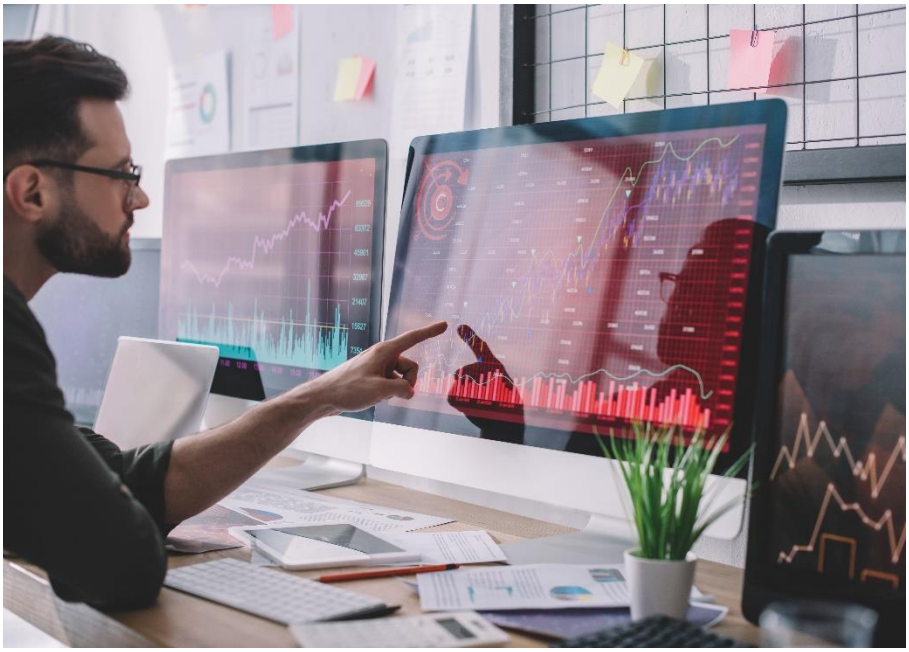
January 2021

Skills Evaluation

Internet Problem Solving



Prepared by the Central Valley/Mother Lode Center of Excellence

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COVID-19 Statement: This report includes employment projection data by EMSI. EMSI's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

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Introduction

The Central Valley/Mother Lode Center of Excellence was asked by the three colleges in the Kern Community College District (KCCD) to conduct an evaluation of occupations where employers requested "network problem solving" skills. The purpose of the analysis was to determine those occupations for which experience or training in website, internet, and problem solving or technical support is beneficial or necessary for employment. The geographic focus for this study was the KCCD service area.

To determine the skills most relevant for network problem solving, the Standard Occupational Classification (SOC) System was analyzed. This process rendered several occupations that could be used as a benchmark against which all other occupations were compared. Four occupations were identified, evaluated, and used as potential benchmarks:

- 15-1121.00, Computer Systems Analysts
- 25-1152.00, Computer Network Support Specialists
- 15-1199.01, Software Quality Assurance Engineers and Testers
- 15-1199.02, Computer Systems Engineers/Architects

Comparison of the SOC codes and titles of these occupations revealed that the four occupations all share nearly the same technical skills, but the occupation 15-1121.00 - Computer Systems Analysts had the greatest number of skills with 155 different types. The occupation's definition also appeared to be the most relevant to solving internet problems. For these reasons, computer systems analysts was selected as the benchmark occupation for this study's analysis. The O*NET OnLine description of computer systems analysts is:

> *"Analyze science, engineering, business, and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations. May analyze or recommend commercially available software."*

There are 21 essential tasks that computer systems analysts perform. Those tasks are:

1. Provide staff and users with assistance solving computer-related problems, such as malfunctions and program problems.
2. Test, maintain, and monitor computer programs and systems, including coordinating the installation of computer programs and systems.
3. Use object-oriented programming languages, as well as client and server applications development processes, and multimedia and internet technology.
4. Confer with clients regarding the nature of the information processing or computation needs a computer program is to address.
5. Coordinate and link the computer systems within an organization to increase compatibility and so that information can be shared.
6. Consult with management to ensure agreement on system principles.

7. Expand or modify a system to serve new purposes or improve workflow.
8. Interview or survey workers, observe job performance, or perform the job to determine what information is processed and how it is processed.
9. Determine computer software or hardware needed to set up or alter a system.
10. Train staff and users to work with computer systems and programs.
11. Analyze information processing or computation needs, and plan and design computer systems, using techniques such as structured analysis, data modeling, and information engineering.
12. Assess the usefulness of pre-developed application packages and adapt them to a user environment.
13. Define the goals of the system and devise flow charts and diagrams describing logical operational steps of programs.
14. Develop, document, and revise system design procedures, test procedures, and quality standards.
15. Review and analyze computer printouts and performance indicators to locate code problems, and correct errors by correcting codes.
16. Recommend new equipment or software packages.
17. Read manuals, periodicals, and technical reports to learn how to develop programs that meet staff and user requirements.
18. Supervise computer programmers or other systems analysts or serve as project leaders for systems projects.
19. Use the computer in the analysis and solution of business problems, such as for the development of integrated production and inventory control, and cost analysis systems.
20. Prepare cost-benefit and return-on-investment analyses to aid in decisions on system implementation.
21. Troubleshoot program and system malfunctions to restore normal functioning.

There are 148 certificates listed for computer systems analysts. Using the Central Valley/Mother Lode Region's Verify Viper tool access, three applicable types of third-party certificates were identified as defined by careeronestop.org: core, advanced, and product/equipment specific (Exhibit 1). The product/equipment specific certificates had the greatest number of occurrences, 120, followed by the core certificates, 19. There were only nine occurrences in the advanced certificate category.

Exhibit 1. Certificate type, definition, and number of occurrences

Type of Certificate	Definition	# of Occurrences
Core	a) The certification does not have a minimum education level or has an education level below a two-year Associates of Arts or Associates of Sciences degree and the certification does not have a minimum requirement for work experience or requires two or less years of work experience. b) The certification has an education level of an Associates of Arts or Associates of Sciences degree or higher but has a work experience requirement of less than 2 years of work experience. c) The certification has a work experience requirement of more than 2 years but does not require a two-year Associates of Arts or Associates of Sciences degree.	19
Advanced	a) The certification has an education level of an Associates of Arts or Associates of Sciences degree or higher and has a work experience requirement of more than 2 years or requires obtaining a 'core' level certification from the same organization.	9
Product/Equipment Specific	a) A product/equipment certification tests for knowledge about the use of proprietary software or hardware products. This classification is used primarily for computer-related companies such as IBM, CISCO, HP, etc.	120

The core certificates for computer systems analysts are:

- CCT Data Center
- Certified Usability Analyst
- Certified Associate Business Analyst
- GIAC Certified Firewall Analyst
- Internet Protocol Engineering Professional
- Certified Network Computer Technician
- Certified Manager of Software Testing
- GIAC Security Essentials Certification
- Certified Healthcare Technology Specialist – Implementation Support Specialist
- CCT Routing & Switching Certification
- Information System Analyst

- Associate Certified Information Systems Examiner
- Certified Associate in Software Quality
- GIAC Certified Incident Handler
- CSX Cybersecurity Fundamentals Certificate
- Certified Network Systems Technician
- Certified Software Business Analyst
- WOW Certified E-Commerce Manager
- Certified Software Analyst

Methodology

The occupations relevant to this study were identified using a keyword function in Burning Glass, an aggregator nationwide online job postings. A dataset of job postings over a 90-day period was pulled using the key words: web technical support, internet technical support, network technical support, or network problem solving.

Job postings were only pulled for the KCCD service area using city titles; Pine Mountain Club was not included in the analysis as this city was not recognized by the system. Analysis of the job postings, revealed that the content pertained primarily to either an employers' desire to hire someone with expertise in technical support/technology problem solving, or a job opening for a non-traditional occupation in technical support/technology problem solving possessing one or more of the qualifications described above. This confirmed that the data pulled was providing the information being sought.

The KCCD service area data pull brought forth a total of 443 job postings distributed among 122 occupations. Of these 122 occupations, 19% were technical support/technology expertise specific. Two additional data pulls for a 12-month period were done for the same KCCD service area using the skills analysis function in Burning Glass. The first 12-month data pull utilized the following skills:

- Call Center Technical Support
- Email Technical Support
- Live Chat Technical Support
- Phone, Email, and Live Chat Technical Support
- Technical Support for Health Information Technology

This second data pull used the above skills with an additional four skills:

- Network Performance Management
- Network Support
- Network Management Center (NMC)
- Network Management Systems (NMS)
- Network Troubleshooting

Occupational Overview

Using the Burning Glass keyword function, the study identified the top 15 SOC codes and titles listed in job postings that indicated the following desirable qualifications: web technical support, internet technical support, network technical support, and network problem solving. Six of these top 15 SOC codes and titles are computer technology specific. The top 15 SOC codes and titles are:

1. 15-1142.00, Network and Computer Systems Administrators
2. 15-1151.00, Computer User Support Specialists
3. 15-1132.00, Software Developers, Applications
4. 13-2011.01, Accountants
5. 29-1141.00, Registered Nurses
6. 41-4012.00, Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
7. 11-9199.00, Managers, All Other
8. 43-3031.00, Bookkeeping, Accounting, and Auditing Clerks
9. 11-9111.00, Medical and Health Services Managers
10. 15-1199.02, Computer Systems Engineers/Architects
11. 49-1011.00, First-Line Supervisors of Mechanics, Installers, and Repairers
12. 11-2022.00, Sales Managers
13. 15-1122.00, Information Security Analysts
14. 43-4051.00, Customer Service Representatives
15. 15-1143.00, Computer Network Architects

Of the above 15 occupations, seven are considered middle-skill occupations. Six of the seven occupations and their top five skills as determined by the Verify Viper tool that sources data from O*NET OnLine are shown in Exhibit 2. The top five skills of computer systems analysts (the study's benchmark occupation) are reading comprehension, critical thinking, active listening, systems analysis, and speaking.

The remaining six middle-skill occupations shown in Exhibit 2 are computer user support specialists; registered nurses; sales representatives (wholesale and manufacturing, except technical and scientific products); bookkeeping, accounting, and auditing clerks; customer service representatives; and first-line supervisors of mechanics, installers, and repairers. Because managers (all other) is an umbrella title that represents a set of emerging occupations, it does not have any specified skills.

Five of the middle-skill occupations share active listening and speaking with the benchmark occupation; four share reading comprehension, and three share critical thinking.

Exhibit 2. Top five skills for the benchmark occupation and six middle-skill occupations requesting web technical support, internet technical support, network technical support, or network problem solving

Computer Systems Analysts (Benchmark Occupation)	Computer User Support Specialists	Registered Nurses	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
15-1121	15-1151	29-1141	41-4012
Reading Comprehension: 3.88 Critical Thinking: 3.88 Active Listening: 3.88 Systems Analysis: 3.75 Speaking: 3.75	Speaking: 4.00 Reading Comprehension: 4.00 Active Listening: 4.00 Critical Thinking: 3.75 Writing: 3.62	Social Perceptiveness: 4.12 Active Listening: 4.12 Speaking: 4.00 Service Orientation: 4.00 Reading Comprehension: 3.88	Speaking: 4.00 Active Listening: 4.00 Persuasion: 3.88 Social Perceptiveness: 3.75 Negotiation: 3.62

Bookkeeping, Accounting, and Auditing Clerks	Customer Service Representatives	First-Line Supervisors of Mechanics, Installers, and Repairers
43-3031	43-4051	49-1011
Mathematics: 3.38 Reading Comprehension: 3.25 Critical Thinking: 3.25 Active Listening: 3.25 Writing: 3.12	Speaking: 3.88 Active Listening: 3.88 Service Orientation: 3.75 Reading Comprehension: 3.38 Persuasion: 3.12	Monitoring: 4.00 Management of Personnel Resources: 4.00 Critical Thinking: 3.88 Time Management: 3.62 Speaking: 3.62

The top 15 activities performed by the benchmark occupation, computer systems analysts, were also pulled and compared to the six middle-skill occupations' 15 activities using the Verify Viper tool.[1] Activities all six occupations shared with the benchmark occupation were: getting information; communicating with supervisors, peers or subordinates; organizing, planning and prioritizing work; updating relevant knowledge; identifying objects, actions and events; and establishing and maintaining interpersonal relationships (Exhibit 3).

Exhibit 3. Top 15 activities for the benchmark occupation and six middle-skill occupations requesting web technical support, internet technical support, network technical support, or network problem solving

Computer Systems Analysts (Benchmark Occupation)	Computer User Support Specialist	Registered Nurses	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
15-1121	15-1151	29-1141	41-4012
Interacting with Computers: 4.62 Getting Information: 4.57 Processing Information: 4.26 Communicating with Supervisors, Peers, or Subordinates: 4.25 Analyzing Data or Information: 4.11 Updating and Using Relevant Knowledge: 4.02 Thinking Creatively: 3.94	Interacting with Computers: 4.88 Getting Information: 4.22 Communicating with Supervisors, Peers, or Subordinates: 4.2 Updating and Using Relevant Knowledge: 4.08 Organizing, Planning, and Prioritizing Work: 3.75 Repairing and Maintaining Electronic Equipment: 3.69	Assisting and Caring for Others: 4.85 Documenting/Recording Information: 4.78 Getting Information: 4.62 Updating and Using Relevant Knowledge: 4.55 Organizing, Planning, and Prioritizing Work: 4.47 Communicating with Supervisors, Peers, or Subordinates: 4.44	Selling or Influencing Others: 4.49 Communicating with Persons Outside Organization: 4.33 Getting Information: 4.13 Establishing and Maintaining Interpersonal Relationships: 4.13 Communicating with Supervisors, Peers, or Subordinates: 4.05

[1] Verify Viper, https://verifyviper.com, accessed January 13, 2021.

Computer Systems Analysts (Benchmark Occupation)	Computer User Support Specialist	Registered Nurses	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
Identifying Objects, Actions, and Events: 3.82 Organizing, Planning, and Prioritizing Work: 3.76 Interpreting the Meaning of Information for Others: 3.66 Establishing and Maintaining Interpersonal Relationships: 3.60 Monitor Processes, Materials, or Surroundings: 3.51 Provide Consultation and Advice to Others: 3.26 Coordinating the Work and Activities of Others: 3.25 Judging the Qualities of Things, Services, or People: 3.23	Processing Information: 3.51 Documenting/Recording Information: 3.49 Thinking Creatively: 3.45 Establishing and Maintaining Interpersonal Relationships: 3.35 Interpreting the Meaning of Information for Others: 3.31 Training and Teaching Others: 3.24 Identifying Objects, Actions, and Events: 3.22 Monitor Processes, Materials, or Surroundings: 3.13 Analyzing Data or Information: 3.10	Identifying Objects, Actions, and Events: 4.32 Performing for or Working Directly with the Public: 4.23 Monitor Processes, Materials, or Surroundings: 4.23 Interacting with Computers: 4.12 Evaluating Information to Determine Compliance with Standards: 4.12 Interpreting the Meaning of Information for Others: 4.00 Establishing and Maintaining Interpersonal Relationships: 3.99 Training and Teaching Others: 3.94 Processing Information: 3.84	Organizing, Planning, and Prioritizing Work: 3.97 Resolving Conflicts and Negotiating with Others: 3.88 Processing Information: 3.76 Identifying Objects, Actions, and Events: 3.76 Thinking Creatively: 3.72 Interacting with Computers: 3.63 Updating and Using Relevant Knowledge: 3.59 Estimating the Quantifiable Characteristics of Products, Events, or Information: 3.49 Developing Objectives and Strategies: 3.48 Performing Administrative Activities: 3.38

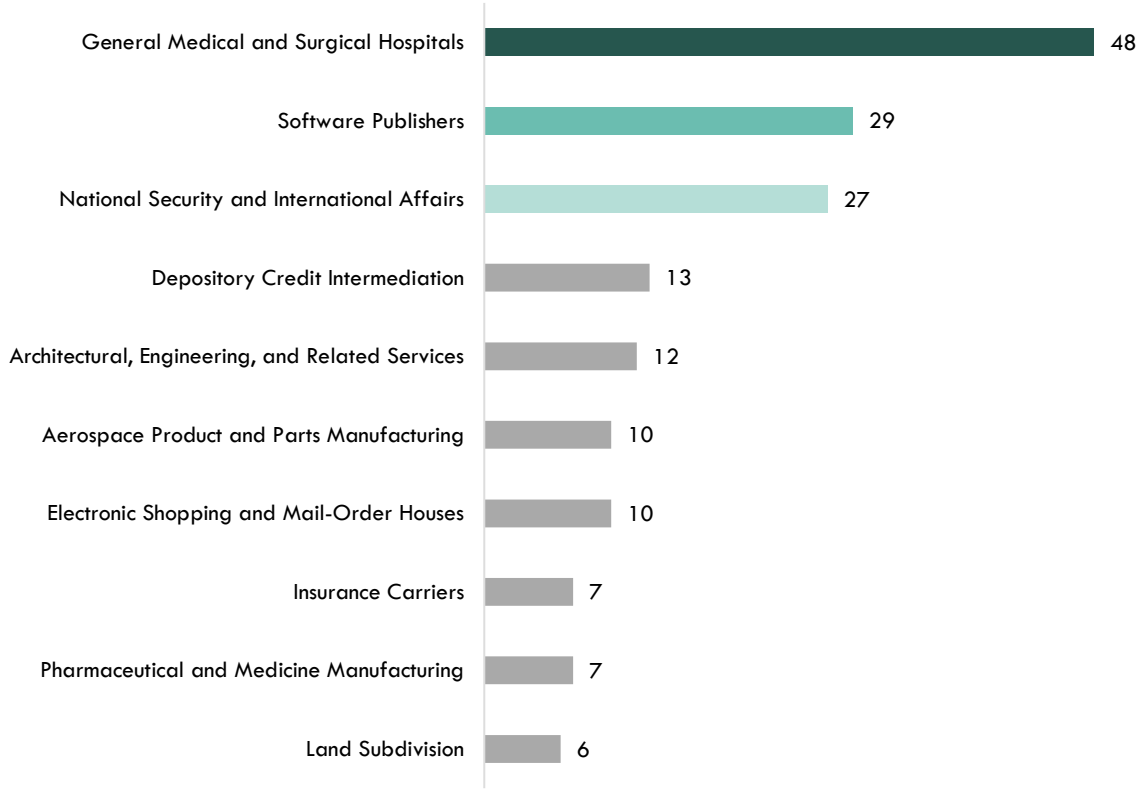
Bookkeeping, Accounting, and Auditing Clerks	Customer Service Representatives	First-Line Supervisors of Mechanics, Installers, and Repairers
43-3031	**43-4051**	**49-1011**
Interacting with Computers: 4.46 Getting Information: 4.26 Documenting/Recording Information: 4.05 Establishing and Maintaining Interpersonal Relationships: 3.97 Communicating with Supervisors, Peers, or Subordinates: 3.82 Processing Information: 3.72 Organizing, Planning, and Prioritizing Work: 3.71 Identifying Objects, Actions, and Events: 3.7 Performing Administrative Activities: 3.68 Communicating with Persons Outside Organization: 3.57 Evaluating Information to Determine Compliance with Standards: 3.34 Monitor Processes, Materials, or Surroundings: 3.33 Analyzing Data or Information: 3.13 Performing for or Working Directly with the Public: 3.08	Getting Information: 4.37 Interacting with Computers: 4.25 Communicating with Persons Outside Organization: 4.2 Communicating with Supervisors, Peers, or Subordinates: 4.18 Establishing and Maintaining Interpersonal Relationships: 4.11 Updating and Using Relevant Knowledge: 3.94 Processing Information: 3.84 Resolving Conflicts and Negotiating with Others: 3.83 Organizing, Planning, and Prioritizing Work: 3.74 Interpreting the Meaning of Information for Others: 3.7 Identifying Objects, Actions, and Events: 3.64 Performing for or Working Directly with the Public: 3.51 Documenting/Recording Information: 3.44 Performing Administrative Activities: 3.33 Analyzing Data or Information: 3.33	Inspecting Equipment, Structures, or Material: 4.53 Getting Information: 4.32 Communicating with Supervisors, Peers, or Subordinates: 4.20 Identifying Objects, Actions, and Events: 4.08 Organizing, Planning, and Prioritizing Work: 4.04 Updating and Using Relevant Knowledge: 4.03 Coordinating the Work and Activities of Others: 4.01 Repairing and Maintaining Mechanical Equipment: 4.00 Scheduling Work and Activities: 3.99 Guiding, Directing, and Motivating Subordinates: 3.98 Monitor Processes, Materials, or Surroundings: 3.91 Communicating with Persons Outside Organization: 3.87 Evaluating Information to Determine Compliance with Standards: 3.84 Judging the Qualities of Things, Services, or People: 3.82 Establishing and Maintaining Interpersonal Relationships: 3.80

Job Postings

There were 64 differeent industires represented in the 443 job postings that indicated a need for web technical support, internet technical support, network technical support, or network problem solving.

The top three industries in the KCCD service area by number of job postings were: general medical and surgical hospitals; software publishers and national security; and international affairs (Exhibit 4). These findings support the premise that there are a variety of industies that are requesting applicants be trained in technology support and internet problem solving.

Exhibit 4. Top 10 industries requesting web technical support, internet technical support, network technical support, or network problem solving, by number of job postings



There were 196 individual employers represented across the 433 job postings. This is a further indication of how widely distributed the need is among employers for workers with web technical support, internet technical support, network technical support, or network problem solving. Intuit had the highest number of job postings, 27, in the KCCD service area. This company was followed by Dignity Health, 24, and Amentum, 12 (Exhibit 5).

Exhibit 5. Top 10 employers requesting web technical support, internet technical support, network technical support, or network problem solving, by number of job postings

Employer	Job Postings
Intuit	27
Dignity Health	24
Amentum	12
Bakersfield	11
Adventist Health	10
The Wonderful Company Llc	8
Naval Air Systems Command	8
Jt4 Llc	8
Amazon	8
General Dynamics	7

Nearly one-fifth of the 122 total occupations were related to technology support and problem solving, and five of these occupations—network and computer systems administrators, computer user support specialist, software developers, computer systems engineers/architects and information security analysts—were among the top 15 middle-skill occupations associated with the four keyword terms.

Of the occupations identified by the 196 employers in their job postings, 49 occupations were middle-skill occupations. Middle-skill occupations with the greatest number of job postings were computer user support specialists, 27; registered nurses, 14; sales representatives (wholesale and manufacturing, except technical and scientific products), 13; and managers (all other), 12 (Exhibit 6).

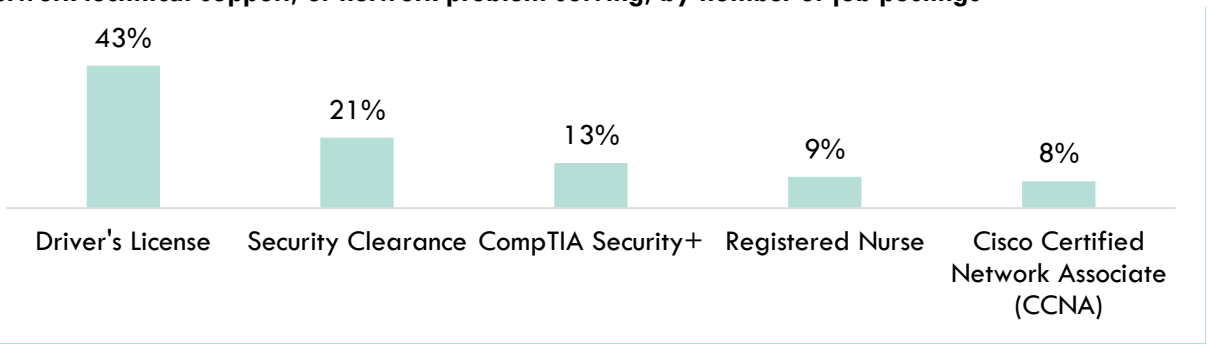
Exhibit 6. Top 15 middle-skill occupations using keyword search for web technical support, internet technical support, network technical support, or network problem solving, by number of job postings

Occupation	Job Postings
Computer User Support Specialists	27
Registered Nurses	14
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	13
Managers, All Other	12
Bookkeeping, Accounting, and Auditing Clerks	11
First-Line Supervisors of Mechanics, Installers, and Repairers	10
Customer Service Representatives	7
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	6
Maintenance and Repair Workers, General	6
Electricians	6
Web Developers	5
Medical Records and Health Information Technicians	5
Industrial Engineering Technicians	5
Electro-Mechanical Technicians	4
Tellers	3

There were more than 223 job postings that requested one or more certification (Exhibit 7). The diversification of the certifications reflects the variety of occupations requesting the four qualifications identified for the study—web technical support, internet technical support, network technical support, or network problem solving. Most employers require a driver's license, as shown in 95 job postings.

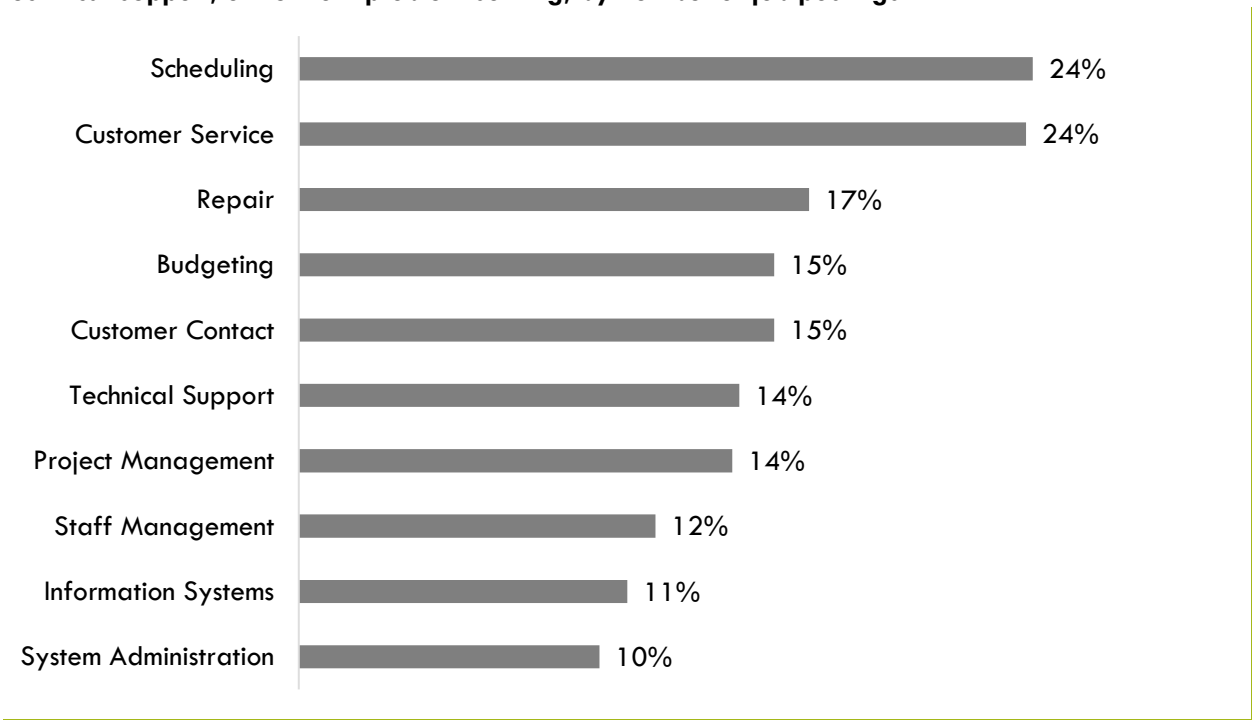
The next most in-demand certification is a security clearance, 47 job postings followed by CompTIA Security+ in 30 job postings, and registered nurse in 21 job postings. Other technology certificates among the top 15 are Cisco Certified Network Associate (CCNA), Certified Information Systems Security Professional (CISSP), and Cisco Certified Network Professional (CCNP).

Exhibit 7. Top five certifications associated with web technical support, internet technical support, network technical support, or network problem solving, by number of job postings



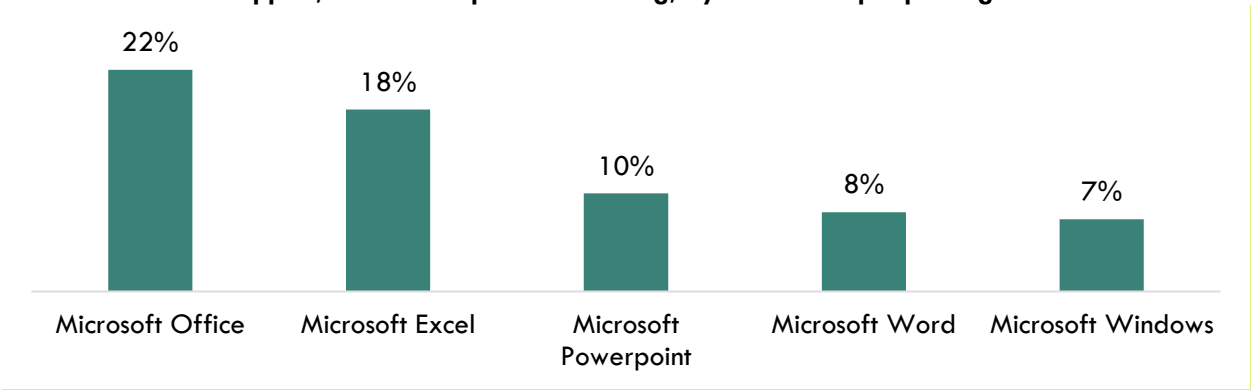
There were 440 job postings that contained specialized skill requirements from employers. Just as with the certifications, the skills also reflected a diversity of occupations in the dataset. The top three specialized skills are scheduling (24% of the job postings), customer service (24%), and repair (17%) (Exhibit 8).

Exhibit 8. Top 10 skills associated with web technical support, internet technical support, network technical support, or network problem solving, by number of job postings



Microsoft software dominates the top five software skills requested in job postings that are associated with the four qualifications identified for the study. Microsoft Office is requested in 22% of job postings, followed by Microsoft Excel in 18% of job postings, and Microsoft PowerPoint in 10% of job postings (Exhibit 9).

Exhibit 9. Top five software skills associated with web technical support, internet technical support, network technical support, or network problem solving, by number of job postings



The analysis also looked at whether certain skills are expected to increase in demand, the median salary associated with that skill, and how important the skills are locally (Exhibit 10). By comparing the share of regional employment with the share of national employment, a location quotient above 1 indicates a skill is unique or specialized to the region because it is concentrated above the national average.

Exhibit 10. Median salary, projected growth, and location quotients associated with certain skills

Skill	Similarity	Median Salary	Job Postings	Projected Growth	Location Quotient
Your Selections	0%	$52K	1,510	26.2%	0.6
Network Hardware	59%	$76K	28	(19.9%)	0.8
Cisco Routers	59%	$64K	6	(30.0%)	0.5
Hardware Support	59%	$40K	45	(14.6%)	0.8
Network Operations Center (NOC)	58%	$43K	1	(16.7%)	0.2
Ethernet Cables/Cards	57%	$43K	4	(19.2%)	0.9
SolarWinds	56%	$75K	2	9.7%	0.7
IT Support	55%	$49K	161	3.3%	0.9

Two additional data pulls for the last 12-months were conducted for the KCCD service area using the skills analysis function in Burning Glass. The first data pull produced 1,465 job postings for the following ascertained skills:

- Call Center Technical Support
- Email Technical Support
- Live Chat Technical Support
- Phone, Email, and Live Chat Technical Support
- Technical Support for Health Information Technology

This second data pull produced 1,510 job postings. It contained the above skills plus the following five:

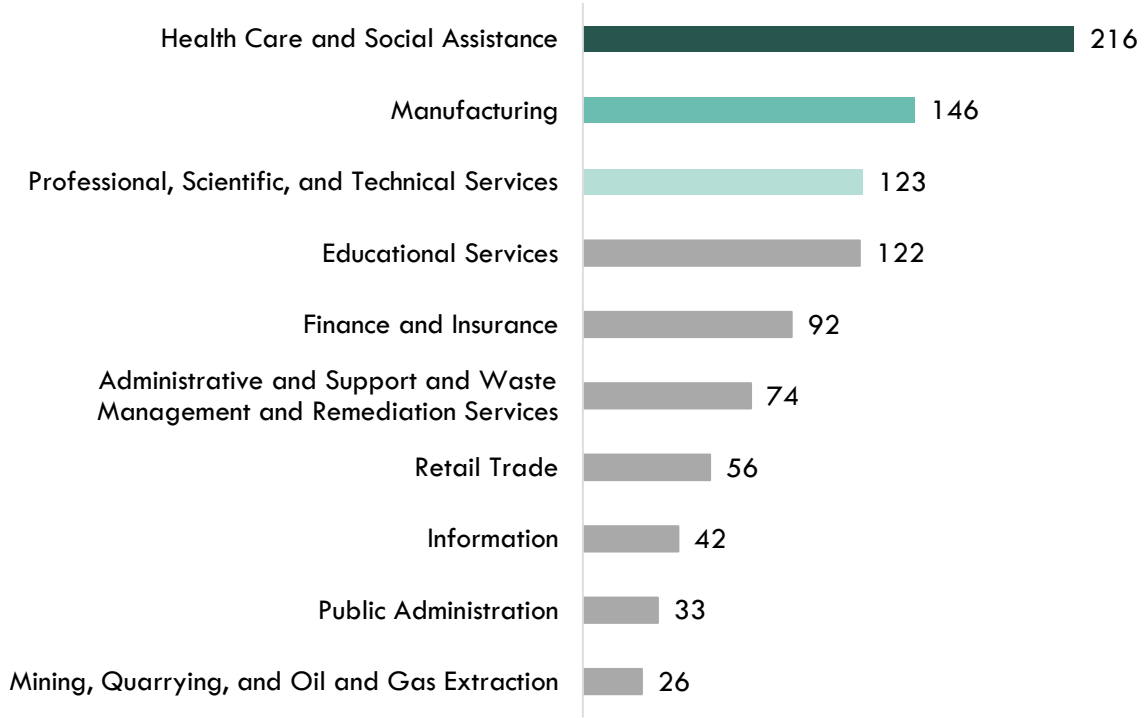
- Network Performance Management
- Network Support
- Network Management Center (NMC)
- Network Management Systems (NMS)
- Network Troubleshooting

Although the number of postings increased by nearly 50 in the second pull, the occupations listed were identical with the exception of Controls/Valve Technician appearing in the first data pull and Network/Systems Support Specialist appearing in the second.

Industries

The data pull using the geographic boundaries of the KCCD service area was analyzed to determine top industries requesting the four identified job qualifications—web technical support, internet technical support, network technical support, or network problem solving. There were 20 industries represented with health care and social assistance being the most common industry, 216 job postings. The second most common industry is manufacturing with 146 job postings, followed by professional, scientific, and technical services, 123 job postings, and educational services,122 job postings. These industry rankings demonstrate the proliferation of technology across the entire business landscape (Exhibit 11).

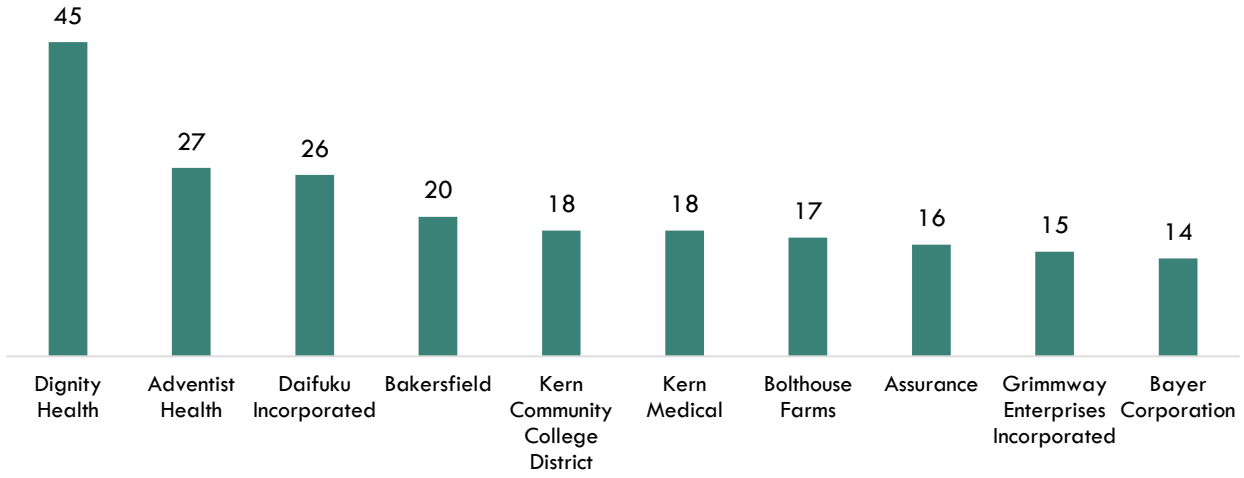
Exhibit 11. Top 10 industries by number of job postings



Employers

Of the 122 employers represented in the job postings, the top two employers are reflective of the top industries identified by the analysis with Dignity Health appearing in 45 job postings, followed by Adventist Health in 27 job postings (Exhibit 12).

Exhibit 12. Top 10 employers by number of job postings



Occupations

The top 15 occupations by number of job postings in the skills analysis are contained in Exhibit 13. Nine of these occupations are considered middle skill. Excluding physician and sales representative, the top three middle-skill occupations are retail store manager/supervisor in 1,508 job postings, customer service representative in 1,068 job postings, and office administrative assistant in 1,059 job postings.

Exhibit 13. Top 15 occupations by number of job postings, last 12 months

Occupation	Job Postings
Physician	2,122
Sales Representative	1,512
Retail Store Manager / Supervisor	1,508
Customer Service Representative	1,068
Office / Administrative Assistant	1,059
Bookkeeper / Accounting Clerk	706
Speech Language Pathologist	652
Insurance Sales Agent	573
Building and General Maintenance Technician	561
Medical Assistant	491
Automotive Service Technician / Mechanic	419
Business Development / Sales Manager	411
Healthcare Administrator	401
Accountant	376
Repair / Service Technician	344

Exhibit 14 lists the top 15 occupations by number of required skills. Nine of the 15 occupations are considered middle skill. Computer support specialists has significantly more required skills, 229, followed by network/system administrator, 63, and software developer/engineer, 36.

Exhibit 14. Top 15 occupations by number of required skills and education level

Occupation	# of Required Skill	Education Level
Computer Support Specialist	229	High school or vocational training
Network / Systems Administrator	63	Bachelor's degree
Software Developer / Engineer	36	Bachelor's degree
Electrical Engineer	35	Bachelor's degree
Repair / Service Technician	33	High school or vocational training
Office / Administrative Assistant	32	High school or vocational training
Sales Representative	29	High school or vocational training
Field Service Technician	27	Associate's degree
Insurance Sales Agent	25	NA
Customer Service Representative	24	High school or vocational training
Database Administrator	24	High school or vocational training
Network Engineer / Architect	24	Bachelor's degree
Cyber / Information Security Engineer / Analyst	24	Bachelor's degree
Clinical Data Systems Specialist / Manager	23	Bachelor's degree
Medical Assistant	22	High school or vocational training

Co-occurring Skills

Burning Glass defines co-occurring skills as the skills that are frequently requested alongside the selected skills. These co-occurring skills can be impacted by industry, education level, and technological

advancements. Exhibit 15 shows the top 10 co-occurring specialized and software skills for the four identified job qualifications—web technical support, internet technical support, network technical support, or network problem solving. Technical support appears in the most job postings, 695, followed by repair, 326 job postings, and customer service, 325 job postings. As reflected in the keyword search analysis, Microsoft products dominate software skills, appearing in seven of the top 10 co-occurring skills. Microsoft Office ranks first with 330 job postings, followed by Excel, 314 job postings, and Word, 314 job postings.

Exhibit 15. Top 10 specialized and software co-occurring skills, by number of job postings

Specialized Skills	Job Postings	Software Skills	Job Postings
Technical Support	695	Microsoft Office	330
Repair	326	Microsoft Excel	314
Customer Service	325	Microsoft Word	141
Scheduling	237	SQL	128
Project Management	215	Microsoft Powerpoint	127
Network Hardware/Software Maintenance	213	Microsoft Windows	119
It Support	161	Microsoft Operating Systems	82
Hardware and Software Installation	158	Linux	70
Budgeting	153	Oracle	59
Troubleshooting Technical Issues	148	Microsoft Outlook	57

Conclusion

In conducting the analysis of occupations that require skills in web technical support, internet technical support, network technical support, or network problem solving in job postings, the Central Valley/Mother Lode Center of Excellence applied a two-prong approach. Bureau of Labor Statistics skills data was pulled from O*NET OnLine for computer system analysts, a primary technology support and problem-solving occupation identified for the analysis and referred to in this study as a benchmark occupation. The skills of computer system analysts were downloaded using the Verify Viper tool and compared to top middle-skill occupations that emerged from a Burning Glass job posting search using web technical support, internet technical support, network technical support, and network problem solving as key words.

The data shows that the top skills shared between computer system analysts and the top middle-skill occupations are:

- Active listening
- Speaking

There were 443 job postings from employers in the KCCD service area over the past 90 days that were analyzed to identify requested skills. A total of 64 industries were represented in the data and were distributed among a diverse group of 196 employers.

Analysis revealed that web technical support, internet technical support, network technical support, and network problem solving are desired skills among employers and are requested for a broad spectrum of occupations, 122 in total. Of the 122 occupations, only 7% were specific to computer technology and only one was among the top 15 middle-skill occupations identified by the study—computer user support specialists. Nine of the top 15 occupations in the skills analysis are considered middle skill.

The most in demand certifications are:

- Driver's license
- Security clearance
- CompTIA Security+

Other technology certifications among the top 15 middle-skill occupations are:

- Cisco Certified Network Associate (CCNA)
- Certified Information Systems Security Professional (CISSP)
- Cisco Certified Network Professional (CCNP)

The top three specialized skills are scheduling (24% of the job postings), customer service (24%), and repair (17%). Microsoft Office products dominate the top five software skills listed by employers.

There were 20 industries represented in the skills analysis using the geographic boundary of the KCCD service area with the health care and social assistance industry represented in 216 of the job postings. Of the 122 employers, the top two are reflective of the most common industry (health care and social

assistance) shown in the analysis with Dignity Health appearing in 45 job postings and Adventist Health appearing in 27.

It was notable that computer support specialists have significantly more requested skills with 229 required skills in job postings. This is followed by two high-skill occupations, network/system administrator with 63 required skills and software developer/engineer with 36 required skills.

Co-occurring skills, those frequently requested alongside the study's four identified skills, can be impacted by industry, education level, and technological advancements. The top co-occurring specialized skills are:

- Technical support
- Repair
- Customer service

As was reflected in the keyword search analysis Microsoft products, again, dominate software skills requested by employers and account for seven of the top 10 co-occurring skills. The top three software skills are:

- Microsoft Office
- Excel
- Word

Industries are increasingly reliant on electronic, cloud-based, and other emerging technologies, such as automation and artificile intelligents (AI), to support their core operations. The pandemic has escalated this situation with many work activities performed remotely. As a result, the ability to operate, service, troubleshoot, and provide technical support is critical. The above findings suggest there is a significant need for web technical support, internet technical support, network technical support, or network problem solving across a broad spectrum of occupations throughout the entire economic landscape, and it is likely that this spectrum has grown broader due to impacts from the pandemic.

For example, the Harvard Buiness Review published an article discussing how technology is transforming the workplace and how business is conducted in the COVID-19 era:

> *"The rapid spread of technology accelerated by the pandemic has led to a pressing need for businesses and governments to adapt. Many businesses, especially in developing economies, are digitally disconnected. They may not have access to workers with the right skills and face challenging business environments. Workers, on the other hand, have little protection and do not have the skills or flexibility in labor markets to adapt. To face these challenges, businesses need to embrace technology and upgrade training programs to equip their workers with the best skills. Technology can be a boon to society if businesses and governments prepare and adapt. The pandemic has pushed societies to an inflection point where embracing technology is no longer an option but a necessity."*[2]

The article also makes three main points:

1. *Technology was already disrupting production processes.*

[2] Frederica Saliola and Asif M. Islam, "How to harness the digital age of the Covid era," Harvard Business Review, September 24, 2020, accessed December 13, 2020, https://hbr.org/2020/09/how-to-harness-the-digital-transformation-of-the-covid-era.

2. *Technology has created seismic shifts in the mix of skills required to succeed in the labor market. While returns to routine, job-specific skills are declining, the premium for skills that cannot be replaced by robots has been increasing; these include cognitive skills such as critical thinking, as well as socio-behavioral skills such as managing and recognizing emotions that enhance teamwork.*

3. *Technologies have given rise to more short-term work, often via online work platforms.*[3]

A blog post by the website Oberlo discusses how virtual reality is transforming e-commerce, with e-commerce automation a growing aspect of online business beyond just warehousing, and how companies are buying software, products, and services for their own workforce.[4] This trend frees up employees' time and resources for more important work. For example, businesses that possess large warehouses to carry out their operations can invest in robotics to become more efficient, allowing staff to focus on more important tasks in the fulfillment process. The blog post also discusses how e-commerce businesses will need to hone their videography skills because video is projected to play a *massive* role in the future of e-commerce given that 60% of shoppers would rather watch a product video than read a product description.

With each passing year, artificial intelligence (AI) is being adopted by another business discipline or department. A survey of 503 U.S.-based IT decisionmakers conducted in May 2020 found that service automation will be an ongoing trend.[5] Nearly three-quarters of respondents agreed that more automation for customer support will benefit their workforce and improve customer relationships and loyalty.

A report released in August by MIT Technology Review highlights how the disruption and uncertainty resulting from the global pandemic is clearing a path for innovation.[6] To remain competitive and ensure worker safety during COVID-19, organizations have had to swiftly pivot to remote operations. In response, technology providers leapt to deliver free or discounted tools to enable new virtual work environments. To address these observations as well as speculation about the "new normal," MIT surveyed 372 senior business leaders and academics to evaluate effects on revenue, corporate technology investments, and innovation models. Analysis revealed how industries and workplace culture were being transformed. The study also measured the ability of businesses to adapt to new social and economic realities and gauged the permanence of changes made.

Nine out of 10 business executives surveyed agreed that COVID-19 increased the speed of corporate technology adoption, and nearly three-quarters of the respondents reported that the pandemic has been a catalyst for company innovation.[7] Roughly half said that technology roadmaps were not substantially altered. Respondents noted that the most important initiatives focused on building new capabilities, ecosystem partnerships, and automating as much as possible. In the report, corporate priorities identified by survey takes were:

- New partnerships – 55% of respondents
- Accelerating AI and automation adoption – 53%

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[3] Ibid.
[4] Ying Lin, "10 virtual reality statistics every marketer should know in 2020," Oberlo, October 10, 2020, accessed December 13, 2020, https://www.oberlo.com/blog/virtual-reality-statistics.
[5] "Intelligent Automation Post-Covid," Inference, 2020, accessed December 13, 2020, http://info.inferencesolutions.com/Intelligent-Automation-Post-Covid-Registration.html.
[6] "Amid the covid-19 pandemic, shifting business priorities," MIT Technology Review Insights, MIT Technology Review August 31, 2020, accessed December 13, 2020, https://www.technologyreview.com/2020/08/31/1007723/amid-the-covid-19-pandemic-shifting-business-priorities/.
[7] Ibid.

- Workplace culture-diversity, ethics, and rights of workers – 37%
- Increasing investment in R&D – 23%
- Diversifying innovation locations – 23%
- Sharing data with other organizations – 22%[8]

As business leaders redraw their technology roadmaps, it is likely that they will be investing more in digital technologies in areas such as data analytics, supply chain digitalization, and cloud migration. The "new normal" resulting from COVID-19 has expedited the requirement to transition the majority of business activities online. Research on the impacts of the pandemic demonstrates a significant technological reliance in the public and private sectors. Prioritizing technology skills for current and future workers is fast becoming a safety and regulatory compliance necessity. Research findings also underpin the social and economic benefits of investing in on-going technology skills training and certifications.

[8] Ibid, page 5 of the report.

Appendix A: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: economicmodeling.com.
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm.
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov.
Job Posting and Skills Data	Burning Glass: burning-glass.com/.
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org.

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state, and local trends.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.