COLORADO
Department of
Labor and Employment

COLORADO 2024:
AUTOMATION & THE WORLD OF WORK

November 2024

[bw] RESEARCH PARTNERSHIP

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The project team is deeply grateful to the following community stakeholders who provided insights that informed the contents of this report.

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About The Colorado Office of the Future of Work[1]

The world of work is changing, propelling some to greater heights while leaving others behind. Globalization, advances in technology, demographic shifts, and other factors leave many wondering whether we, as a society, are ready to face the many challenges tomorrow's economy will bring. That's why the Office of the Future of Work (OFW) was created: **to understand, prepare for, and develop policy and programmatic solutions to foster an economy that works for everyone in Colorado.** The OFW shapes an equitable economy of the future and ensures that Coloradans are equipped with the necessary education, training, skills, and tools to fully participate in the labor force.

The office, created by an Executive Order from Governor Polis on September 4, 2019 and codified into law in SB23-051: Conforming Workforce Development Statutes in March 2023 also seeks to raise

[1] https://cdle.colorado.gov/future-of-work

awareness about the future of work. To accomplish its goals, the office works in partnership with other state departments, convenes summits with diverse stakeholders across regions, and establishes task forces and working groups.

About BW Research

BW Research is an independent economic research organization, experienced in workforce and economic development analyses. BW Research has led over one hundred workforce, supply chain, community benefit, policy, and market research studies over the last fifteen years. BW Research serves both public and private sector clients, including economic development organizations, cities, counties, workforce development boards, and educational institutions.

EXECUTIVE SUMMARY

Introduction

Automation is expected to be a key driver of economic growth, productivity, and workforce transformation across economies worldwide, including Colorado. The State of Colorado has taken a proactive approach to addressing the potential challenges and opportunities associated with automation with the passage of HB23-1074, effective August 7, 2023.

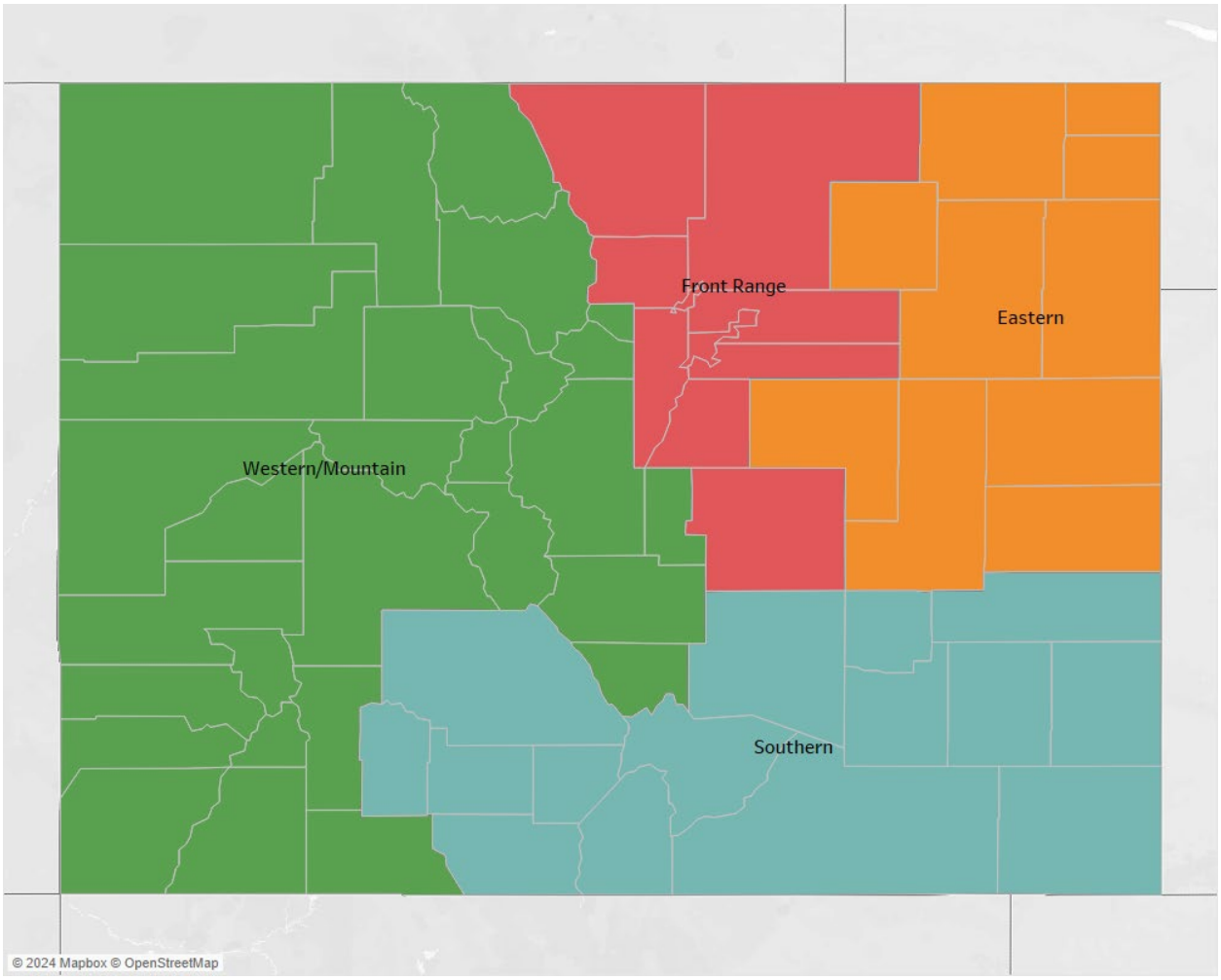
HB 23-1074 requires Colorado's Office of the Future of Work to analyze workforce transitions in the state's economy, with a particular focus on (1) workers in the oil and gas industry, and (2) workers in occupations across Colorado that are facing the most disruption due to automation.

This report focuses on the latter part of the state's mandate, exploring the impact of automation across Colorado's workforce, focusing on the regional variations and specific sectors most impacted by automation. The primary objectives of this research are to (1) assess the current levels of automation across different industries and regions in Colorado, (2) identify occupations most susceptible to automation and those likely to experience growth, and (3) evaluate the potential economic and workforce implications of increased automation across the state.

Through a detailed analysis of employment data, categorized by automation levels (high, medium, and low), this study seeks to explore the impact of automation on occupation employment, job quality, and skills. By investigating these dynamics, the report aims to provide an understanding of how automation has already shaped Colorado's economy and how it could do so in the future.[2] The study classifies Colorado into four regions: Front Range, Mountain/West, Eastern, and Southern counties (Figure 1).

[2] Detail about the methodology used in the report can be found in Appendix A: Methodology.

Figure 1. Map of Colorado Region Definitions[3]



[3] Colorado Counties Inc. Regional Districts definition. https://ccionline.org/about/counties/

Key Findings

1. **Colorado's most highly automated industries include Finance and Insurance; Manufacturing; and Transportation and Warehousing.** Colorado's least automated industries include Construction; Agriculture, Forestry, Fishing and Hunting; and Educational Services. The Front Range region has the largest share of employment in the most automated industries relative to other regions, with the most automated industries accounting for one in three Front Range jobs (34.7 percent). The Eastern region has the largest share of low-automated industries (45.9%).

2. **The occupational impacts of automation vary.** In highly automated industries such as Manufacturing, workers employed as Packers and Packagers, Hand and Helpers—Production Workers have been displaced by automation. At the same time, the increased implementation of automation has increased the demand for more specialized positions, such as Database Architects and Computer and Information Systems Managers in Colorado's Finance and Insurance and Information industries. Other occupations have required upskilling as automation replaces low-quality jobs and increases demand for high-quality, highly skilled jobs. For example, the number of Fast-Food Cooks has decreased, while the number of First-Line Supervisors of Food Preparation and Serving Workers has increased in Colorado. Furthermore, automation has the potential to help make jobs, especially labor-intensive jobs, more desirable and help resolve hiring difficulties in certain industries, such as agriculture.

3. **More highly automated industries in Colorado have higher paying jobs.**[4] Industries with high degrees of automation have a higher share of Tier 1 (high wage) jobs (39 percent) relative to the statewide average (24 percent), in addition to a higher share of Tier 1 jobs relative to industries with medium (20 percent) or low degrees of automation (18 percent) (Figure 9). The average annual wage for high, medium, and low automated industries is $107,000, $63,000, and $57,000, respectively. Highly automated industries are the only category that provides above the required annual wage to support two working adults and two children ($66,000 per working adult).

4. **Skills such as complex problem solving, writing, mathematics, and operations monitoring are the most important in highly automated industries.** Skills such as instructing, learning strategies, service orientation, and social perceptiveness are more important in industries with moderate or low levels of automation.

5. **Over the last ten years, implementation of automation has changed which workforce skills are most in demand.** Critical thinking, judgment and decision-making skills have become increasingly important. Troubleshooting and repair have also grown in importance across all industries, especially in highly automated industries. In contrast, programming, science, and mathematics skills have become less important across all industries.

[4] Note that the job quality framework employed in this report differs slightly from the job quality framework defined in Colorado's annual Talent Pipeline Report, although they are somewhat comparable: Tier 1 jobs as defined herein are more likely to be Top Jobs as defined by the Talent Pipeline Report. In the Colorado Talent Pipeline Report, Top Jobs are defined in part based on non-wage metrics such as historical employment growth, labor demand, and availability of employee benefits. However, due to a lack of data availability, this report employs a job quality tier definition based solely on historical wages.

Conclusions & Recommendations

BW Research offers the following conclusions and recommendations based on the findings of the study:

1. Track the evolving impact automation technologies are having on employment across Colorado.

The findings of this study illustrate the recent impact that automation and technological advances are having on Colorado's employment ecosystem. While these findings provide some evidence of how automation could continue to change employment patterns in the future, newer technologies, particularly those in emerging automation, are still early in their implementation and should be continually examined to better understand their future impact on Colorado's employment. The following metrics and indicators should be tracked – for Colorado as a whole, as well as for the four regions that are discussed in this report – and, examined on an annual basis to reevaluate the strategies and investments that are being made based on the second (tools & training) and third (transitions) conclusions and recommendation.

a. **Industry & occupational employment metrics** – This study provided an initial assessment of how industry and occupational employment is changing in Colorado and some examples of how technology and automation are playing a role in that. A continued examination of industry and occupational employment over time will clarify the growing role that emerging automation is having on employment in the Colorado economy. It is worth noting that these metrics should continue to examine the role overall employment and job quality are playing at the industry level, and at the occupational level within each industry for Colorado and its four regions.

b. **Technology usage/implementation metrics or indicators** – The examples of traditional and emerging automation impacting employment along with the case studies of automation in Colorado often point to specific technologies that are being implemented within given industries. Whether this is expanding robotics in manufacturing or food processing OR implementing AI systems to compile and organize health records, tracking technology adoption in specific industries will help explain the changing employment landscape due to automation. This tracking metric would identify the key technologies that are automating tasks within a given industry and determine the level of implementation on an annual basis.

2. Develop tools & training resources to support current and future workers to better prepare for an automated future and their evolving employment opportunities.

The growth of automation in Colorado is changing the world of work and the knowledge, skills and abilities that are demanded by employers. This report identifies some of the trends, including an increase in jobs that tend to require more ***specialized technical knowledge*** of systems and technologies as well as ***high-touch*** positions that require more personal communication and advanced customer service skills. The role of emerging technologies, particularly those that are impacted by artificial intelligence and machine learning, is hard to predict and their impact on future skills is difficult to forecast, but there are some areas that we can lean into to prepare current and future workers for a more automated environment.

a. **Foundational skills** – Developing the next generation of workers who are resilient to changes in the demand for work, will require a few general characteristics:

   i. **Learn how to learn -** evolving technologies, markets and job responsibilities all will require workers to be able to continually learn and adapt in an ever-changing environment. Future workers will need to be confident in their ability to learn and adapt quickly and efficiently.

   ii. **Be able to communicate with different and changing audiences -** communication skills both writing and speaking remain a critical element for many of the higher paying jobs in Colorado, both those that are impacted by automation and those that are less likely to be.

   iii. **Learn how to use new tools to enhance efficiency and/or effectiveness -** many of the automation technologies that are being implemented do not completely replace a worker but instead complement or reduce the tasks that they need to complete. Workers in the future will need to be able to effectively use these tools to optimize their efficiency and effectiveness in the workplace.

b. **Specialized skills -** These evolving skills will be tied to the industry, occupation, and technologies that workers are interested in moving into. Any tools and training for developing specialized skills should identify the relevant industry, occupation, and technologies that they are focused on.

c. **Incumbent worker upskilling** – This strategy would focus on expanding tools and training opportunities for current workers that may be in a position that is being replaced by automation and prepared to move into an occupation or area of need within the company. This would require employers to understand which of their positions are slowly being replaced and identify those growth opportunities and skills.

3. Foster awareness of, and provide access to, workforce supports among workers transitioning from declining career pathways to growing ones.

Automation and the technologies driving both traditional and emerging automation are expected to continue to grow in Colorado, significantly impacting employment opportunities across the state. This final recommendation aims to help workers transitioning between occupations and/or career pathways to understand the potential challenges and/or opportunities associated with automation in a rapidly evolving labor market; and to ensure that jobseekers are aware of, and have access to, effective and easily navigable workforce support systems that offer access to such information.

a. **Communicate evolving employment opportunities -** highlight and/or expand those resources and programs that communicate those employment opportunities that are growing and are increasingly needed by Colorado's employers.

b. **Identify, and promote awareness of, condensed training opportunities to upskill and/or reskill transitioning workers** – This strategy would focus on identifying and promoting awareness of condensed upskilling and reskilling training programs among workers looking to transition to a growing employment opportunity.

CURRENT AUTOMATION AND THE WORKFORCE

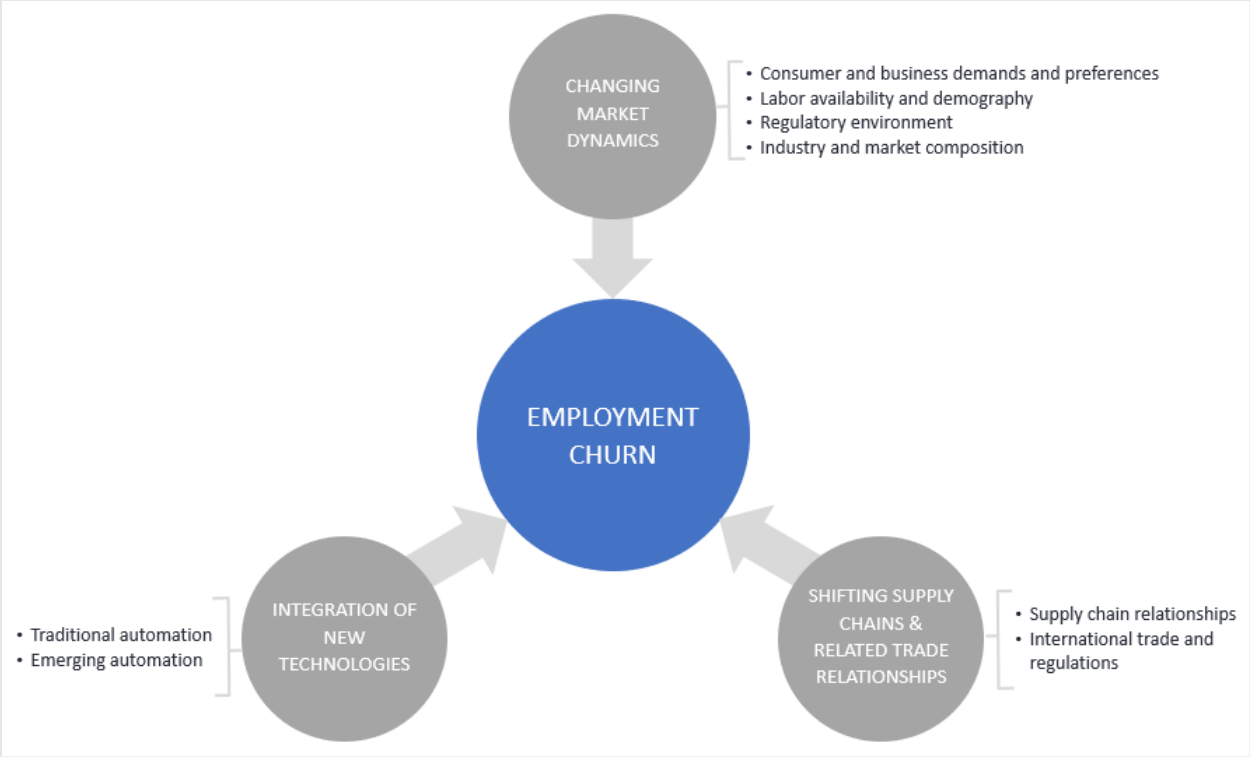
The world of work is evolving, and just like the technologies that are impacting it, the rate of change is increasing. According to the latest release from the BLS[5], the median number of years that wage and salary workers have been with their employers is now below 4 years, the lowest it has been measured in 20 years, and below three years (2.7) for workers aged 25 to 34. This change and churn that defines the modern labor market is not expected to slow down, and Colorado's businesses, workers, and learners would benefit from better understanding the dynamics that are driving this evolution.

Churn in Employment

The churn in employment refers to the creation of new jobs and the displacement or destruction of jobs that have become obsolete. In Colorado and across the country, churn is driven by several foundational elements, the integration of new technologies just being one of them. As the figure below shows (Figure 2) the four primary drivers of evolving employment include changing market dynamics, shifting supply chains and related trade relationships, consumer preferences and lastly the integration of new technologies and its impact on automation.

[5] U.S. Bureau of Labor Statistics. News Release (2024). https://www.bls.gov/news.release/pdf/tenure.pdf

Figure 2. Churn in Employment



While there are several factors that drive employment churn, this report focuses on the "integration of new technologies" element to simplify the process of identifying patterns and trends in employment impacts associated with automation, that might otherwise be obscured by interaction effects with other variables. Focusing on a single element of employment churn allows for a more targeted and deeper analysis of the specific impacts of automation on Colorado's workforce, which may also drive more actionable outcomes specifically with regard to automation.

The report will refer to two primary forms of automation, traditional automation and emerging automation. The different types of automation can be further delineated, but for simplicity, these terms will be used throughout the report.

Traditional Automation

Traditional automation refers to technology and technology implementation that reduces the level of human activity needed to complete a particular task by replacing or augmenting specific tasks or processes that are typically repeated and/or can follow a repeated pattern. This could include:

- **Robotics or programmable machines** that can complete parts of the manufacturing and/or assembly process.
- **Accounting, administrative, and related software** that replaces elements of accounting, administrative, and business service roles.
- **Customer service kiosks and/or user interfaces** that replace some tasks completed by customer service workers.

Emerging Automation

Emerging automation includes Artificial Intelligence (AI), Robotic Process Automation, Large Language Models (LLMs), autonomous systems and Machine Learning which enable machines and/or programs to learn from data, adapt, and make decisions without explicit input from humans. Emerging automation technologies that could potentially impact Colorado's workforce could include:

- **Large Language Models** (LLMS) that can create an initial draft of memos, code, or summarized reports based on the AI's analysis of datasets and/or summarized information.
- **Robotic Process Automation** (RPA) and bots that can quickly duplicate human interaction with a computer and duplicate processes related to data entry, database organization, and data analyses.
- **Autonomous vehicles and mobile robots** that can work in warehouses and transport goods and people both short and long-distances.
- **Autonomous security and surveillance** include autonomous drones and robotic security guards that can patrol and overlook large areas.

Story of Automation in Colorado Today

This section provides an overview of automation's impact on Colorado's economy based on employment and wage data through the first quarter of 2024, summarizing key economic and workforce outcomes in Colorado through the lens of automation. Indicators such as aggregate and region-specific industry employment trends, occupation-level impacts, job quality metrics, and an analysis of key skills impacted by automation are used to inform this section. For a detailed description of the methodology underlying this section, please visit Appendix A.

Industry Employment

Table 1 categorizes each of Colorado's 20 industries into high, medium, and low automation tiers, based on each industry's calculated Degree of Automation score, ranging from 1 to 100. **A score of 100 indicates an industry is fully automated, while a score of 1 indicates an industry is not at all automated.**

Highly automated industries are those that fall within the top one-third of Degree of Automation scores, while medium and low automated industries are industries that fall within the middle and bottom third, respectively.[6] All Colorado industries possess some level of automation, with scores ranging from 20 (somewhat automated) to 40 (moderately automated).

Colorado's Finance and Insurance industry has the highest Degree of Automation among the state's 20 industries, along with Management of Companies and Enterprises; Manufacturing; Transportation and Warehousing; Information; Professional, Scientific, and Technical Services; and Government. **These highest automated industries employ 1.02 million workers in the state and represent one-third (33.0 percent) of total state employment as of 2024.**

Colorado's medium automated industries include Real Estate and Leasing; Accommodation and Food Services; Wholesale Trade; Utilities; Administrative, Support, and Waste Remediation Services; and

[6] A full description of the methodological approach utilized to calculate these scores is available in Appendix A: Methodology.

Healthcare and Social Assistance. **Colorado's medium automated industries represent the largest share of state employment among the three categories, employing 1.07 million workers, or 34.6 percent of the state's workforce, as of 2024.**

Colorado's lowest automated industries include Retail Trade; Mining, Quarrying, and Oil and Gas Extraction; Arts, Entertainment, and Recreation; Other Services; Construction; Agriculture, Forestry, Fishing, and Hunting; and Educational Services. **Colorado's lowest automated industries employ approximately 1 million workers and represent the remaining one-third (32.4 percent) of total state employment.**

Table 1. Industry Degree of Automation Classification[7]

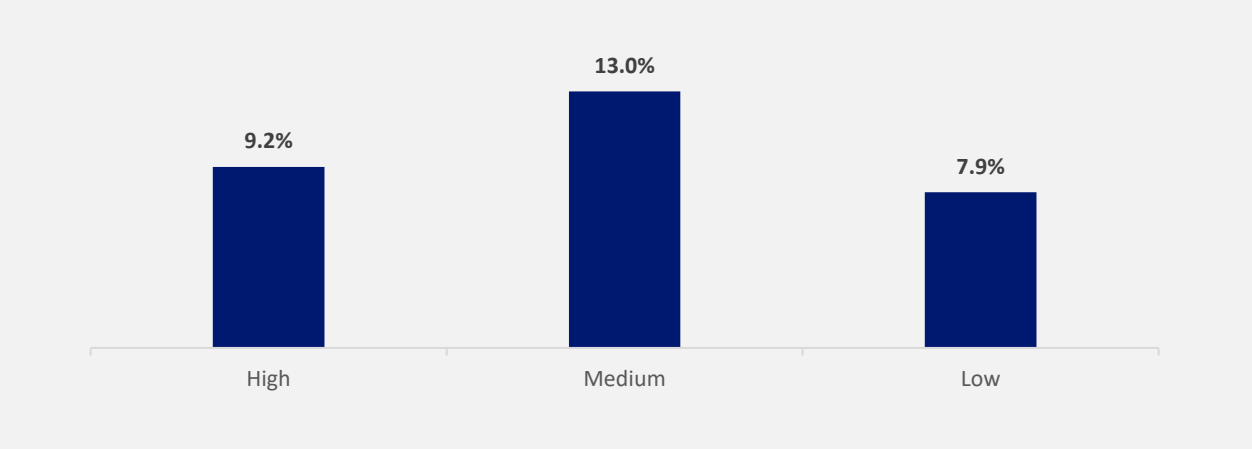
CLASSIFICATION	INDUSTRY[8]	NAICS	DEGREE OF AUTOMATION[9]	COLORADO EMPLOYMENT (2024Q1)
High	Finance and Insurance	52	39.2	1,020,940 (33.0%)
	Management of Companies and Enterprises	55	35.7	
	Manufacturing	31-33	33.7	
	Transportation and Warehousing	48-49	33.2	
	Information	51	33.2	
	Professional, Scientific, and Technical Services	54	33.1	
	Government	92	32.7	
Medium	Real Estate and Leasing	53	31.8	1,070,220 (34.6%)
	Accommodation and Food Services	72	31.6	
	Wholesale Trade	42	31.5	
	Utilities	22	31.1	
	Administrative, Support, and Waste Remediation Services	56	30.5	
	Healthcare and Social Assistance	62	28.5	
Low	Retail Trade	44-45	27.4	1,002,754 (32.4%)
	Mining, Quarrying, and Oil and Gas Extraction	21	27.3	
	Arts, Entertainment, and Recreation	71	24.1	
	Other Services (except Public Administration)	81	22.6	
	Construction	23	21.4	
	Agriculture, Forestry, Fishing, and Hunting	11	20.8	
	Educational Services	61	20.1	

Colorado's medium automated industries grew the fastest since 2021, with overall employment in these industries increasing 13.0 percent from 2021 to 2024. Colorado's most highly automated

[7] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024). O*NET Online. Degree of Automation Dataset (2023).
[8] A full description of each industry is available in Table 8. Industry Definitions.
[9] It is important to note that the Degree of Automation score quantities the **current** prevalence of automation in a given industry and does not necessarily indicate the **future** automation potential of a given industry.

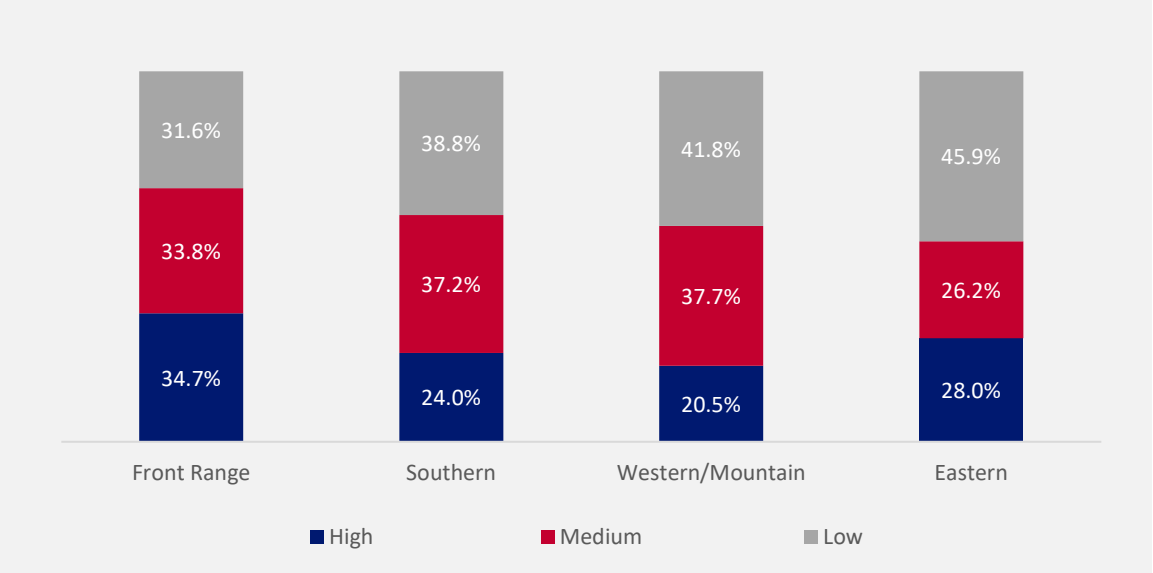
industries grew by 9.2 percent during the same period, while its least automated industries grew by 7.9 percent (Figure 3).

Figure 3. Colorado Employment Growth by Automation Classification (2021Q1 - 2024Q1)[10]



Colorado's Front Range region[11] **has the largest share of employment in highly automated industries relative to other regions, with one in three jobs in highly automated industries (34.7 percent).** The Southern and Western/Mountain regions have the largest share of employment in the medium automated industries (37.2 percent and 37.7 percent, respectively), while the Eastern region has the largest share of employment in the least automated industries, representing 45.9 percent of Eastern region jobs (Figure 4).

Figure 4. Colorado Employment Distribution by Region and Automation Classification (2024Q1)[12]



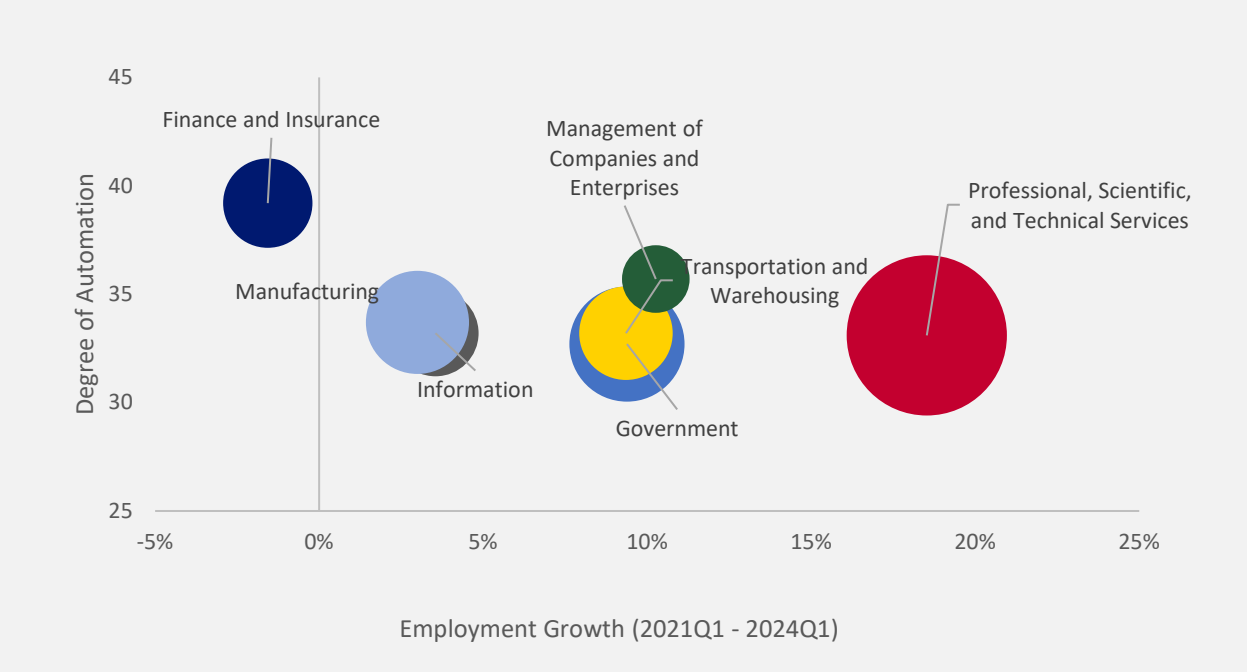
[10] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).
[11] Colorado Counties Inc. Regional Districts definition.
[12] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).

All of Colorado's highly automated industries grew between 2021 and 2024, except for the Finance and Insurance industry. The Professional, Scientific, and Technical Services industry saw the largest growth rate of all highest automated industries, at 18.5 percent.

The Management of Companies and Enterprises industry also experienced robust employment growth of 10.3 percent, while the Transportation and Warehousing and Government industries each grew by 9.4 percent from 2021 to 2024. The Information and Manufacturing industries exhibited weaker growth of 3.5 percent and 3.0 percent, respectively, while the Finance and Insurance industry was the only declining industry, sustaining a 1.6 percent employment loss during this period (

Figure 5).

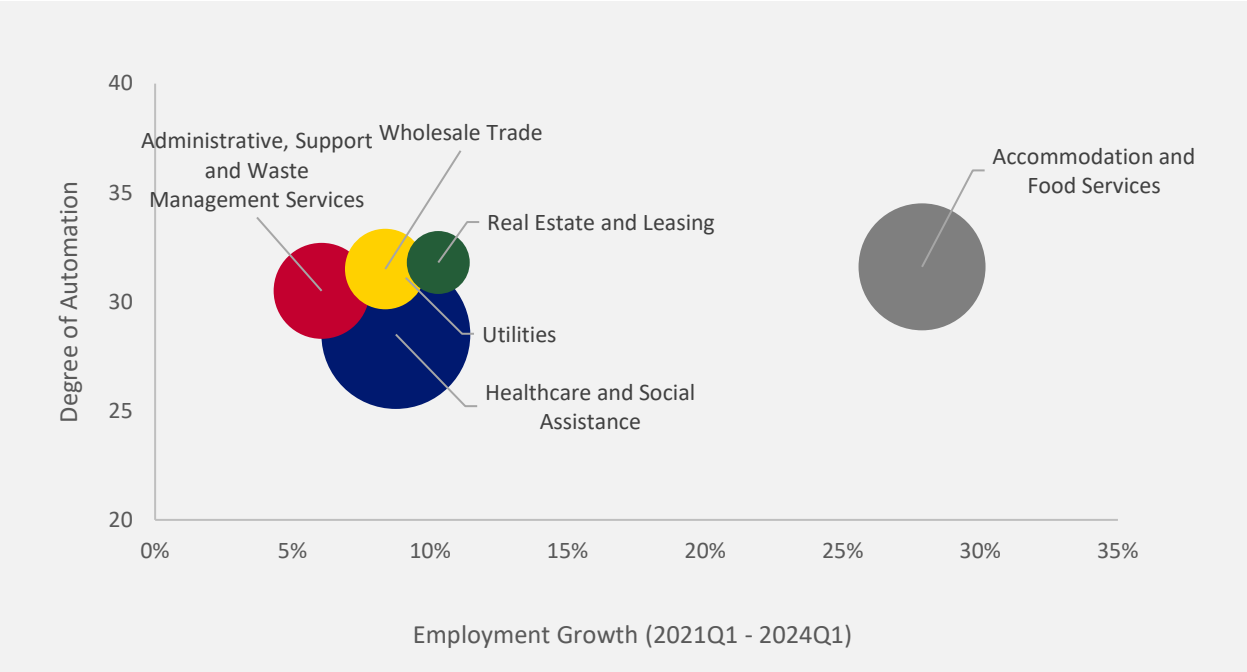
Figure 5. Highest Automated Industries in Colorado (2021Q1 – 2024Q1)[13]



Colorado's medium automated industries – Accommodation and Food Services (+27.9 percent), Real Estate and Leasing (+10.3 percent), Utilities (+9.1 percent), Healthcare and Social Assistance (+8.8 percent), Wholesale Trade (+8.4 percent), and Administrative, Support, and Waste Remediation Services (+6.1 percent) – all experienced growth between 2021 and 2024. Additionally, the Accommodation and Food Services industry experienced the second-largest growth among all Colorado industries, regardless of automation classification (Figure 6).

[13] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024). O*NET Online. Degree of Automation Dataset (2023). Bubble size is proportional to 2024Q1 employment levels.

Figure 6. Medium Automated Industries in Colorado (2021Q1 – 2024Q1)[14]

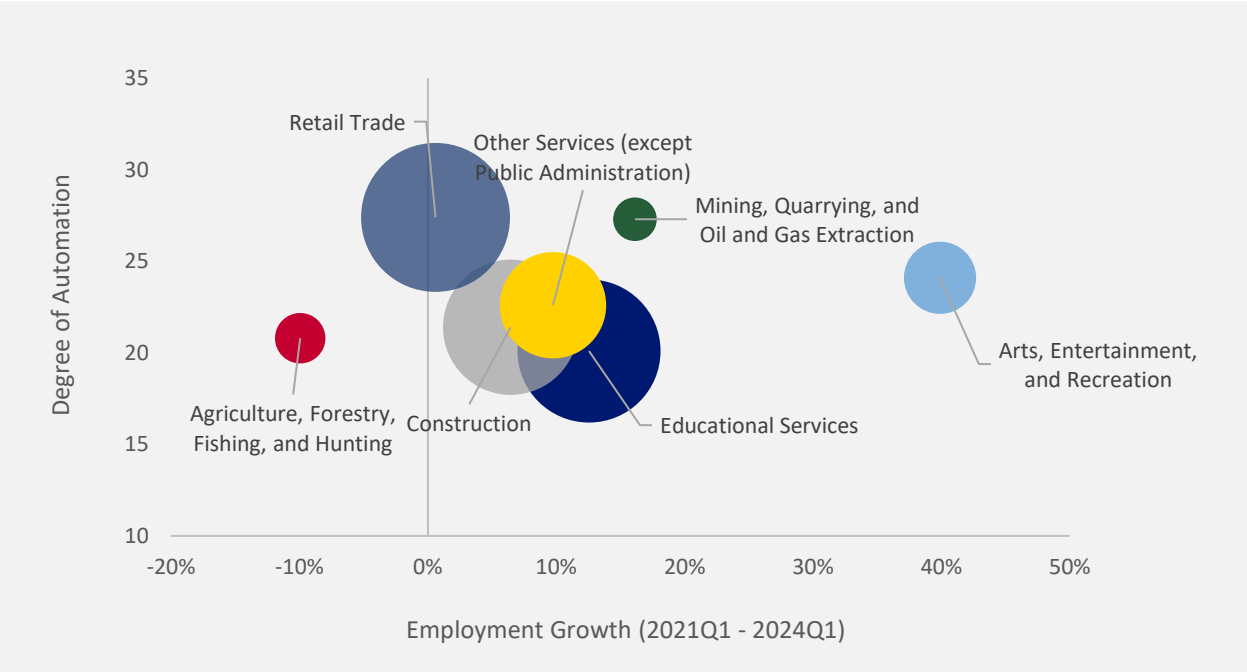


Employment in all of Colorado's lowest automated industries grew between 2021 and 2024, except for the Agriculture, Forestry, Fishing, and Hunting industry. The Arts, Entertainment, and Recreation industry saw the highest growth rate among Colorado's lowest automated industries and all Colorado industries, regardless of automation classification (+39.9 percent).

The Mining, Quarrying, and Oil and Gas Extraction industry employment grew by 16.1 percent from 2021 to 2024, while the Educational Services, Other Services, and Construction industries grew by 12.5 percent, 9.7 percent, and 6.4 percent, respectively. The Retail Trade industry exhibited slight growth of 0.6 percent, while the Agriculture, Forestry, Fishing, and Hunting industry experienced a sharp decline of 9.9 percent during the same period (Figure 7).

[14] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024). O*NET Online. Degree of Automation Dataset (2023). Bubble size is proportional to 2024Q1 employment levels.

Figure 7. Lowest Automated Industries in Colorado (2021Q1 – 2024Q1)[15]



As noted previously, employment growth within each automation tier is driven by a multitude of factors, including automation. While high levels of automation have been associated with high levels of historical job growth in recent years, there are many factors that may contribute to, or inhibit growth within a specific industry.

Identifying industries that are rapidly growing is crucial to help prepare Colorado's workforce for changes spurred by automation. It will be important to inform Colorado's jobseekers about these growing job opportunities; and to foster awareness of the workforce supports available to help them transition into new roles, especially as technology changes the skills needed to succeed in a more highly automated labor market.

Occupation Employment

Colorado's highest automated industries have seen a significant increase in technology-based occupations such as **Database Architects**, **Computer and Information Systems Managers**, and **Software Developers**. These occupations within the highest automated industries have grown 21 percent from 2021 to 2023 and are all involved with the integration and management of automated systems. **Database Architects** design data warehouse systems and networks to automate the storage and intermediary processing of data, while **Computer and Information Systems Managers** plan and coordinate computer-related activities in organizations, and **Software Developers** design applications, programs, and network software.

It is important to recognize that some technology-based occupations, such as Software Developers, have already incorporated the usage of emerging automation tools (e.g., ChatGPT, Google Gemini, etc.), which can both assist with, and replace, core job functions. Employment growth across these

[15] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024). O*NET Online. Degree of Automation Dataset (2023). Bubble size is proportional to 2024Q1 employment levels.

occupations can be attributed to the increasing role of automation in these industries, in addition to the growing need for operations and management of these automated systems.

Occupations such as **Slaughterers and Meat Packers**, **Insurance Claim and Policy Processing Clerks**, and **Helpers—Production Workers** saw significant decreases compared to other occupations in Colorado's highest automated industries. These occupations saw a 50 percent decline from 13,930 in 2021 to 6,380 in 2023 in Colorado (Table 2). **Insurance Claims and Policy Processing Clerks** are likely being automated to streamline data processing, reduce human error, and improve the speed and accuracy of claim handling, while **Helpers - Production Workers** roles are being automated to increase efficiency in supporting skilled production roles, handling materials, tools, and equipment in ways that reduce repetitive manual tasks.

Table 2. Key Employment Changes Within High Automated Industries (2021 – 2023)[16]

SOC	OCCUPATION	2021 EMPLOYMENT	2023 EMPLOYMENT	PERCENTAGE CHANGE
	GROWING			
15-1243	Database Architects	480	1,710	256.3%
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	17,650	25,480	44.4%
11-3021	Computer and Information Systems Managers	8,060	10,190	26.4%
15-1252	Software Developers	34,580	40,080	15.9%
13-1111	Management Analysts	9,210	11,810	28.2%
	DECLINING			
51-3023	Slaughterers and Meat Packers	1,980	440	-77.8%
53-7064	Packers and Packagers, Hand	1,770	860	-51.4%
51-9198	Helpers--Production Workers	1,490	850	-43.0%
43-9041	Insurance Claims and Policy Processing Clerks	2,850	1,760	-38.2%
43-9061	Office Clerks, General	11,360	9,750	-14.2%

Colorado's medium automated industries experienced similar trends, with **Computer Network Architects** doubling in employment since 2021, and **Computer User Support Specialists** experiencing a 57.7 percent employment increase during the same period.[17] The rise in Computer User Support Specialists indicates the increasing need for automation-related training and upskilling support services within medium automated industries.

[16] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2021 – 2023).
[17] **Computer Network Architects** design networks for organizations to automate data flow and enhance communication, while **Computer User Support Specialists** maintain computer networks and provide technical help to computer users.

The contrast in growth trends between **Cooks, Fast Food,** a declining occupation, and **First-Line Supervisors of Food Preparation and Serving Workers,** a growing occupation, demonstrates how automation is impacting the demand for skills in the workplace – shrinking demand for production skills that can be automated, while increasing demand for executive function skills in customer service, team management, and equipment issue identification and resolution. Notably, **Cooks, Fast Food** employment decreased by over 50 percent from 2021 to 2023, despite the Accommodation and Food Services industry growing by 28 percent during the same period.

Farmworkers and Laborers, Crop, Nursery, and Greenhouse workers saw a 55.3 percent employment decline in Colorado's medium automated industries – as with Slaughterers and Meatpackers, these manual labor-intensive jobs will continue to experience automation-related job displacement, driven by continued implementation of automation technologies (Table 3).

Table 3. Key Employment Changes Within Medium Automated Industries (2021 – 2023)[18]

SOC	OCCUPATION	2021 EMPLOYMENT	2023 EMPLOYMENT	PERCENTAGE CHANGE
	GROWING			
15-1241	Computer Network Architects	700	1,530	118.6%
35-3011	Bartenders	7,900	13,030	64.9%
13-1151	Training and Development Specialists	2,630	4,160	58.2%
15-1232	Computer User Support Specialists	2,340	3,690	57.7%
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	17,820	22,190	24.5%
	DECLINING			
43-3011	Bill and Account Collectors	1,700	630	-62.9%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	940	420	-55.3%
41-9022	Real Estate Sales Agents	6,210	4,690	-24.5%
35-2011	Cooks, Fast Food	12,710	5,930	-53.3%
53-3031	Driver/Sales Workers	8,510	6,750	-20.7%

In Colorado's lowest automated industries, both **Project Management Specialists** and **General and Operations Managers** saw substantial employment growth of 39.6 percent and 20.7 percent from 2021 to 2023, respectively. **Laborers and Freight, Stock, and Material Movers, Hand** also experienced robust employment growth of 28 percent, likely driven by the cost of implementing automation outweighing current labor costs for this role. Additionally, the increase in **Customer Service Representatives** (+25.1 percent) suggests a growing need for human interaction in roles that require empathy despite the automation of routine customer service tasks.

[18] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2021 – 2023).

Packers and Packagers, Hand saw the sharpest employment declines of 41.3 percent, as automated packaging systems have become more prevalent in warehouses and factories, reducing reliance on manual packing. **Packers and Packagers, Hand** is likely more automatable than **Laborers and Freight, Stock, and Material Movers, Hand,** which involves the situation or context-specific application of labor, rather than the routine packaging of items.

Receptionists and Information Clerks and Bookkeeping and **Accounting, and Auditing Clerks** declined by 20.3 percent and 9.1 percent, respectively, reflecting the adoption of automated systems for information management and financial accounting (Table 4).

Table 4. Key Employment Changes Within Low Automated Industries (2021 – 2023)[19]

SOC	TITLE	2021 EMPLOYMENT	2023 EMPLOYMENT	PERCENTAGE CHANGE
	GROWING			
13-1082	Project Management Specialists	6,370	8,890	39.6%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	3,790	4,880	28.8%
43-4051	Customer Service Representatives	10,820	13,540	25.1%
11-1021	General and Operations Managers	12,630	15,240	20.7%
41-2011	Cashiers	45,290	48,320	6.7%
	DECLINING			
53-7064	Packers and Packagers, Hand	3,050	1,790	-41.3%
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	1,900	1,450	-23.7%
43-4171	Receptionists and Information Clerks	4,390	3,500	-20.3%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	8,170	7,430	-9.1%
41-2031	Retail Salespersons	73,180	70,230	-4.0%

[19] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2021 – 2023).

Industry Job Quality

Job quality – which is typically measured in tiers – serves as a crucial measure of the economic vitality of a region or an industry. For instance, if a region or industry has many jobs, but most of those jobs pay less than a sustainable wage, workers will struggle to live and work in the region or industry.

In Colorado households with two working adults and two children, each adult would need to work **1.4 Tier 3 jobs** to meet the living wage determination.

Table 5. Job Tier Description[20] [21]

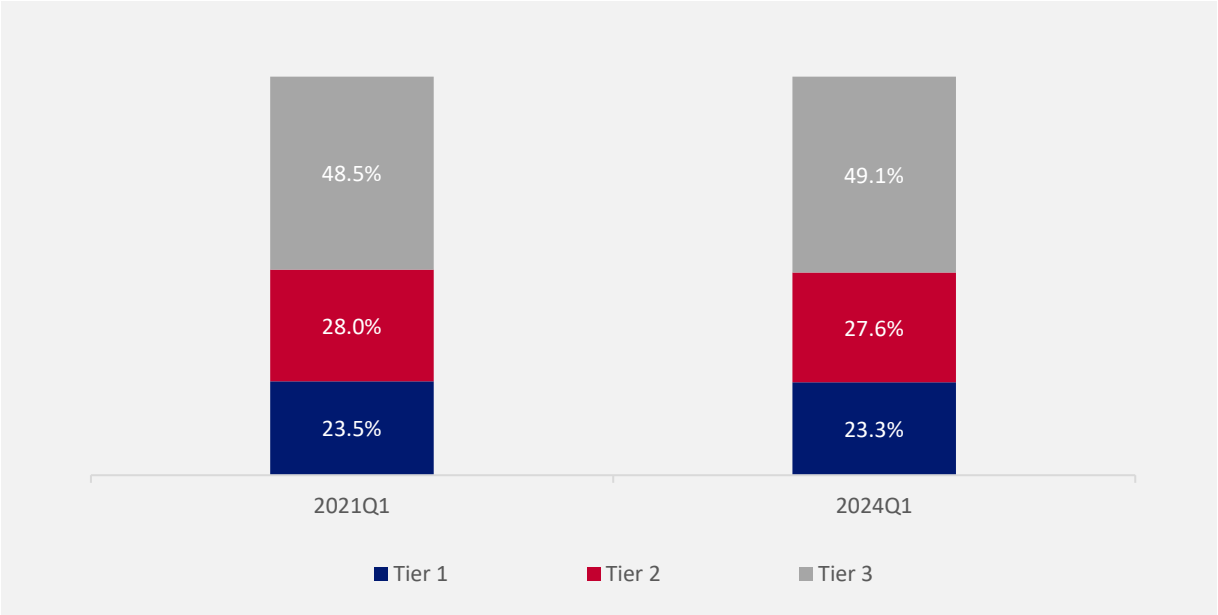
TIER 1	TIER 2	TIER 3
Tier 1 occupations are typically the highest-paying, highest-skilled occupations in the economy. Such occupations include managerial positions (e.g., Sales Managers), professional positions (e.g., Lawyers), and highly skilled technology occupations, such as engineers, scientists, and computer programmers.	Tier 2 occupations are typically middle-wage, middle-skill occupations. These occupations include office and administrative positions (e.g., Accounting Clerks and Secretaries), manufacturing operations, and production positions (e.g., Electricians, Machinists).	Tier 3 occupations are typically the lowest-paying, lowest-skilled occupations and tend to account for the largest share of jobs in a region. These occupations include food service and retail jobs, building and grounds cleaning positions, and personal care positions.
$111,600	**$66,800**	**$46,100**
Median Annual Salary	**Median Annual Salary**	**Median Annual Salary**
$58.18	**$34.56**	**$23.44**
Average Hourly Wage	**Average Hourly Wage**	**Average Hourly Wage**

As shown in Figure 8, lower-skill and lower-wage Tier 3 jobs represent approximately half (49.1 percent) of all Colorado jobs as of 2024, while middle-skill and middle-wage Tier 2 jobs represent just over one in four (27.6 percent) of all Colorado jobs. Tier 1 jobs, or highest-skill and highest-wage jobs, represent the smallest share of jobs in Colorado (23.3 percent). Additionally, job quality has fallen slightly within Colorado since 2021, with the share of Tier 3 jobs increasing by 0.6 percentage points between 2021 and 2024. However, as discussed in the following section, Colorado's job quality remains above the national average.

[20] Tiers do not include all SOC codes, and therefore may not sum up to total county and statewide employment. Average annual salary and average hourly wage calculated as of 2024Q1. A list of SOC codes and its associated tier is available upon request.

[21] Note that the job quality framework employed in this report differs slightly from the job quality framework defined in Colorado's annual Talent Pipeline Report, although they are somewhat comparable: Tier 1 jobs as defined in this report are more likely to be Top Jobs as defined by the Talent Pipeline Report. In the Colorado Talent Pipeline Report, Top Jobs are defined in part based on non-wage metrics such as historical employment growth, labor demand, and availability of employee benefits. However, due to a lack of data availability, this report employs a job quality tier definition based solely on historical wages.

Figure 8. Colorado Job Quality by Tier (2024Q1)[22]



Declines in job quality can affect the workforce impacts of automation. For example, falling wages could decrease the incentive for employers in certain "low touch" industries to automate, as the cost savings generated by automation decrease.

Additionally, a growing share of workers in Tier 3 industries indicates a rising level of income inequality between more highly skilled and less skilled workers, implying a greater need to connect Tier 3 jobseekers to workforce supports that provide access to information regarding the availability of higher-paying jobs and the skills needed to improve prospects for employment in such jobs.

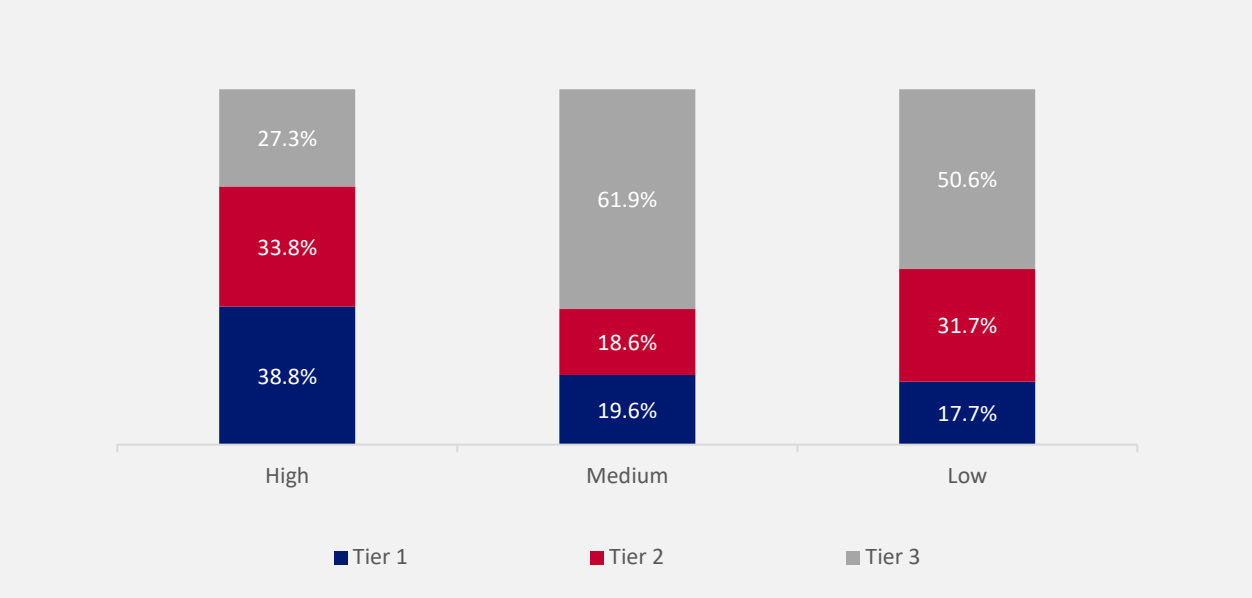
Table 6. Colorado Living Wage Determination[23] [24]

FAMILY SIZE	LIVING WAGE ANNUAL SALARY	HOURLY WAGES REQUIRED TO ACHIEVE SALARY (PER WORKING ADULT)	NUMBER OF TIER 3 JOBS REQUIRED TO ACHIEVE SALARY
1 Adult (working) & 2 Children	$122,274	$58.79	2.5
2 Adults (1 working) & 2 Children	$94,998	$45.67	1.9
2 Adults (both working) & 2 Children	$66,243	$31.85	1.4

[22] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).
[23] MIT Living Wage Calculator (2024).
[24] In this table, the living wage required for one adult to support a family of four is lower than the living wage required to support a family of three since it is assumed that the non-working adult in the family of four will assume the responsibilities of childcare, reducing the associated expenses.

Job quality varies significantly by automation classification. Industries with high degrees of automation possess a higher share of Tier 1 jobs (39 percent) relative to the statewide average (24 percent), in addition to a higher share of Tier 1 jobs relative to industries with medium (20 percent) or low degrees of automation (18 percent) (Figure 9). The Professional, Scientific, and Technical Services industry possesses the highest share of Tier 1 jobs among all Colorado industries, at 60 percent, while the Arts, Entertainment, and Recreation and Agriculture, Forestry, Fishing, and Hunting industries possess the highest share of Tier 3 jobs, at 78 percent each (Figure 26).

Figure 9. Colorado Job Quality by Tier and Automation Classification (2023)[25]



Colorado's highest automated industries provide average wages above the state's Living Wage standard, offering average annual wages of $106,536, well above the Living Wage standard for 2 working adults and 2 children of $66,243. However, medium and low-automated industries offer average annual wages of $62,925 and $57,149, respectively, both of which are below the Living Wage standard (Figure 10).

Figure 10. Colorado Average Annual Wages by Automation Classification[26]

INDUSTRY	COLORADO AVERAGE ANNUAL WAGE (2024Q1)	AVERAGE ANNUAL WAGE RELATIVE TO LIVING WAGE FOR 2 WORKING ADULTS, 2 CHILDREN
High Automation	$106,536	↑
Medium Automation	$62,925	↓
Low Automation	$57,149	↓
All Industries	$75,198	↑

[25] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2021 – 2023).
[26] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024). MIT Living Wage Calculator (2024).

Key Skills Impacted by Automation

The integration of automation is transforming key skills across various occupations, reshaping both job demands and workforce capabilities. As industries continue to implement automation, skills once considered essential in traditionally non-automated roles are being supplemented or replaced by technical competencies and systems management. This shift emphasizes the importance of upskilling, as workers are increasingly expected to engage with automated systems. Conversely, declining occupations indicate a reduced need for routine manual tasks, indicating the importance of skills that complement or enhance automated processes.

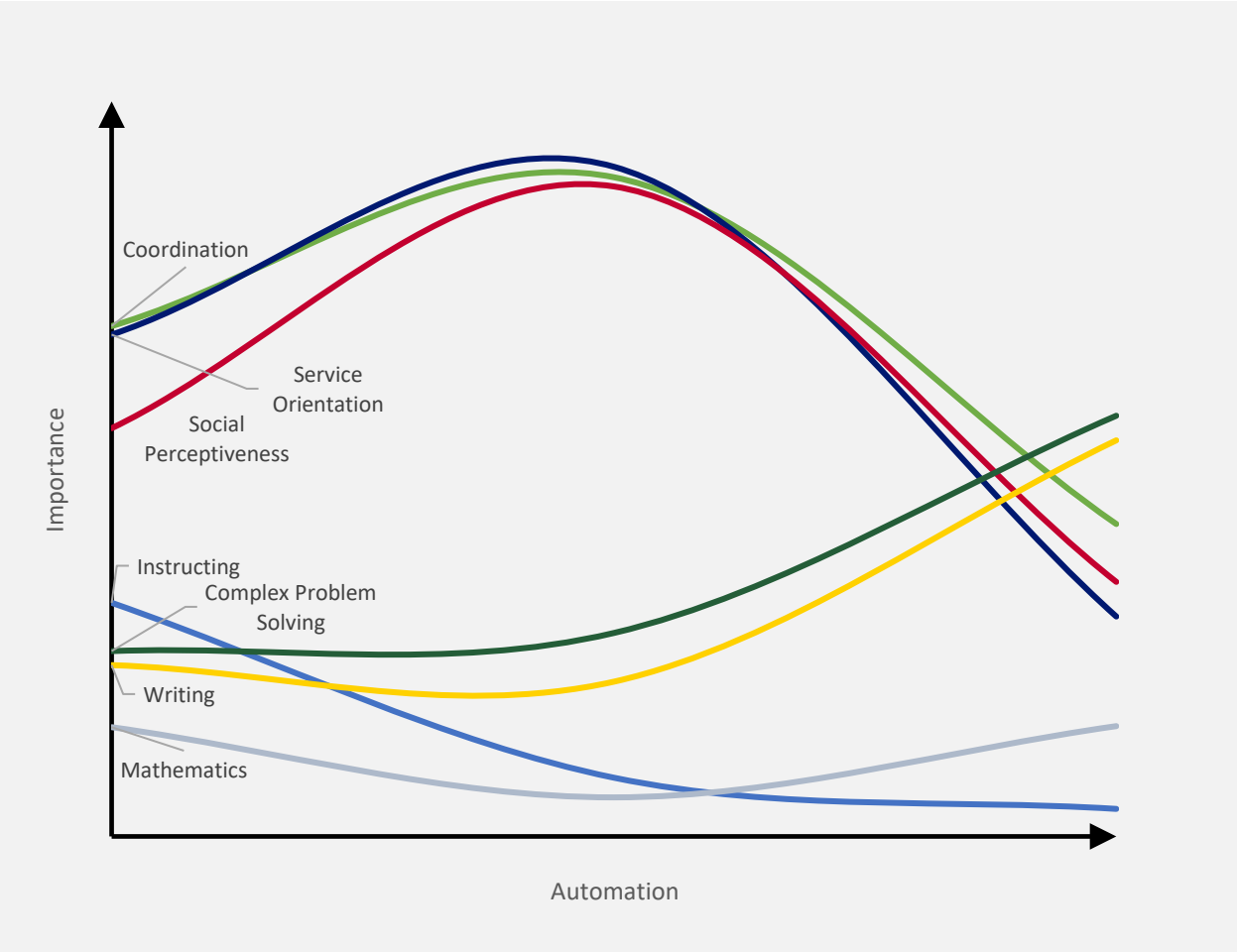
Figure 11 illustrates the importance of selected skills among varying levels of automation. Skills such as **Writing**, **Complex Problem Solving**, and **Mathematics** have become increasingly important in higher automated industries. These skills are essential in higher automated industries because workers often interact with advanced systems and technologies that require critical thinking, analytical reasoning, and clear communication. As automation takes over routine tasks, workers increasingly need to manage and troubleshoot automated systems, requiring specialized knowledge and precision to maintain efficiency and accuracy.

Instructing becomes less important in more automated industries. In highly automated industries, machines and software often perform tasks independently or with minimal human input, reducing the need for instruction. Low-automated industries include Education Services, which revolve around instruction.

Service Orientation, **Social Perceptiveness**, and **Coordination** are most important in medium automated industries and see a decline when industries become more (or less) automated. Medium automated industries still rely on a significant degree of human interaction alongside the usage of technology, making interpersonal skills like Service Orientation and Social Perceptiveness important for collaborative tasks and customer-focused roles. These industries balance human oversight with automation, where effective coordination between people and machines is necessary, but as automation intensifies or reduces, the demand for other skills takes priority.

A full list of skill rankings, along with the definition for each skill, is available in Appendix B: Supporting Figures.

Figure 11. Importance of Selected Skills by Automation Prevalence[27]



The following figures illustrate the changing demand for selected skills from 2013 to 2023. A 10-year window was used to observe skills changes to capture greater variation in skills demand that may not be reflected in a shorter period.

Colorado's highest automated industries saw skills such as **Monitoring**, **Critical Thinking**, **Operation and Control**, **Judgment and Decision Making**, and **Troubleshooting** become increasingly important from 2013 to 2023. This trend can be attributed to the nature of automation, where human workers need to manage, assess, and address automated systems. Advanced machines handle many repetitive tasks, so workers are increasingly involved with oversight and problem-solving roles that machines cannot fully replace. On the other hand, **Programming** has generally become less important across all levels of automation. This change results from the increasing accessibility and user-friendliness of automation technologies and artificial intelligence, such as ChatGPT, where pre-built platforms and Large Language Models reduce the need for extensive programming skills in day-to-day operations (Figure 12).

[27] BW Research analysis of O*NET Online Skills Database, O*NET online Degree of Automation Dataset (2023), and BLS Occupation Wage and Statistics (OEWS). The underlying data used for this graph can be found in Appendix B: Supporting Figures, Table 11.
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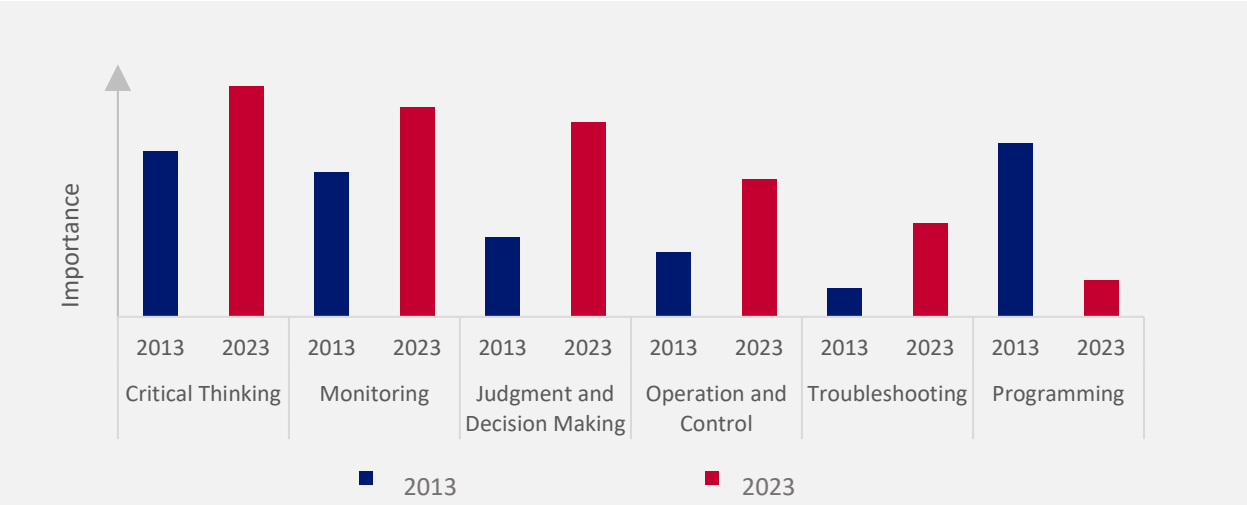
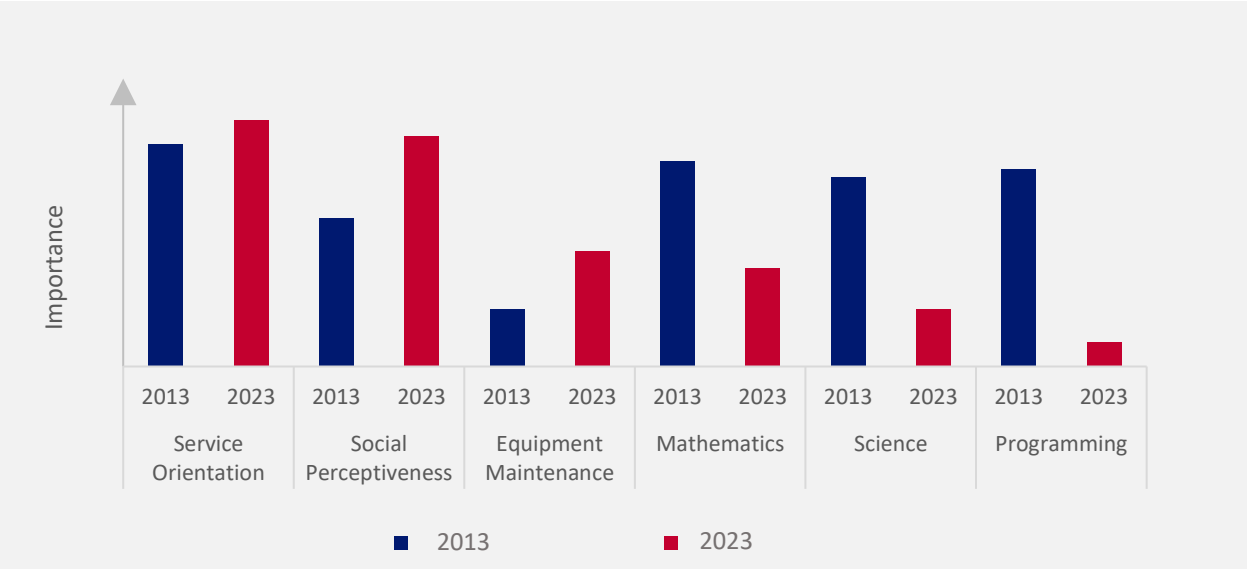
Figure 12. High Automated Industries Skills Importance (2013-2023)[28]



Medium automated industries saw technical skills such as **Mathematics** and **Science** decrease in importance, while **Social Perceptiveness**, **Service Orientation**, and **Equipment Maintenance** have become more important. This change could be due to automation handling many technical tasks that previously required manual calculations or scientific knowledge, allowing employees to focus more on interpersonal roles and maintaining the equipment that automates the technical work (Figure 13).

Figure 13. Medium Automated Industries Skill Ranking (2013-2023)[29]

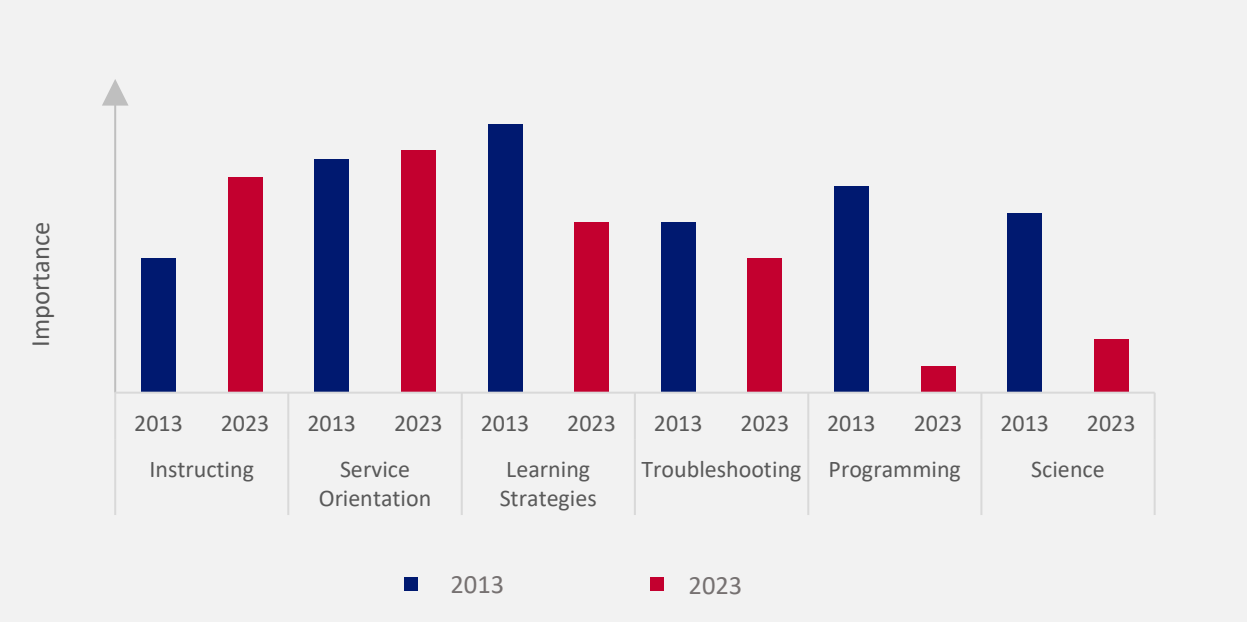


Industries with low automation saw **Science**, **Troubleshooting**, and **Learning Strategies** become less important, while **Service Orientation** and **Instructing** have grown in importance. With fewer automated systems, the demand for technical problem-solving and strategic learning decreases, while

[28] BW Research analysis of O*NET Online Skills Database, O*NET online Degree of Automation Dataset (2023), and BLS Occupation Wage and Statistics (OEWS).
[29] BW Research analysis of O*NET Online Skills Database, O*NET online Degree of Automation Dataset (2023), and BLS Occupation Wage and Statistics (OEWS).

interpersonal skills and the ability to teach or guide others become essential. Workers often need to collaborate closely with clients or train team members, as manual processes dominate these industries (Figure 14).

Figure 14. Low Automated Industries Skill Ranking (2013-2023)[30]



Any analysis of the workforce impacts of automation should necessarily include an assessment of job quality, as it is important not only to determine the magnitude of jobs displaced and/or added by automation, but also the nature of jobs lost or created. Higher-quality jobs offer sustainable wages that support economic stability and growth, not only for individual workers, but for the state's economy; and support the well-being of Colorado's communities by improving residents' living standards.

Identification of in-demand skills needed in high-growth industries helps to ensure that automation promotes job quality, by ensuring that current and potential workers in growing and automating industries have the skills necessary to succeed in environments being transformed by technology.

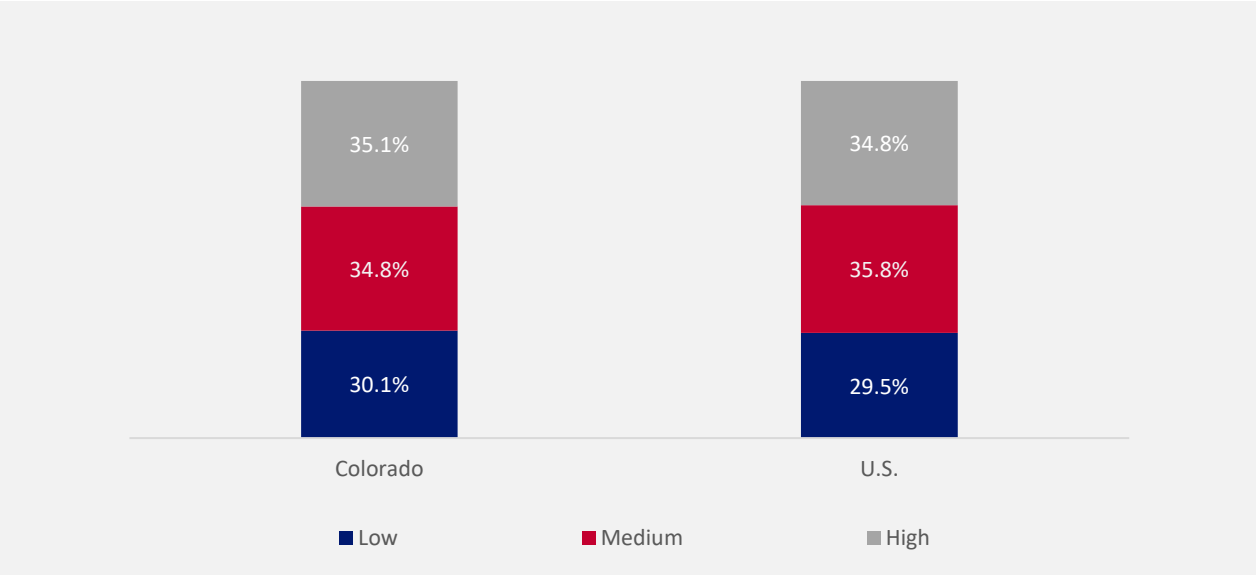
Comparison of Automation in the US to Colorado Today

This section identifies key differences in Colorado's automation industries relative to the overall United States, including a comparison of overall employment trends, industry growth rates, and job quality within each automation classification tier.

Colorado has a slightly larger employment share in the highest automated industries than the nation. 35.1 percent of Colorado jobs are within the highest automated industries compared to 34.8 percent nationally – however, Colorado's employment distribution is generally comparable to the national distribution (Figure 15).

[30] BW Research analysis of O*NET Online Skills Database, O*NET online Degree of Automation Dataset (2023), and BLS Occupation Wage and Statistics (OEWS).

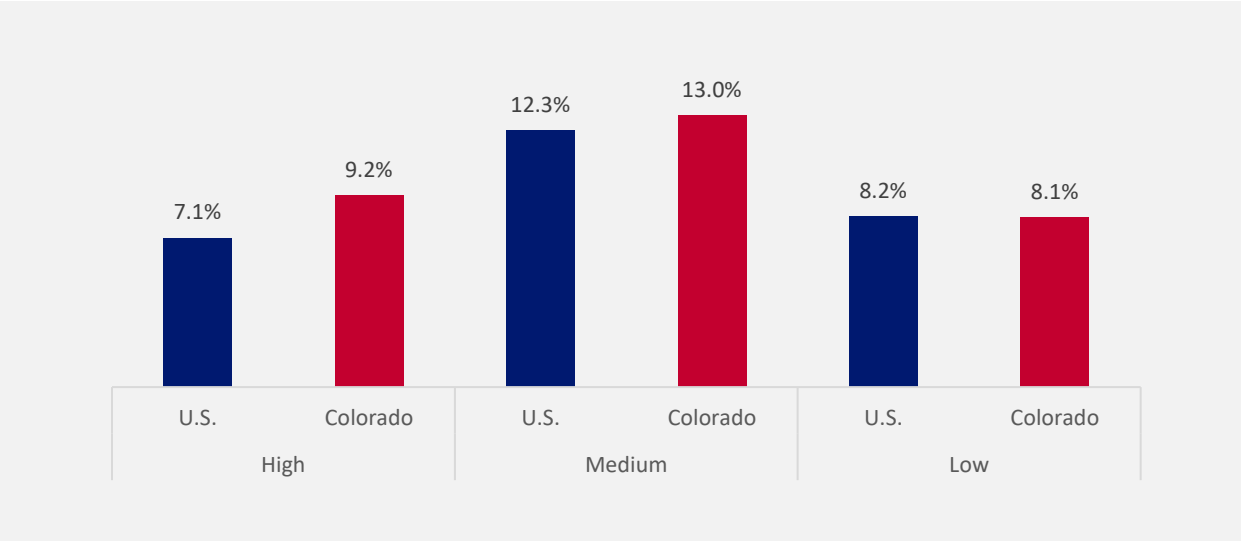
Figure 15. Colorado and U.S. Employment Distribution by Automation Classification (2023)[31]



Aggregate growth in Colorado's highest automated industries outpaced national growth rates, with Colorado's highest automated industries growing by 9.2 percent from 2021 to 2024, compared to 7.1 percent nationally. Colorado's medium automated industries also grew at a slightly faster rate during this period (13.0 percent) relative to national growth (12.3 percent), while Colorado's lowest automated industries grew at a comparable rate to national growth (Figure 16).

[31] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2023).

Figure 16. Colorado and U.S. Employment Growth by Automation Classification (2021Q1 – 2024Q1)[32]



Finance and Insurance, Colorado's highest automated industry, experienced slight employment declines of 1.6 percent from 2021 to 2024, in contrast to national employment growth of 2.8 percent in this industry. Table 7 provides a breakdown of Colorado and U.S. industry growth rates from 2021 to 2024 – Colorado's growth in four of the seven highest automated industries (Management of Companies and Enterprises; Transportation and Warehousing; Professional, Scientific, and Technical Services; and Government) outpaced national growth rates.

Other notable differences include Colorado's Professional, Scientific, and Technical Services industry outpacing national growth rates (18.5 percent employment growth in Colorado, compared to 11.4 percent nationally), and Colorado's Agriculture, Forestry, Fishing, and Hunting industry declining faster than nationally (-9.9 percent employment declines in Colorado, compared to -2.5 percent nationally).

Experiences from the Field

Kirk Mielenz, CEO of RevGen Partners, a Colorado-based firm business and technology consulting firm specializing in digital enablement, customer experience, and analytical solutions, cited the role of AI in automating accounts payable and accounts receivable processing tasks for Colorado firms, allowing them to replace manual and paper-based processes with digital solutions that improve processing accuracy.

Kirk highlighted the importance of company leadership adopting a thoughtful approach to automation as a critical ingredient in the successful implementation of AI solutions. He noted that companies whose leadership (1) maps out clear paths for workers to upskill and/or transition to other roles following implementation and (2) effectively communicates this information to their workforce, can maximize productivity and optimize the allocation of staff resources by (1) allowing employees to take better advantage of AI solutions in their current roles, and/or (2) transition to other roles in the company.

[32] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).

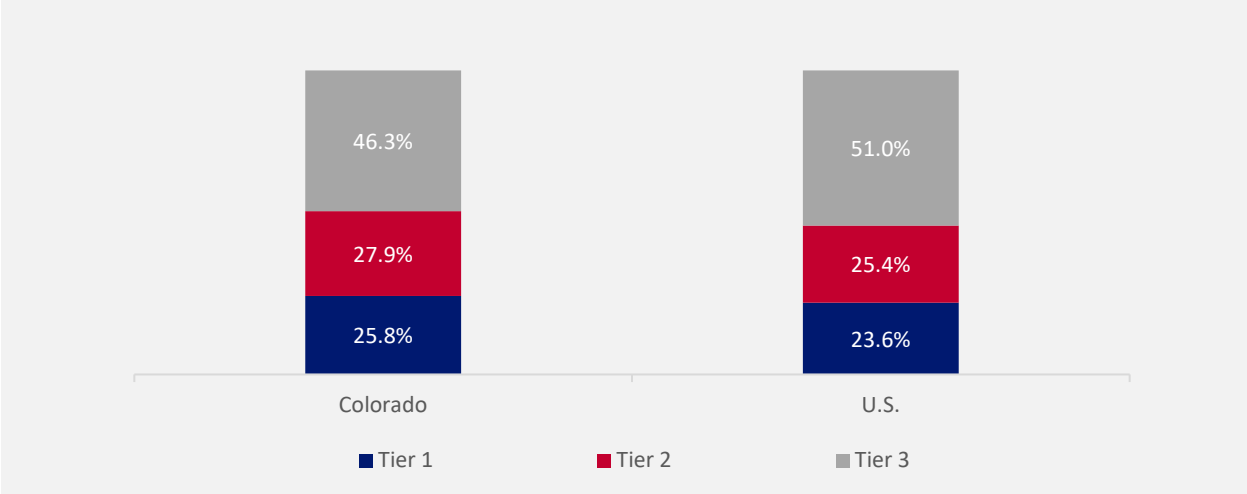
Table 7. Colorado and U.S. Employment Growth by Industry and Automation Classification (2021Q1 – 2024Q1)[33]

CLASSIFICATION	INDUSTRY	COLORADO EMPLOYMENT CHANGE (2021Q1-2024Q1)	U.S. EMPLOYMENT CHANGE (2021Q1-2024Q1)	COLORADO EMPLOYMENT CHANGE RELATIVE TO U.S.
HIGH	Finance and Insurance	-1.6%	2.8%	↓
	Management of Companies and Enterprises	10.3%	10.1%	↑
	Manufacturing	3.0%	5.5%	↓
	Transportation and Warehousing	9.4%	8.5%	↑
	Information	3.5%	8.4%	↓
	Professional, Scientific, and Technical Services	18.5%	11.4%	↑
	Government	9.4%	4.5%	↑
MEDIUM	Real Estate and Leasing	10.3%	10.0%	↑
	Accommodation and Food Services	27.9%	26.5%	↑
	Wholesale Trade	8.4%	9.0%	↓
	Utilities	9.1%	6.7%	↑
	Administrative, Support, and Waste Remediation Services	6.1%	4.6%	↑
	Healthcare and Social Assistance	8.8%	9.8%	↓
LOW	Retail Trade	0.6%	2.9%	↓
	Mining, Quarrying, and Oil and Gas Extraction	16.1%	17.6%	↓
	Arts, Entertainment, and Recreation	39.9%	48.1%	↓
	Other Services (except Public Administration)	9.7%	8.7%	↑
	Construction	6.4%	9.7%	↓
	Agriculture, Forestry, Fishing, and Hunting	-9.9%	-2.5%	↓
	Educational Services	12.5%	9.7%	↑

[33] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).

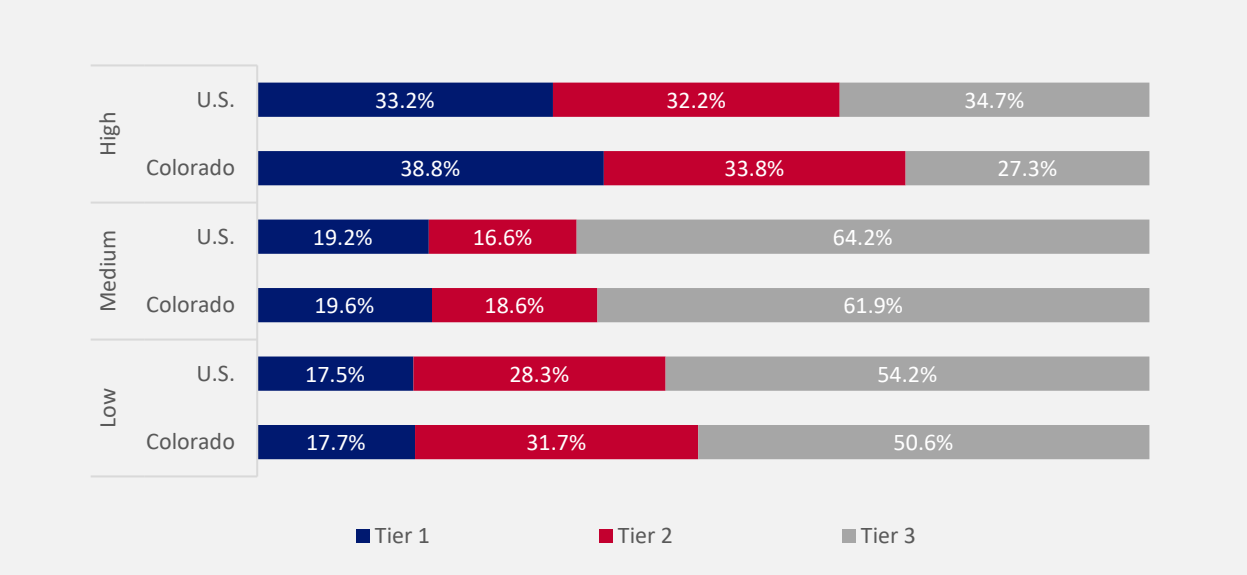
Colorado possesses a higher overall share of Tier 1 and Tier 2 jobs relative to the national average, with Tier 1 and Tier 2 jobs representing over half (53.7 percent) of the Colorado workforce, compared to 49.0 percent nationally (Figure 17).

Figure 17. Colorado and U.S. Job Quality by Tier (2023)[34]



Colorado's highest automated industries provide better job quality than nationally, as shown in Figure 18. 38.8 percent of jobs within Colorado's highest automated industries are Tier 1 jobs, compared to 33.2 percent nationally. Job quality in Colorado's medium and low automated industries is also better than nationally, with Colorado's medium and low automated industries possessing a lower share of Tier 3 jobs than nationally.

Figure 18. Colorado and U.S. Job Quality by Tier and Automation Classification (2023)[35]



[34] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2023).
[35] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2023).

Colorado also offers higher average annual wages than nationally, across all automation tiers. While Colorado offers aggregate annual wages 6.1 percent higher than nationally, Colorado's highest automated industries offer an average annual wage 6.4 percent greater than the national average, or $6,362 higher. Colorado's medium and low automated industries also offer higher average annual wages than nationally, 6.5 percent and 5.4 percent higher than national averages, respectively, **though it is important to note Colorado's cost of living is, on average, 12 percent higher than nationally** (Figure 19).[36]

Figure 19. Average Annual Wage Comparison by Automation Classification[37]

INDUSTRY	U.S. AVERAGE ANNUAL WAGE (2024Q1)	COLORADO AVERAGE ANNUAL WAGE (2024Q1)	PERCENT DIFFERENCE	COLORADO AVERAGE ANNUAL WAGE RELATIVE TO U.S. AVERAGE ANNUAL WAGE
High Automation	$100,174	$106,536	6.4%	↑
Medium Automation	$59,070	$62,925	6.5%	↑
Low Automation	$54,209	$57,149	5.4%	↑
All Industries	$70,857	$75,198	6.1%	↑

A comparison of Colorado's historical levels of job quality, wages, and industry automation to the national averages underscores regional labor market dynamics that could affect the magnitude of workforce impacts of automation.

For example, states like Colorado, which offer higher wages compared to the national average, may provide stronger incentives for employers in "low touch" industries to automate to reduce labor costs, leading to increased churn and higher demand for upskilling and reskilling as workers transition to new opportunities. Higher wages in automating industries may also contribute to labor mobility and churn, if the jobs newly created due to automation are of significantly higher quality.

Thus, understanding of the relative distribution of jobs across automating industries within Colorado, alongside the relatively high level of wages compared to the national average, can help inform workforce planning efforts by highlighting the possibility of automation proceeding at an accelerated rate across the state's industries in the years to come.

[36] Colorado Office of Economic Development & International Trade. Cost of Living Estimates. https://choosecolorado.com/living/cost-of-living/
[37] JobsEQ 2024Q1. Bureau of Labor Statistics. Quarterly Census of Employment and Wages (2024).

Opportunities for Automation

In this study, the research team conducted one-on-one interviews with various stakeholders in Colorado, including, but not limited to, workforce development experts in government and industry, such as the Governor's Office on Workforce, the Colorado Technology Association, the Colorado Business Roundtable, and Colorado Succeeds. The research team also consulted with a private provider of automation solutions headquartered in Colorado; and an expert in the field of quantum computing, a technology expected to have profound impacts on both the pace and scale of automation once it is commercialized.

In addition, the research team convened an Advisory Council of experts, which included representatives of the Colorado Department of Labor and Employment, the Colorado Education Initiative, the Colorado AFL-CIO, and an esteemed expert on sustainable inclusive growth, to discuss the challenges, opportunities, and industries most likely to be impacted by automation.

Based on these discussions, the research team concluded that Colorado's workforce experts have observed the growing adoption of automation across the state's industries, from Aerospace and Logistics to Manufacturing, Construction, Transportation, Food and Beverage, Professional and Business Services, and beyond.

Colorado's workforce experts emphasized the potential of automation solutions to help mitigate structural challenges affecting the state's economy, such as labor force participation and the supply of affordable housing. For example, one workforce expert posited that AI solutions could help to supplement labor force declines due to falling birthrates, citing Japan's use of foodservice robots as an example of automation solutions used to fill workforce gaps. Automation solutions in Healthcare were also cited as a possible means to address the current shortage of healthcare practitioners and support workers, as the rising share of seniors drives increased demand for healthcare products and services. Automation solutions generating 3-D printed housing were cited as a possible solution to help mitigate the significant and growing issue of affordable housing in Colorado.

According to Ben Gerig, Director of Workforce Pathways at Colorado Succeeds, Colorado's Construction industry should prioritize upskilling workers, as Superintendent, Foreman, and Project Manager positions in the state are difficult to fill, with intense competition for local talent often forcing employers to import talent from out of state. AI solutions that automate specific tasks in project management and quality control can help bridge this gap, by reducing the educational requirements typically associated with leadership positions (i.e., mathematics courses offered within a bachelor's degree program).

As such, automation could reshape career pathways in the Construction industry by providing advancement opportunities for experienced workers lacking four-year degrees, allowing them to access leadership positions simply by upskilling via a two-to three-month bootcamps led by a community college and/or an AJCC provider. Such bootcamps could offer coursework targeted at developing introductory and foundational skills in understanding and analyzing AI outputs as well as the mechanics of applying AI to specific tasks in areas such as project management and quality control.

Thus, Colorado's workforce experts not only emphasize the potential of automation to transform specific industries but highlight the importance of education and training providers in supporting the workforce transition within automating industries.

FUTURE AUTOMATION AND THE WORKFORCE

This section uses the Bureau of Labor Statistics' occupation projections to identify occupations impacted by automation in manufacturing, accommodation and food services, and the healthcare and social assistance industry. For each of these industries, a relevant case study is included that provides an example of the impacts of automation on employment within Colorado. Employment projections for selected occupations are also included for each industry to illustrate jobs that are forecast to exhibit significant displacement or growth through 2030. Projections are tied to recent activities in Colorado, which assumes that social, demographic, and technological changes will be consistent with historical trends.[38]

The case studies presented in this section demonstrate the varying occupational impacts of automation, and the evolving nature of skills in different industries impacted by automation. Each of these industries – manufacturing, accommodation and food services, and healthcare and social assistance – were selected for deeper analysis since they exemplify distinct patterns of automation impacts across diverse industries exhibiting varying levels of automation and growth.

In Colorado's manufacturing industry, workers such as Team Assemblers, Assemblers and Fabricators, and All Other are predicted to exhibit displacement from automation through 2030. However, automation is expected to create new employment opportunities in more desirable jobs in manufacturing, by moving workers away from such manual, labor-intensive production roles, into positions focused on operating and maintaining highly sophisticated machinery.

Colorado's fast food industry provides examples of automation leading to upskilling as automation reduces demand for low-quality jobs such as Fast Food Cooks, while increasing demand for First-Line Supervisors of Food Preparing and Serving Workers. Increasingly automated food preparation jobs have also led to growing demand for system maintenance and customer service positions.

Finally, Colorado's healthcare and social assistance industry provides an example of automation leading to relatively little worker displacement, as healthcare jobs are "high touch", requiring considerable skills in interpersonal communication and customer service; thus, human interaction is highly valued in this field. A detailed description of impacts across each of these industries follows.

[38] U.S. Bureau of Labor Statistics. Handbook of Methods. https://www.bls.gov/opub/hom/emp/concepts.htm

Manufacturing

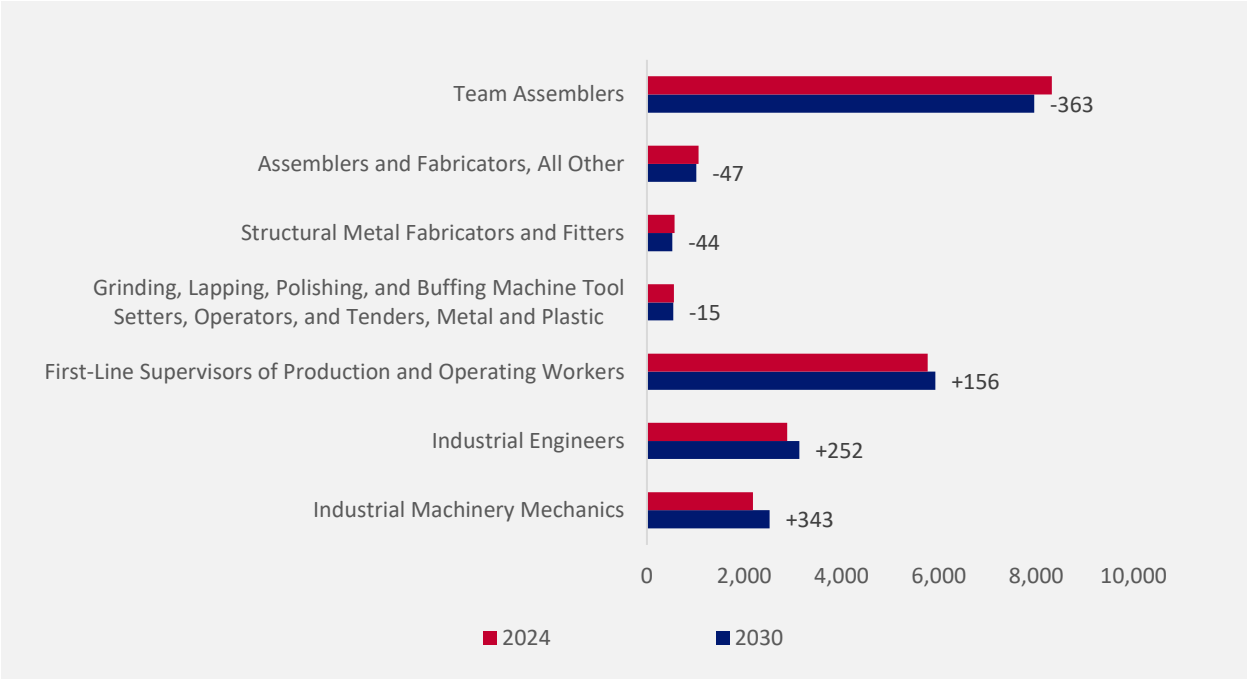
Automation is creating employment opportunities and more desirable jobs in the manufacturing industry. The National Renewable Energy Laboratory (NREL) Composites Manufacturing Education and Technology Facility (CoMET)[39], located in Golden, CO, is a prime example of the state's increasingly automated manufacturing industry. Opened in 2017 as a joint venture between the Department of Energy's Advanced Manufacturing and Industrial Decarbonization Offices, the Institute for Advanced Composites Manufacturing Innovation,[40] the State of Colorado, and NREL, CoMET has integrated robotics and automated technologies into wind turbine blade manufacturing by automating certain labor-intensive precision cutting and assembly manufacturing processes. These innovations have made these jobs more desirable by moving away from manual, labor-intensive production roles, to positions focused on operating and maintaining highly sophisticated machinery. Additionally, wind turbine blades have historically been imported from overseas, with Chinese-based firms representing four of the five largest offshore wind manufacturers as of 2023.[41]

With NREL's continued implementation of automated manufacturing processes at the CoMET facility, more blades are now being produced domestically. This supply chain shift has bolstered local manufacturing output, creating more attractive, higher-skilled, and less physically demanding jobs. Workers in the sector are now required to develop expertise in advanced robotics and precision manufacturing, which has the potential to attract a new generation of skilled workers to the renewable energy industry. These higher-skilled, higher-paying jobs offer more stability and are seen as less hazardous and physically demanding than traditional manufacturing roles, contributing to a higher-quality workforce.[42]

Additional implementation of automation in Colorado's manufacturing industry is projected to displace low-quality jobs such as **Team Assemblers**, **Assemblers and Fabricators, and All Other** by a combined 400 jobs by 2030. Market demand will shift away from these lower-quality jobs to higher-quality jobs such as **Industrial Engineers** and **Industry Machinery Mechanics,** which will see an additional 250 and 340 jobs in Colorado by 2030, respectively (Figure 20).

[39] National Renewable Energy Laboratory (NREL). Composites Manufacturing Education and Technology Facility (CoMET). https://www.nrel.gov/wind/facilities-comet.html
[40] National Renewable Energy Laboratory (NREL). The Institute for Advanced Composites Manufacturing Innovation. https://www.nrel.gov/wind/iacmi.html
[41] Global Wind Energy Council. Wind Turbine Manufacturers See Record Year Driven by Growth in Home Markets. https://gwec.net/wind-turbine-manufacturers-see-record-year-driven-by-growth-in-home-markets/
[42] Robotics Tomorrow. NREL Invites Robots to Help Make Wind Turbine Blades. https://www.roboticstomorrow.com/story/2024/05/nrel-invites-robots-to-help-make-wind-turbine-blades/22517/

Figure 20. Employment Projections for Selected Manufacturing Occupations[43]



Accommodation and Food Services

Increasingly automated food preparation jobs are leading to growing demand for system maintenance and customer service positions. Good Times Burgers & Frozen Custard in Denver has integrated AI to streamline operations, replacing cashiers with machines to take drive-through orders and handle some cooking tasks.[44] This shift reduces dependency on human labor, particularly for repetitive or some customer-facing tasks, while increasing order accuracy and efficiency. Positions traditionally held by entry-level workers are shifting to roles focused on maintaining automated systems as businesses look to balance cost savings with customer experience outcomes.

Similarly, Chipotle, originally founded in Denver, CO, has begun in-store testing of "Autocado," a robot designed to process and prepare avocados.[45] By automating labor-intensive tasks like avocado preparation, Chipotle aims to free up staff hours to focus on tasks requiring human interaction, such as customer service. These initiatives also reflect a broader industry trend of applying automation to increase efficiency while addressing high turnover rates and labor shortages. As a result, employees in the food industry are seeing their roles evolve, with shrinking demand for positions involving repetitive tasks, and an emerging need for technical skills to operate and monitor these advanced systems.

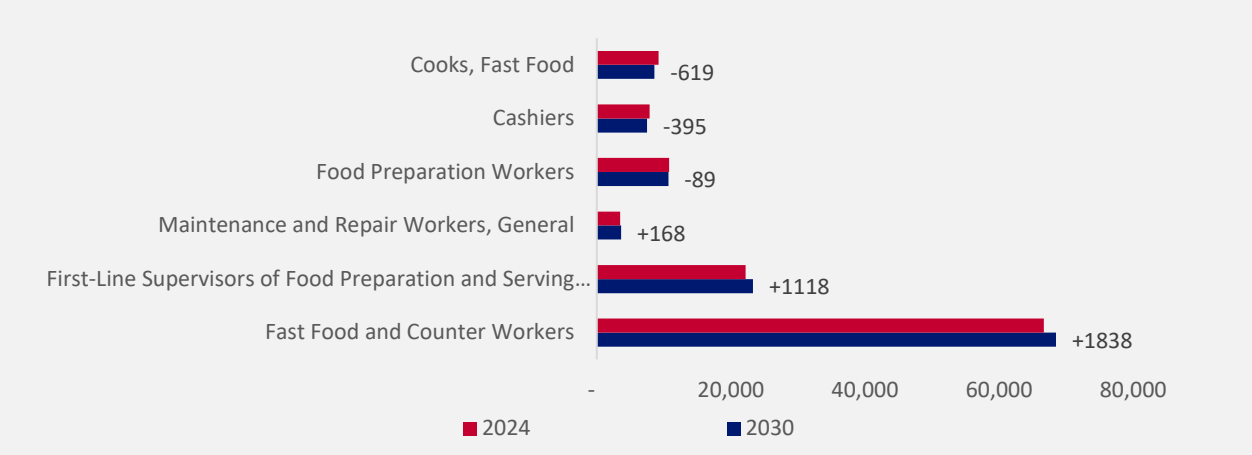
Projected employment estimates show **Cashiers** employment decreasing by around 400 jobs. "Low-touch occupations", or roles that require minimal customer interaction, such as **Food Preparation Workers** and **Cooks, Fast Food** are expected to decrease by a combined 700 jobs, while **First-Line Supervisors of Food Preparation and Serving Workers** increase by 1,100. Lower-quality jobs, such as

[43] Bureau of Labor Statistics. Employment Projections (2024).
[44] The Colorado Sun. Understanding AI through Holly, the fast-food bot taking breakfast orders at Good Times. https://coloradosun.com/2019/08/07/good-times-artificial-intelligence-fast-food-workers/
[45] Chipotle Mexican Grill. Chipotle Partners with Vebu to test Autocado prototype, a robotic solution to guacamole prep. https://newsroom.chipotle.com/2023-07-12-CHIPOTLE-PARTNERS-WITH-VEBU-TO-TEST-AUTOCADO-PROTOTYPE,-A-ROBOTIC-SOLUTION-TO-GUACAMOLE-PREP

food preparation workers, can move into managerial positions as food preparation jobs become increasingly automated.

Fast Food and Counter Workers see strong projected employment growth in Colorado by 2030, due to the "high touch" nature of customer service and displaced food preparation workers transitioning into customer service positions. Additionally, the industry will see an increase in **Maintenance and Repair Workers, General** to look after the implementation of automated technologies and devices, such as Autocado (Figure 21).

Figure 21. Employment Projections for Selected Accommodation and Food Services Occupations[46]



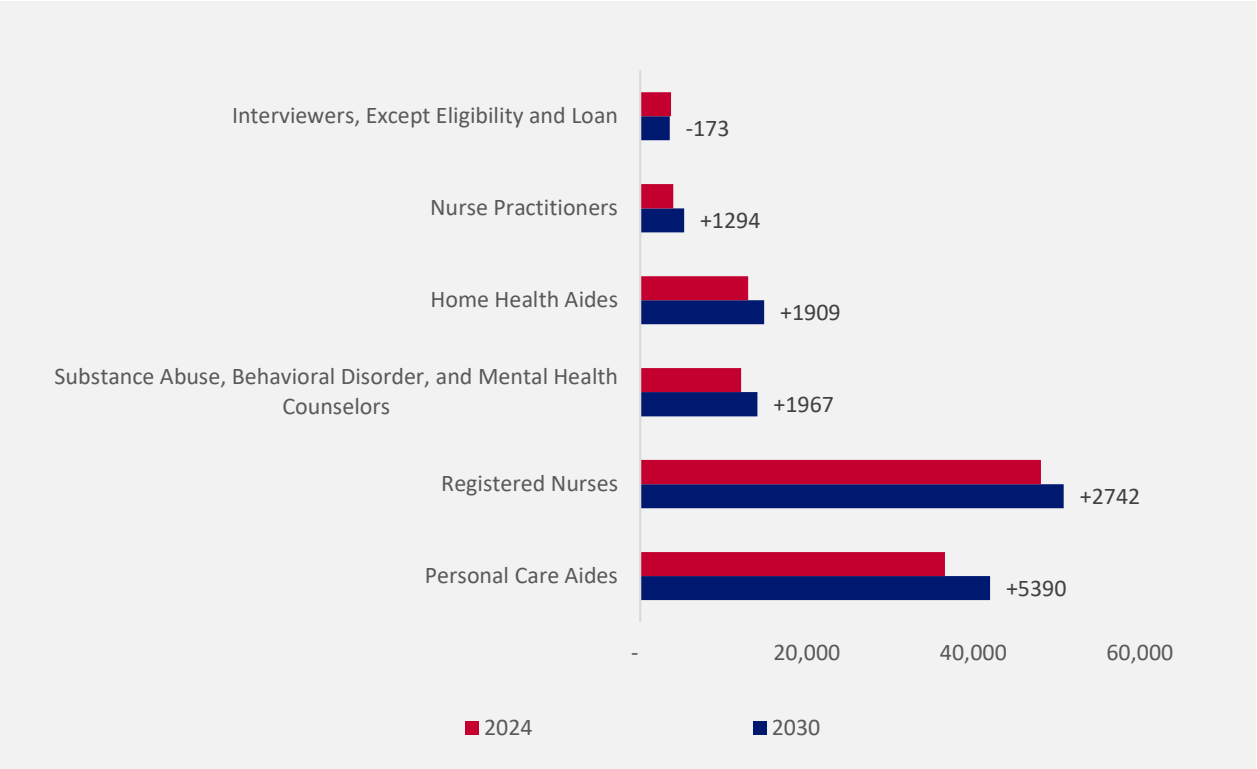
Healthcare and Social Assistance

Despite being heavily automated, the healthcare and social assistance industry will see relatively little displacement. Healthcare has historically experienced high levels of automated technology integration, with patient information management systems being controlled by automated networks and the use of machine learning to diagnose patients.[47] Despite this, there has been relatively little employment displacement by automation due to healthcare being a "high touch" industry.

Recent research reveals that six in ten (60 percent) patients are uncomfortable with their healthcare provider relying on AI or automated technologies, with one in three patients (33 percent) indicating increased AI or automated technology integration would actually *worsen* healthcare outcomes.[48] Patients do not want to be diagnosed by an automated robot or communicate with artificial intelligence, especially when discussing their personal health, though there are potential applications to increase efficiency of tasks like scheduling and patient notification. As a result, there are significant projected increases in employment among **Personal Care Aides**, **Registered Nurses**, **Home Health Aides**, and **Nurse Practitioners**, totaling an employment increase of around 11,000 jobs by 2030 in Colorado (Figure 22).

[46] Bureau of Labor Statistics. Employment Projections (2024).
[47] MedTech Intelligence. Care Beyond Walls: Six Digital Trends Shaping Health Care in 2024. https://medtechintelligence.com/feature_article/care-beyond-walls-six-digital-trends-shaping-health-care-in-2024/
[48] Pew Research Institute. 60% of Americans Would be Uncomfortable with Provider Relying on AI in Their Own Health Care. https://www.pewresearch.org/science/2023/02/22/60-of-americans-would-be-uncomfortable-with-provider-relying-on-ai-in-their-own-health-care/

Figure 22. Employment Projections for Selected Healthcare and Social Assistance Occupations[49]



Interviewers, Except Eligibility and Loan see the most significant decrease in the healthcare and social assistance industry, losing an estimated 170 jobs by 2030. These jobs are being displaced by automated data collection, archival processes, and machine learning algorithms designed to collect, sort, and analyze patient data.

Machine learning models are used in different industries to categorize and process data. These models can sometimes introduce bias into their analysis, called "model bias," which is defined as when a predictive algorithm favors one group over others, even if it's not explicitly trained to incorporate such bias. This can stem from biased training data, incorrect model parameters, or inappropriate application in new contexts. Many states have adopted legislation to regulate bias in AI which can impact adoption and, therefore, worker impact across geographies, industries, and firms.

[49] Bureau of Labor Statistics. Employment Projections (2024).

Quantum Computing and the Future of Automation

While the quantum computing industry is currently in a nascent stage, quantum computing is poised to propel the computing industry toward a major technological leap forward, enabling higher processing speeds and elevating the capabilities of automation technologies.

Experts in Colorado's quantum computing sector believe that predictive analytics and R&D in defense, energy, and biotechnology offer the most compelling use case for quantum computing in the near term; as quantum enables and accelerates processes in these industries, new products can be created, spurring job creation in manufacturing, sales, marketing, and support. Skilled workers will be needed to fill jobs in operating, installing, testing, and repairing new equipment that integrate quantum technologies; and research technicians and salespersons will require knowledge of more highly specialized tools, in addition to an advanced understanding of quantum computing.

Ultimately, Colorado's experts believe that the application of quantum computing to automation will not necessarily affect job titles significantly for Colorado's highly educated workers, but that the knowledge and experience that will be required for their jobs will ultimately need to expand to include skills related to quantum computing. Some of these core competencies might include knowledge regarding circuit processors and chips, application of quantum science and technology, semiconductor retooling, new software languages, and analytical and model-building skills specific to quantum.

However, the path to commercialization for quantum computing remains uncertain, with the tipping point for widespread adoption likely beyond 2030 and the specific workforce impacts difficult to predict with high certainty.

APPENDIX A: METHODOLOGY

Analysis Framework

This section outlines the methodology for each section of the report.

Industry Degree of Automation

Industry Degree of Automation scores were calculated using Degree of Automation from O*NET. The Degree of Automation is a context measure that measures the level of automation in an occupation. This measure is provided for 6-digit Standard Occupational Classification (SOC) codes. O*NET obtains the Degree of Automation by surveying a random sample of businesses to determine the current automation prevalence in each occupation. This report used the 2-digit North American Classification System (NAICS) industries for analysis. For each industry, the Degree of Automation was calculated by calculating a weighted average using Degree of Automation data from O*NET and the occupational distribution for each 2-digit NAICS industry in Colorado from JobsEQ. If an SOC code was not assigned a degree of Automation assigned by O*NET, the 3-digit SOC code average was used instead. Lastly, the industries were categorized into high, medium, and low automated categories depending on the calculated measure.

Job Quality

The Job Quality analysis utilized a tier system constructed by BW Research. In this system, there are three tiers based on wages. Tier 1 encompasses the highest-wage jobs, while Tier 3 encompasses the lowest-wage jobs, and Tier 2 encompasses mid-wage jobs.[50] These tiers were used in unison with Occupation Employment and Wage Statistics (OEWS) Research Estimates by State and Industry to determine job quality for high, medium, and low-automated industries.

Occupation Employment Change

Occupation employment change analysis by low, medium, and high automated industries was conducted using the OEWS Research Estimates by State and Industry. For each level of automated industries, employment change was analyzed over a two-year period, 2021-2023.

Automation and Skills

Skills were analyzed across different levels of automation by collecting employment numbers for each occupation using high, medium, and low automated categories. This data was pulled from the U.S. Bureau of Labor Statistics' Occupational Employment and Wage Statistics (OEWS). This data was combined with a system of skills ranked by O*NET for 6-digit SOC codes to determine which skills were the most important for different levels of automated industries.

O*NET provides the top 10 skills for 6-digit SOC codes. The voting system was organized such that the top skill contributed 10 to its score and was multiplied by the employment number for the respective SOC code. The final scores were ranked in order, one being most important and 33 being the least. The proportion of each skill's votes was also taken to understand the importance of the skills in each level

[50] A full list of the SOC codes in each tier is available upon request.

of automated industry. That is, a score of 100 indicates this is the only skill needed in the respective industry, while a score of zero indicates this skill is not needed at all.

O*NET Online Data Sources

Degree of Automation Dataset

Degree of Automation is a measure that quantifies how automated a job is, with 100 being the most automated and zero being the least. O*NET collects this data by surveying a statistically random sample of businesses expected to employ workers in the targeted occupations and a random sample of workers in those occupations within those selected businesses.

*O*NET, Degree of Automation.* *https://www.onetonline.org/find/descriptor/result/4.C.3.b.2*

Skills Database

O*NET provides a broad range of skills and quantifies them like the Degree of Automation measure. The process for collecting data regarding occupation skills is the same as collecting data for the Degree of Automation measure.

*O*NET Online, Browse by Basic Skills.* *https://www.onetonline.org/find/descriptor/browse/2.A*

*O*NET Online, Browse by Cross-Functional Skills.*
https://www.onetonline.org/find/descriptor/browse/2.B

U.S. Bureau of Labor Statistics

Occupational Employment and Wage Statistics (OEWS), Research Estimates by State and Industry

OEWS Research Estimates by State and Industry provides Standard Occupation Classification (SOC) code employment by North American Industry Classification System (NAICS). This data was used to group employment into high, medium, and low-automated NAICS industries. The last release of this data was in 2023.

U.S. Bureau of Labor Statistics, Occupational Employment and Wage Statistics Research Estimates by State and Industry. *https://www.bls.gov/oes/current/oes_research_estimates.htm*

Quarterly Census of Employment and Wage Statistics

QCEW provides regularly updated employment figures for different NAICS. This data was used to provide more recent estimates up to 2024Q1.

U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW).
https://www.bls.gov/cew/data.htm

APPENDIX B: SUPPORTING FIGURES

Table 8 outlines the definition for each 2-digit North American Industry Classification System (NAICS) industry utilized in the report. NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

Table 8. Industry Definitions[51]

INDUSTRY	NAICS	DESCRIPTION
Finance and Insurance	52	Establishments primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions.
Management of Companies and Enterprises	55	Establishments that hold the securities of companies and enterprises or establishments (except government establishments) that oversee establishments of the company or enterprise and that normally undertake the strategic planning and decision-making role of the company or enterprise.
Manufacturing	31-33	Establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products.
Transportation and Warehousing	48-49	Establishments involved in the transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. These establishments use transportation equipment or transportation-related facilities as a productive asset.
Information	51	Establishments engaged in producing and distributing information and cultural products, providing the means to transmit or distribute these products as well as data or communications, or processing data.
Professional, Scientific, and Technical Services	54	Establishments that specialize in performing professional, scientific, and technical activities for others.
Government	92	Establishments of federal, state, and local government agencies that administer, oversee, and manage public programs and have executive, legislative, or judicial authority over other institutions within a given area.
Real Estate and Rental and Leasing	53	Establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services.
Accommodation and Food Services	72	Establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption.
Wholesale Trade	42	Establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.

[51] U.S. Census Bureau. North American Industry Classification System (NAICS) (2022). https://www.census.gov/naics/

Utilities	22	Establishments engaged in the provision of electric power, natural gas, steam supply, water supply, or sewage treatment and disposal.
Administrative and Support and Waste Management and Remediation Services	56	Establishments performing routine support activities for the day-to-day operations of other organizations.
Health Care and Social Assistance	62	Establishments providing health care and social assistance for individuals.
Retail Trade	44-45	Establishments primarily engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.
Mining, Quarrying, and Oil and Gas Extraction	21	Establishments that extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas.
Arts, Entertainment, and Recreation	71	Establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons.
Other Services (except Public Administration)	81	Establishments engaged in providing services not specifically provided for elsewhere in the classification system.
Construction	23	Establishments primarily engaged in the construction of buildings or engineering projects (e.g., highways and utility systems).
Agriculture, Forestry, Fishing and Hunting	11	Establishments primarily engaged in growing crops, raising animals, harvesting timber, and harvesting fish and other animals from a farm, ranch, or their natural habitats.
Educational Services	61	Establishments that provide instruction and training in a wide variety of subjects. This instruction and training is provided by specialized establishments, such as schools, colleges, universities, and training centers.

Figure 23 illustrates the proportion of employment in each county that is in high-automated industries, using the definition utilized throughout the paper.

Figure 23. Share of High Automation Industry Employment by County

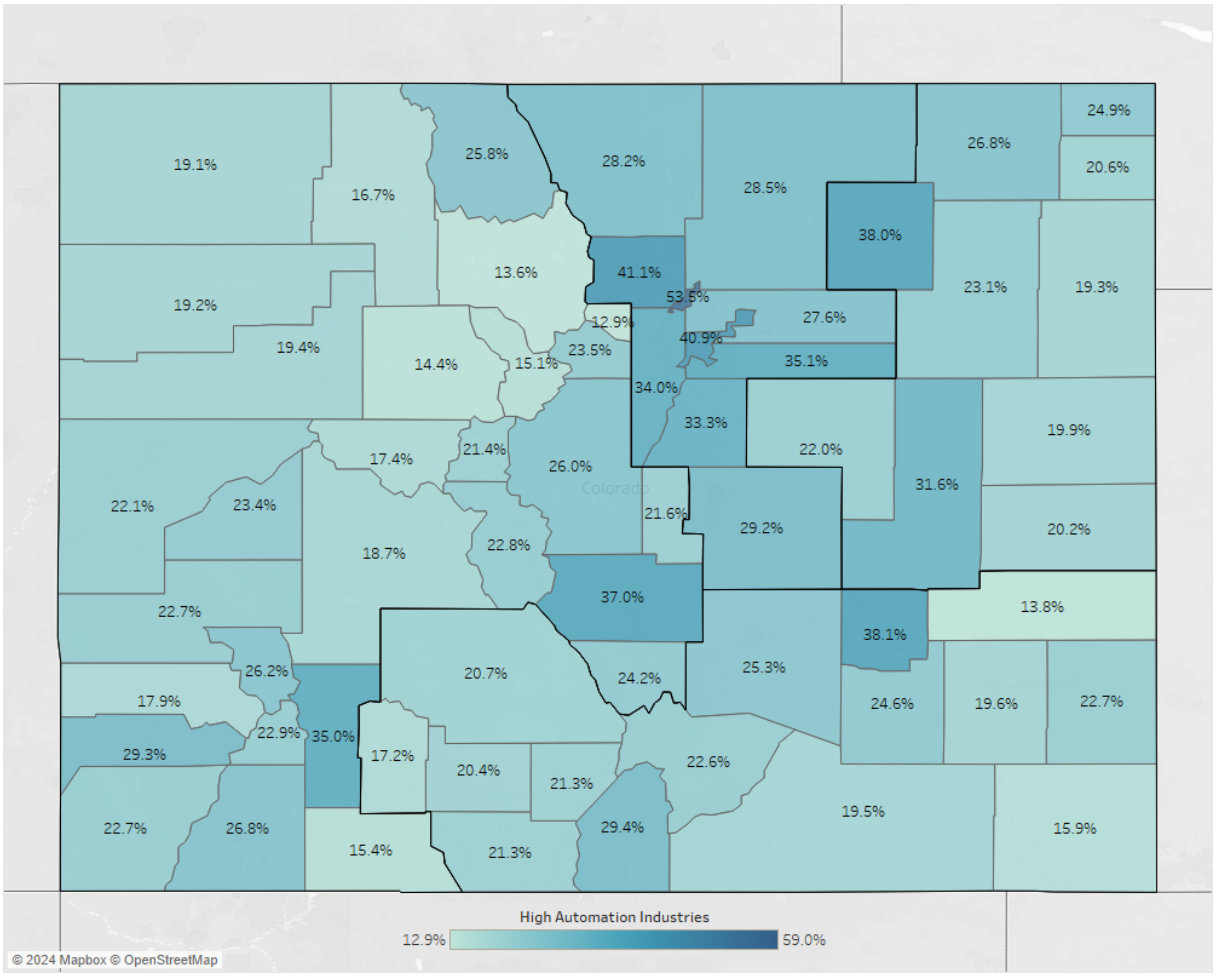


Figure 24 shows the proportion of employment in each county in medium-automated industries, using the definition utilized throughout the paper.

Figure 24. Share of Medium Automation Industry Employment by County

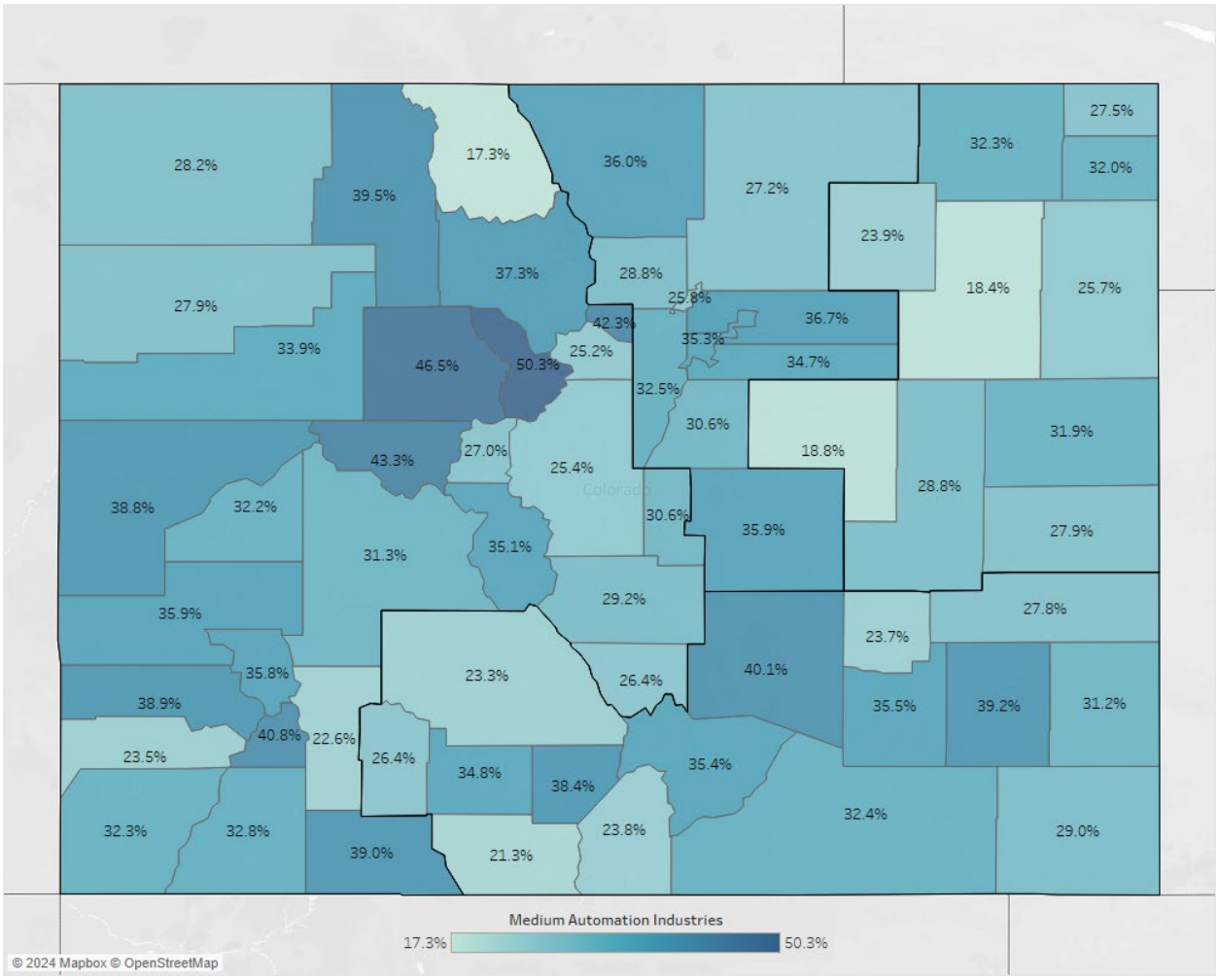


Figure 25 shows the proportion of employment in each county in low-automated industries, using the definition utilized throughout the paper.

Figure 25. Share of Low Automation Industry Employment by County

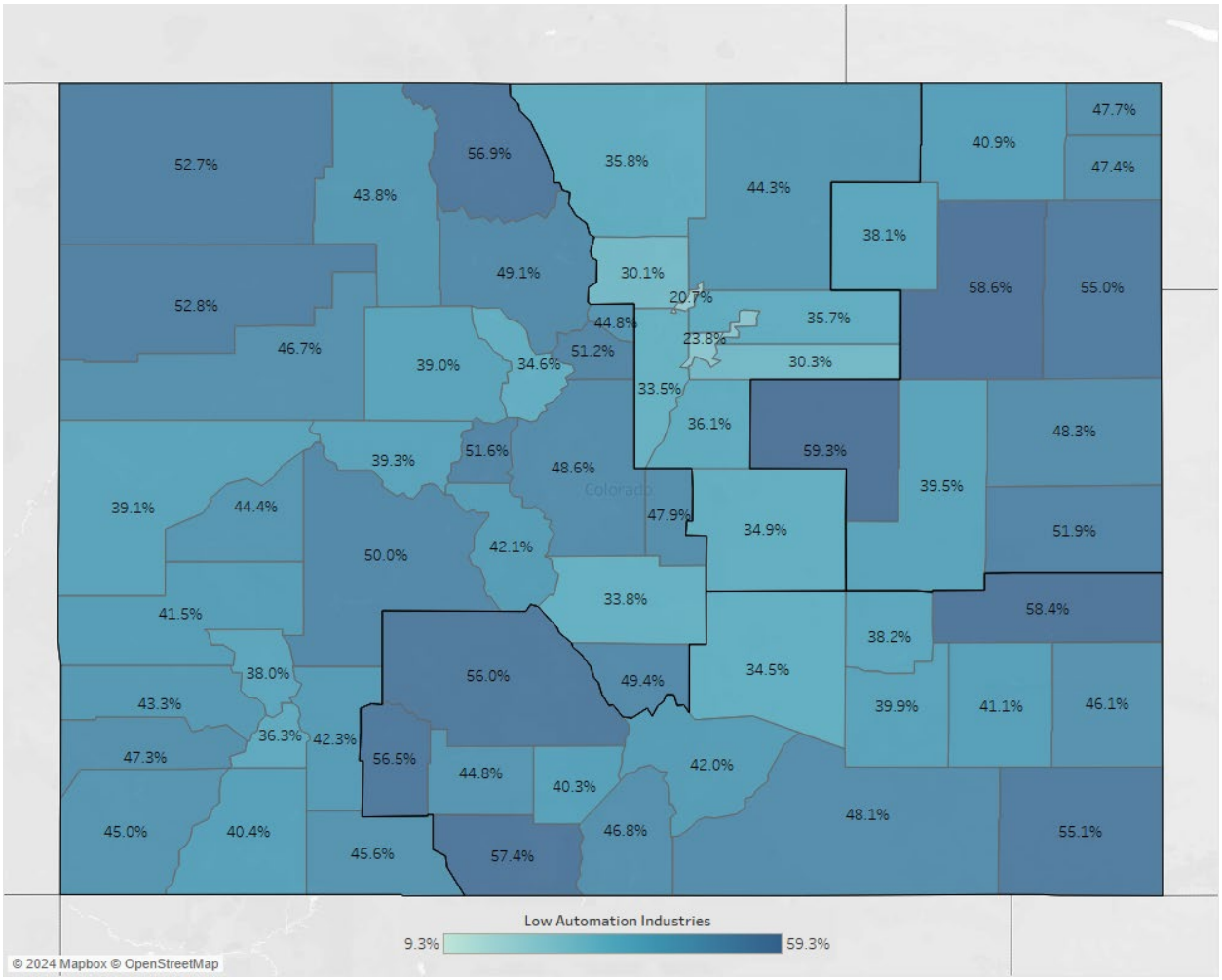


Table 9 outlines the definition for each skill discussed in the report. The definition for all skills can be found on O*NET Online.

Table 9. Definitions for Identified Skills[52]

SKILL	DEFINITION
Complex Problem Solving	Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
Coordination	Adjusting actions in relation to others' actions.
Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
Equipment Maintenance	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
Instructing	Teaching others how to do something.
Judgment and Decision Making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
Learning Strategies	Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
Mathematics	Using mathematics to solve problems.
Monitoring	Monitoring/Assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
Operation and Control	Controlling operations of equipment or systems.
Programming	Writing computer programs for various purposes.
Science	Using scientific rules and methods to solve problems
Service Orientation	Actively looking for ways to help people.
Social Perceptiveness	Being aware of others' reactions and understanding why they react as they do.
Troubleshooting	Determining causes of operating errors and deciding what to do about it.
Writing	Communicating effectively in writing as appropriate for the needs of the audience.

Table 10 presents the ranking for each skill by high, medium, and low automated industries. A ranking of 1 indicates the skill is the most important in this level of automated industry and a ranking of 33 indicates it is the least important.

[52] O*NET Online. Basic and Cross-Function Skills.

Table 10. Skills Classification by Automation Classification in Colorado[53]

SKILL	IMPORTANCE RANKING		
	HIGH AUTOMATED INDUSTRIES	MEDIUM AUTOMATED INDUSTRIES	LOW AUTOMATED INDUSTRIES
Active Listening	1	1	1
Speaking	4	2	2
Critical Thinking	2	3	3
Service Orientation	12	4	7
Coordination	9	5	6
Social Perceptiveness	10	6	8
Monitoring	5	7	5
Reading Comprehension	3	8	4
Judgment and Decision Making	7	9	9
Time Management	14	10	13
Active Learning	11	11	11
Complex Problem Solving	6	12	12
Writing	8	13	14
Operation and Control	15	14	18
Operations Monitoring	13	15	17
Persuasion	17	16	16
Management of Personnel Resources	19	17	23
Negotiation	23	18	21
Instructing	26	19	10
Equipment Maintenance	22	20	25
Troubleshooting	21	21	19
Mathematics	16	22	20
Repairing	24	23	22
Quality Control Analysis	18	24	24
Learning Strategies	27	25	15
Systems Analysis	20	26	29
Science	25	27	28
Equipment Selection	31	28	27
Installation	32	29	26

[53] Skills are classified such that a score of 1 is the most important skill in the level of automated industries, and a score of 33 is the lowest.

Systems Evaluation	28	30	30
Programming	29	31	31
Operations Analysis	30	32	32
Management of Financial Resources	33	33	33

Table 11 shows the importance of each skill in high, medium, and low-automated industries. A higher importance level indicates the skill is more important in that level of automated industries.

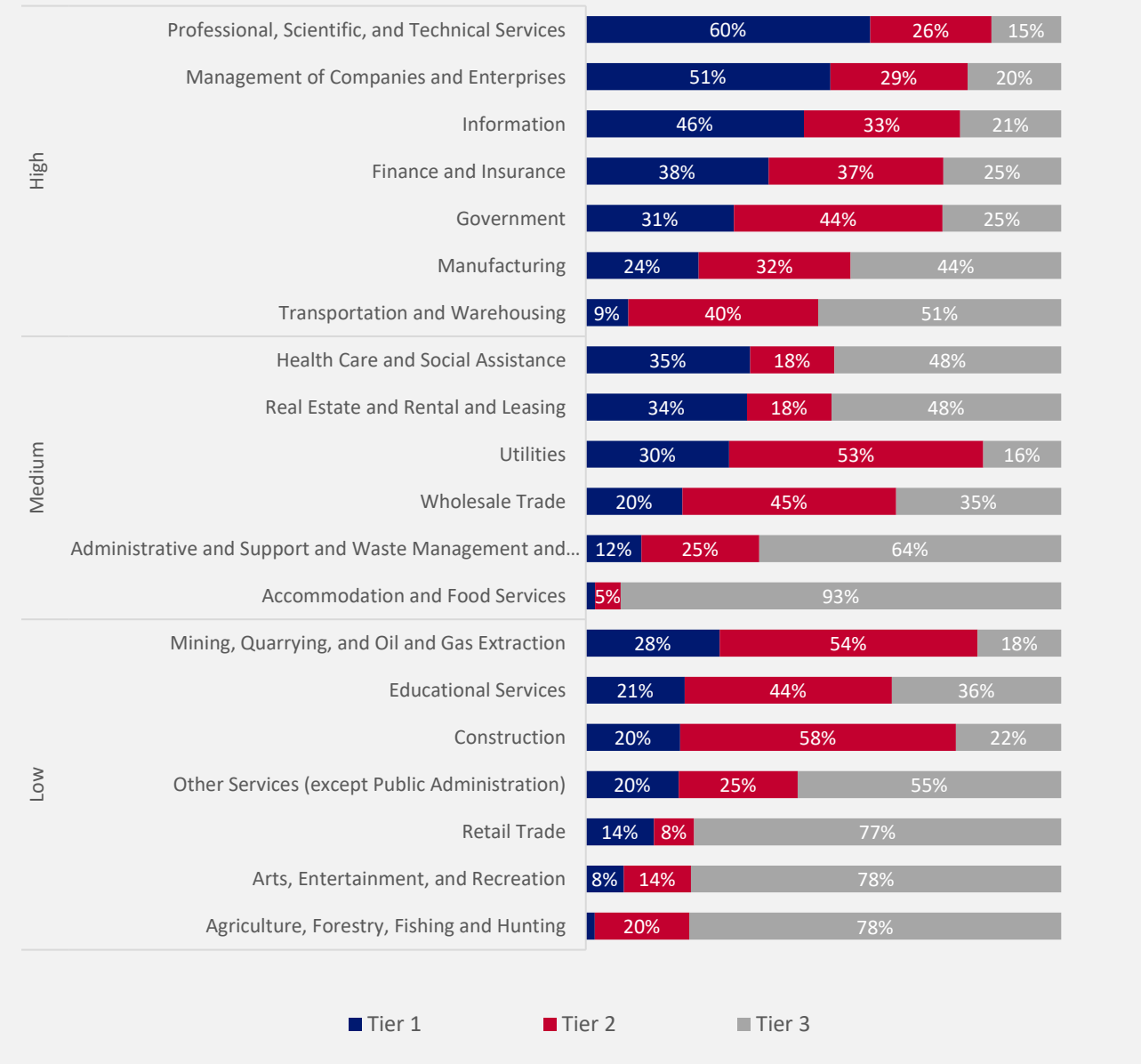
Table 11. Skills Ranking by Automation Classification in Colorado

Skill	Importance Level		
	High Automated Industries	Medium Automated Industries	Low Automated Industries
Active Listening	14.95	15.85	15.04
Speaking	11.46	12.32	12.24
Critical Thinking	12.50	10.19	9.57
Reading Comprehension	12.00	7.66	7.20
Monitoring	6.38	7.92	6.91
Coordination	3.83	8.07	6.25
Service Orientation	2.69	8.20	6.14
Social Perceptiveness	3.12	7.96	5.00
Judgment & Decision Making	5.11	3.20	3.16
Instructing	0.34	0.72	2.86
Active Learning	2.80	2.55	2.54
Complex Problem Solving	5.15	2.49	2.27
Time Management	2.14	2.69	2.25
Writing	4.85	1.90	2.10
Learning Strategies	0.27	0.23	2.09
Persuasion	1.03	1.08	2.02
Operations Monitoring	2.25	1.34	1.99
Operation and Control	2.12	1.39	1.59
Troubleshooting	0.66	0.51	1.39
Mathematics	1.35	0.48	1.34
Negotiation	0.62	0.78	1.25
Repairing	0.44	0.44	1.10
Management of Personnel Resources	0.71	0.80	1.07
Quality Control Analysis	0.82	0.38	0.98

Equipment Maintenance	0.66	0.54	0.75
Installation	0.02	0.05	0.50
Equipment Selection	0.04	0.06	0.15
Science	0.36	0.06	0.08
Systems Analysis	0.70	0.08	0.08
Systems Evaluation	0.27	0.03	0.03
Programming	0.23	0.03	0.01
Operations Analysis	0.15	0.00	0.01
Management of Financial Resources	0.00	0.00	0.00

Figure 26 shows job quality for 2-digit NAICS industries in high, medium, and low automated industries.

Figure 26. Colorado Job Quality by Tier, Industry, and Automation Classification[54]



[54] Bureau of Labor Statistics. Occupational Employment and Wage Statistics, Research Estimates by State and Industry (2021 – 2023).

APPENDIX C: REGION DEFINITION

Table 12 details the counties included in each of the four defined regions: Western/Mountain, Southern, Front Range, and Eastern counties.

Table 12. Region Definition Counties and County FIPS Codes

Western/ Mountain Counties	Southern Counties	Front Range Counties	Eastern Counties
Archuleta, Chaffee, Clear Creek, Custer, Delta, Dolores, Eagle, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Jackson, Lake, LaPlata, Mesa, Moffat, Montezuma, Montrose, Ouray, Park, Pitkin, Rio Blanco, Routt, San Juan, San Miguel, Summit, Teller	Alamosa, Baca, Bent, Conejos, Costilla, Crowley, Huerfano, Kiowa, Las Animas, Mineral, Otero, Prowers, Pueblo, Rio Grande, Saguache	Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Weld	Cheyenne, Elbert, Kit Carson, Lincoln, Logan, Morgan, Phillips, Sedgwick, Washington, Yuma
COUNTY FIPS CODES: 08007, 08015, 08019, 08027, 08029, 08033, 08037, 08043, 08045, 08047, 08049, 08051, 08053, 08057, 08067, 08065, 08077, 08081, 08083, 08085, 08091, 08093, 08097, 08103, 08107, 08111, 08113, 08117, 08119	COUNTY FIPS CODES: 08003, 08009, 08011, 08021, 08023, 08025, 08055, 08061, 08071, 08079, 08089, 08099, 08101, 08105, 08109	COUNTY FIPS CODES: 08001, 08005, 08013, 08014, 08031, 08035, 08041, 08059, 08069, 08123	COUNTY FIPS CODES: 08017, 08039, 08063, 08073, 08075, 08087, 08095, 08115, 08121, 08125