIRST ® LEGO® League Challenge: Robotics (9-14 years of age) FIRST ® Tech Challenge: Robotics CoderZ Program: computational thinking, problem-solving, and collaboration (Grades 4 -12)	One-time events	Prices range from $49 to $399 to participate in a competition

# Postsecondary Education in Information Technology

In this report, we have reviewed specific employer demand for Information Technology talent. As previously stated, existing Information Technology talent often holds higher educational attainment than posted requirements creating a competitive landscape for individuals with certificates, bootcamp experience, or 2-year degrees to stand out and be competitive despite having the skills necessary to do the job. There are multiple explanations for this educational mismatch, including oversaturation of low-skilled graduates in the job market,[24] underemployment in the pathway, individual choice, or trends in "upskilling," in which worker's educational attainment increases over time to meet occupational or employer demands.[25] In this section of the report, we further elaborate on how employer needs and expectations match up with the talent pool in Ramsey County. This section begins with the current postsecondary regional degree awards, followed by award gaps, and, finally, credential gaps by gender, race, and ethnicity.

REGIONAL AWARDS

Graduate award data in this report are reported at the local and regional levels for two main reasons. First, postsecondary students are mobile and may not live or work in the same region where they receive an education. The other reason is that postsecondary institutions with multiple sites may report all their data through one specified site independent of geography.[26] The National Center for Education Statistics provides the program-to-occupation correspondence for these data, which may not include non-traditional training routes, such as online bootcamps or micro-bachelors. In addition, the counts below represent awards and not students. As a result, if a student has a double major, both awards will be counted in the data set.

Postsecondary institutions in the MSP Metro conferred about 2,806 academic awards in programs corresponding to Information Technology occupations in the Academic Year 2018-2019. Institutions in Ramsey County conferred about 27% or 765 of those awards. Bachelor's degrees were the most common awards conferred in both the MSP Metro and Ramsey County Information Technology programs. A higher share of awards conferred in Ramsey County postsecondary institutions are at the Bachelor's degree and Post-Baccalaureate degree levels than observed in the MSP Metro overall.

Computer and Information Sciences and Support Services Awards by Institution (CIP 11), MSP Metro and Ramsey County, Academic Year 2018-2019
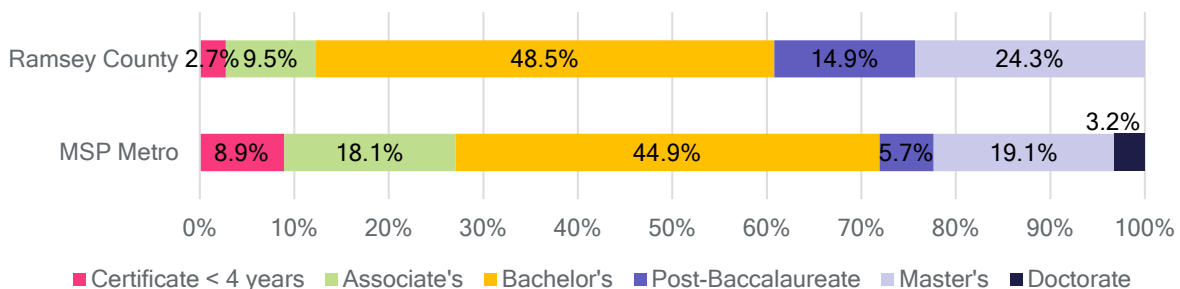
	Certificate < 4 years	Associate's	Bachelor's	Post-Baccalaureate	Master's	Doctorate
Ramsey County	2.7%	9.5%	48.5%	14.9%	24.3%	
MSP Metro	8.9%	18.1%	44.9%	5.7%	19.1%	3.2%

Source: JobsEQ®, Data as of the 2018-2019 academic year, related occupation data as of 2020Q3.

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[24] https://techbeacon.com/app-dev-testing/bootcamps-wont-make-you-coder-heres-what-will-0
[25] https://www.bls.gov/emp/documentation/education/tech.htm
[26] JobsEQ, https://help.eqsuite.com/analytics/awards/

	Certificate < 4 years	Associate's	Bachelor's	Post-Baccalaureate	Master's	Doctorate	Total Awards
MSP Metro	250	509	1,259	161	536	91	2,806
Ramsey County	21	73	371	114	186	0	765

Source: JobsEQ®, Data as of the 2018-2019 academic year, related occupation data as of 2020Q3.

In the Academic Year 2018-2019, the University of St. Thomas conferred the most Computer and Information Sciences and Support Services awards in Ramsey County with 303 awards: 33 Bachelor's and 158 Master's degrees.

Computer and Information Sciences and Support Services Awards by Institution (CIP 11), Ramsey County, Academic Year 2018-2019

Title	Certificate < 4 years	Associate's	Bachelor's	Post-Baccalaureate	Master's	Doctorate	Total Awards	Avg Net Price[1]
University of St Thomas	0	0	33	110	160	0	303	$30,183
Metropolitan State University	0	0	230	4	26	0	260	$14,900
Saint Paul College	12	68	0	0	0	0	80	$11,973
Macalester College	0	0	58	0	0	0	58	$29,013
Concordia University-Saint Paul	0	0	27	0	0	0	27	$18,591
Bethel University	0	0	15	0	0	0	15	$27,085
Minneapolis Business College	9	5	0	0	0	0	14	$13,724
University of Northwestern-St Paul	0	0	8	0	0	0	8	$24,286
Hamline University	0	0	0	0	0	0	0	$22,079
Total	21	73	371	114	186	0	765	

Source: JobsEQ®
Data as of the 2018-2019 academic year unless noted otherwise; related occupation data as of 2020Q3.
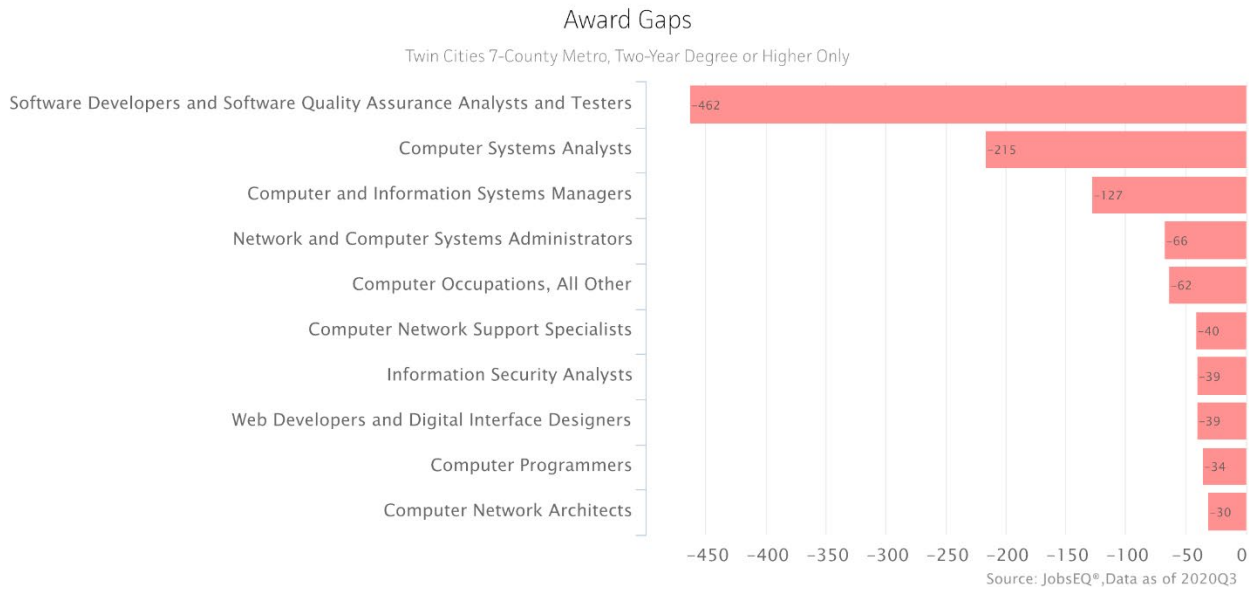Note: Figures may not sum due to rounding.
1. Data as of the 2017-2018 academic year
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AWARD GAPS
Five out of the seven counties in the MSP Metro underproduce talent in Information Technology postsecondary programs compared to national benchmarks, making it challenging for Ramsey County employers to find highly qualified local Information Technology talent. The largest award gap is Software Developers.

Award Gaps
Twin Cities 7-County Metro, Two-Year Degree or Higher Only

Occupation	Gap
Software Developers and Software Quality Assurance Analysts and Testers	–462
Computer Systems Analysts	–215
Computer and Information Systems Managers	–127
Network and Computer Systems Administrators	–66
Computer Occupations, All Other	–62
Computer Network Support Specialists	–40
Information Security Analysts	–39
Web Developers and Digital Interface Designers	–39
Computer Programmers	–34
Computer Network Architects	–30

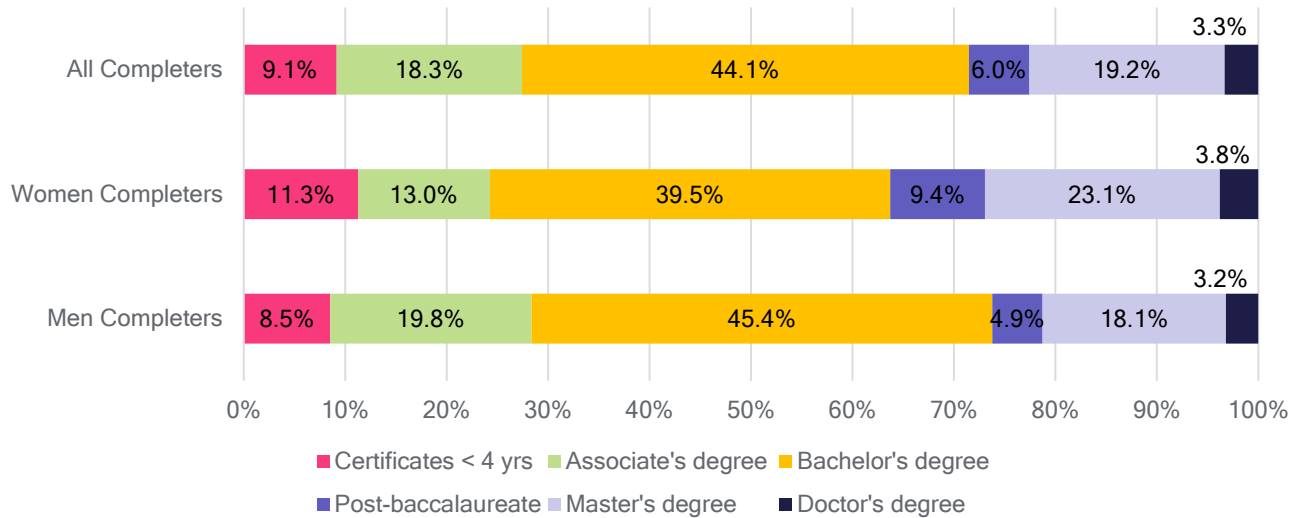Source: JobsEQ®,Data as of 2020Q3

AWARD GAPS BY GENDER

In 2020, 82% of all Ramsey County Information Technology job postings required a BA or higher, which has been consistent for at least the past four years. Increased educational attainment requirements or credential inflation can have major implications for individuals with certificates, bootcamp experience, or 2-year degrees and employers struggling to fill jobs.[27] In some cases, Information Technology occupations may have increased skill requirements because workers use advanced technology or apply more sophisticated methods. [28] In other cases, the attributes of the role may not have changed, and employers may be using a Bachelor's degree to filter candidates.

Among 2019 MSP Metro Information Technology postsecondary graduates, 72.6% completed a Bachelor's degree or higher in Information Technology. Compared to the current education requirements for tech jobs, the percent completion suggests an overall 9.4-percentage point credential gap.

[27] https://www.burning-glass.com/research-project/credentials-gap/
[28] https://www.burning-glass.com/research-project/credentials-gap/

Postsecondary Degree/Certificate Completions in Information Technology by Gender in the MSP Metro, IPEDS 2019

	Certificate < 4 years	Associate's	Bachelor's	Post-Baccalaureate	Master's	Doctorate	Total Awards
Female Completers	71	82	249	59	146	24	631
Male Completers	179	417	955	104	380	67	2,102
Total Completions	250	499	1,204	163	526	91	2,733

U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), 2019, Completions. Retrieved from nces.ed.gov on 3/22/2021.

With a 26-percentage point employment gap between the percent of females working in tech and the share of female workers in all occupations, it is worth exploring if a credential gap impedes female talent from making it through the educational attainment filter and obtaining Information Technology roles. In 2019, among females who completed a postsecondary degree or certification in Information Technology in the MSP Metro, about 75.8% completed a Bachelor's degree or higher; compared to 71.6% of males who completed a Bachelor's degree or higher in Information Technology. Considering that 82% of Information Technology postings call for a Bachelor's degree or higher, there is a 6.2-percentage point credential gap for females and a 10.4-percentage point credential gap for males.
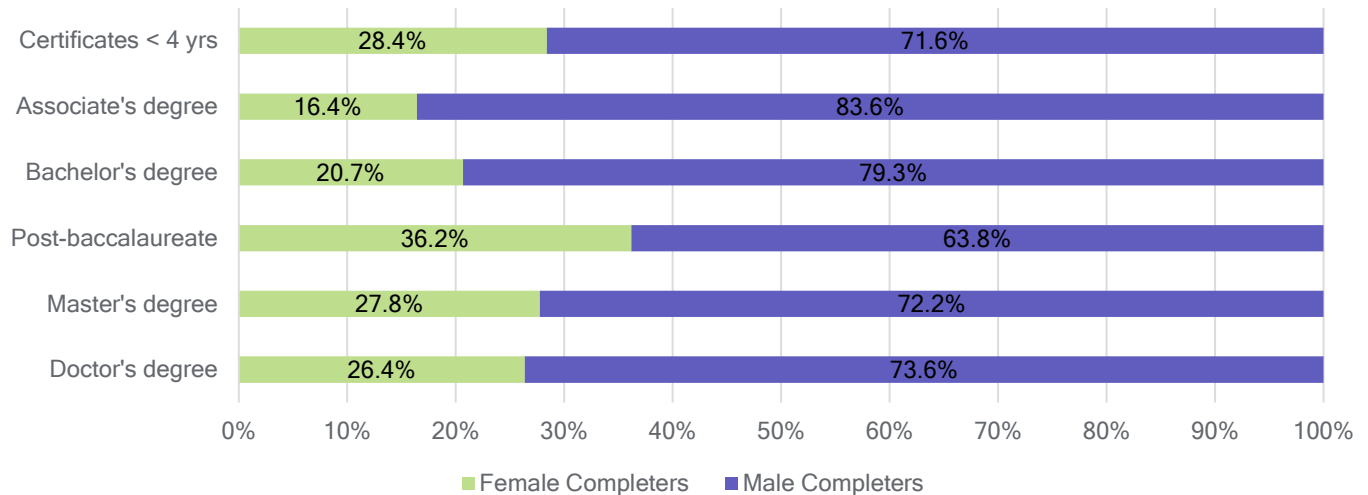
Credential Gap in Information Technology by Gender in Ramsey County

	Females	Males	Total
Credential Gap	-6.2%	-10.4%	-9.4%
% MSP Completers with BA+ in IT (2019) (IPEDS)	75.8%	71.6%	72.6%
% IT Postings Requiring BA+ in Ramsey County (TNR)		82%	
Job Postings in 2020 (TNR)		7,851	

Women are earning advanced Information Technology degrees at a similar rate to men, but women remain less represented in the overall population of individuals completing Information Technology degrees. Females account for 24.1% of all individuals who completed a Bachelor's degree or higher in Information Technology in the MSP Metro in 2019, compared to 75.9% of males. Further research into

gender parity in credentialing could include recruitment and persistence of women in Information Technology degree programs and retention of women after they have earned their degrees.

Postsecondary Degree/Certificate Completion in Information Technology (CIP 11) by Award Type in the MSP Metro, IPEDS 2019

	Certificate < 4 years	Associate's	Bachelor's	Post-Baccalaureate	Master's	Doctorate	Total Awards
Female Completers	71	82	249	59	146	24	631
Male Completers	179	417	955	104	380	67	2,102
Total Completions	250	499	1,204	163	526	91	2,733

U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), 2019, Completions. Retrieved from nces.ed.gov on 3/22/2021.

AWARD GAPS BY RACE AND ETHNICITY

There are also disparate gaps in employment by racial and ethnic subgroups in Information Technology roles. For instance, there is a 5.4-percentage point underrepresentation of Black or African American talent working in tech compared to the share of Black or African American workers in all Ramsey County occupations.

Employment Gap in Information Technology by Race and Ethnicity in Ramsey County
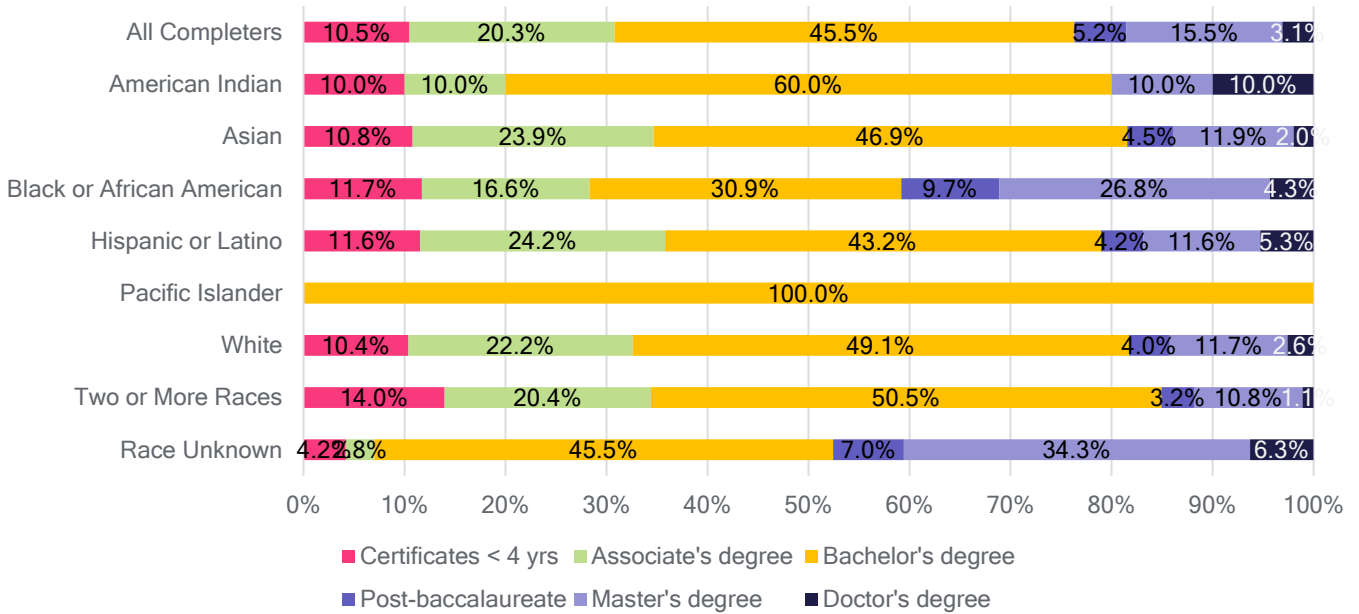
	American Indian	Asian	Black or African American	Hispanic or Latino	Pacific Islander	White	Two or More Races	Total
Employment Gap	-0.4%	12.9%	-5.4%	-4.8%	0.0%	-6.5%	-0.6%	--
All Information Technology Careers	0.2%	25.6%	5.2%	2.2%	0.0%	66.7%	2.3%	9,981
Total - All Occupations	0.6%	12.7%	10.6%	7.0%	0.0%	73.2%	2.9%	277,359

Source: JobsEQ®, Data as of 2020Q3

Potential credential gaps could impede racial and ethnic subgroup talent from making it through the educational attainment filter to land an Information Technology role. In 2019, 69.2% of MSP Metro Information Technology postsecondary award completers who identified a race or ethnicity attained a Bachelor's degree or higher. Considering that 82% of Information Technology postings call for a Bachelor's degree or higher, this completion rate represents a 12.8-percentage point credential gap.

Among Black and African American Information Technology degree or certificate completers, 71.7% completed a Bachelor's degree or higher compared to 82% of tech job postings with the same educational requirement, representing a 10.3-percentage point credential gap. Among Asian Information Technology degree or certificate completers, 65.3% completed a Bachelor's degree or higher compared to 82% of tech job postings with the same educational requirement, representing a 16.7-percentage point credential gap compared to local job postings. By contrast, Asian talent is overrepresented by 12.9-percentage points in tech employment compared to the share of all Asian workers in all Ramsey County occupations.

Postsecondary Degree/Certificate Completion in Information Technology (CIP 11) by Race and Ethnicity in the MSP Metro, IPEDS 2019

	Ame. Indian	Asian	Black or African Ame.	Hispanic or Latino	Pacific Islander	White	Two or More Races	Race Unknown	Total
Doctor's degree	1	7	17	5	0	34	1	9	**74**
Master's degree	1	42	105	11	0	154	10	49	**372**
Post-baccalaureate	0	16	38	4	0	53	3	10	**124**
Bachelor's degree	6	165	121	41	2	648	47	65	**1095**
Associate's degree	1	84	65	23	0	293	19	4	**489**
Certificates < 4 yrs	1	38	46	11	0	137	13	6	**252**
Total	**10**	**352**	**392**	**95**	**2**	**1,319**	**93**	**143**	**2,406**

U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), 2019, Completions. Retrieved from nces.ed.gov on 3/22/2021.

## Credential Gap in Information Technology by Race and Ethnicity in Ramsey County, 2019*

	Ame. Indian	Asian	Black or African Ame.	Hispanic or Latino	Pacific Islander	White	Two or More Races	Race Unknown	Total
Credential Gap	-2.0%	-16.7	-10.3%	-17.8%	18.0%	-14.6%	-16.4%	11.0%	-12.8%
% MSP Completers with BA+ in IT (2019) (IPEDS)	80.0%	65.3%	71.7%	64.2%	100.0%	67.4%	65.6%	93.0%	69.2%

*82% or 7,851 of IT jobs postings require BA+ in Ramsey County in 2020 (TNR). This percentage is used to calculate the credential gap.

Black and African American talent is underrepresented in Information Technology careers in Ramsey County, accounting for just 5.2% of tech workers. However, Black and African American completers account for 16.9% of all individuals who completed a Bachelor's degree or higher in Information Technology in the MSP Metro in 2019, compared to 53.4% being White and 13.8% being Asian.

The lack of Black and African American Information Technology talent In Ramsey County could indicate a retention gap considering the sufficient educational attainment to increase representation. In other words, Black and African American talent completing tech degrees are not working in the field at the same rate as other groups. A longitudinal study could reveal another possibility that Black and African American talent are catching up to other groups in earning Bachelor's degrees in Information Technology and have only recently started entering the tech workplace.

Postsecondary Degree/Certificate Completion in Information Technology (CIP 11) by Award Type in the MSP Metro, IPEDS 2019
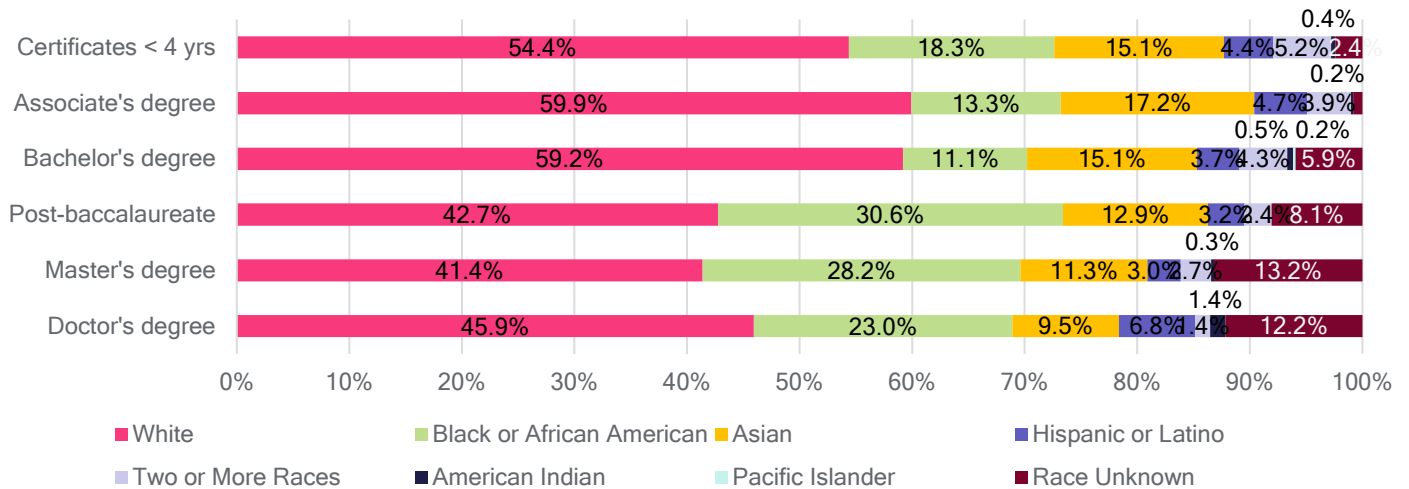
Degree Level	White	Black or African American	Asian	Hispanic or Latino	Two or More Races	American Indian	Pacific Islander	Race Unknown	Total
Certificates < 4 yrs	137	46	38	11	13	1	0	6	252
Associate's degree	293	65	84	23	19	1	0	4	489
Bachelor's degree	648	121	165	41	47	6	2	65	1,095
Post-baccalaureate	53	38	16	4	3	0	0	10	124
Master's degree	154	105	42	11	10	1	0	49	372
Doctor's degree	34	17	7	5	1	1	0	9	74
Total	1,319	392	352	95	93	10	2	143	2,406

U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), 2019, Completions. Retrieved from nces.ed.gov on 3/22/2021.

WORKFORCE TRAINING AND TECH BOOTCAMPS
Workforce development training programs and bootcamps in Ramsey County seek to address some of the barriers that underrepresented communities in tech face to starting or switching to a career in Information Technology.

MSP Tech Hire
MSP Tech Hire is an innovative collaboration between the cities of Minneapolis and Saint Paul, along with regional employers and accelerated tech education programs to meet the high demand for local tech jobs. [29] The three tech education partners are Prime Digital Academy, a Full Stack software development bootcamp, and a new user experience design program. [30] Creating IT Futures offers an IT-Ready 8-week intensive course on hardware technical support and IT training through CompTia Tech Career Academy.[31] Finally, Software Guild also offers a software development bootcamp in Java or .NET/C# languages with an option to study virtually and part-time.[32] Since MSP Tech Hire's inception in 2015, the collaboration has graduated over 1,600 students from accelerated learning programs and guided 1,322 graduates to full-time positions at 500 employer partners. Due to COVID-19, most MSP TechHire trainings are now available online.

Although there are no age limits for enrollment, the program is focused on adult jobseeker looking to enter into a tech career. Each of the learning programs collaborating with MSP Tech Hire have an associated tuition. The City of St. Paul funds a limited number of scholarships to currently un- or underemployed St. Paul Residents over 18 years old, with a high school, and either a member of an underrepresented community in tech or have a household income of 50% Area Median Income or below. [33]

[29] https://www.stpaul.gov/businesses/open-business-0/full-stack-saint-paul/msp-techhire
[30] https://primeacademy.io/courses/engineering
[31] https://www.creatingitfutures.org/
[32] https://www.thesoftwareguild.com/
[33] https://www.stpaul.gov/businesses/open-business-0/full-stack-saint-paul/msp-techhire

Bootcamps

As the name suggests, bootcamps are intensive, accelerated learning programs that teach beginners digital skills like Full-Stack Web Development, Data Science, Digital Marketing, UX/UI Design, Cybersecurity, and Technical Sales. Bootcamps emerged over that last decade to fill a critical and growing talent shortage when postsecondary institutions could not meet the demand with four-year degree programs. There are vast numbers of free or low-cost local learning opportunities, detailed on the following page.

These short-term intensive learning programs provide an accessible entry for individuals who want to transition into a tech career or upskill but do not have the time or money to earn a four-year degree.[34] However, some sources warn that bootcamps are not necessarily a fast path to a more secure and better-paying job.[35] Despite teaching the basic digital skills needed to perform in a tech role, bootcamps do not cover these skills in the depth or scope of a four-year computer science degree, making it hard for bootcamp graduates to compete with computer science graduates.

[34] https://www.bestcolleges.com/bootcamps/guides/are-coding-bootcamps-worth-it/
[35] https://techbeacon.com/app-dev-testing/bootcamps-wont-make-you-coder-heres-what-will-0

MSP Metro Tech Trainings by Skills, updated March 2021[36]

Skill	Training	Offered by	Time Commitment	Cost
Technical Support/Computer User Support Specialist	CompTIA A+ Certification Prep - Online	Jewish Family and Children's Service	12 -16 weeks	Free to eligible students
Technical Support/Computer User Support Specialist	CompTIA A+ Certification Prep - Classroom	CompTIA	240 hours over 8 weeks, M-F 9 a.m.-4 p.m.; or 240 hours over 16 weeks, M-F, 6 p.m.-9 p.m.	$8,500 with partial and full tuition grants available to qualifying students
Cisco IT Essentials	Network Administration - Classroom	Minnesota Computers for Schools	6-14 weeks	Free
Full Stack Engineering		PRIME	720 hours	$16,000
User Experience Design		PRIME	720 hours	$16,000
.Net/C# or Java - Classroom	Coding Boot Camp - Classroom	SOFTWAREGUILD	2 weeks	$13,750
.Net/C# or Java - Online	Coding Boot Camp - Online	SOFTWAREGUILD	10 to 14 months 720-1,020 hours	$12,000
CompTIA IT Fundamentals	Classroom*	TAKODA INSTITUTE	12 weeks, 2 days per week	Scholarships available for eligible students, contact provider for more information
CompTIA A+	Classroom*	TAKODA INSTITUTE	6 weeks, 4 days per week	Scholarships available for eligible students, contact provider for more information
CompTIA Network+	Classroom*	TAKODA INSTITUTE	6 weeks, 4 days per week	Scholarships available for eligible students, contact provider for more information
CompTIA Security+	Classroom*	TAKODA INSTITUTE	12 weeks, 2 days per week	Scholarships available for eligible students, contact provider for more information
Project Management	Classroom*	TAKODA INSTITUTE	Evening classes, 6 weeks, 2 days per week	Scholarships available for eligible students, contact provider for more information
Computer Support Specialist	Accredited Certificate Program, 45 credits - Classroom	TAKODA INSTITUTE	9 months	Scholarships available for eligible students, contact provider for more information

[36] https://www2.minneapolismn.gov/resident-services/employment-training/minneapolis-employment-training/adult-programs/career-pathways/techhire/tech-trainings/

MSP Metro Tech Trainings by Skills, updated March 2021 (Continued)

Skill	Training	Offered by	Time Commitment	Cost
Java, ITIL v4, MS Suite, Agile		SUMMIT Academy OIC	20 weeks	No out-of-pocket cost. Tuition is paid for entirely by grants, scholarships, and contracts.
Cybersecurity Infrastructure Configuration and Prevention, MS Suite, Network Security Essentals		SUMMIT Academy OIC	20 weeks	No out-of-pocket cost. Tuition is paid for entirely by grants, scholarships, and contracts.
Service Desk Technician, ITIL and MS Suite		SUMMIT Academy OIC	20 weeks	No out-of-pocket cost. Tuition is paid for entirely by grants, scholarships, and contracts.
Comp TIA A+ 1001 and A+ 1002 Certification credentials, MS Suite, Computer hardware and repair		AVIVO	636-hour (27 week)	
Microsoft 365: Modern Desktop Administrator Associate (MDAA)		IT Career Lab	6 weeks	$4,500
CompTIA Network+ certification		IT Career Lab	4 weeks	$4,500
Cisco Certified Network Associate (CCNA) certification		IT Career Lab	12 weeks	$4,500

Skill Transferability and Talent Attraction

Comparing Computer User Support Specialist to related occupations allows us to analyze career-change potential into the occupation, as well as evaluate the skillset fit required for future career growth. The blue Willing/Able quadrant represents target occupations for a career change; these are roles with related skillsets with an equal or higher average annual wage. There is only one occupation in this quadrant for Computer User Support Specialist: Utilities Meter Reader. A Utilities Meter Reader role would be a relatively easy transition with some necessary upskilling in mechanical and mathematical skills, however over the next ten years there will be a likely oversupply of talent needed for these roles in Ramsey County (represented by the red color).

In the lower yellow Not Willing/Able quadrant is a related occupation, Communications Equipment Operators. The difficulty of retraining to become Communications Equipment Operators is low and in Ramsey County demand for these roles currently exceeds the talent supply (represented by the blue color), however this career change would likely mean a 10% pay cut from the current occupation. Instead, existing Communications Equipment Operators may look to Computer User Support Specialist roles as a possible higher wage position for career transition.

The Willing/Not Able quadrant in the upper left highlights long-term career growth opportunities. Talent trained and experienced as a Computer User Support Specialist may be able to retrain for these occupations, but the difficulty of retraining is higher and would take time. Occupations listed in the Willing/Not Able quadrant are in order of difficulty of retraining with blue occupations indicating possible future talent shortages and red indicating likely talent oversupply in Ramsey County within the next ten years.

Finally, the Not Willing/Not Able bottom left quadrant contains related occupations that have a higher difficulty of retraining and offer a lower average wage. These positions would not be the ideal sources for future Computer User Support Specialist talent or destination occupations for career growth for current Computer User Support Specialists, as they offer lower average annual wages, anticipate talent surpluses over time, and have fewer overlapping skillsets.

Computer User Support Specialist Skill Transferability in Ramsey County*

Willing/Not Able *(listed in order of difficulty of retraining)* • Audiovisual Equipment Installers and Repairers ($54,300) • Insurance Appraisers, Auto Damage ($66,600) • Life, Physical, and Social Science Technicians, All Other ($53,100) • Broadcast Technicians ($53,400) • Computer Network Support Specialists ($67,000) • Web Developers Interface Designers ($83,700) • Computer Programmer ($83,700)	Willing/Able • Utilities Meter Reader ($60,700)
Not Willing/Not Able • Library Technicians ($46, 200) • Computer, Automated Teller, and Office Machine Repairers ($42,900) • Telecommunications Equipment Installers and Repairers, Except Line Installers ($51,600)	Not Willing/Able • Communications Equipment Operators, All Other ($50,600)

* Average Annual wage in parenthesis

Color Key: Blue = positive gap (projected demand exceeds projected supply) Red = negative gap (projected demand is less than projected supply),

Conclusion

Demand for Information Technology talent crosses every industry in Ramsey County and touches nearly every area of daily life. Tech skills are the new essential skills for the most high-wage, high-demand careers of today and tomorrow. The majority of Minnesota's Information Technology talent and opportunities are concentrated in the 7-county MSP Metro; continuing to cultivate a strong local tech talent pipeline will help drive Minnesota's economy in a positive direction.

Growth of the Information Technology talent pipeline must be done with an eye to equitable recovery. Critical considerations for successful growth and diversification of the future talent pool will take into consideration:

- Access to the internet and computers at home,
- Access to quality and affordable education and training programs across the talent pipeline–from K-12 through opportunities for the adult workforce,
- Employer intentionality in investing in the training and career advancement of diverse talent.

Postsecondary graduates in Information Technology fields are growing in diversity, but the persistent employment disparities in these roles across multiple sectors are troubling. Employer strategies cannot simply focus on talent attraction but must also promote inclusive workplaces and meaningful pathways for career advancement from within.

Information Technology careers are good jobs. They are high-wage, high-demand, and high-skill, and current forecasts suggest that the existing talent supply and talent pipelines will not be enough to meet local employer demand in the future. An investment in Information Technology education and training programs is an investment in individuals, families, communities, businesses, the economy, and the future.