



Innovation and Lifelong Learning In The Human Economy

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The Evolving Skill Landscape

The world of work is changing - fast

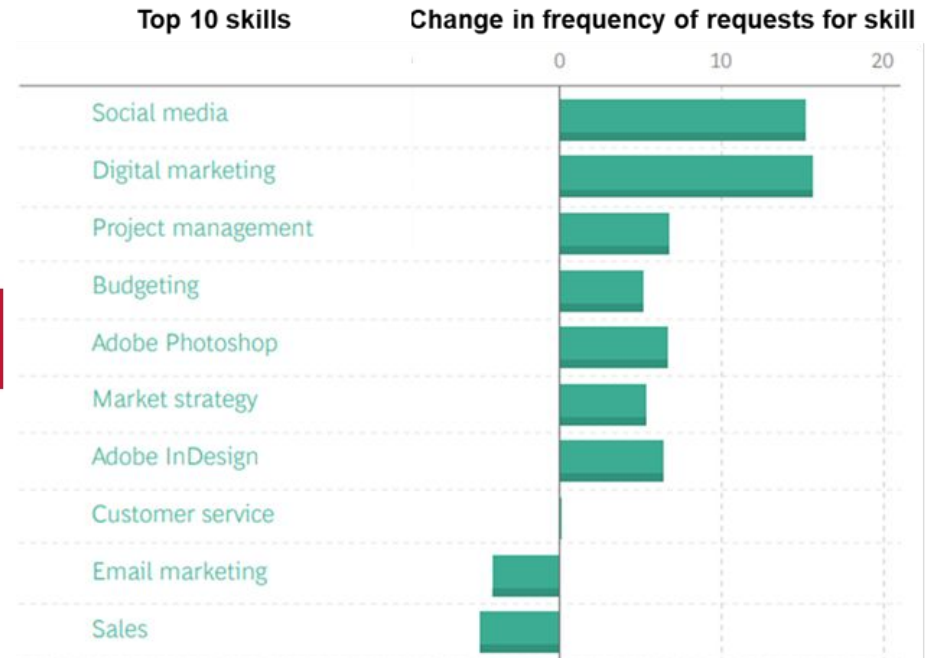
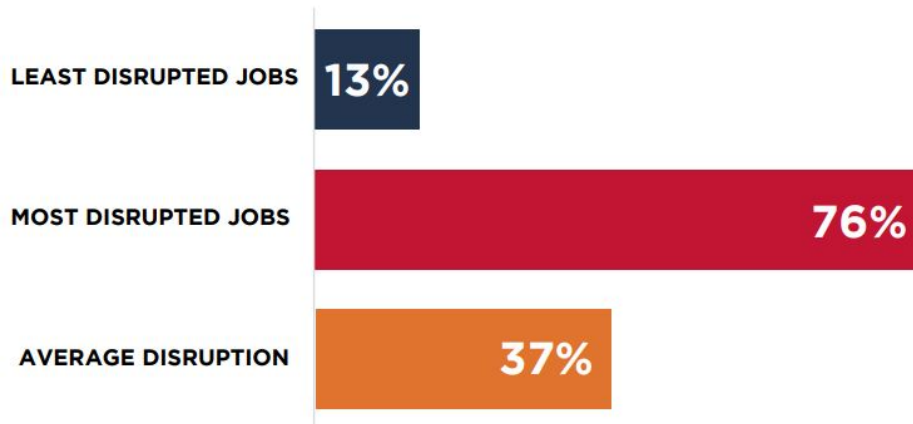
The Skills, They Are A-Changin’

37% of the skills of the average job have been replaced over the past five years. Gen AI is accelerating that further. What does it take to keep up?

In the top quartile of jobs, **three-quarters of the skill requirements have changed** over the past five years.

These skills are bearing out across every occupation. Half of the skills required of a Marketing Assistant are new.

SINCE 2016, THE TOP 20 REQUESTED SKILLS FOR A GIVEN OCCUPATION HAVE CHANGED BY:



Jobs Are Evolving in Profound Ways

Jobs increasingly require new skills from across domains, challenging workers' ability to learn them as they go

Careers are colliding, leading to the emergence of a hybrid skill genome

Skills Not Jobs: Data science skills aren't just for data scientists

Occupations with at least 3K postings requiring data science / analytics / mining

Accountant

Data Scientist

ACCOUNTING

- Accounting
- Account Reconciliation
- General Ledger
- Financial Statements
- Generally Accepted Accounting Principles
- Financial Reporting
- Balance Sheets

SOFT SKILLS

- Communication Skills
- Detail-oriented
- Excel



+23%
Since 2013

PROGRAMMING

- Python
- SQL
- Hadoop
- R

DATA SKILLS

- Data Visualization
- Tableau
- Excel
- MapReduce

BUSINESS SKILLS

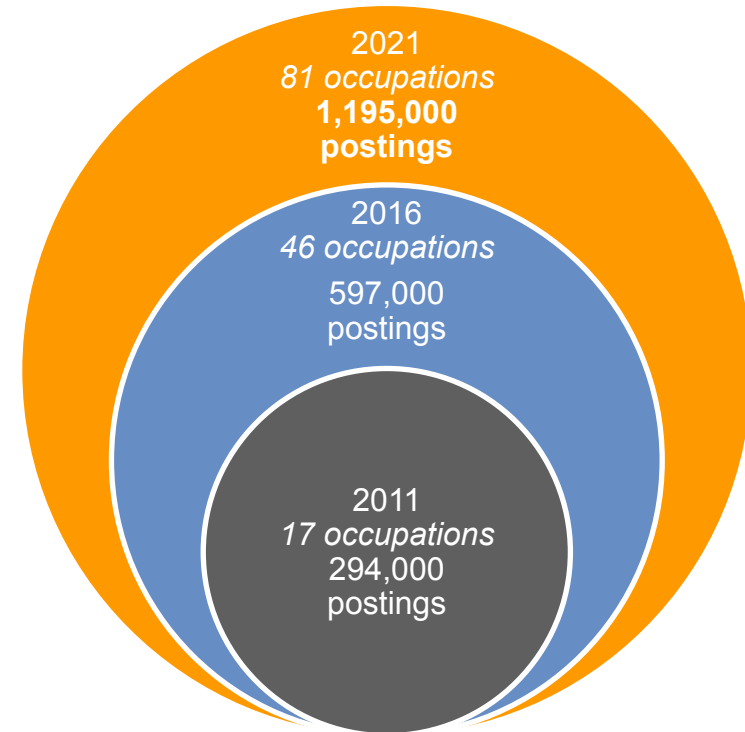
- Predictive Models
- Business Process
- Economics
- Strategic Planning

SOFT SKILLS

- Problem Solving
- Writing
- Teamwork

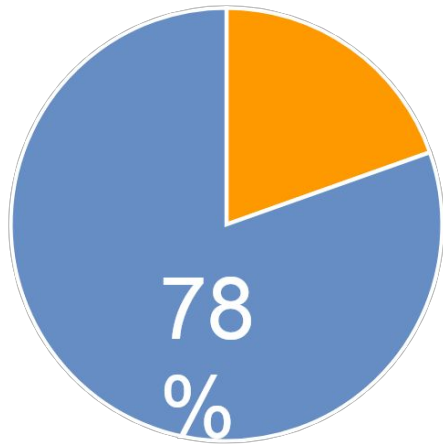


+598%
Since 2013

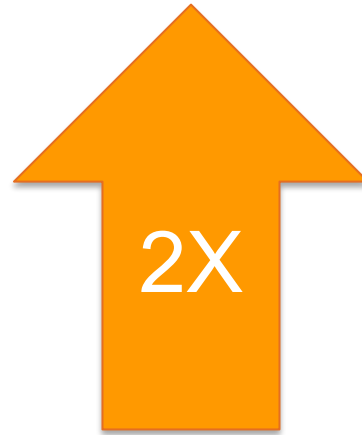


A Sea Change In Middle Skills Too

Digital skills: A minimum ticket to ride



Of middle-skill jobs require digital skills



Digitally intensive jobs are growing twice as fast as other middle-skill jobs



Digitally intensive jobs are twice as likely to pay a living wage

As new technologies intersect familiar roles,

Workers May Need Radically Different Skills

Mechanical Engineers

Traditional Mechanical Engineer
Top Specialized Skills
Mechanical Engineering
Project Management
Mechanical Design
SolidWorks
AutoCAD
Budgeting
Scheduling
Product Development
HVAC
Repair

Vehicle-to-Infrastructure Specialist
Top Specialized Skills
Transportation Systems
C++
Global Positioning System (GPS)
Business Development
Civil Engineering
Hardware & Software Configuration
LiDAR
Simulation
Traffic Management
Linux

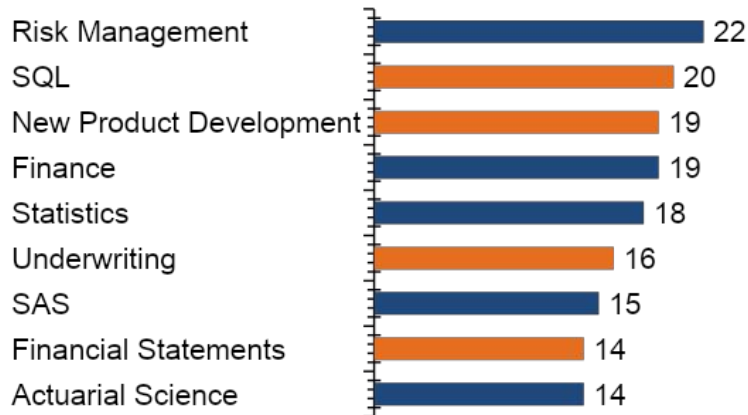
Autonomous Systems Specialist
Top Specialized Skills
Autonomous Systems
Mechanical Engineering
Robotics
Simulation
Python
C++
Systems Engineering
MATLAB
Machine Learning
Electromechanical Systems

Emerging Skills Aren't Just Cut and Paste

How emerging technologies like GenAI disrupt roles more broadly

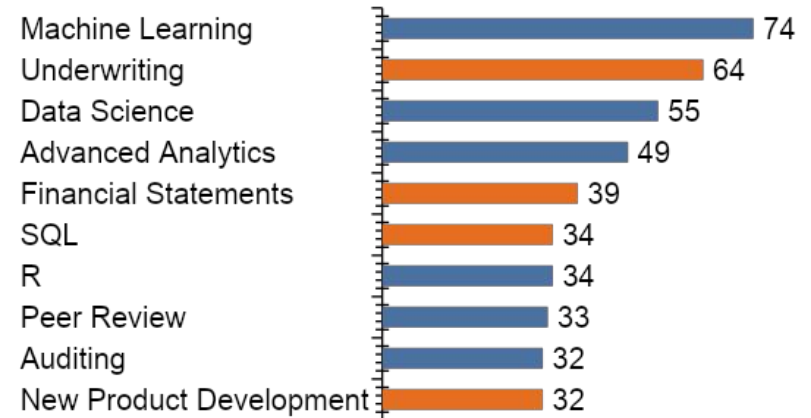
ML skills transform the role of the actuary

Skills for Actuaries (All)



% of Job Postings Requesting Skill

Skills for Actuaries with ML Skills



% of Job Postings Requesting Skill

Several skills needed by Actuaries without ML skills – risk management, finance, statistics, and actuarial science – are no longer even sought from those with ML skills.

In their place are brand new skills – data science, advanced analytics, advanced programming languages like R, and peer review – that point to a transformation of the job itself for actuaries with ML skills

How Generative AI Will Impact Skills

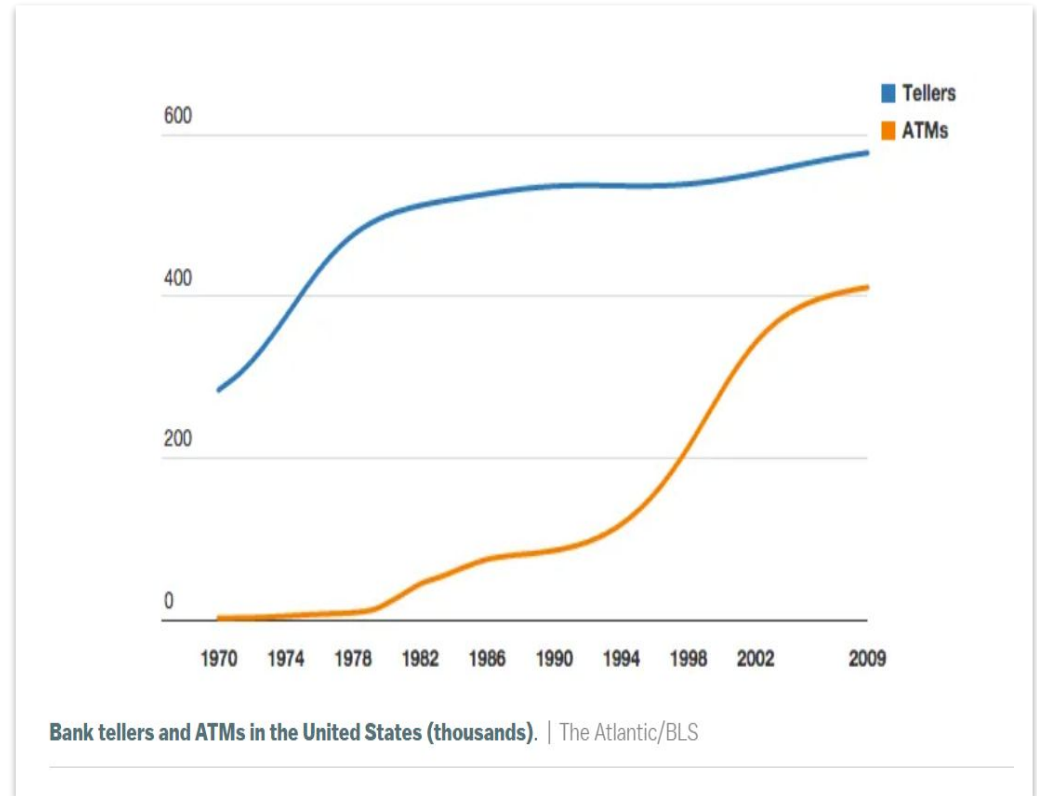
New technologies like GenAI promise to accelerate the pace of change

Not All Doom and Gloom

In previous automation waves, demand for some impacted roles increased as technology drove new efficiencies – but that’s not universally true. How can we make sure we’re guiding workers to jobs on the rise?

In theory, the invention of ATMs threatened the jobs of bank tellers

In practice, ATMs drove heightened demand for banking – increasing the total number of tellers



AI Will Be a Double-Edged Sword

Some argue AI may be a force for greater access. Others say it will concentrate advantage as AI raises the bar. What does it take to prepare students to start their careers in the middle?

In many roles, GenAI will automate entry-level work, **pulling out the bottom rungs of career ladders**

On the other hand, GenAI will also drive **new levels of accessibility into jobs with high expertise barriers**



Example: Marketing Specialists



Example: Database Architects

AI will Reshape the Key Skills for Each Career

To understand AI impacts, the right unit of analysis is skills. As skills shift in importance, we may need very different learning models

In some jobs, Gen AI automation of routine tasks will lead to new emphasis on higher value work

As AI augments some skills and automates others, the nature of occupations will change radically



Example: Human Resource Officers

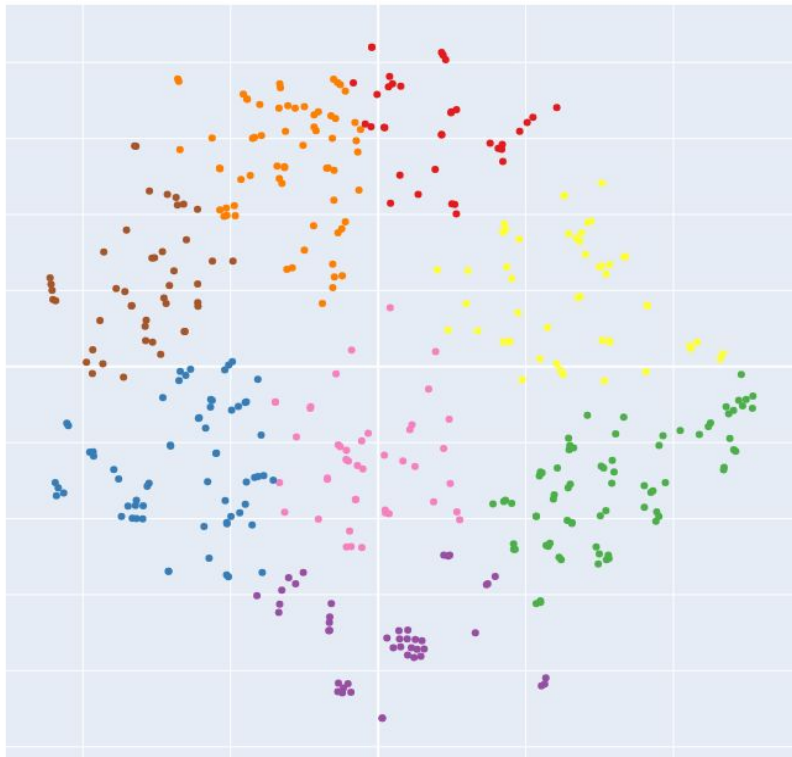
Technical Writer: Top 10 Skills Before GenAI	Technical Writer: Top 10 Skills After GenAI
Technical Writing	Technical Writing
Technical Documentation	Technical Documentation
Editing	Editing
Technical Communication	Technical Communication
Software Documentation	Project Management
Proofreading	Analytical Skills
Grammar	Coordinating
Content Creation	Critical Thinking
Writing	Problem Solving
Adobe Illustrator	Time Management

Example: Technical Writer

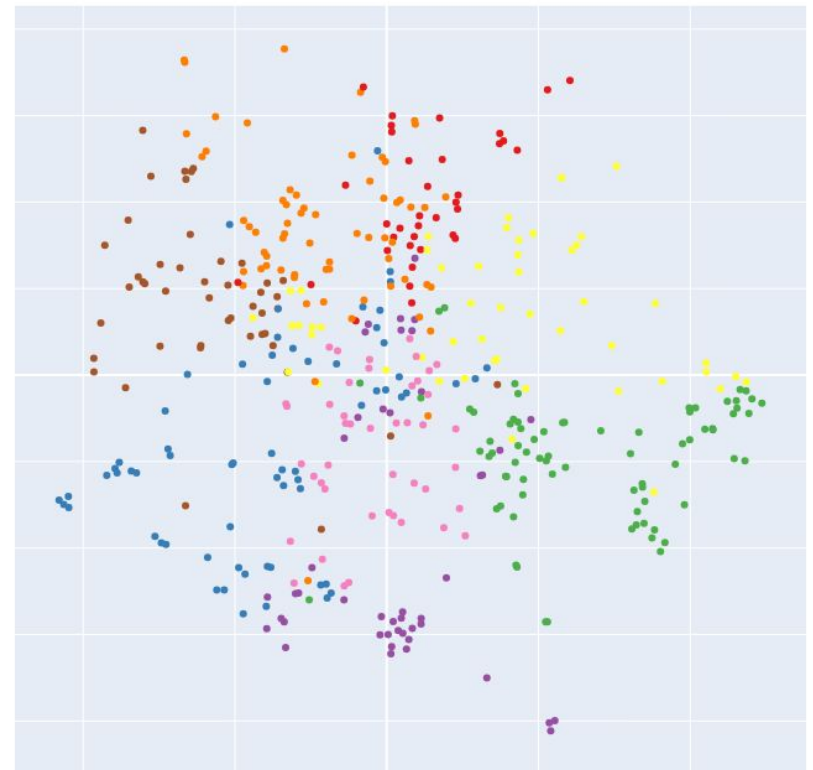
The Career Map Will Be Rewired

As skills change, the relationship between jobs changes – and that will change how people progress in their careers

Jobs have an underlying DNA, determined by their skills. Just like commonalities in DNA across species, jobs can be arranged based on commonalities in underlying skills



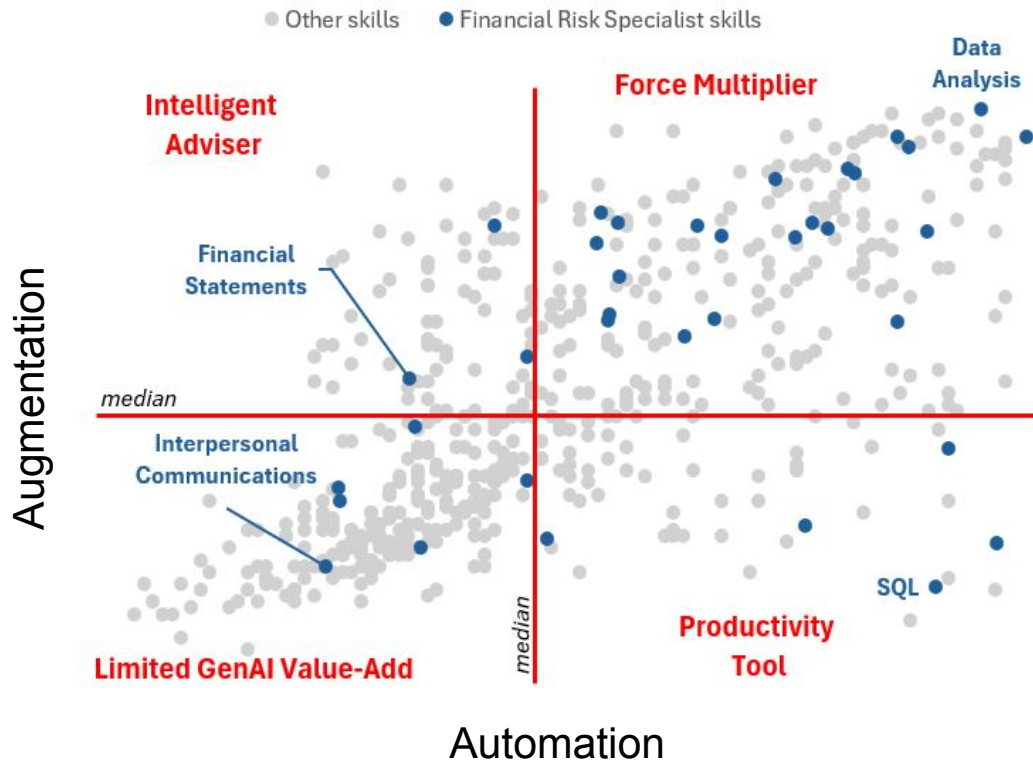
GenAI's impact on the relative importance of skills will re-wire the career map, closing off some paths and opening new opportunities



The New Power Skills

The interplay of automation and augmentation means some skills will take on new importance in people's careers

While some skills may simply be automated – the impact on most skills is more nuanced, with AI acting as a force multiplier



The New Power Skills of the AI Era	
Writing	Budgeting
Statistical Analysis	Investigation
Troubleshooting/ Problem Solving	Technical Training
Risk Management	Forecasting
Customer Service	Research
Technical Communication	Incident Reporting
Editing	Financial Analysis
Regulatory Compliance	Data Visualization
Marketing	Business Intelligence
Sales Prospecting	New Product Development

Foundational Skills Will Endure

Despite a turbulent economic landscape, a core set of foundational skills will remain critical to career success

Foundational Skill Group	Foundational Skill Area	Total Openings in Entry-Level Postings in BA-plus SOCs: March 2019 - Feb 2020	Growth in Number of Postings: 2017-2019	Share of Openings Outside IT and Analysis Job Families	Average Salary Premium
Business Enablers	Business Process	370,883	29%	67%	12%
	Project Management	281,999	51%	69%	14%
	Digital Design	152,960	44%	64%	-
	Communicating Data	39,897	101%	34%	27%
Digital Building Blocks	Managing Data	292,817	49%	28%	34%
	Analyzing Data	217,623	48%	55%	21%
	Software Development	263,261	48%	17%	43%
	Computer Programming	203,328	56%	13%	45%
	Digital Security and Privacy	67,879	30%	29%	38%
Human Skills	Communication	1,264,535	48%	81%	-
	Collaboration	595,402	58%	79%	2%
	Critical Thinking	587,966	52%	66%	0%
	Analytical Skills	490,311	44%	76%	1%
	Creativity	276,003	60%	82%	-

Source: Burning Glass Technologies

Coding & Data Science Don't Go Away

Skills currently the domain of specialists will become part of every job. How does this reshape what we consider foundational to education and work?

Excel and similar tools made spreadsheet skills highly accessible to a wide audience



In much the same way, Generative AI will democratize creative work. A broader swath of workers will need to undertake creative functions



AI-generated graphics and logos

Skills Offer A Bulwark

Arming workers with high-value and foundational skills can help workers adapt to a changing world

Skills Determine How Well You Launch

Our forthcoming research ranks starting jobs for those not going to university based on economic mobility and long-term wages. Many of the best options require some prior skill attainment.

Occupation	Launchpad Job Score
Electrical Power-Line Installers and Repairers	77
Aircraft Mechanics and Service Technicians	72
Millwrights	72
Telecommunications Line Installers and Repairers	72
Commercial Divers	71
Captains, Mates, and Pilots of Water Vessels	68
Control and Valve Installers and Repairers	67
Ship Engineers	67
Health Technologists and Technicians, All Other	66
Medical Equipment Repairers	66
Mobile Heavy Equipment Mechanics, Except Engines	62
Industrial Machinery Mechanics	62
Licensed Practical and Licensed Vocational Nurses	61
First-Line Supervisors of Retail Sales Workers	61

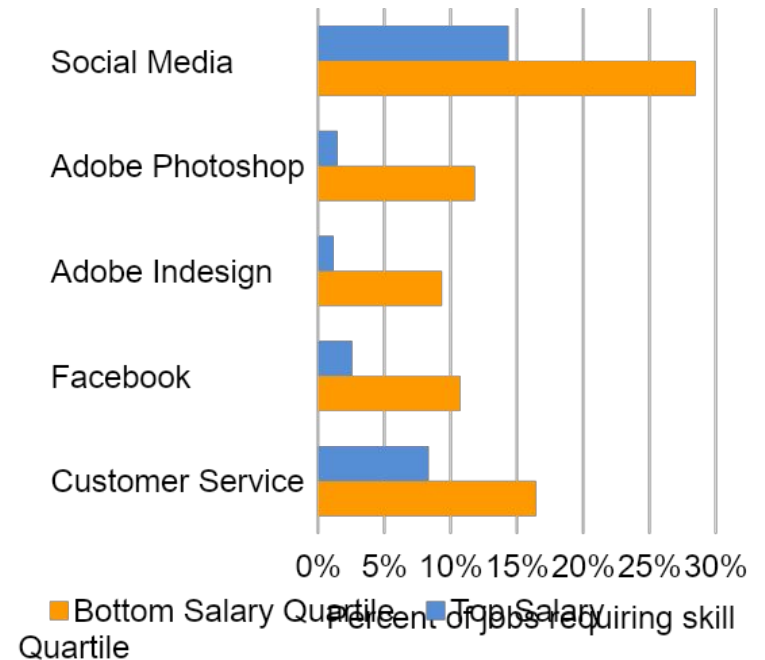
Skills Determine Your Prospects

Train workers in the skills associated with better paying jobs & higher upward mobility

High-Paying Skills for Marketing Managers



Low-Paying Skills for Marketing Managers



Skills Determine How Far You Advance

Some skills close the gap between low- and high-value work...

...and dramatically increase the likelihood that workers will move up

Skills Gaps for Top Transitions from Lower-Wage to Opportunity Occupations



Customer Service & Support Workers

Skill/Certification(*)	% Increase in Mobility Rate
Project Management	390%
Certified A+ Technician*	430%
Budgeting	280%
Hardware Experience	250%
Social Media	240%
Adobe Photoshop	200%
Quality Assurance and Control	180%

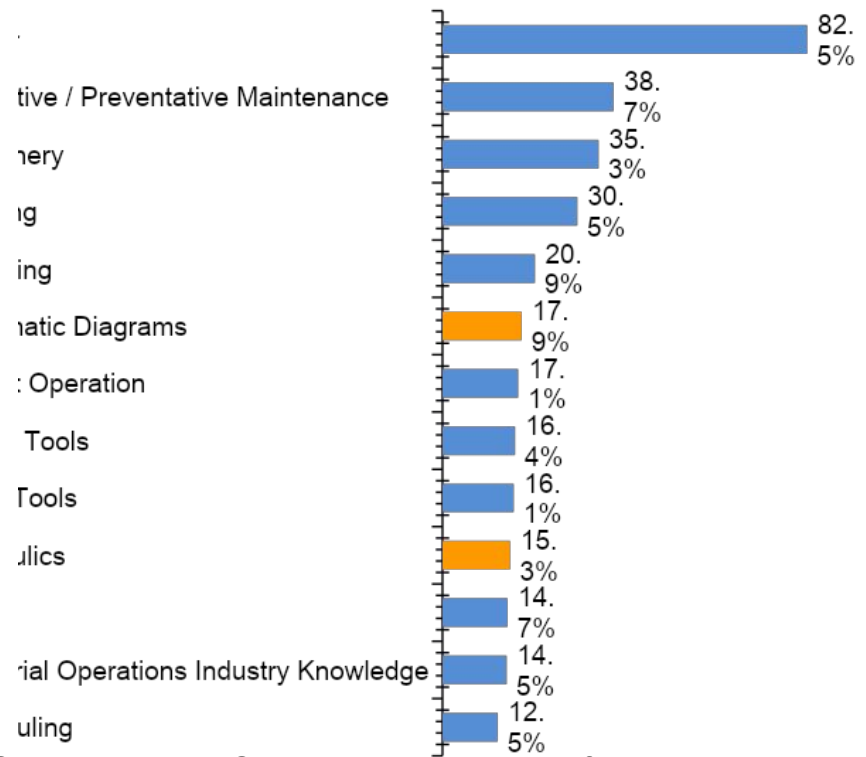
Note: The share of destinations requesting a skill is weighted by the employment of the destination occupations. The y-axis reflects the share of top transitions for which the skill ranks among the destination occupation's top 25 skills but not the origin's.

Source: Federal Reserve Banks of Cleveland & Philadelphia based on Burning Glass data

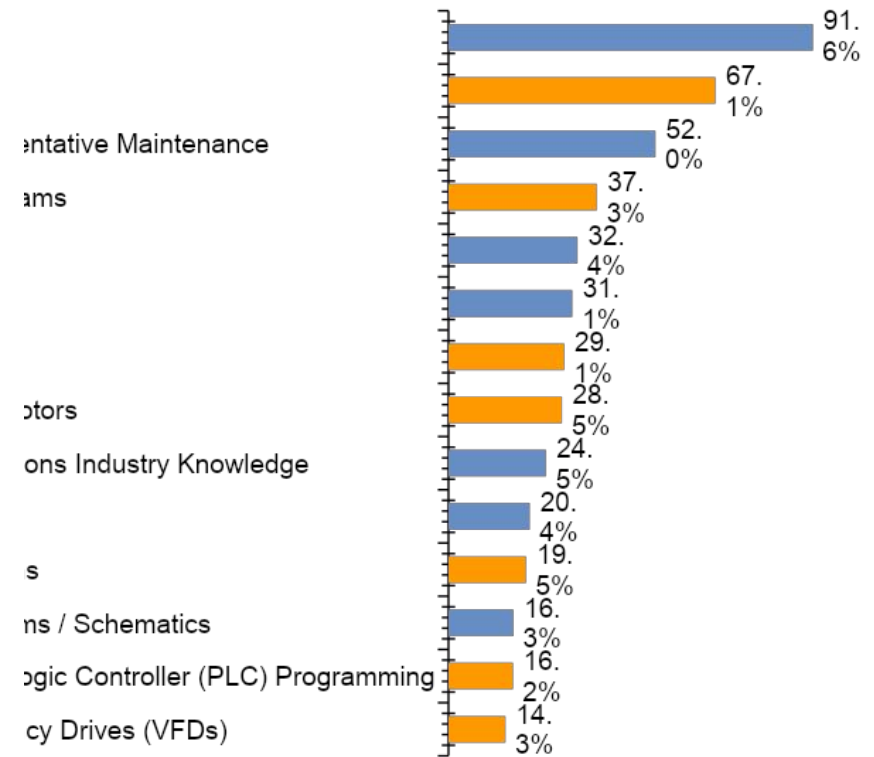
Amidst Rising Wages & Short Supply, Some Skills Make Workers More Valuable

To offset rising wages and to make do with fewer workers, companies will need to boost productivity. **But automation isn't the only tool for increasing productivity. Specific skills can make workers more productive and more valuable.**

Skills for Maintenance Technicians, Overall



Skills for Maintenance Technicians, Robotics



Source: Burning Glass Institute analysis of Lightcast data

Skills Determine Future Readiness

Not all skills are created equal. “Frontier Skills” stand out for their value and growth. Competitiveness depends on your workforce having these skills

Out of all software skills, we identified 104 at the “frontier”- those that are **growing quickly and defining the future of the sector**

Boston ranks #22 in the US for frontier skills, lagging all other major software hubs despite having third highest # of software jobs

Skill Growth vs Skill Value

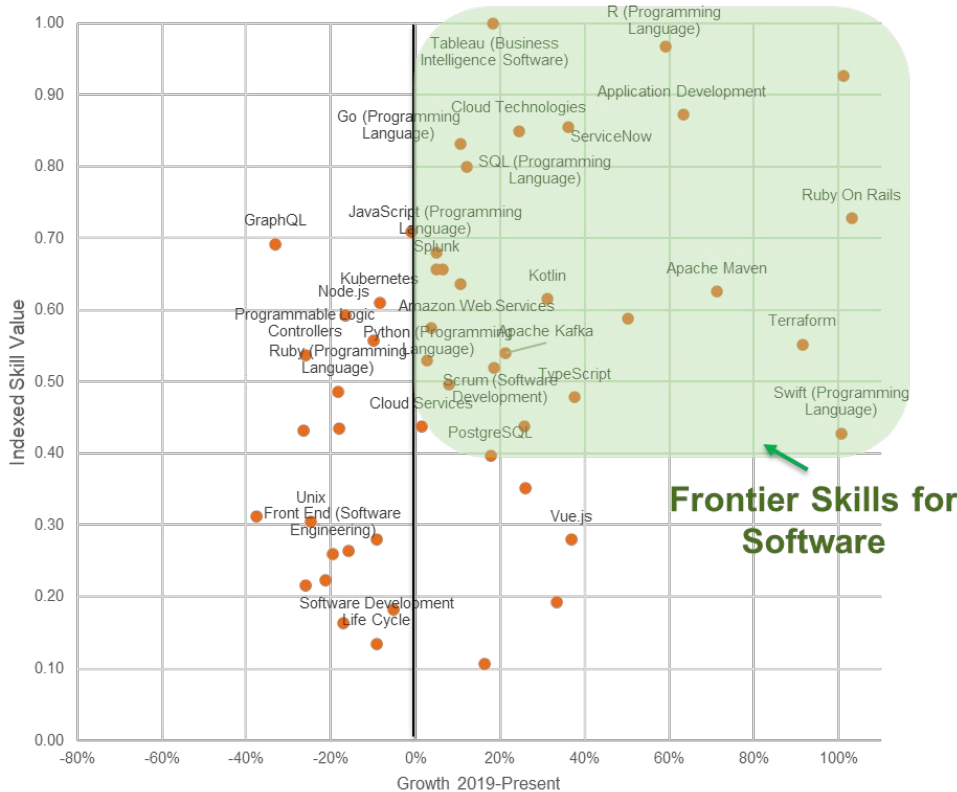
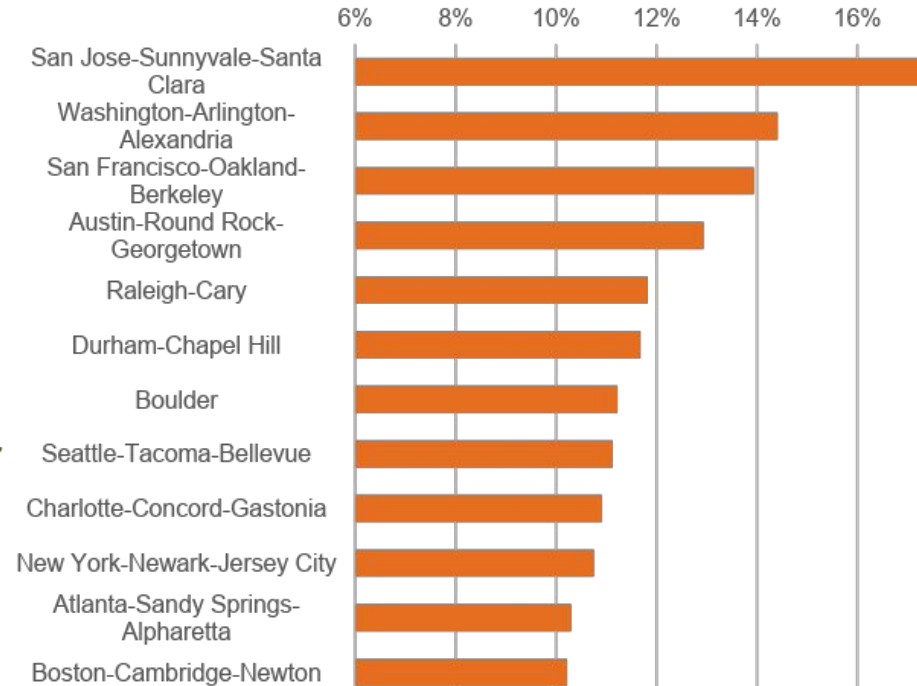


Chart shows subset of frontier skills, along with other specialized and software skills

Share of Jobs Requiring Frontier Skills



Build Skills to Help Workers Rise

Identify the specific skills that will help advance careers

Administrative Assistant Transition Pathways



Customer Service Management

Operations Leadership

Office Management

Problem Solving

Coaching

Office Manager
+ \$22,710 annual salary



Adjuster License

Subrogation

Claims Resolution

Medical Insurance Claims

Claims Investigations

Insurance Claims Clerk
+ \$7,640 annual salary



Supply Chain Planning

Primavera (Software)

Earned Value Management

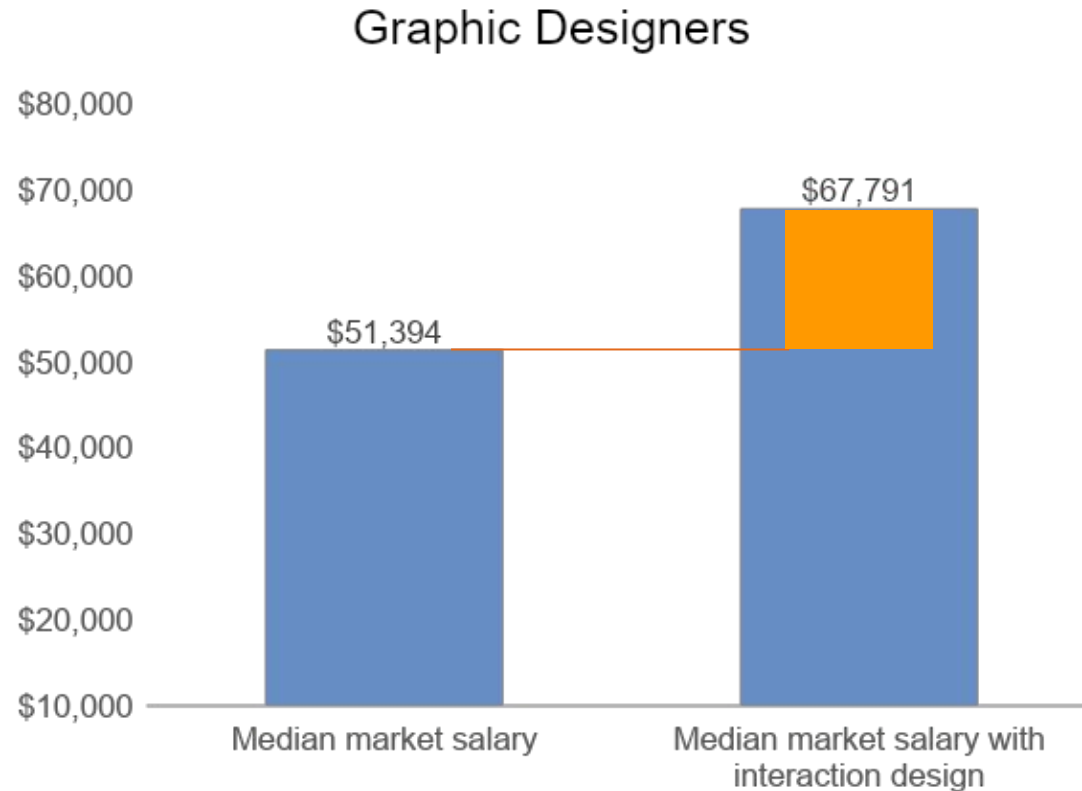
Material Handling Equipment

Logistics

Production & Planning Clerk
+ \$10,160 annual salary

Skills Arbitrage Careers

It doesn't cost €16,000 to learn interaction design



Building a Future Ready Workforce

How can leaders invest in an intentional way into the workforce?

Building a Future Ready Workforce

Three keys to building a thriving workforce in the Human Economy



***Know what talent you will need,
and where the gaps lie***



Align education to deliver high value skills

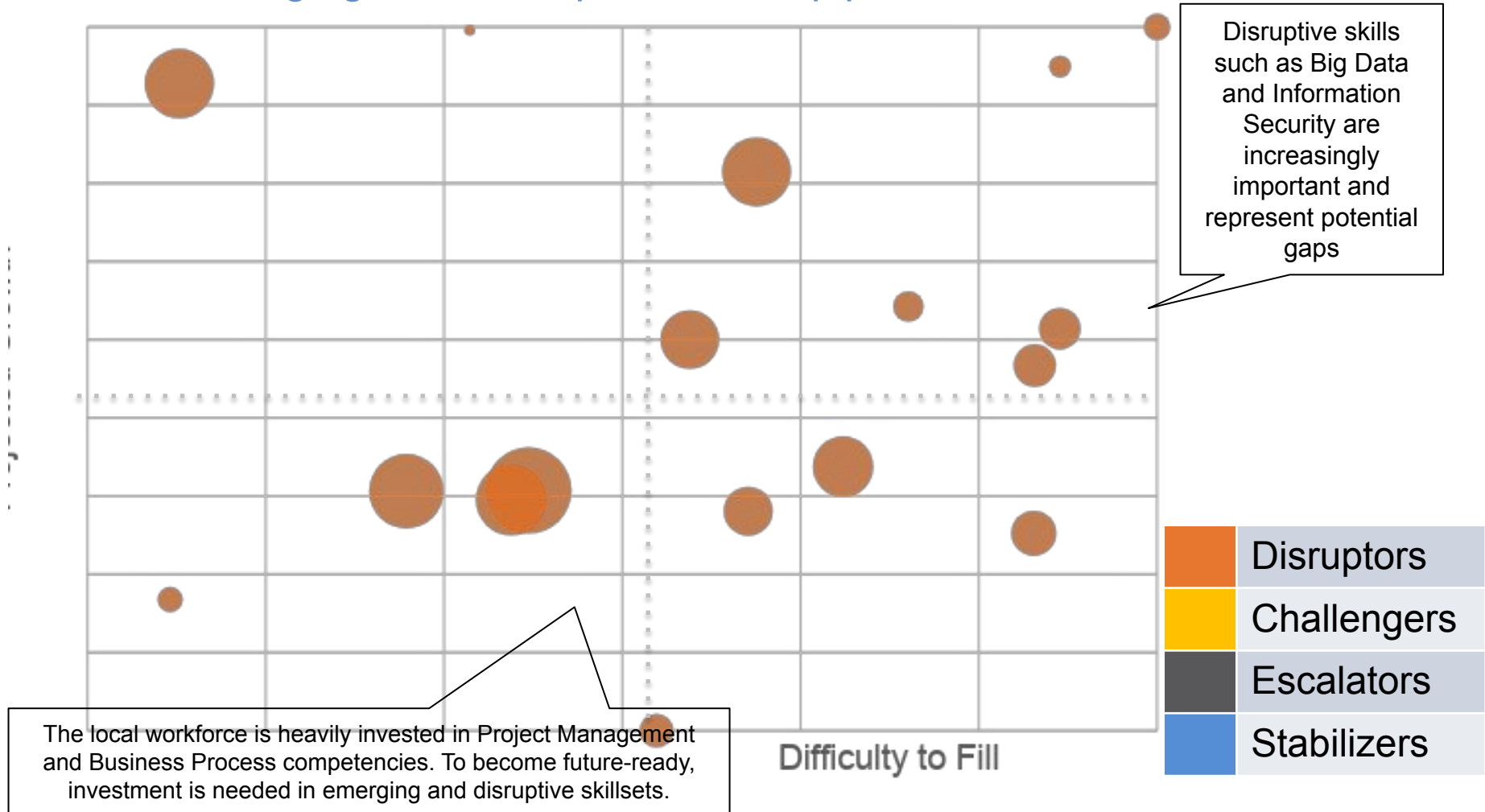


***Grow the pie by tapping hidden talent pools &
playing your whole team***



Know the Contours of Your Current Talent Base

Where will emerging skills disrupt the talent pipeline?



* The size of the bubbles in this plot represent the saturation of the job in the local IT workforce. Axes represent median values.



Is Your Workforce Prepared for the Future?

Benchmark your strengths vs. best-in-class peers

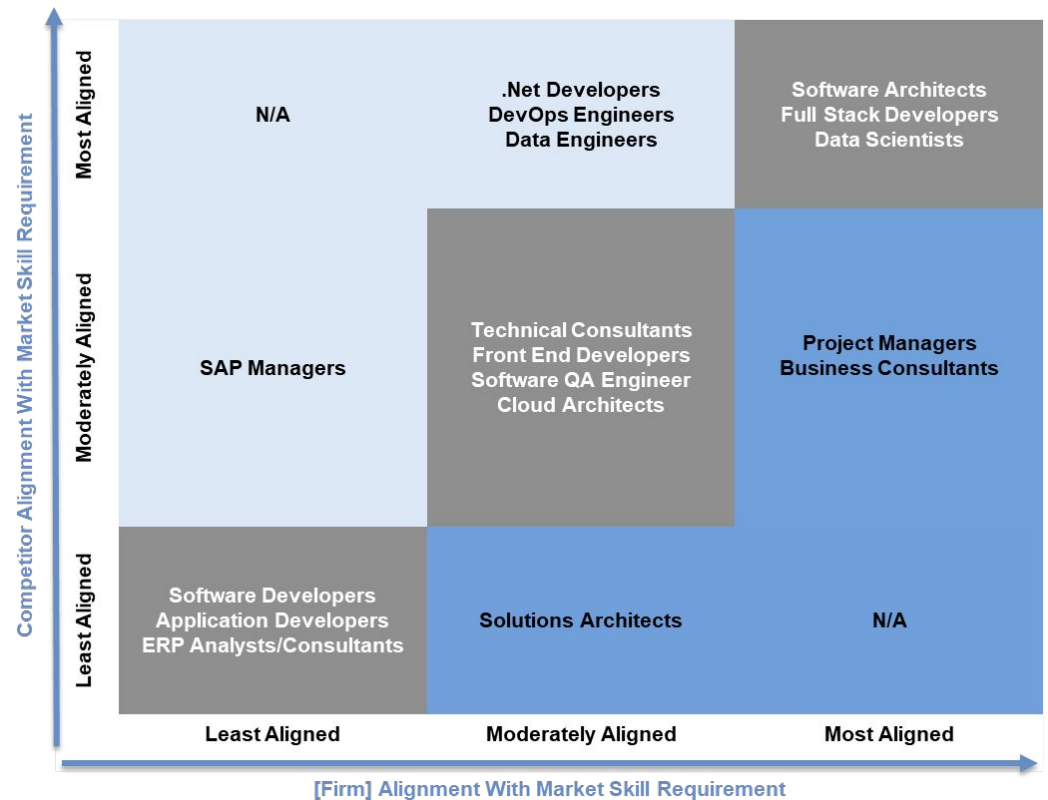
Assess your firm's future readiness
role by role...

...And **across the firm**

*Top skill requirements for
Mechanical Engineers – VW vs. Tesla*

*Skill alignment vs. competitors of a global tech firm's key
roles (light blue = competitors lead)*

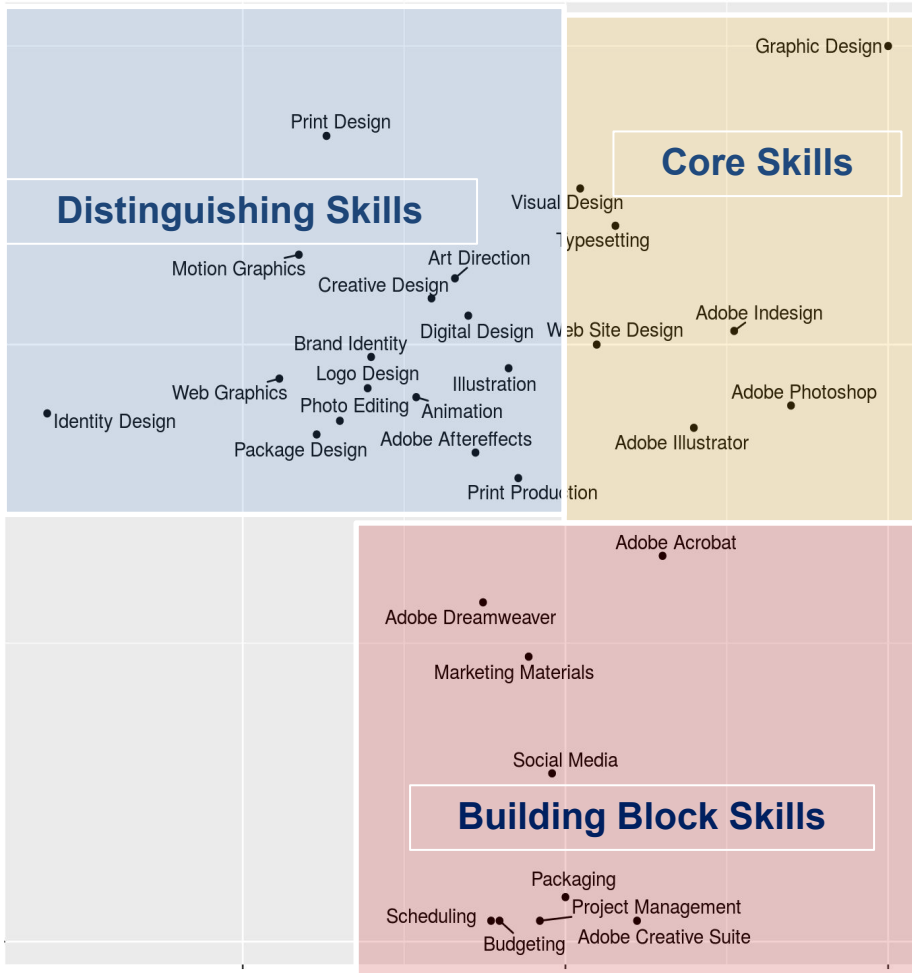
VW	Tesla
Project Management	Mechanical Engineering
Purchasing	CATIA
Mechanical Engineering	Finite Element Analysis
Supplier Selection	Mechanical Design
Technical Assistance	Materials Science
Benchmarking	Python
Business Planning	Manufacturing Processes
Competitive Analysis	Electromech. Systems
Component Design	Electrical Design
Cost Analysis	Electrical Systems





In Aligning Education & Work, Architect Curricula to Teach the Skills That Matter

Graphic Designer / Desktop Publisher (BGTOcc)



Core Skills: Definitional skills to each occupation which students will need in order to contribute

Building Block Skills: Although these are required and relevant across many roles, **they aren't always included in curriculum, putting graduates at a disadvantage**

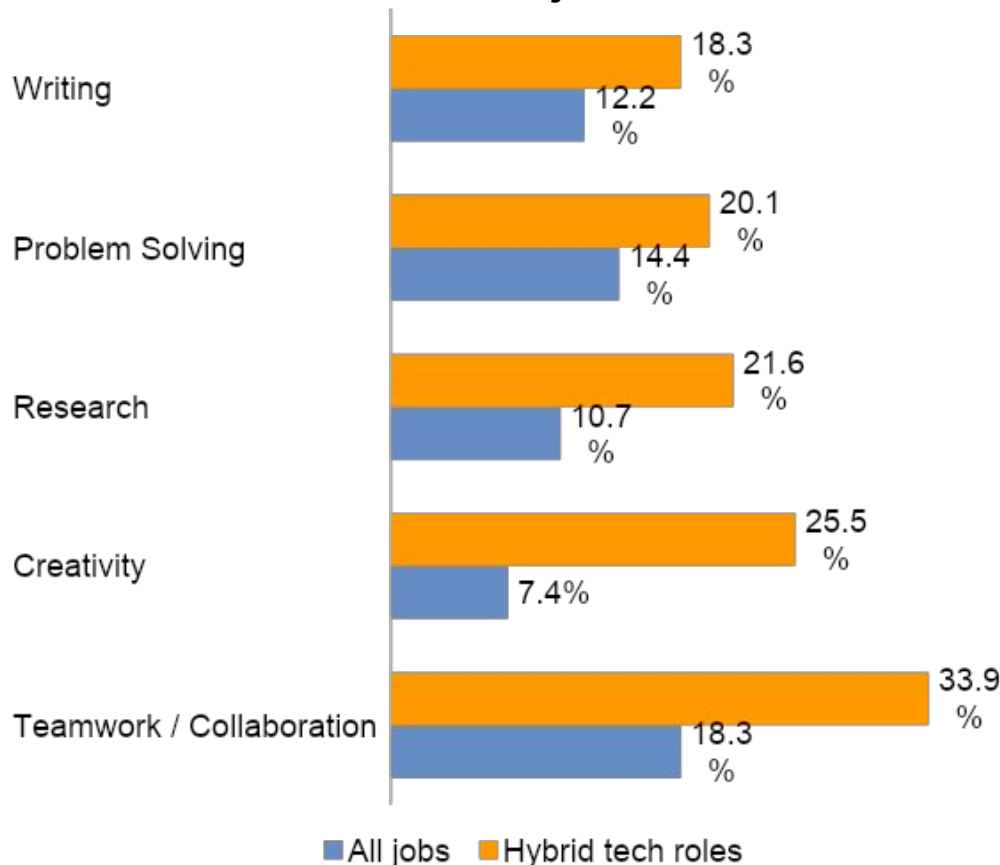
Distinguishing Skills: These are emerging, fast-growth skills or core opportunities for specialization that **enable students to differentiate themselves – and often command significant salary premiums**



Foundational Skills Are Increasingly Important

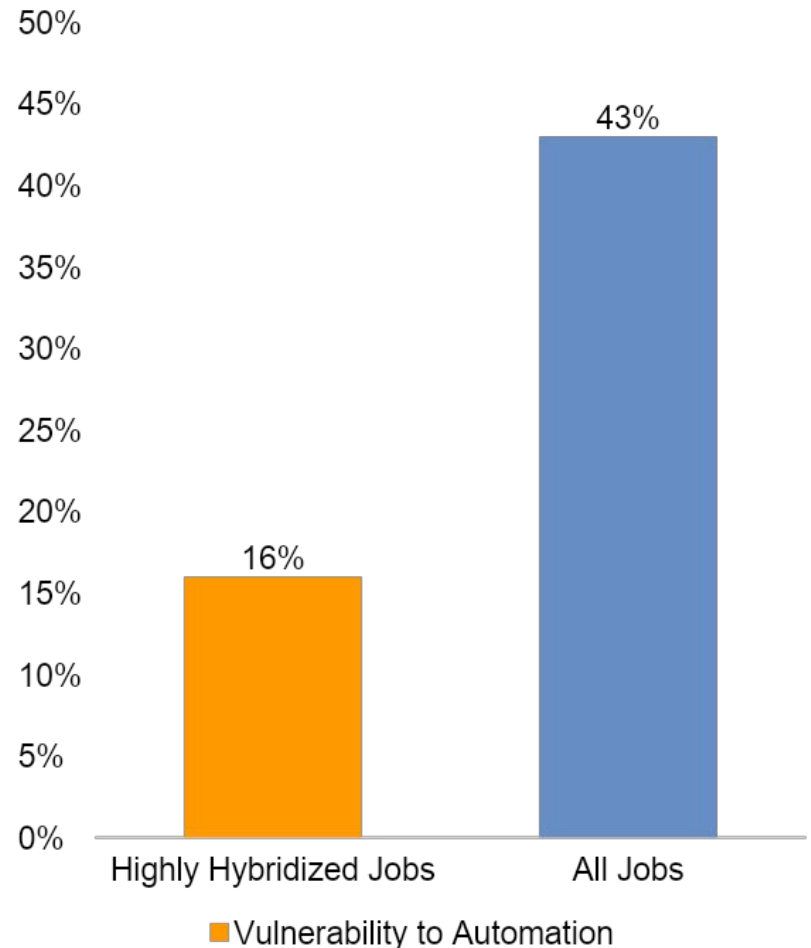
Even among tech-economy jobs, human skills matter more than ever

% of hybrid jobs requesting key soft skills vs. % of all jobs



Source: Burning Glass Technologies

Vulnerability to Automation





Integrate lifelong learning into educational system to

Help Workers Grow And Adapt Over Time

Career Area	% of Workers in Career Area after 5 Years	% of Workers in Occupations with Low to Moderate Probability of Automation	How much safer or at risk than the nation?
Core Retail (e.g. Retail Sales)	33.5%	35%	0.95
Administrative	15.7%	13%	0.35
Customer Service	12.3%	8%	0.22
Food	6.2%	0%	NA
General Sales	5.9%	95%	2.57
Finance	5.5%	18%	0.49
Health Care	4.2%	40%	1.08
Hospitality	3.7%	19%	0.51
Restaurant Management	3.4%	14%	0.38
Retail Operations: Logistics	3.0%	20%	0.54
IT	2.4%	100%	2.70
Call Center	1.1%	4%	0.11
Retail Operations: Merchandising	1.1%	100%	2.70
Real Estate	0.9%	0%	NA
Retail Operations: Buyers	0.6%	0%	NA
Hospitality Management	0.3%	100%	2.70
Auto	0.2%	0%	NA
Total	100%	38%	1.02

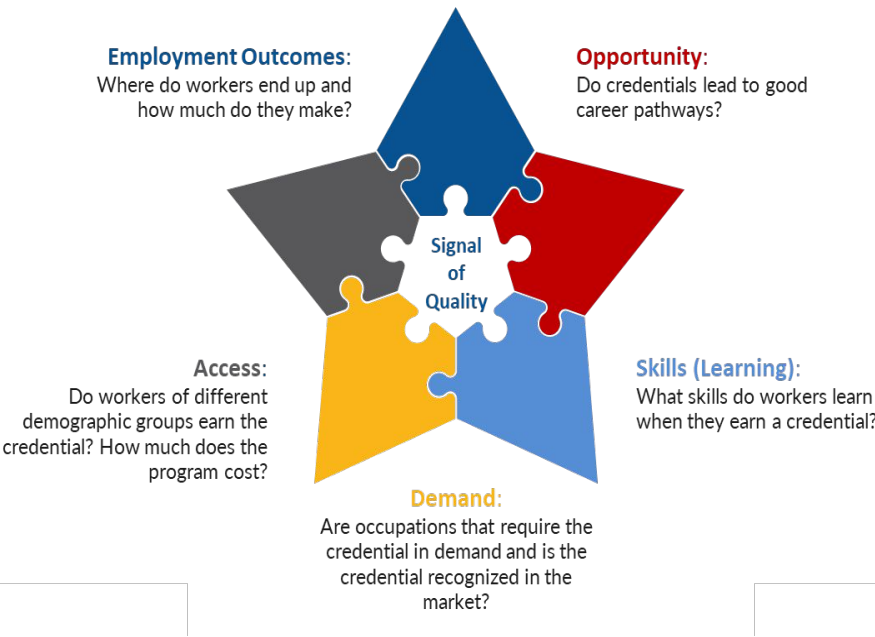


Certifications Work, But It Matters Which Ones

The landscape of non-degree credentials is exploding. What's needed is a practical framework to identify which ones work.

The **EQOS** framework brings together ~50 models to measure outcomes for non-degree credentials

Example: Measurement of Placement & Wages for OSHA30 Certification Across Providers



	Provider A	Provider B	Provider C	Provider D	Provider E
In a new job by one year	67%	68%	70%	40%	58%
Moved into an aligned occupation by one year	18%	18%	19%	12%	22%
Wages after one year	\$63,000	\$65,000	\$61,000	\$46,000	\$40,000
Percent change in wages after one year	10%	9%	13%	3%	8%
Absolute wage changes after one year	\$4,000	\$3,100	\$4,500	\$2,300	\$4,300
Percent of workers with wage increases after one year	44%	45%	46%	41%	44%
Percent change in wages after three years	13%	14%	16%	-6%	17%
Percent change in wages after five years	15%	13%	19%	0%	28%
Employment Outcomes Grade	B	B	A-	F	C+

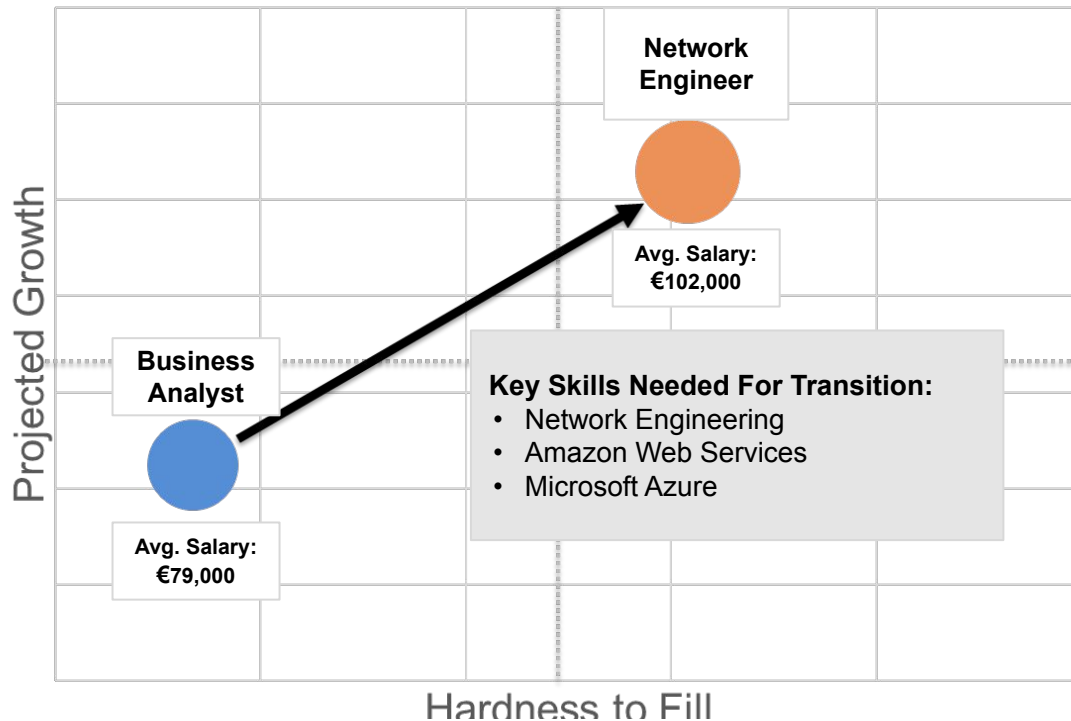
Source: Burning Glass Institute / EQOS

Grow the Pie by Tapping Hidden Talent

Talent isn't a zero-sum game. Efficient training programs tap new reservoirs of talent.

With targeted, efficient training, Business Analysts can be a key source of talent for Network Engineers – a key role for cyber readiness

Leverage considerable overlap in core foundational skills by filling in technical gaps



Business Analyst (€79,000)	Network Engineer (€102,000)
Communications	Communications
Management	Management
Problem Solving	Computer Science
Operations	Leadership
Leadership	Troubleshooting (Problem Solving)
Microsoft Excel	Solution Architecture
Presentations	Operations
Business Proce	Automation
Planning	Network Engineering
Research	Problem Solving
Business Requirement	Planning
Customer Service	Amazon Web Services
Data Analysis	Agile Methodology
Microsoft PowerPoint	Python
Finance	Microsoft Azure
Detail Oriented	Firewall
Agile Methodology	Presentations
Written Communication	Information Technology
Business Analysis	Sales
Consulting	Customer Service



Identifying Hidden Talent

A framework for seeking out underleveraged talent

Some transitions make sense because they are well-worn paths, frequently observed. Others make sense because they involve bridging between similar roles. **Transitions with high skill match and few observed transitions represent underleveraged opportunity.**

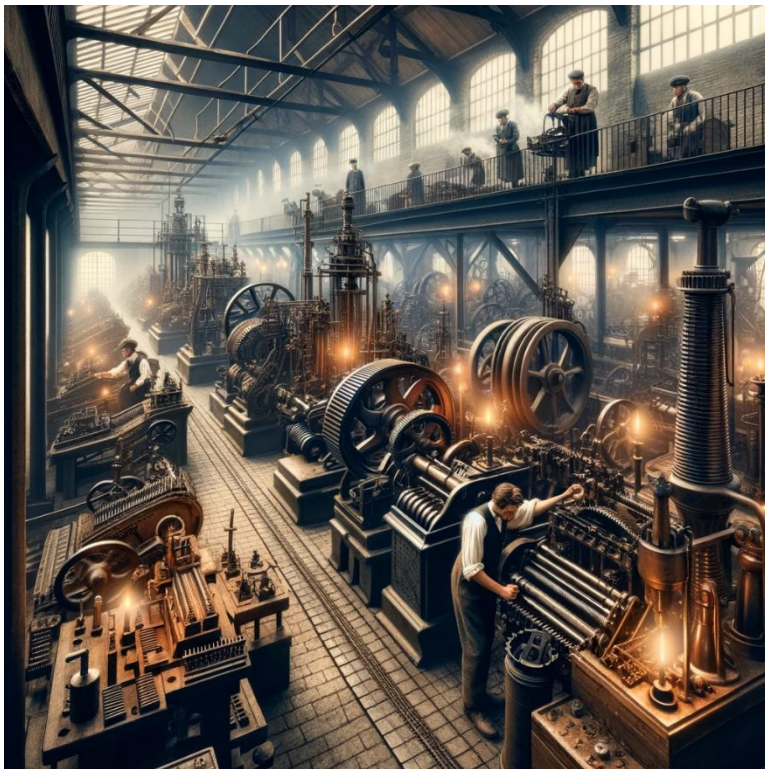
	Most Similar	Similar	Least Similar
Most Observed	Computer Programmers Web Developers Network and Computer Systems Administrators	Information Technology Project Managers	Industrial Engineers
Observed	Software Quality Assurance Analysts & Testers	Information Security Engineers Radio Frequency ID Device Specialists	Sales Engineers
Least Observed	Database Architects*	Business Intelligence Analysts Clinical Data Managers Telecommunications Engineering Specialists	Nurse Practitioners

*Database architects have few observed transitions and high similarity- but are a very small talent pool and tend to earn more than software developers, and thus were excluded from the next step of analysis

A New Paradigm of Productivity

We need a new framework fit for the Human Economy

Historically, we have focused on driving down the cost of **inputs**



By investing in skills, we can grow productivity by making workers and their **outputs** worth more



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