Automation Potential of Jobs in Phoenix

# Introduction

Today, work as we know it is shifting, and rapidly. Over the next decade and beyond, how will artificial intelligence and automation change work and opportunity in cities like Phoenix?

The Phoenix metro area and other communities across the country will be at the front lines of this change. To prepare for this future, New America will host the first [ShiftLabs](https://www.newamerica.org/work-workers-technology/about-shiftlabs/) on April 20th in Phoenix, Arizona in partnership with Arizona State University and with support from the Rockefeller Foundation. At the day-long design lab, leaders from the Phoenix region and across the country—technology, industry, policy, philanthropy and culture—will come together to consider the impact of technology and automation on work in Phoenix and to develop a long-term, place-based vision for opportunity.

To bring a data-driven lens to ShiftLabs, New America partnered with leading labor market analytics company [Burning Glass Technologies](https://www.burning-glass.com/) to conduct a first-of-its-kind analysis on the potential of automation to impact jobs in the greater Phoenix region. We ask: Of the thousands of jobs held by Phoenix workers today, which could be performed by existing technology in the next decade? Which occupations and skills are at greatest risk of automation, and who holds those jobs today? To answer these questions, we combined and analyzed (adjective) Burning Glass data on the likelihood of a computer being able to do a job using existing technology, as well as data from the Bureau of Labor Statistics on occupations in Phoenix and nationally.

To be sure, emerging technologies will also create many jobs, including entirely new jobs that don’t even exist today. This is a familiar pattern—McKinsey estimates that every decade, 7 percent of jobs did not exist a decade earlier. On balance, automation and technology may create more jobs than they eliminate, but predictions of the number and types of jobs that will be created are outside the scope of this study.

The findings of our analysis are clear: Automation will have a widespread impact on jobs in Phoenix in the years ahead, slightly more than in the country as a whole. In some cases, technology will eliminate high-risk jobs. In many more cases, technology will change them—sometimes dramatically.

# Overview: How Vulnerable are Phoenix Jobs to Automation?

In the Phoenix metro area, 649,040 people are employed in occupations that are at high risk of automation—35 percent of total jobs. Another 537,110 jobs (29 percent of total jobs) are at moderate risk of automation. Only a little more than a third (36 percent) are at low risk.

## Which Workers in Phoenix are Most Vulnerable to Automation?

Among workers, the least educated workers are at greatest risk of automation. This is especially true of workers with a high school degree or less, who comprise 45 percent of the workers at high risk of automation in Phoenix and just 18 percent of workers at low risk. Average wages also illustrate the disproportionate risk of automation among low-skilled and low-paid workers. According to data from the McKinsey Global Institute, workers in the Phoenix area earning $10/hour on average have a 63 percent risk of automation, while workers earning $30 or higher an hour have an average 27 percent risk of automation. Workers earning more than $50/hour have an even lower risk of 24 percent.

## Largest Occupations at Most Risk

Of the 50 occupations that employ the most people in the Phoenix metro area (totally just over half of all workers), the following 15 occupations are the most at risk of automation.

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| --- | --- | --- |
| **PAY SCALE** | **TOP OCCUPATIONS THAT ARE HIGH RISK TO AUTOMATION** | **# EMPLOYED** |
| **LOW PAID JOBS (< $35k)** | Retail Salespersons | 67,450 |
| Cashiers | 44,630 |
| Combined Food Preparation and Serving Workers, Including Fast Food | 44,930 |
| Waiters and Waitresses | 36,870 |
| Cooks, Restaurant | 16,410 |
| Landscaping and Groundskeeping Workers | 13,380 |
| Receptionists and Information Clerks | 12,590 |
| Telemarketers | 10,520 |
| **MIDDLE PAID JOBS**  **($35k - $60k)** | Office Clerks, General | 36,220 |
| Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 29,630 |
| Bookkeeping, Accounting, and Auditing Clerks | 16,650 |
| Construction Laborers | 12,590 |
| Billing and Posting Clerks | 9,130 |
| **HIGH PAID JOBS**  **($60k-$90k)** | Accountants and Auditors | 16,270 |
| Loan officers | 8,510 |

## Largest Occupations Least at Risk

Of the 50 occupations that employ the most people in the Phoenix metro area (or about half of all workers), the following 17 occupations have a low risk of automation.

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| **PAY SCALE** | **OCCUPATIONS, ORDERED BY SIZE** | **# EMPLOYED** |
| **LOW PAID JOBS (<$35k)** | Medical Assistants | 12,260 |
| Home Health Aides | 10,770 |
| Nursing Assistants | 8,950 |
| **MIDDLE PAID JOBS**  **($35k-$60k)** | First-Line Supervisors of Office and Administrative Support Workers | 28,260 |
| First-Line Supervisors of Retail Sales Workers | 18,810 |
| Sales Representatives, Services, All Other | 16,120 |
| Elementary School Teachers, Except Special Education | 15,010 |
| Computer User Support Specialists | 10,980 |
| Secondary School Teachers, Except Special and Career/Technical Education | 10,640 |
| **HIGH PAID JOBS**  **($60k- $90k)** | Registered Nurses | 37,120 |
| First-Line Supervisors of Construction Trades and Extraction Workers | 10,030 |
| **TOP PAID JOBS**  **(>$90k)** | General and Operations Managers | 32,210 |
| Computer Systems Analysts | 12,900 |
| Software Developers, Applications | 12,190 |
| Business Operations Specialists, All Other | 8,650 |
| Sales Managers | 8,770 |
| Financial Managers | 8,730 |

## Greatest Impact of Automation on the Lowest Skill, Low-Paid Occupations

The jobs at high risk of automation are nearly half as well paid, on average, as the jobs at low risk of automation. The average annual salary of workers in the more than 200 jobs that are at high risk of automation is $32,959. Meanwhile, the average salary of the workers in the more than 300 jobs that are at low risk of automation is $67,416—more than double that of the high-risk workers.

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| **Risk level** | **# of people employed** | **% of people at risk** | **Weighted mean salary** |
| **High risk** | 649,040 | 35% | $32,959 |
| **Medium risk** | 537,110 | 29% | $36,856 |
| **Low risk** | 683,520 | 36% | $67,416 |

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| **PHOENIX EMPLOYMENT BY INCOME RANGE - HIGH RISK** | **# Employed** | **% of total in high risk** |
| Lowest paid: All jobs > $25k ($19k - $24,999) | 169,600 | 26% |
| Low paid: $25k - $34,999 | 228,520 | 35% |
| Medium pay: A $35k - $64,999 | 218,080 | 34% |
| High pay: $65k - $89,999 | 31,830 | 5% |
| Top pay: > $90k | 240 | 0% |
|  | **648,270** |  |

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| **PHOENIX EMPLOYMENT BY INCOME RANGE - MEDIUM RISK** | # Employed | # of total in medium risk |
| Lowest paid: All jobs > $25k ($19k - $24,999) | 101,640 | 19% |
| Low paid: $25k - $34,999 | 214,240 | 40% |
| Medium pay: $35k - $64,999 | 195,640 | 36% |
| High pay: $65k - $89,999 | 16,200 | 3% |
| Top pay: > $90k | 9,050 | 2% |
|  | **536,770** |  |

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| **PHOENIX EMPLOYMENT BY INCOME RANGE - LOW RISK** | # Employed | % of total in low risk |
| Lowest paid: Sum of all jobs > $25k ($19k - $24,999) | 30,940 | 5% |
| Low paid: Sum of all jobs $25k - $34,999 | 56,060 | 9% |
| Medium pay: Sum of all jobs $35,000 - $64,999 | 275,200 | 43% |
| High pay: $65k - $89,999 | 116,690 | 18% |
| Top pay: > $90k | 162,780 | 25% |
|  | **641,670** |  |

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| --- | --- | --- |
| **Lowest paid (<> $25k) by risk** | # employed | % of total lowest paid |
| High risk | 169,600 | 56% |
| Medium risk | 101,640 | 34% |
| Low risk | 30,940 | 10% |
|  | **302,180** |  |

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| --- | --- | --- |
| **Low paid ($25k - $34,999) by risk** | # employed | % of total low paid |
| High risk | 228,520 | 46% |
| Medium risk | 214,240 | 43% |
| Low risk | 56,060 | 11% |
|  | **498,820** |  |

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| --- | --- | --- |
| **Medium paid ($35k - $64,999) by risk** | # employed | % of total med paid |
| High risk | 218,080 | 32% |
| Medium risk | 195,640 | 28% |
| Low risk | 275,200 | 40% |
|  | **688,920** |  |

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| --- | --- | --- |
| **High paid ($65k - $90k) by risk** | # employed | % of total high paid |
| High risk | 31,830 | 19% |
| Medium risk | 16,200 | 10% |
| Low risk | 116,690 | 71% |
|  | **164,720** |  |

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| --- | --- | --- |
| **Highest paid (>$90k) by risk** | # employed | % of total highest pay |
| High risk | 240 | 0% |
| Medium risk | 9,050 | 5% |
| Low risk | 162,780 | 95% |
|  | **172070** |  |

# Section 3

## EDUCATION

The workers in the Phoenix region facing the greatest risk of automation are those with the least education, especially those with a high school degree or less. Forty-five percent of workers at the highest risk of automation have a high school degree or less, compared to just 17 percent of those with a BA or higher. Those numbers are flipped for low-risk jobs: Half of workers in low-risk occupations have a BA or higher, while just 18 percent have a high school degree or less.

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| --- | --- | --- | --- | --- | --- | --- |
| **Risk level** | **# of people employed** | **% of workers** | **Mean salary** | **Avg % w/ high school or less** | **Avg % w/ some college or AA** | **Avg % w/ BA or higher** |
| **High risk** | 649,040 | 35% | $32,959 | 45% | 39% | 17% |
| **Medium risk** | 537,110 | 29% | $36,856 | 48% | 37% | 7% |
| **Low risk** | 683,520 | 36% | $67,416 | 18% | 32% | 50% |

This vulnerability is further magnified by Phoenix’s lower levels of post-secondary education attainment, compared to the country overall. Across the United States, between 2012 and 2016, 87 percent of people above age 25 had a high school degree or higher and just over 30 percent held a BA or higher. ([Citation](https://www.census.gov/quickfacts/fact/table/US/PST045217) - US Census.) In contrast, in Phoenix, 81 percent of people above the age of 25 had a high school degree or higher and just over 27 percent held a BA or higher. ([Citation](https://www.census.gov/quickfacts/fact/table/phoenixcityarizona/EDU685216#viewtop) - US Census.)

## GENDER

The high risk occupations in Phoenix are those that disproportionately employ women.. Applying national averages of women employed across occupations[[1]](#footnote-1), women constitute 58 percent of workers in high risk occupations in Phoenix. Women dominate in many food and retail-related industries that are especially high risk. For instance:

1. **Cashiers:** Over 44,000 people in Phoenix worked last year as a cashier - a job with a 97 percent risk of automation. Nationally, 73 percent of cashier jobs were held by women.
2. **Office clerks:** More than 36,000 people in Phoenix worked as office clerks - an occupation with a 96 percent risk of automation. Nationally, 83 percent of those positions were held by women.
3. **Secretaries and administrative assistants:** More than 29,000 people worked as secretaries and administrative assistants in Phoenix, which carry a 96 percent risk of automation. Nationally, 95 percent of those positions were held by women.
4. **Hosts and hostesses**: In Phoenix, more than 6,000 people worked as a host or hostess, which has a 97 percent automation risk. Nationally, 86 percent of host or hostess positions were held by women.

# PHOENIX ECONOMY

## 3 categories

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| --- | --- | --- |
| **PHOENIX EMPLOYMENT BY INCOME RANGE** | Number of employees | Percent of total |
| Low paid (<$35k) | 801,000 | 43% |
| Middle pay - $35k - $65k | 691,220 | 37% |
| High pay (> $65k) | 379,110 | 20% |

## 5 categories

|  |  |  |
| --- | --- | --- |
| **PHOENIX EMPLOYMENT BY INCOME RANGE** |  |  |
| Lowest paid: Sum of all jobs > $25k ($19k - $24,999) | 302,180 | 16% |
| Low paid: Sum of all jobs $25k - $34,999 | 498,820 | 27% |
| Medium pay: Sum of all jobs $35,000 - $64,999 | 691,220 | 37% |
| High pay: $65k - $89,999 | 204,380 | 11% |
| Top pay: > $90k | 174,730 | 9% |

## TOP 50 OCCUPATIONS BY NUMBER OF PEOPLE EMPLOYED

|  |  |  |  |
| --- | --- | --- | --- |
| **OCCUPATIONS, ORDERED BY SIZE** | **AUTOMATION RISK** | **# EMPLOYED** | **MEAN SALARY** |
| Customer service Representatives | Medium Risk | 69,170 | $33,590 |
| Retail Salespersons | High Risk | 67,450 | $25,570 |
| Cashiers | High Risk | 44,630 | $21,910 |
| Combined Food Preparation and Serving Workers, Including Fast Food | High Risk | 44,930 | $20,120 |
| Registered Nurses | Low Risk | 37,120 | $74,930 |
| Waiters and Waitresses | High Risk | 36,870 | $22,420 |
| Office Clerks, General | High Risk | 36,220 | $35,170 |
| Laborers and Freight, Stock, and Material Movers, Hand | Medium Risk | 33,840 | $29,000 |
| General and Operations Managers | Low Risk | 32,210 | $103,090 |
| Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | High Risk | 29,630 | $35,910 |
| First-Line Supervisors of Office and Administrative Support Workers | Low Risk | 28,260 | $53,900 |
| Stock Clerks and Order Fillers | Medium Risk | 26,720 | $26,490 |
| Janitors and Cleaners, Except Maids and Housekeeping Cleaners | Medium Risk | 26,150 | $24,660 |
| Personal Care Aides | Medium Risk | 25,490 | $22,310 |
| First-Line Supervisors of Retail Sales Workers | Low Risk | 18,810 | $42,340 |
| Security Guards | Medium Risk | 17,830 | $29,580 |
| Heavy and Tractor-Trailer Truck Drivers | Medium Risk | 17,760 | $43,410 |
| Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products | Medium Risk | 17,710 | $62,450 |
| Bookkeeping, Accounting, and Auditing Clerks | High Risk | 16,650 | $39,060 |
| Cooks, Restaurant | High Risk | 16,410 | $25,160 |
| Accountants and Auditors | High Risk | 16,270 | $68,650 |
| Maintenance and Repair Workers, General | Medium Risk | 16,160 | $36,470 |
| Sales Representatives, Services, All Other | Low Risk | 16,120 | $52,410 |
| Teacher Assistants | Medium Risk | 15,290 | $25,200 |
| Elementary School Teachers, Except Special Education | Low Risk | 15,010 | $43,730 |
| Cooks, Fast Food | Medium Risk | 13,660 | $20,350 |
| Landscaping and Groundskeeping Workers | High Risk | 13,380 | $25,970 |
| First-Line Supervisors of Food Preparation and Serving Workers | Medium Risk | 13,230 | $33,590 |
| Computer Systems Analysts | Low Risk | 12,900 | $91,080 |
| Construction Laborers | High Risk | 12,590 | $40,984 |
| Receptionists and Information Clerks | High Risk | 12,590 | $28,790 |
| Medical Assistants | Low Risk | 12,260 | $33,990 |
| Software Developers, Applications | Low Risk | 12,190 | $94,490 |
| Light Truck or Delivery Services Drivers | Medium Risk | 11,460 | $37,230 |
| Computer User Support Specialists | Low Risk | 10,980 | $50,080 |
| Home Health Aides | Low Risk | 10,770 | $24,000 |
| Secondary School Teachers, Except Special and Career/Technical Education | Low Risk | 10,640 | $50,360 |
| Telemarketers | High Risk | 10,520 | $28,190 |
| First-Line Supervisors of Construction Trades and Extraction Workers | Low Risk | 10,030 | $63,320 |
| Medical Secretaries | Medium Risk | 9,930 | $33,530 |
| Correctional Officers and Jailers | Medium Risk | 9,920 | $43,920 |
| Automotive Service Technicians and Mechanics | Medium Risk | 9,240 | $41,300 |
| Billing and Posting Clerks | High Risk | 9,130 | $36,150 |
| Nursing Assistants | Low Risk | 8,950 | $30,400 |
| Sales Managers | Low Risk | 8,770 | $113,110 |
| Maids and Housekeeping Cleaners | Medium Risk | 8,750 | $22,400 |
| Financial Managers | Low Risk | 8,730 | $116,760 |
| Market Research Analysts and Marketing Specialists | Medium Risk | 8,720 | $64,810 |
| Business Operations Specialists, All Other | Low Risk | 8,650 | $68,340 |
| Loan officers | High Risk | 8,510 | $68,060 |

## How Does Phoenix Differ From the U.S. Average in Occupations and Automation Risk?

Overall, the risk of automation facing workers in the Phoenix region is just slightly above the the risk to all workers nationally. Workers in Phoenix and nationally have the same rate of high risk, but Phoenix is one percentage point higher than the United States on medium risk, and one percentage point less in low risk.

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| --- | --- | --- |
| **PHOENIX EMPLOYMENT BY RISK** | **# of people employed** | **% of people at risk** |
| **High risk** | 649,040 | 35% |
| **Medium risk** | 537,110 | 29% |
| **Low risk** | 683,520 | 36% |
| *TOTAL* | **1,869,670** |  |

|  |  |  |
| --- | --- | --- |
| **All of Phoenix metro area** | 1,878,180 |  |

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| --- | --- | --- |
| **NATIONAL EMPLOYMENT BY RISK** |  |  |
| High risk | 48,966,290 | 35% |
| Medium risk | 38,016,850 | 28% |
| Low risk | 51,033,030 | 37% |
|  | **138,016,170** |  |

Looking more closely at specific occupational groups within the economy, there are some pockets of greater vulnerability and greater resilience.

The chart below illustrates the occupational groups in Phoenix that differ significantly from the national average.

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| --- | --- | --- | --- | --- | --- | --- |
| **PHOENIX Occupational Group** | **# of people employed 2017** | **% of total US employment** | **% of Phoenix 2017** | **2017 difference** | **% difference** | **McK automation risk** |
| Management | 127,160 | 5.1 | 6.4 | 1.3 | 20.3% | Low |
| Business and financial operations | 113,350 | 5.2 | 5.7 | 0.5 | 8.8% | Low |
| Computer and mathematical | 76,010 | 3 | 3.8 | 0.8 | 21.1% | Medium |
| Education, training, and library | 92,890 | 6.2 | 4.7 | -1.5 | -31.9% | Low |
| Healthcare support | 49,330 | 2.9 | 2.5 | -0.4 | 16.0% | Medium |
| Sales and related | 219,130 | 10.4 | 11.1 | 0.7 | 6.3% | Medium |
| Office and administrative support | 343,990 | 15.7 | 17.4 | 1.7 | 9.8% | Medium |
| Production | 84,410 | 6.5 | 4.3 | -2.2 | -51.2% | High |
| Transportation and material moving | 120,890 | 6.9 | 6.1 | -0.8 | -13.1% | Medium |

## Resilience: more low, risk, high paid jobs -- management and business/finance; less manufacturing

1. Management has a low risk of automation. As a percent of employment, Phoenix’s population has 20 percent more workers in management positions than the national average. As a percent of employment, Phoenix’s population has 9 percent more workers in business and financial operations, which carry a low risk of automation.
2. Phoenix also has 21 percent more of its workforce in computers and mathematical positions.
3. Phoenix has a much lower rate of manufacturing, which is a high risk occupation - 51 percent fewer than the national average. Phoenix also has 13 percent fewer workers than the national average employed in transportation and material moving.

## Vulnerability: more high risk (office and administrative support, retail and sales); less low-risk (education)

Phoenix has a greater share of its workforce than the national average in several big occupational groups that have at least a medium risk of automation. These include:

1. Office and administrative support: 10 percent more than national average. These occupations have a medium-high risk of automation.
2. Sales and related occupations (e.g. retail salespersons and cashiers): 6 percent more than national average.

Phoenix area employees are less well-represented in certain low-risk occupational groups than the national average:

1. Education, training and library occupations are at very low risk of automation. Phoenix has 32% fewer workers in these occupations than the national average. Nationally, 73 percent of those positions are held by women. Thus, compared to the rest of the country, Phoenix has significantly fewer low-risk jobs in education that overwhelmingly employ women.

# DATA AND METHODOLOGY

## What Do We Mean by Automation and Risk of Automation?

Our rankings of automation risk describe the technical feasibility that an occupation can be computerized or automated with start-of-the-art technology available today. To calculate the automation risk, the researchers evaluated the ability of computers to perform the underlying tasks associated with the given occupation.

* “High risk” occupations are the top quartile of risk, with at least 85 percent risk of automation for a given occupation.
* “Medium risk” occupations are in the second quartile of risk, between 50 percent and 85 percent risk of automation for a given occupation.
* “Low risk” occupations are in the bottom two quartiles, with less than 50 percent risk.

A few key caveats are important to consider when interpreting the data.

First, the rankings are *not* a probability that a given job will actually be automated. Because a job or task can *technically* be done by a computer does not mean that it *will*. A range of legal, logistical, business, financial, political, and social factors could lower the real rate at which businesses and employers adopt technology and automate functions. Moreover, predictions about technology have a relatively high degree of uncertainty.

Second, jobs that have some tasks that can technically be automated will not necessarily be displaced. Instead, the nature of many jobs will change—in some cases, dramatically—but will not be eliminated. (McKinsey estimates that [just 5 percent of jobs](https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/Digital%20Disruption/Harnessing%20automation%20for%20a%20future%20that%20works/MGI-A-future-that-works_Full-report.ashx) will be outright eliminated, but that half of job tasks could be automated.) The implication of this change is the need for workers in at risk occupations to continuously upskill to keep pace with the changing requirements of their occupation.

Finally, while technology and automation will displace some jobs and change others, new jobs will also be created. For instance, McKinsey estimates that every decade, 7 percent of jobs did not exist a decade earlier. Our analysis does not capture the impact of projected job creation.

## NOTES ON THE DATA

1. The data on automation potential comes from Burning Glass Technologies, which is derived largely from a well known 2013 study from two researchers at Oxford, Carl Benedikt Frey and Michael A. Osborn, titled “[The Future of Employment: How Susceptible are Jobs to Computerisation](https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)?”
2. Occupational and wage data for the Phoenix metropolitan area is from the Bureau of Labor Statistics and covers the period from January 1, 2017 to December 31, 2017. The geographic area spans Phoenix, Mesa, and Scottsdale, including Pinal and Maricopa counties.
3. Data on national averages of women in occupations comes from the Bureau of Labor Statistics.
4. Data on education levels of employed individuals comes from the American Community Survey (ACS) five-year estimates (2011 - 2015)

1. Data from gender makeup of national occupations from the Bureau of Labor statistics. [↑](#footnote-ref-1)