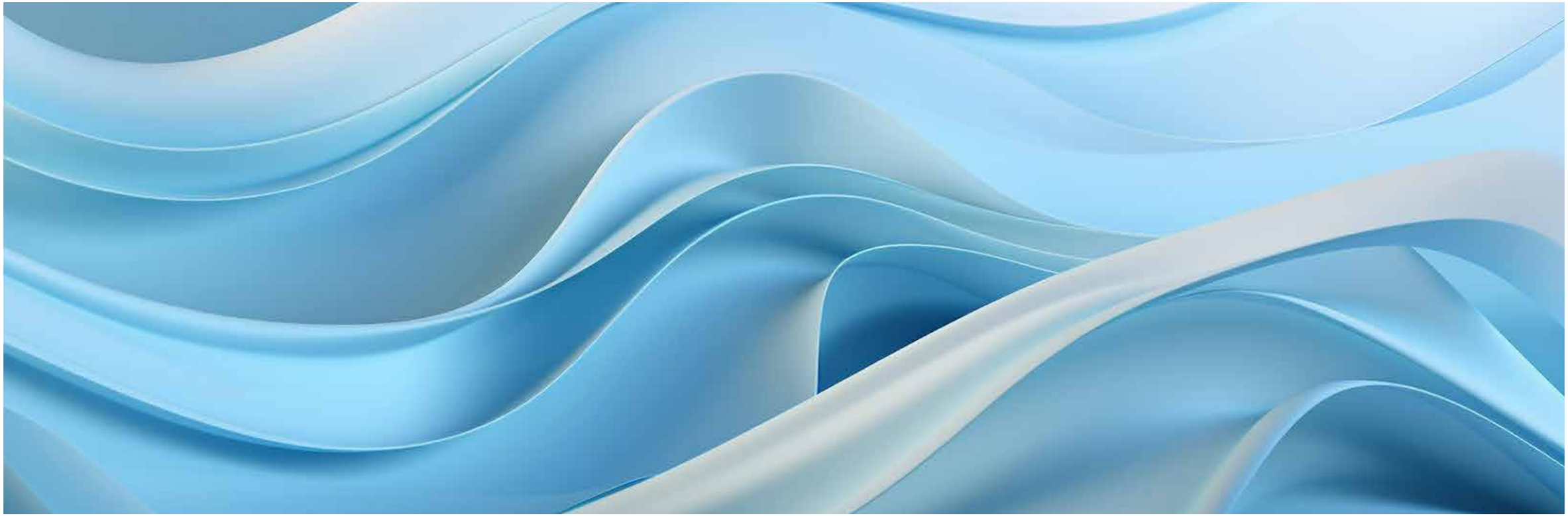

# State of Skills

## 2024 Industry Report

A detailed analysis of emerging skills and evolving roles

phenom

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# Foreword

This first-of-its-kind Phenom 2024 State of Skills Report reflects a pivotal trend in the employment sphere: the rise of skills as the primary metric in recruiting and retaining talent. Skills stand out as the key indicators of an individual's current aptitude and future potential, proving to be resilient and adaptable in a rapidly evolving job market. They've become more significant than traditional educational or professional markers.

## Skills Are the Currency of Meaningful Work

In recruitment, there's a noticeable shift. The focus is now on candidates' skills, which offer a deeper insight into their suitability for a role. This nuanced understanding of skills improves the accuracy of job matches, ensuring that individuals are placed in positions that align with their strengths and potential for growth.

For talent retention, the emphasis on skills is transforming organizational culture. It's creating an environment that prioritizes and encourages learning, personal growth, and innovation. Employees with a clear vision of their career path within an organization are more likely to feel engaged and motivated — and thus, stay with their current employer longer.

The Phenom State of Skills Report emphasizes that skills are a unifying force, essential for learning, and critical for career progression. Recognizing skills as the common thread in education and employment, this report is a call to action for organizations to adapt to a skill-centric approach. It's an approach that promises to shape the workforce for future readiness and align with the changing dynamics of the job market.

To the executives, talent acquisition and management professionals, strategic workforce planners, and all those invested in the future of work, this report is your compass. Emerging roles and skills data are specified for several industries, along with guidance on related skills and what roles can most easily evolve to fit future needs.

This framework provides fundamental building blocks for understanding how to support your innovation with the right talent at the right time. It also provides the necessary clarity to understand at a detailed level whether employee development or external hiring makes the most sense to meet your needs.

The Phenom State of Skills Report highlights the necessity for a skill-focused strategy in the contemporary professional landscape. By adopting this approach, organizations position themselves to thrive, ensuring they have a workforce that's capable, adaptable, and primed for the challenges and opportunities ahead.

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VP, Product Management
Phenom

Kumar has product management skills like roadmapping and agile, but also used to work in cybersecurity, so is proficient in mobile device management.

Cliff Jurkiewicz

VP, Global Strategy, Evangelist
Phenom

Cliff has strategy, business development, and public speaking skills. Additionally, he has skills like aircraft pilot, instrument musician, critical problem solving, and creative design.

SECTION 2

# INTRODUCTION

The idea of using skills to assess talent isn't new. **Skill** and **competency** frameworks have been around for forty or fifty years, but they typically fail to answer two fundamental questions:

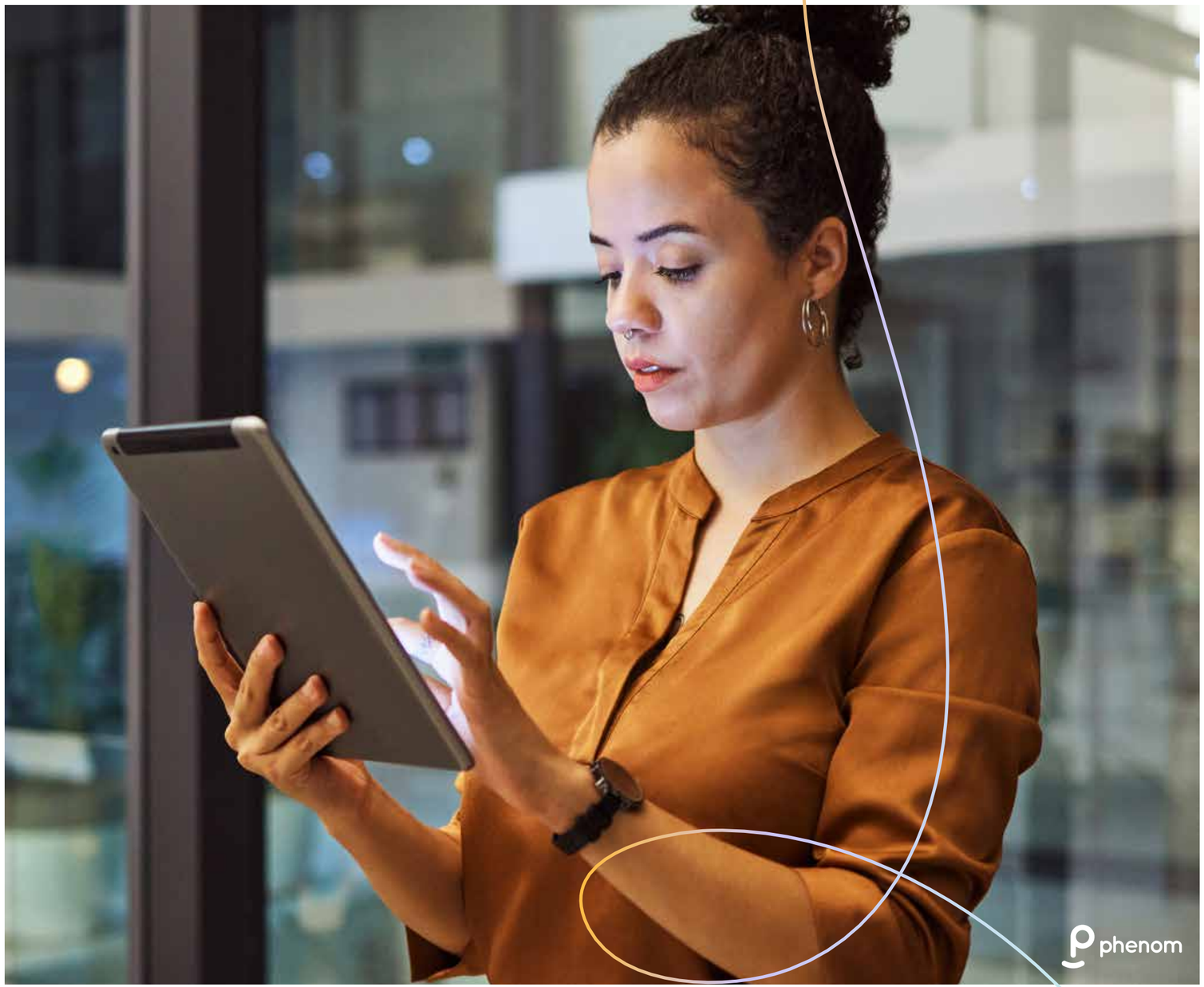
1. **How do I apply these frameworks to all the work that's required today and in the future?**

2. **How do I take action on this data, and more importantly, how do I make it actionable for managers, recruiters, and other employees in my company?**

Limitations in technology made it difficult to make role-to-skill mapping universally applicable, so the focus was typically on critical roles. In a market where talent is scarce, more roles become critical. But there's good news: AI can help. Using a robust skills ontology, AI can rapidly create a career architecture for an entire organization in weeks instead of years, which brings us to question number two.

A system of action takes the skill and role data and puts it at the fingertips of everyone in your organization — and even candidates applying for jobs at your company — to drive higher-quality hiring, development, manager/employee conversations, succession planning, and career progression. Talent acquisition practices like **removing degree requirements** and talent development practices like **microlearning** are helping to push the skills agenda forward.

Still, the data needs to be integrated into the flow of work to make sure it's adopted (e.g. using skills for relevant career path suggestions to employees, best-fit matches for recruiters' open jobs, etc.). Weaving data into the flow of work is just one part of the equation. The recommendations need relevancy — and they can only be relevant if the data they are based on is accurate.





Data quality can be tricky to gauge at this point because almost everyone in the HR tech space seems to be touting a skills solution. So how can you tell if the solution they're offering is good? Are they just repackaging ChatGPT outputs and marking them up? What are they bringing to the table to create the best experience for users?

There are also ongoing concerns about AI use in the hiring process. Legislation continues to drip out from different states, countries, and regions. This added complexity increases the burden of evaluating technology and understanding whether the full value of an AI-driven skills solution can be realized in your organization.

It's no longer a question of whether you should use AI in your talent practices, it's how you can use it while adhering to ethical standards and legal requirements. With the right controls and development philosophies, your business can adopt AI to unlock new levels of efficiency and skills data insights.

This report addresses the questions and concerns outlined above — and a lot more. At its heart, it's a data report that provides information about the future of roles and skills as well as current market demand for five key industries: Financial Services, Healthcare, Life Sciences (Pharmacy, Biotechnology, Medical Devices), Manufacturing, and Technology & IT.

You can use this data to see how you're performing from a talent acquisition and management perspective related to inventory of important skills, framing job descriptions with the right requirements, and planning for future needs.

The report also serves as a guide for the many applications of skills in use by companies ranging in size from hundreds to millions of employees, from candidate attraction to recruiting efficiency to performance management and more. It also outlines the responsible use of AI in these applications to make sure practitioners understand how they can glean value from these tools in an ethical, explainable way.

Skills can provide a common language for your organization to use for talent planning, acquisition, and management. It's time to move past theory into action with hard market data and real-life applications. Let's get started!

SECTION 3

# WHO THIS REPORT IS FOR

This inaugural report targets five industries: Financial Services, Healthcare, Life Sciences (Pharmacy, Biotechnology, Medical Devices), Manufacturing, and Technology & IT.

However, many of these skills are relevant across other industries.

The content in this report is meant for the following personas:

**Talent Management professionals** who are looking to understand more about what skills to target for upskilling their employees to meet the coming needs of their industry

**Talent Acquisition leaders** to learn more about the demand for skills and roles and how that information can be woven into job descriptions and recruiting processes

**Strategic Workforce Planning practitioners** to see what they will need in the future and how to get granular about skills and roles to help drive the execution of either internal or external hiring

**Chief Human Resources Officers (CHROs)** looking for a concise way to identify the right skills data to make decisions and the right application of that data in their organization

This report is also applicable to anyone who wants to see where skills and roles are going so they can equip themselves to excel in the job market. After all, Phenom is on a mission to help a billion people find the right work.

*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.

SECTION 4

# WHAT'S INCLUDED IN THE REPORT

## ABOUT THE DATA

This report includes information about emerging and declining roles and skills, how current roles are evolving, and the most popular roles on the market today for the five industries outlined above.

This data was compiled leveraging the Phenom skill and role ontologies, which are based on several trusted public data sources (e.g. O*Net, ESCO, government labor statistics) and customer research, and have been continuously curated over the past 12+ years to highlight skill-to-skill, skill-to-role, and role-to-role relationships, as well as the prevalence of certain skills in the market and different industries.

The report also delineates between technical skills and soft skills. Technical, or hard, skills are related to the knowledge necessary to accomplish required tasks of a role, typically related to using specific tools (computers, software, etc.) or processes to complete those tasks (e.g. Blockchain Integration). Soft skills relate more to the way you perform your job and how you communicate or interact with others (e.g. Digital Transformation Leadership). This report does not put a rating on one skill over another, or one type of skill over the other.

## For each industry, we have provided:

**Top Emerging Skills**
New skills we have seen in the industry over the past year, a description of the skill, and related skills that form the foundation for the emerging skill

**Top Emerging Roles**
New roles we have seen in the industry over the past year that contain emerging and other skills related to changing business needs

**Required Skills for Emerging Roles**
An overview of the skills required for the emerging roles

**Evolving Roles**
Current roles that are the best starting point to evolve into emerging roles with minimal upskilling

**Top Declining Skills**
Skills that aren't in demand due to industry changes

**Top Declining Roles**
Roles that we have seen a significant decline in postings over the past year due to industry changes

**Most Popular Roles**
The roles in the industry for which there is the most competition for talent

This report also includes information about the use of skills in different applications across the talent lifecycle. These applications are real-life examples in use by Phenom's customers globally using one or more parts of the Phenom Intelligent Talent Experience platform. All of these applications use the same framework that was used to provide the data in this report to create consistency between experiences.

The goal of providing this information and the example applications is so you can take this data and make it actionable in your organization by sharing it with:

- Recruiters and hiring managers to fine-tune job descriptions
- Talent development teams to understand emerging roles, the skills required, and which existing roles are ideal for upskilling; they can also see which roles and skills are declining and identify potential to use those resources to fill the most in-demand roles that have the heaviest competition for talent in the industry
- People managers to better understand what their team makeup needs to look like so they can manage performance and career development using data intelligence

# 12+ Years of Global Data Across Multiple Industries

| | | | | |
|---|---|---|---|---|
| **1.1B** Candidates | **400M** Jobs | **1K** Categories | **1.3M** Companies | **400K** Skills |
| **570K** Jobs Titles | **270K** Schools | **12M** Locations | **50** Industries | |

SECTION 5

# INDUSTRY OVERVIEWS & KEY FINDINGS

INDUSTRY ANALYSIS

# Financial Services

SUMMARY

The **Financial Services industry** includes both Finance and Insurance companies that provide a range of monetary products and services either online or via brick-and-mortar locations. Example organizations in this industry include Cigna, Truist, and Excellus*.

Not surprisingly, **traditional sales** (insurance agents, investment brokers) and **transaction processing roles** (bank tellers, insurance claims processors), and the associated skills are on the decline as online systems continue to become more sophisticated.

To handle and promote this shift, companies are investing in skills devoted to crafting a world-class experience — even if a customer never physically speaks to anyone. This is driving the need for both technical skills that can implement technologies, like chatbots, effectively and overarching roles that look at the customer journey end-to-end to ensure the quality of all interactions.

As financial services organizations continue to innovate, modernize, and digitize their services, roles like cybersecurity specialists, data scientists, blockchain specialists, regulatory compliance officers, and professionals focused on cryptocurrency and fintech are in high demand.

There is also a push for more AI skills around the analysis of risk and fraud, which is allowing companies to not only leverage much larger data sets in their risk calculations and fraud detection but also cut costs related to the delivery of different financial and insurance products.

This is leading to an expansion of products that companies can offer to more individuals without increasing their risk profile. As a result, there are more roles related to personal advice, financial wellness, and sustainable finance emerging in the industry.



*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.

# Financial Services: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Explainable AI | Explainable AI refers to AI models and algorithms that can provide transparent explanations for their decisions and predictions, ensuring accountability, trust, and compliance in financial and insurance applications. | Tech | Machine Learning, Data Interpretation, Communication Skills |
| Automated Financial Advice | Automated financial advice, also known as robo-advisory services, involves AI-powered algorithms providing personalized investment recommendations and financial planning advice to clients, enhancing accessibility and affordability. | Tech | Financial Planning, Investment Management, Programming (Python/R) |
| AI-Powered Fraud Detection | AI-powered fraud detection utilizes machine learning and pattern recognition algorithms to detect and prevent fraudulent activities, such as identity theft, payment fraud, and insurance scams, improving security and reducing losses. | Tech | Data Analysis, Fraud Detection Techniques, Machine Learning |
| Natural Language Processing (NLP) | Natural Language Processing (NLP) involves AI techniques that enable computers to understand, interpret, and generate human language. In finance and insurance, NLP is used for sentiment analysis, document processing, and chatbot interactions. | Tech | Machine Learning, Data Interpretation, Communication Skills |
| AI-Driven Credit Scoring | AI-driven credit scoring leverages machine learning models to assess borrowers' creditworthiness based on various data points, enabling more accurate risk assessment and lending decisions while reducing bias and human error. | Tech | Credit Risk Analysis, Statistical Modeling, Data Analysis |
| Predictive Underwriting | Predictive underwriting utilizes AI and predictive analytics to assess insurance risks and determine policy premiums based on individual behavior, demographics, and other factors, enhancing pricing accuracy and competitiveness. | Tech | Underwriting Principles, Risk Assessment, Predictive Modeling |
| AI-Powered Customer Service | AI-powered customer service employs virtual assistants, chatbots, and conversational AI to handle customer inquiries, provide support, and offer personalized recommendations, enhancing efficiency and satisfaction in financial and insurance services. | Tech | Customer Relationship Management (CRM), Natural Language Processing (NLP), Chatbot Development |
| Algorithmic Trading | Algorithmic trading involves using AI algorithms to execute high-speed trades automatically based on predefined parameters, such as price movements, market trends, and risk factors, optimizing trading strategies and execution efficiency. | Tech | Financial Markets Knowledge, Programming (Python/C++), Statistical Analysis |
| AI-Enhanced Regulatory Compliance | AI-enhanced regulatory compliance utilizes machine learning and natural language processing to streamline compliance processes, monitor regulatory changes, and ensure adherence to complex financial and insurance regulations. | Tech | Regulatory Compliance, Legal Knowledge, Data Management |
| Personalized Risk Management | Personalized risk management involves using AI and data analytics to customize risk assessments and insurance policies based on individual needs, behaviors, and preferences, providing tailored coverage and pricing for clients. | Tech | Risk Assessment, Insurance Principles, Data Analytics |
| Quantum Computing | Quantum computing harnesses quantum mechanics principles to perform complex computations at unprecedented speeds, enabling advanced simulations, optimization, and cryptography applications with profound implications for finance and insurance. | Tech | Mathematics (Linear Algebra, Calculus), Computer Science, Quantum Mechanics |
| AI-Driven Investment Strategies | AI-driven investment strategies leverage machine learning models to analyze market data, identify trends, and optimize asset allocation and portfolio management decisions, enhancing returns and reducing volatility for investors and fund managers. | Tech | Investment Management, Portfolio Optimization, Machine Learning |
| RegTech Solutions | RegTech solutions utilize AI, data analytics, and automation to streamline regulatory compliance processes, manage risk, and ensure adherence to financial regulations and reporting requirements, enhancing efficiency and reducing compliance costs. | Tech | Regulatory Compliance, Data Governance, Technology Integration |
| Blockchain Integration | Blockchain integration involves implementing distributed ledger technology (DLT) to facilitate secure, transparent, and immutable transactions, contracts, and data sharing in financial services, insurance claims, and supply chain management. | Tech | Distributed Ledger Technology (DLT), Cryptography, Smart Contracts |
| Cybersecurity Resilience | Cybersecurity resilience focuses on enhancing organizations' ability to withstand, adapt to, and recover from cyber threats, including data breaches, ransomware attacks, and social engineering scams, safeguarding sensitive financial and client data. | Tech | Information Security, Risk Management, Incident Response |
| Digital Identity Management | Digital identity management involves using AI, biometrics, and blockchain to establish and manage secure digital identities for individuals and entities, enabling seamless authentication and access control in online financial transactions and services. | Tech | Identity and Access Management (IAM), Cryptography, Biometrics |
| AI-Driven Regulatory Reporting | AI-driven regulatory reporting automates the collection, analysis, and submission of regulatory data and compliance reports, ensuring accuracy, timeliness, and completeness while reducing manual effort and minimizing regulatory risks and fines. | Tech | Regulatory Compliance, Data Management, Automation |
| Sustainable Finance Strategies | Sustainable finance strategies incorporate environmental, social, and governance (ESG) criteria into investment decisions, risk management, and corporate practices, promoting ethical, responsible, and sustainable financial activities and outcomes. | Soft | Environmental, Social, and Governance (ESG) Knowledge, Finance Principles |
| Behavioral Economics Analysis | Behavioral economics analysis applies insights from psychology and decision-making theory to understand and influence financial behaviors, preferences, and outcomes, improving product design, marketing strategies, and customer engagement initiatives. | Soft | Behavioral Psychology, Decision-Making Theory, Data Analysis |
| Digital Transformation Leadership | Digital transformation leadership involves guiding organizations through technological changes, innovation initiatives, and cultural shifts to embrace digital technologies, data-driven practices, and customer-centric strategies in finance and insurance. | Soft | Change Management, Strategic Planning, Leadership Skills |

# Financial Services: Top Emerging Roles

| Emerging Role | Description |
|---|---|
| AI Risk Analyst | Utilizes AI algorithms to assess and manage risks in financial portfolios and insurance underwriting processes. |
| Blockchain Specialist | Implements blockchain technology for secure and transparent transactions, smart contracts, and identity verification. |
| Financial Data Scientist | Applies data science techniques to analyze financial data, detect patterns, and develop predictive models for investment strategies. |
| Cybersecurity Specialist | Develops and implements cybersecurity measures to protect financial and customer data from cyber threats and fraud. |
| Robo-Advisor Developer | Designs and develops automated investment advisory systems powered by AI algorithms for personalized portfolio management. |
| Insurtech Innovator | Drives innovation in the insurance industry by leveraging technologies like AI, IoT, and blockchain for product development and customer engagement. |
| Quantitative Analyst | Applies mathematical and statistical methods to analyze financial markets, assess investment risks, and develop trading strategies. |
| Compliance Officer | Ensures that financial institutions and insurance companies comply with regulatory requirements and industry standards. |
| Fintech Product Manager | Manages the development and implementation of financial technology products, such as mobile banking apps and digital wallets. |
| Digital Transformation Strategist | Develops and implements strategies for integrating digital technologies into financial services and insurance operations. |
| Data Privacy Officer | Oversees compliance with data protection regulations and ensures the privacy and security of customer information. |
| Cryptocurrency Analyst | Analyzes trends and market dynamics of cryptocurrencies, evaluates investment opportunities, and advises on trading strategies. |
| Machine Learning Engineer | Develops machine learning models and algorithms for applications in fraud detection, credit scoring, and automated trading. |
| Regtech Solutions Architect | Designs and implements regulatory technology solutions for automating compliance processes, reporting, and risk management. |
| Customer Experience Manager | Focuses on enhancing the customer journey by leveraging AI, analytics, and personalized services in financial and insurance interactions. |
| Digital Asset Manager | Manages digital assets such as cryptocurrencies, tokens, and digital securities for investment portfolios and financial institutions. |
| Financial Wellness Consultant | Provides personalized financial advice and guidance to individuals and businesses to improve financial health and well-being. |
| AI-Powered Chatbot Developer | Designs and develops AI-powered chatbots for customer service, financial advice, and automated transactions in banking and insurance. |
| Wealthtech Advisor | Utilizes technology and data analytics to optimize wealth management strategies, investment portfolios, and financial planning. |
| Regulated Tokenization Specialist | Facilitates the tokenization of assets such as real estate, securities, and commodities in compliance with regulatory requirements. |
| Alternative Data Analyst | Analyzes non-traditional datasets, such as social media trends and satellite imagery, to gain insights for investment decisions and risk assessment. |
| Fraud Detection Analyst | Utilizes AI and machine learning algorithms to detect and prevent fraudulent activities in financial transactions and insurance claims. |
| Digital Identity Manager | Develops and manages digital identity solutions for secure and seamless authentication in financial services and insurance processes. |
| Sustainable Finance Advisor | Advises on sustainable investing strategies, ESG (Environmental, Social, Governance) criteria, and impact measurement in finance and insurance. |
| AI Governance Specialist | Ensures ethical and responsible use of AI technologies in finance and insurance, including fairness, transparency, and accountability. |

# Financial Services: Required Skills for Emerging Roles

## AI RISK ANALYST

- Data Analysis
- Risk Management
- Artificial Intelligence
- Machine Learning
- Financial Modeling
- Statistical Analysis
- Python
- R
- SQL
- Data Visualization
- Predictive Modeling
- Quantitative Analysis
- Financial Reporting
- Financial Risk Assessment
- Regulatory Compliance
- Financial Forecasting
- Econometrics
- Financial Markets
- Insurance Industry Knowledge
- Financial Statement Analysis

## BLOCKCHAIN SPECIALIST

- Blockchain Technology
- Smart Contracts
- Cryptocurrency
- Distributed Ledger
- Decentralized Applications
- Ethereum
- Hyperledger
- Solidity
- Consensus Algorithms
- Tokenization
- Digital Identity
- Security
- Regulatory Compliance
- Financial Services
- Insurance Industry
- Risk Management
- Data Privacy
- Audit and Assurance
- Business Strategy
- Project Management

## FINANCIAL DATA SCIENTIST

- Data Analysis
- Financial Modeling
- Statistical Analysis
- Machine Learning
- Python
- R
- SQL
- Data Visualization
- Predictive Modeling
- Risk Management
- Financial Reporting
- Econometrics
- Time Series Analysis
- Portfolio Management
- Quantitative Analysis
- Financial Markets
- Investment Management
- Valuation
- Derivatives
- Financial Planning
- Insurance Industry Knowledge

## CYBERSECURITY SPECIALIST

- Risk Management
- Information Security
- Cybersecurity
- Data Privacy
- Compliance
- Financial Services
- Insurance
- Network Security
- Threat Intelligence
- Vulnerability Management
- Penetration Testing
- Incident Response
- Security Architecture
- Cloud Security
- Identity and Access Management
- Data Protection
- Regulatory Compliance
- Business Continuity Planning
- Security Auditing
- Fraud Detection

## ROBO-ADVISOR DEVELOPER

- Programming Languages (Python, Java, C++, etc.)
- Machine Learning and AI
- Data Analysis and Visualization
- Financial Modeling and Forecasting
- Risk Management
- Portfolio Management
- Algorithmic Trading
- Financial Regulations and Compliance
- Big Data Technologies (Hadoop, Spark, etc.)
- Cloud Computing
- Natural Language Processing
- Quantitative Analysis
- Statistical Modeling
- Database Management
- Software Development Methodologies (Agile, Scrum, etc.)
- Financial Markets and Instruments
- Econometrics
- Blockchain Technology
- Cybersecurity
- Communication and Collaboration Skills

# Financial Services: Required Skills for Emerging Roles

## INSURTECH INNOVATOR

- Data Analysis
- Risk Management
- Financial Modeling
- Insurance Industry Knowledge
- Innovation Management
- Technology Integration
- Business Strategy
- Project Management
- Customer Experience Design
- Market Research
- Product Development
- Agile Methodologies
- Data Visualization
- Digital Transformation
- Emerging Technologies
- Regulatory Compliance
- Strategic Partnerships
- Change Management
- Leadership
- Communication Skills

## QUANTITATIVE ANALYST

- Data Analysis
- Financial Modeling
- Risk Management
- Statistical Analysis
- Quantitative Research
- Python
- R
- SQL
- Machine Learning
- Time Series Analysis
- Portfolio Management
- Financial Markets
- Econometrics
- Derivatives
- Monte Carlo Simulation
- Asset Allocation
- Financial Reporting
- Valuation
- Regression Analysis
- Portfolio Optimization

## COMPLIANCE OFFICER

- Risk Management
- Compliance
- Financial Regulations
- Audit
- Legal Compliance
- Financial Reporting
- Internal Controls
- Anti-Money Laundering
- Financial Analysis
- Corporate Governance
- Regulatory Compliance
- Financial Services
- Financial Planning
- Financial Modeling
- Data Analysis
- Investment Management
- Financial Risk
- Financial Markets
- Financial Statements
- Financial Accounting
- Insurance Industry Knowledge

## FINTECH PRODUCT MANAGER

- Product Management
- Financial Services
- Insurance
- Fintech
- Data Analysis
- Market Research
- Project Management
- Agile Methodologies
- User Experience (UX) Design
- Business Strategy
- Risk Management
- Financial Modeling
- Market trends
- Digital Marketing
- Product Development
- Data Visualization
- Financial Planning
- Customer Relationship Management (CRM)
- Competitive Analysis
- Regulatory Compliance

# Financial Services: Required Skills for Emerging Roles

## DIGITAL TRANSFORMATION STRATEGIST

- Digital Transformation
- Strategic Planning
- Finance
- Insurance
- Business Analysis
- Data Analysis
- Project Management
- Change Management
- Risk Management
- Process Improvement
- Customer Experience
- Market Analysis
- Competitive Analysis
- Leadership
- Communication
- Teamwork
- Problem Solving
- Innovation
- Technology Integration
- Data Visualization
- Financial Modeling

## DATA PRIVACY OFFICER

- Data Privacy
- Risk Management
- Compliance
- Data Protection
- Legal Knowledge
- Financial Regulations
- Insurance Laws
- Data Governance
- Privacy Laws and Regulations
- Data Security
- Data Analysis
- Project Management
- Communication Skills
- Problem Solving
- Critical Thinking
- Attention to Detail
- Ethical Decision Making
- Strategic Planning
- Business Acumen
- Industry Knowledge

## CRYPTO-CURRENCY ANALYST

- Financial Analysis
- Risk Management
- Data Analysis
- Cryptocurrency Knowledge
- Blockchain Technology
- Market Research
- Investment Strategies
- Financial Modeling
- Economic Analysis
- Financial Reporting
- Portfolio Management
- Quantitative Analysis
- Financial Forecasting
- Cryptocurrency Trading
- Financial Regulations
- Industry Trends
- Financial Planning
- Cryptocurrency Mining
- Financial Markets
- Cryptocurrency Investment

## MACHINE LEARNING ENGINEER

- Machine Learning
- Data Science
- Python
- R
- Statistical Modeling
- Deep Learning
- Natural Language Processing
- Big Data
- Data Visualization
- Predictive Modeling
- Financial Analysis
- Risk Management
- Insurance Industry Knowledge
- Financial Domain Expertise
- Quantitative Analysis
- Algorithm Development
- Data Mining
- Time Series Analysis
- Cloud Computing
- Database Management

## REGTECH SOLUTIONS ARCHITECT

- Regulatory Compliance
- Risk Management
- Financial Services
- Insurance Industry Knowledge
- Solution Architecture
- Cloud Computing
- Data Governance
- Data Privacy
- Data Security
- Regulatory Reporting
- Compliance Management
- Financial Regulations
- Information Security
- Data Management
- Business Analysis
- Project Management
- Agile Methodologies
- Change Management
- Stakeholder Management
- Vendor Management

# Financial Services: Required Skills for Emerging Roles

## CUSTOMER EXPERIENCE MANAGER

- Customer Service
- Communication
- Problem-Solving
- Time Management
- Data Analysis
- Financial Management
- Leadership
- Teamwork
- Negotiation
- Project Management
- Sales
- Marketing
- Risk Management
- Customer Satisfaction
- Process Improvement
- Strategic Planning
- Budgeting
- Market Research
- Customer Relationship Management (CRM)
- Industry Knowledge (Finance and Insurance)

## DIGITAL ASSET MANAGER

- Digital Asset Management
- Finance
- Insurance
- Data Management
- Content Management
- Metadata Management
- Digital Asset Lifecycle
- Asset Tracking
- Digital Asset Organization
- Digital Asset Preservation
- Digital Asset Distribution
- Digital Asset Security
- Digital Asset Analytics
- Digital Asset Strategy
- Digital Asset Governance
- Digital Asset Compliance
- Digital Asset Workflow
- Digital Asset Collaboration
- Digital Asset Integration
- Digital Asset Training

## FINANCIAL WELLNESS CONSULTANT

- Financial Planning
- Investment Management
- Risk Management
- Retirement Planning
- Estate Planning
- Tax Planning
- Wealth Management
- Insurance Planning
- Financial Analysis
- Budgeting
- Cash Flow Management
- Financial Reporting
- Financial Modeling
- Data Analysis
- Customer Service
- Sales
- Relationship Management
- Communication
- Problem Solving
- Time Management
- Industry Knowledge (Finance and Insurance)

## AI-POWERED CHATBOT DEVELOPER

- Natural Language Processing (NLP)
- Machine Learning
- Deep Learning
- Python
- Chatbot Development
- Artificial Intelligence (AI)
- Finance and Insurance Industry Knowledge
- Data Analysis
- Data Visualization
- Statistical Modeling
- Predictive Analytics
- Cloud Computing
- Big Data
- Data Mining
- Programming Languages (Java, C++, etc.)
- Software Development
- User Experience (UX) Design
- Human-Computer Interaction (HCI)
- Agile Methodologies
- Project Management

## WEALTHTECH ADVISOR

- Financial Planning
- Investment Management
- Risk Management
- Wealth Management
- Financial Analysis
- Client Relationship Management
- Financial Advisory
- Portfolio Management
- Retirement Planning
- Estate Planning
- Tax Planning
- Asset Allocation
- Insurance Planning
- Wealth Preservation
- Financial Literacy
- Market Analysis
- Financial Regulations
- Customer Service
- Data Analysis
- Communication Skills

# Financial Services: Required Skills for Emerging Roles

## REGULATED TOKENIZATION SPECIALIST

- Regulatory Compliance
- Tokenization
- Blockchain Technology
- Securities Knowledge
- Investment Strategy
- Smart Contract Development
- Data Privacy
- Anti-Money Laundering
- Financial Modeling
- Digital Asset Strategy
- Financial Reporting
- Financial Product Development
- Regulatory Frameworks
- Data Visualization
- Project Management
- Decentralized Finance
- Financial Derivativeis
- Financial Technology
- Token Economics
- Financial Accounting

## ALTERNATIVE DATA ANALYST

- Data Analysis
- Financial Analysis
- Insurance Industry Knowledge
- Alternative Data Sources
- Data Mining
- Data Visualization
- Statistical Analysis
- Machine Learning
- Python
- R
- SQL
- Excel
- Tableau
- Data Modeling
- Predictive Modeling
- Risk Management
- Financial Reporting
- Market Research
- Business Intelligence
- Critical Thinking

## FRAUD DETECTION ANALYST

- Fraud Detection
- Data Analysis
- Risk Management
- Financial Services
- Insurance
- Investigative Techniques
- Fraud Prevention
- Financial Crimes
- Anti-Money Laundering
- Fraud Investigation
- Financial Regulations
- Data Mining
- Fraud Analytics
- Financial Fraud
- Fraud Risk Assessment
- Fraud Detection Software
- Financial Intelligence
- Fraud Detection Strategies
- Financial Forensics
- Fraud Detection Tools

## DIGITAL IDENTITY MANAGER

- Digital Identity Management
- Finance and Insurance
- Risk Management
- Data Privacy
- Cybersecurity
- Compliance
- Identity and Access Management
- Data Governance
- Financial Regulations
- Fraud Detection
- Information Security
- Cloud Computing
- Data Analysis
- Project Management
- Business Continuity Planning
- Vendor Management
- IT Governance
- Data Protection
- Audit and Compliance
- Business Process Improvement
- Change Management

# Financial Services: Required Skills for Emerging Roles

## SUSTAINABLE FINANCE ADVISOR

- Sustainable Finance
- Financial Analysis
- Risk Management
- Environmental, Social, and Governance (ESG) Standards
- Climate Change Mitigation
- Impact Investing
- Sustainability Reporting
- Green Bonds
- Carbon Accounting
- Sustainable Investment Strategies
- Corporate Social Responsibility (CSR)
- Sustainable Development Goals (SDGs)
- Environmental Law and Regulations
- Financial Modeling
- Project Management
- Stakeholder Engagement
- Data Analysis
- Economic Analysis
- Sustainability Metrics
- Sustainable Supply Chain Management

## AI GOVERNANCE SPECIALIST

- Artificial Intelligence
- Governance
- Finance
- Insurance
- Risk Management
- Data Privacy
- Ethics
- Compliance
- Regulatory Frameworks
- Data Governance
- Machine Learning
- Data Analysis
- Data Security
- Legal Compliance
- Financial Regulations
- Insurance Regulations
- Data Protection
- Audit
- Policy Development
- Stakeholder Management
- Communication

## DIGITAL TRANS-FORMATION STRATEGIST

- Digital Transformation Strategies
- Business Process Analysis
- Change Management
- Innovation Management
- Strategic Planning
- Leadership and Influence
- Technology Trends Analysis
- Customer Experience Design
- Data-driven Decision Making
- Agile Methodologies
- Stakeholder Management
- Project Management
- Digital Literacy
- Collaboration and Communication
- Risk Management
- Performance Measurement
- Vendor Management
- Continuous Improvement
- Problem-solving
- Organizational Development

# Financial Services: Evolving Roles

| | |
|---|---|
| Risk Analyst, Credit Risk Manager, Financial Analyst | AI Risk Analyst |
| Software Developer, Systems Architect, Cryptocurrency Analyst | Blockchain Specialist |
| Data Analyst, Business Intelligence Analyst, Quantitative Analyst | Financial Data Scientist |
| Information Security Analyst, Network Security Engineer, IT Auditor | Cybersecurity Specialist |
| Software Engineer, Investment Analyst, Financial Advisor | Robo-Advisor Developer |
| Insurance Underwriter, Product Manager, Business Analyst | Insurtech Innovator |
| Data Scientist, Statistician, Financial Engineer | Quantitative Analyst |
| Legal Counsel, Regulatory Affairs Specialist, Compliance Analyst | Compliance Officer |
| Product Manager, Business Development Manager, Project Manager | Fintech Product Manager |
| Digital Strategy Consultant, IT Manager, Change Management Specialist | Digital Transformation Strategist |
| Privacy Compliance Officer, Data Protection Officer, Legal Counsel | Data Privacy Officer |
| Financial Analyst, Investment Analyst, Blockchain Developer | Cryptocurrency Analyst |
| Data Scientist, AI Engineer, Software Developer | Machine Learning Engineer |
| IT Architect, Regulatory Compliance Consultant, Systems Analyst | Regtech Solutions Architect |
| Customer Relationship Manager, Marketing Manager, UX Designer | Customer Experience Manager |
| Portfolio Manager, Investment Analyst, Asset Manager | Digital Asset Manager |
| Financial Planner, Personal Finance Advisor, Wealth Manager | Financial Wellness Consultant |
| Software Developer, UX Designer, AI Engineer | AI-Powered Chatbot Developer |
| Financial Advisor, Investment Manager, Wealth Manager | Wealthtech Advisor |
| Financial Analyst, Blockchain Developer, Compliance Officer | Regulated Tokenization Specialist |
| Data Scientist, Market Analyst, Research Analyst | Alternative Data Analyst |
| Fraud Investigator, Risk Analyst, Security Analyst | Fraud Detection Analyst |
| Identity Management Specialist, Cybersecurity Analyst, IT Security Manager | Digital Identity Manager |
| Environmental Analyst, ESG Specialist, Sustainability Consultant | Sustainable Finance Advisor |
| Compliance Officer, Data Protection Officer, Legal Counsel | AI Governance Specialist |

# Financial Services: Top Declining Skills

| Skill | Reason for Decline |
|---|---|
| **Manual Data Entry** | Automation of data entry tasks through digital systems and software reduces the need for manual input. |
| **Paper-based Document Filing** | Transition to digital document management systems eliminates the need for physical filing and storage of paper documents. |
| **Cash Handling** | Increasing use of digital payments, online banking, and electronic transactions reduces the need for cash handling skills. |
| **Manual Calculations** | Automation of calculations through spreadsheets, software, and algorithms reduces reliance on manual arithmetic skills. |
| **Basic Bookkeeping** | Adoption of accounting software automates bookkeeping tasks, reducing the need for manual entry and reconciliation. |
| **Manual Underwriting** | Implementation of automated underwriting systems and AI-driven risk assessment tools diminishes the need for manual underwriters. |
| **Physical Security Management** | Advanced security systems and digital surveillance technologies decrease the need for manual security monitoring and management. |
| **Traditional Sales Techniques** | Shift towards digital marketing, online sales platforms, and automated customer relationship management reduces reliance on traditional sales approaches. |
| **Basic Accounting Software Proficiency** | Increasing sophistication and automation of accounting software reduces the need for manual data entry and reconciliation skills. |
| **Basic Spreadsheet Skills** | Automation of data analysis and reporting through advanced spreadsheet functionalities and business intelligence tools decreases reliance on basic spreadsheet skills. |

| Skill | Reason for Decline |
|---|---|
| **Basic Statistical Analysis** | Adoption of advanced statistical software and machine learning algorithms reduces the need for manual statistical analysis skills. |
| **Manual Claims Processing** | Implementation of automated claims processing systems and AI-driven software decreases reliance on manual claims processing. |
| **Manual Loan Processing** | Automation of loan origination and processing through digital platforms reduces the need for manual loan processing skills. |
| **Manual Risk Assessment** | Advancements in AI and machine learning enable automated risk assessment and modeling, decreasing reliance on manual risk analysis. |
| **Manual Securities Trading** | Increasing use of algorithmic trading and electronic trading platforms reduces reliance on manual securities trading skills. |
| **Cold Calling** | Shift towards digital marketing, lead generation tools, and online sales platforms reduces reliance on traditional cold calling techniques. |
| **Manual Financial Reporting** | Adoption of automated financial reporting systems and business intelligence tools decreases reliance on manual financial reporting. |
| **Manual Invoice Processing** | Automation of invoice processing through accounting software and electronic invoicing systems decreases reliance on manual processing. |
| **Basic Tax Preparation** | Increasing use of tax preparation software and digital tax filing platforms reduces reliance on manual tax preparation skills. |
| **Manual Inventory Management** | Adoption of inventory management software and RFID technology reduces reliance on manual inventory tracking and management. |

# Financial Services: Top Declining Roles

| Role | Reason for Decline |
|---|---|
| **Bank Teller** | Automation of routine banking transactions through online banking, ATMs, and mobile apps reduces the need for in-person teller services. |
| **Insurance Claims Processor** | Implementation of automated claims processing systems and AI-driven software reduces the need for manual claims processing. |
| **Data Entry Clerk** | Advancements in data automation and digitalization streamline data entry processes, decreasing the demand for manual data entry clerks. |
| **Mortgage Underwriter** | Adoption of automated underwriting systems and AI-based risk assessment tools reduces the need for manual mortgage underwriting. |
| **Loan Processor** | Automation of loan processing tasks and digitalization of loan applications reduce the need for manual loan processors. |
| **Insurance Agent** | Shift towards online insurance platforms and direct-to-consumer sales models diminishes the demand for traditional insurance agents. |
| **Securities Trader** | Increasing use of algorithmic trading and electronic trading platforms reduces the need for manual securities traders. |
| **Bookkeeper** | Automation of bookkeeping tasks through accounting software and cloud-based solutions decreases the demand for manual bookkeepers. |
| **Investment Broker** | Rising popularity of robo-advisors and online investment platforms decreases the need for traditional investment brokers. |
| **Risk Analyst** | Advancements in AI and machine learning enable automated risk assessment and modeling, reducing the reliance on manual risk analysts. |

# Financial Services: Most Popular Roles

### Financial Analyst

Analyzes financial data, prepares reports, and provides insights to guide investment decisions, budgeting, and forecasting.

### Risk Manager

Identifies, assesses, and mitigates financial risks within an organization, including market, credit, operational, and strategic risks.

### Investment Analyst

Conducts research, analyzes financial data, and evaluates investment opportunities to make recommendations for portfolio management.

### Loan Officer

Evaluates loan applications, assesses creditworthiness, and approves or denies loan requests for individuals and businesses.

### Actuary

Assesses and manages financial risks by analyzing data and using mathematical models to calculate insurance premiums and reserves.

### Financial Advisor

Provides personalized financial advice and guidance to individuals and businesses on investments, retirement planning, and wealth management.

### Mortgage Broker

Facilitates mortgage loans between borrowers and lenders, assisting clients in finding suitable loan options and securing financing.

### Tax Advisor

Provides tax planning and preparation services to individuals and businesses, ensuring compliance with tax laws and maximizing tax efficiency.

### Investment Banker

Facilitates corporate finance transactions, such as mergers and acquisitions, capital raising, and financial advisory services.

### Accountant

Prepares and maintains financial records, performs audits, and ensures compliance with tax regulations and accounting standards.

### Insurance Agent

Sells insurance policies to individuals and businesses, advises clients on coverage options, and assists with claims processing.

### Credit Analyst

Assesses the creditworthiness of individuals and businesses, analyzes credit risk, and makes recommendations for lending decisions.

### Insurance Underwriter

Evaluates insurance applications, assesses risks, and determines coverage terms and premiums for individuals and businesses.

### Compliance Officer

Ensures that financial institutions and insurance companies comply with regulatory requirements and industry standards.

### Financial Planner

Develops comprehensive financial plans for clients, including investment strategies, retirement planning, and risk management.

### Portfolio Manager

Manages investment portfolios on behalf of clients or institutions, making strategic investment decisions to achieve financial goals.

# Financial Services: Most Popular Roles

### Financial Controller

Oversees financial reporting, accounting operations, and internal controls within an organization to ensure accuracy and compliance.

### Wealth Manager

Provides holistic wealth management services to high-net-worth individuals and families, including investment management and estate planning.

### Treasury Analyst

Manages cash flow, liquidity, and financial assets for corporations, optimizing investment returns and minimizing financial risks.

### Insurance Broker

Acts as an intermediary between insurance companies and clients, helping clients find insurance coverage tailored to their needs.

### Insurance Claims Adjuster

Investigates insurance claims, assesses damages, and determines coverage eligibility and claim settlements for policyholders.

### Derivatives Trader

Buys and sells financial derivatives, such as options, futures, and swaps, to hedge risks, speculate on price movements, and generate profits.

### Financial Risk Analyst

Identifies, analyzes, and evaluates financial risks within an organization, such as market risk, credit risk, and liquidity risk.

### Retirement Planning Advisor

Specializes in retirement planning strategies, including pension plans, 401(k) accounts, and individual retirement accounts (IRAs).

### Corporate Finance Manager

Oversees financial planning, analysis, and decision-making processes within a corporation, including capital budgeting and investment analysis.

INDUSTRY ANALYSIS

# Healthcare

SUMMARY

The **Healthcare industry** encompasses hospitals, ambulatory services, long-term care facilities, and social assistance services. Examples of organizations in this industry include Children's Hospital of Pennsylvania, Trinity Health, and Ascension Health*. The Bureau of Labor Statistics has **projected** that due to the increasing need for care for an aging population, Healthcare employment will grow the fastest of any industry during the next eight years, and is projected to create up to 45% of all job gains during that period.

Healthcare organizations will continue to strive to attract and retain professionals with clinical skills tied directly to nursing and nurse practitioners at hospitals and clinics, home health care aides and staffing for assisted living facilities, physical therapy, and radiological and laboratory skilled technicians.

Beyond the ongoing struggle of sourcing and keeping clinical staff, health systems are continuously dealing with getting comprehensive health information about their patients and making sure that data stays private and secure, as well as helping those patients (and themselves) minimize costs incurred from preventable issues.

Care improvement and cost reduction in recent years have focused on efficient and safe ways to distribute the right medication to the right patient at the right time, which has been aided by a combination of electronic health records and mobile technology. This has led to a decrease in the need for records management, pharmacy technicians, and even admissions/receptionists at check-in.




*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.*

The emerging strategies for keeping costs down by proactively identifying potential problems will require further investment in skills like pharmacogenomics, genetic engineering, and next-generation sequencing. This is also being combined with digital transformation efforts to hire AI specialists who can identify the best areas to leverage AI in processes and patient care, as well as leveraging wearable health technology that can transmit early warning indicators to their users and health professionals.

Cost impacts and disruption to effective patient care as a result of increased cyberattacks in this industry are also driving high demand for cybersecurity analysts, data management and IT skills, and skills managing electronic health records and patient health information.

Besides the proliferation of outpatient clinics in rural areas to help expand a health system's reach, there has been an increased investment in "tele" skills and technology to help deliver psychology and psychiatry, health coaching, medical consults, and even treatment remotely. Skilled nurses (RN, LPN, CNA, and CNS), nurse practitioners, and therapists with both telehealth and in-person treatment skills will be in high demand to meet this need.

The next iteration of this will be injecting augmented and virtual reality concepts into these health services so you can still be in the "room" with them to get the best treatment no matter where you are in the world.

# Healthcare: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Pharmacogenomics | Study of how genes affect a person's response to drugs, enabling personalized medication and treatment plans. | Tech | Genetics, Genomics, Pharmacology, Molecular Biology, Bioinformatics |
| Genetic Engineering | Manipulation of an organism's genetic material to produce desired traits or outcomes, applied in fields such as medicine, agriculture, and biotechnology. | Tech | Molecular Biology, Genetics, Biotechnology, Biochemistry, Microbiology |
| Precision Medicine | Approach to healthcare that considers individual variability in genes, environment, and lifestyle for disease prevention and treatment. | Tech | Genetics, Genomics, Pharmacology, Clinical Medicine, Bioinformatics |
| Bioinformatics | Integration of biology, computer science, and information technology to analyze and interpret biological data, such as DNA sequences and protein structures. | Tech | Computer Science, Biology, Statistics, Genetics, Programming (e.g., Python, R) |
| Next Generation Sequencing | High-throughput DNA sequencing technology that enables rapid and cost-effective sequencing of entire genomes or specific regions of interest. | Tech | Molecular Biology, Genetics, Bioinformatics, Laboratory Techniques, Genomics |
| Healthcare Data Governance | Establishment of policies and procedures to ensure the availability, integrity, and security of healthcare data throughout its lifecycle. | Soft | Data Management, Healthcare Regulations, Information Security, Risk Management, Compliance |
| Healthcare Data Integration | Process of combining and harmonizing healthcare data from disparate sources to enable comprehensive analysis and insights. | Tech | Data Management, Database Management, Data Warehousing, Health Informatics, Interoperability Standards |
| Healthcare Data Standards | Guidelines and protocols for organizing and formatting healthcare data to ensure consistency, interoperability, and quality across systems and applications. | Tech | Health Informatics, Data Management, Healthcare Regulations, Health Information Exchange, Healthcare IT Standards |
| Healthcare Data Reporting | Creation and presentation of structured healthcare data in meaningful formats to support decision-making, compliance, and performance monitoring. | Tech | Data Analysis, Data Visualization, Statistics, Health Informatics, Healthcare Quality Improvement |
| Digital Health Coaching | Use of digital tools and platforms to deliver personalized coaching and support for lifestyle modifications, chronic disease management, and wellness promotion. | Tech | Health Coaching, Digital Health Technologies, Behavioral Psychology, Communication Skills, Health Education |
| Behavior Change Techniques | Strategies and methods to promote positive behavior change, such as goal setting, self-monitoring, reinforcement, and social support. | Soft | Behavioral Psychology, Counseling Skills, Motivational Interviewing, Health Coaching, Communication Skills |
| Blockchain Technology | Distributed ledger technology that enables secure, transparent, and tamper-proof recording and verification of transactions and data across multiple parties. | Tech | Cryptography, Distributed Systems, Computer Science, Networking, Data Structures |
| Smart Contracts | Self-executing contracts with the terms of the agreement directly written into code, automatically enforcing and executing contractual clauses. | Tech | Blockchain Technology, Programming (e.g., Solidity), Contract Law, Cryptography, Distributed Systems |
| Distributed Ledger Technology | Framework for recording and sharing data across multiple nodes in a decentralized and secure manner, as exemplified by blockchain technology. | Tech | Blockchain Technology, Distributed Systems, Cryptography, Computer Science, Networking |
| Electronic Medical Records | Digital versions of patient health records that are stored and accessible electronically, facilitating efficient information sharing and healthcare management. | Tech | Health Informatics, Medical Terminology, Data Management, Electronic Health Records Systems, Healthcare Regulations |
| Telemedicine | Remote delivery of healthcare services and information using telecommunications technology, enabling consultations, diagnoses, and treatments from a distance. | Tech | Telecommunications, Clinical Medicine, Health Informatics, Medical Technology, Patient Communication Skills |
| Telehealth | Broad term encompassing various remote healthcare services and technologies, including telemedicine, telemonitoring, and teleconsultation. | Tech | Telecommunications, Clinical Medicine, Health Informatics, Medical Technology, Patient Communication Skills |
| Teleconsultation | Remote consultations between healthcare providers and patients or between healthcare providers, leveraging video conferencing and communication tools. | Tech | Telecommunications, Clinical Medicine, Health Informatics, Patient Communication Skills, Telehealth Technologies |
| Telepharmacy | Provision of pharmacy services remotely, allowing patients to receive medication consultations, prescriptions, and refills via telecommunication technology. | Tech | Telecommunications, Pharmacy Practice, Pharmacology, Health Informatics, Patient Communication Skills |
| Telepsychiatry | Delivery of psychiatric care and mental health services remotely, including assessments, therapy sessions, and medication management, via telecommunication. | Tech | Telecommunications, Psychiatry, Psychology, Health Informatics, Patient Communication Skills |
| Teleoncology | Provision of oncology services and cancer care remotely, including consultations, treatment planning, and follow-up care, via telecommunication technology. | Tech | Telecommunications, Oncology, Clinical Medicine, Health Informatics, Patient Communication Skills |
| Telecardiology | Remote delivery of cardiology services, including diagnosis, monitoring, and treatment of cardiovascular conditions, using telecommunication technology. | Tech | Telecommunications, Cardiology, Clinical Medicine, Health Informatics, Patient Communication Skills |
| Telestroke | Rapid assessment and treatment of stroke patients remotely, leveraging telecommunication technology to connect stroke specialists with emergency departments. | Tech | Telecommunications, Neurology, Emergency Medicine, Health Informatics, Patient Communication Skills |
| TeleICU | Remote monitoring and support of intensive care unit (ICU) patients by critical care specialists through telecommunication technology. | Tech | Telecommunications, Critical Care Medicine, Health Informatics, Clinical Medicine, Patient Communication Skills |
| Telepediatrics | Remote provision of pediatric care and consultations to children and adolescents, including assessments, diagnoses, and follow-up care, via telecommunication. | Tech | Telecommunications, Pediatrics, Clinical Medicine, Health Informatics, Patient Communication Skills |

# Healthcare: Top Emerging Roles

| Emerging Role | Description |
|---|---|
| AI Healthcare Specialist | Experts who leverage artificial intelligence to optimize healthcare processes, diagnosis, treatment plans, and patient care. |
| Genetic Counselor | Professionals who assess individual or family risk for inherited conditions, providing guidance and support to individuals considering genetic testing. |
| Telemedicine Specialist | Specialists who provide medical care remotely, leveraging telecommunications technology for diagnosis, treatment, and consultation. |
| Remote Patient Monitoring Specialist | Professionals who monitor patients remotely using various devices and technologies to collect and transmit health data for analysis and intervention. |
| Health Data Analyst | Analysts who interpret complex healthcare data to identify trends, patterns, and insights to inform decision-making and improve patient outcomes. |
| Genomic Data Scientist | Data scientists specializing in genomic data analysis, responsible for extracting meaningful insights from genetic information. |
| Personalized Medicine Specialist | Experts who tailor medical treatment and interventions based on an individual's genetic makeup, lifestyle, and environmental factors. |
| Healthcare Chatbot Developer | Developers who create chatbots and virtual assistants for healthcare applications, facilitating patient engagement, scheduling, and basic diagnosis. |
| Health Informatics Manager | Managers responsible for overseeing the implementation and utilization of health informatics systems and technologies within healthcare organizations. |
| Digital Health Coach | Coaches who use digital platforms and tools to provide personalized guidance and support for improving health and wellness behaviors. |
| Virtual Reality Therapist | Therapists who utilize virtual reality technology to deliver immersive therapy experiences for treating various mental health conditions. |
| Augmented Reality Healthcare Developer | Developers specializing in creating augmented reality applications and solutions for medical training, visualization, and surgical assistance. |
| Remote Surgery Technician | Technicians who support remote surgical procedures by managing and maintaining surgical robotics, teleoperation systems, and other equipment. |
| Blockchain Healthcare Specialist | Specialists who implement blockchain technology in healthcare systems to ensure secure, transparent, and interoperable data management and transactions. |
| Health AI Ethics Consultant | Consultants who address ethical considerations and implications associated with the development and deployment of AI technologies in healthcare. |
| Biomedical AI Engineer | Engineers who design and develop AI-powered medical devices, diagnostic tools, and systems to enhance patient care and treatment outcomes. |
| AI-driven Drug Discovery Scientist | Scientists who utilize artificial intelligence and machine learning algorithms to accelerate the process of drug discovery and development. |
| Health Robotics Engineer | Engineers specializing in designing, building, and maintaining robotic systems used in healthcare for surgery, rehabilitation, and patient care. |
| Wearable Health Tech Developer | Developers who create wearable devices and sensors for monitoring health metrics, providing real-time data for personalized healthcare interventions. |
| Healthcare IoT Specialist | Specialists who focus on integrating and managing Internet of Things (IoT) devices and sensors within healthcare environments to improve patient care. |
| Health AI Policy Analyst | Analysts who evaluate and develop policies and regulations governing the use of artificial intelligence in healthcare to ensure ethical and responsible practices. |
| Regenerative Medicine Specialist | Specialists who research and apply advanced techniques, such as stem cell therapy and tissue engineering, to regenerate damaged tissues and organs. |
| AI-driven Clinical Trial Manager | Managers who leverage artificial intelligence to optimize the design, recruitment, monitoring, and analysis of clinical trials for pharmaceutical research. |
| Population Health Manager | Managers who oversee programs and initiatives aimed at improving the health outcomes of specific populations through preventive care and interventions. |
| Health AI Cybersecurity Specialist | Specialists who focus on ensuring the security and privacy of healthcare data and AI systems, guarding against cyber threats and vulnerabilities. |

# Healthcare: Required Skills for Emerging Roles

## AI HEALTHCARE SPECIALIST

- Artificial Intelligence
- Machine Learning
- Data Science
- Natural Language Processing
- Deep Learning
- Computer Vision
- Big Data Analytics
- Predictive Modeling
- Statistical Analysis
- Healthcare Industry Knowledge
- Electronic Health Records
- Clinical Data Management
- Medical Terminology
- Healthcare Regulations
- Data Visualization
- Data Mining
- Programming Languages (Python, R, Java)
- Cloud Computing
- Data Warehousing
- Business Intelligence

## GENETIC COUNSELOR

- Genetic Counseling
- Patient Care
- Medical Terminology
- Genetic Testing
- Risk Assessment
- Family History Evaluation
- Genetic Counseling Techniques
- Communication Skills
- Empathy
- Cultural Sensitivity
- Ethical Principles
- Data Analysis
- Research Skills
- Genetic Counseling Software
- Patient Education
- Interpersonal Skills
- Critical Thinking
- Problem-Solving
- Time Management
- Teamwork

## TELEMEDICINE SPECIALIST

- Telemedicine
- Healthcare
- Medical Technology
- Virtual Care
- Remote Patient Monitoring
- Electronic Health Records
- Telehealth
- Teleconsultation
- Teletriage
- Telepharmacy
- Telepsychiatry
- Teleoncology
- Telecardiology
- Telestroke
- TeleICU
- Telepediatrics
- Telegeriatrics
- Teleobstetrics
- Telephlebotomy
- Teleaudiology

## REMOTE PATIENT MONITORING SPECIALIST

- Remote Patient Monitoring
- Healthcare Industry Knowledge
- Patient Care
- Medical Terminology
- Electronic Health Records
- Data Analysis
- Telehealth
- Patient Education
- Critical Thinking
- Problem Solving
- Communication Skills
- Time Management
- Attention to Detail
- Teamwork
- Adaptability
- Customer Service
- HIPAA Compliance
- Medical Coding
- Quality Assurance
- Risk Management
- Patient Advocacy

## HEALTH DATA ANALYST

- Data Analysis
- Healthcare Industry Knowledge
- Statistical Analysis
- Data Visualization
- SQL
- Python
- R
- Data Mining
- Data Modeling
- Machine Learning
- Predictive Analytics
- Healthcare Data Management
- Database Management
- Data Warehousing
- Data Governance
- Data Quality Assurance
- Data Interpretation
- Critical Thinking
- Problem Solving
- Communication Skills

# Healthcare: Required Skills for Emerging Roles

## GENOMIC DATA SCIENTIST

- Genomics
- Data Science
- Healthcare
- Bioinformatics
- Machine Learning
- Statistical Analysis
- Next Generation Sequencing
- Precision Medicine
- Clinical Research
- Big Data Analytics
- Genetic Testing
- Pharmacogenomics
- Data Mining
- Biomarker Discovery
- Genetic Counseling
- Clinical Trials
- Genetic Engineering
- Medical Genetics
- Molecular Diagnostics
- Bioethics

## PERSONALIZED MEDICINE SPECIALIST

- Personalized Medicine
- Heatlhcare Industry Knowledge
- Medical Terminology
- Clinical Research
- Genetic Testing
- Data Interpretation
- Precision Medicine
- Electronic Health Records
- Communication Skills
- Cross-Functional Teamwork
- Healthcare Regulations
- Data Mining
- Genomics
- Pharmacogenomics
- Personalized Medicine Technology
- Patient Education
- Critical Thinking
- Data Analysis
- Clinical Trials
- Precision Medicine Software

## HEALTHCARE CHATBOT DEVELOPER

- Natural Language Processing (NLP)
- Machine Learning
- Artificial Intelligence (AI)
- Python
- Java
- Chatbot Development
- Healthcare Industry Knowledge
- Data Analysis
- Data Visualization
- Cloud Computing
- API Development
- Agile Methodology
- User Experience (UX) Design
- Software Development Life Cycle (SDLC)
- Database Management
- Problem-Solving
- Critical Thinking
- Communication Skills
- Teamwork
- Project Management

## HEALTH INFORMATICS MANAGER

- Healthcare Information Technology
- Electronic Health Records
- Data Analysis
- Project Management
- Healthcare Regulations
- Healthcare Data Management
- Healthcare Analytics
- Healthcare Quality Improvement
- Healthcare Information Security
- Healthcare Workflow Optimization
- Healthcare Data Privacy
- Healthcare Data Governance
- Healthcare Data Visualization
- Healthcare Data Integration
- Healthcare Data Standards
- Healthcare Data Exchange
- Healthcare Data Reporting
- Healthcare Data Warehousing
- Healthcare Data Mining
- Healthcare Data Modeling

# Healthcare: Required Skills for Emerging Roles

## DIGITAL HEALTH COACH

- Healthcare Industry Knowledge
- Digital Health Coaching
- Patient Education
- Healthcare Technology
- Data Analysis
- Electronic Health Records
- Telehealth
- Healthcare Regulations and Compliance
- Behavior Change Techniques
- Healthcare Communication
- Patient Engagement
- Healthcare Data Privacy and Security
- Healthcare Informatics
- Healthcare Quality Improvement
- Healthcare Research
- Healthcare Policy
- Healthcare Ethics
- Healthcare Leadership
- Healthcare Project Management
- Healthcare Finance

## VIRTUAL REALITY THERAPIST

- Virtual Reality Therapy
- Healthcare Industry Knowledge
- Patient Care
- Counseling
- Mental Health Assessment
- Treatment Planning
- Empathy
- Communication
- Problem Solving
- Critical Thinking
- Technology Literacy
- Data Analysis
- Research
- Teamwork
- Time Management
- Adaptability
- Stress Management
- Cultural Competence
- Ethical Standards
- Self-Care

## AUGMENTED REALITY HEALTHCARE DEVELOPER

- Augmented Reality
- Healthcare
- Software Development
- Mobile Development
- User Experience Design
- User Interface Design
- Virtual Reality
- Medical Imaging
- Medical Devices
- Data Analysis
- Machine Learning
- Artificial Intelligence
- Human-Computer Interaction
- 3D Modeling
- Computer Vision
- Medical Visualization
- Medical Simulation
- Medical Education
- Medical Training
- Medical Research

## REMOTE SURGERY TECHNICIAN

- Surgical Technology
- Medical Terminology
- Anatomy and Physiology
- Sterilization Techniques
- Infection Control
- Patient Care
- Emergency Response
- Medical Equipment Maintenance
- Electronic Medical Records
- Telemedicine
- Remote Monitoring
- Surgical Instrumentation
- Operating Room Procedures
- Patient Assessment
- Critical Thinking
- Teamwork
- Communication
- Time Management
- Attention to Detail
- Adaptability

## BLOCKCHAIN HEALTHCARE SPECIALIST

- Blockchain Technology
- Healthcare Industry Knowledge
- Data Security
- Smart Contracts
- Distributed Ledger Technology
- Electronic Health Records
- Healthcare Data Management
- Privacy Regulations
- Healthcare Data Analytics
- Interoperability
- Healthcare Data Exchange
- Patient Identity Management
- Healthcare Data Governance
- Healthcare Data Standards
- Healthcare Data Integration
- Healthcare Data Privacy
- Healthcare Data Sharing
- Healthcare Data Storage
- Healthcare Data Protection
- Healthcare Data Validation

# Healthcare: Required Skills for Emerging Roles

## HEALTH AI ETHICS CONSULTANT

- Healthcare Regulations
- Machine Learning
- Ethics
- Data Interpretation
- Communication Skills
- Critical Thinking
- Project Management
- Healthcare Data Privacy
- Healthcare Data Analytics
- Heatlhcare Technology
- Cross-Functional Teamwork
- Risk Management
- Healthcare Policy
- Healthcare Data Governance
- Healthcare Data Standards
- Healthcare Data Storage
- Healthcare Data Protection
- Healthcare Data Reporting
- Healthcare Data Privacy
- Healthcare Data Auditing

## BIOMEDICAL AI ENGINEER

- Machine Learning
- Deep Learning
- Natural Language Processing
- Computer Vision
- Data Mining
- Data Analysis
- Statistical Modeling
- Python
- R
- Java
- C++
- TensorFlow
- Keras
- PyTorch
- Scikit-learn
- SQL
- Big Data
- Cloud Computing
- Healthcare Industry Knowledge
- Medical Terminology

## AI-DRIVEN DRUG DISCOVERY SCIENTIST

- Artificial Intelligence
- Drug Discovery
- Machine Learning
- Data Analysis
- Bioinformatics
- Chemoinformatics
- Pharmacology
- Genomics
- Proteomics
- Data Mining
- Statistical Modeling
- Python
- R
- Big Data
- Cloud Computing
- Natural Language Processing
- Deep Learning
- Computer Vision
- Medical Imaging
- Healthcare Industry Knowledge

## HEALTH ROBOTICS ENGINEER

- Robotics Engineering
- Healthcare Industry Knowledge
- Medical Device Design
- Software Development
- Data Analysis
- Machine Learning
- Artificial Intelligence
- Human-Robot Interaction
- Sensors and Actuators
- Medical Imaging
- Biomedical Signal Processing
- Regulatory Compliance
- Quality Assurance
- Project Management
- Problem Solving
- Critical Thinking
- Communication Skills
- Teamwork
- Time Management
- Adaptability

# Healthcare: Required Skills for Emerging Roles

## WEARABLE HEALTH TECH DEVELOPER

- Mobile Application Development
- Cloud Computing
- Data Analytics
- Machine Learning
- Artificial Intelligence
- Internet of Things (IoT)
- Wearable Technology
- Healthcare Industry Knowledge
- User Experience (UX) Design
- User Interface (UI) Design
- Agile Methodology
- Project Management
- Software Development Life Cycle (SDLC)
- Programming Languages (e.g. Java, Python, Swift)
- Database Management
- Security and Privacy
- Data Visualization
- Human-Computer Interaction (HCI)
- Medical Device Regulations
- Healthcare Data Standards

## HEALTHCARE IoT SPECIALIST

- Healthcare Regulations
- Internet of Things (IoT)
- Medical Devices
- Machine Learning
- Cloud Computing
- Cybersecurity
- Healthcare Systems Integration
- Electronic Health Records
- Telemedicine
- Healthcare Data Management
- Healthcare Data Standards
- Healthcare Data Analytics
- Healthcare Data Security
- Healthcare Data Governance
- Healthcare Data Privacy
- Healthcare Data Exchange
- Healthcare Data Storage
- Healthcare Data Integration
- Healthcare Data Systems
- Healthcare Data Governance

## HEALTH AI POLICY ANALYST

- Healthcare Policy
- Artificial Intelligence
- Data Analysis
- Research
- Critical Thinking
- Problem Solving
- Communication
- Project Management
- Policy Development
- Regulatory Compliance
- Healthcare Industry Knowledge
- Data Privacy
- Ethics
- Public Health
- Healthcare Technology
- Legal Knowledge
- Risk Assessment
- Strategic Planning
- Stakeholder Management
- Healthcare Economics

# Healthcare: Required Skills for Emerging Roles

## REGENERATIVE MEDICINE SPECIALIST

- Regenerative Medicine
- Stem Cell Research
- Regenerative Medicine Research
- Regenerative Medicine Ethics
- Cell Culture Techniques
- Molecular Biology
- Regenerative Medicine Experiment Design
- Biomaterials
- Preclinical Studies
- Problem Solving
- Communication Skills
- Independent Work
- Protocol Design
- Data Interpretation
- Good Laboratory Practices
- Biostatistics
- Clinical Trials
- Grant Writing
- Patent Law
- Market Research

## AI-DRIVEN CLINICAL TRIAL MANAGER

- Artificial Intelligence
- Clinical Trials
- Project Management
- Data Analysis
- Machine Learning
- Healthcare Industry Knowledge
- Regulatory Compliance
- Data Management
- Clinical Research
- Statistical Analysis
- Problem Solving
- Communication Skills
- Leadership
- Teamwork
- Critical Thinking
- Time Management
- Attention to Detail
- Adaptability
- Innovation
- Ethical Decision Making
- Industry Networking

## POPULATION HEALTH MANAGER

- Data Analysis
- Population Health Management
- Healthcare Industry Knowledge
- Project Management
- Strategic Planning
- Data Visualization
- Data Interpretation
- Risk Assessment
- Quality Improvement
- Healthcare Regulations
- Data Management
- Communication Skills
- Leadership
- Team Management
- Critical Thinking
- Problem-Solving
- Change Management
- Process Improvement
- Budget Management
- Healthcare Technology
- Patient Engagement

## HEALTH AI CYBERSECURITY SPECIALIST

- Artificial Intelligence
- Cybersecurity
- Healthcare Industry Knowledge
- Data Analysis
- Machine Learning
- Risk Management
- Information Security
- Privacy Regulations
- Medical Terminology
- Data Privacy
- Network Security
- Healthcare Data Management
- Threat Detection
- Data Governance
- Healthcare Compliance
- Security Auditing
- Predictive Analytics
- Healthcare Information Systems
- Vulnerability Assessment
- Healthcare Regulations

# Healthcare: Evolving Roles

| | |
|---|---|
| Healthcare Provider, Data Scientist | AI Healthcare Specialist |
| Geneticist, Counselor | Genetic Counselor |
| Physician, Nurse Practitioner, Telehealth Specialist | Telemedicine Specialist |
| Nurse, Medical Technician, Remote Monitoring Technician | Remote Patient Monitoring Specialist |
| Data Analyst, Healthcare Informatics Specialist | Health Data Analyst |
| Data Scientist, Geneticist | Genomic Data Scientist |
| Physician, Geneticist, Pharmacologist | Personalized Medicine Specialist |
| Software Developer, AI Engineer | Healthcare Chatbot Developer |
| Health Informatics Specialist, Healthcare Manager | Health Informatics Manager |
| Health Coach, Wellness Coach | Digital Health Coach |
| Therapist, Virtual Reality Developer | Virtual Reality Therapist |
| Software Developer, Augmented Reality Developer | Augmented Reality Healthcare Developer |
| Surgical Technician, Robotics Engineer | Remote Surgery Technician |
| Blockchain Developer, Healthcare IT Specialist | Blockchain Healthcare Specialist |
| Ethicist, Healthcare Policy Analyst | Health AI Ethics Consultant |
| Biomedical Engineer, AI Engineer | Biomedical AI Engineer |
| Pharmaceutical Scientist, Data Scientist | AI-driven Drug Discovery Scientist |
| Robotics Engineer, Biomedical Engineer | Health Robotics Engineer |
| Wearable Technology Developer, Biomedical Engineer | Wearable Health Tech Developer |
| IoT Specialist, Healthcare IT Specialist | Healthcare IoT Specialist |
| Policy Analyst, Healthcare Administrator | Health AI Policy Analyst |
| Medical Scientist, Regenerative Medicine Researcher | Regenerative Medicine Specialist |
| Clinical Trial Manager, Data Scientist | AI-driven Clinical Trial Manager |
| Public Health Specialist, Healthcare Administrator | Population Health Manager |
| Cybersecurity Specialist, Healthcare IT Specialist | Health AI Cybersecurity Specialist |

# Healthcare: Top Declining Skills

| Skill | Reason for Decline |
|---|---|
| **Medical Transcription** | Advances in speech recognition technology and widespread adoption of electronic health records (EHRs) have reduced the need for manual transcription of medical documents. |
| **Manual Billing** | Automation of billing processes and the implementation of centralized billing systems have diminished the need for manual billing and invoicing tasks. |
| **Paper-Based Records Keeping** | Transition from paper-based to electronic health records (EHRs) has led to a decline in the need for skills related to managing and maintaining paper-based medical records. |
| **Typing Speed** | With the increasing use of dictation software and voice recognition technology, the emphasis on manual typing speed for data entry tasks has decreased. |
| **Fax Machine Operation** | The decreasing reliance on fax machines in favor of electronic communication methods has reduced the need for skills in operating fax machines in healthcare settings. |
| **Basic Bookkeeping** | Automation of financial management processes and the use of specialized accounting software have reduced the demand for manual bookkeeping skills in healthcare finance. |
| **Manual Appointment Scheduling** | Automated scheduling systems and online appointment platforms have reduced the need for manual appointment scheduling tasks performed by administrative staff. |
| **Handwritten Communication** | The shift towards electronic communication methods, including email and messaging platforms, has reduced the need for handwritten communication skills in healthcare settings. |
| **Basic Medical Terminology** | While still valuable, the widespread use of electronic health records (EHRs) and medical reference tools has decreased the need for memorization of basic medical terminology. |
| **Paper-Based Documentation** | Transition to electronic health records (EHRs) has led to a decline in the need for skills related to documenting patient information on paper-based forms and charts. |

| Skill | Reason for Decline |
|---|---|
| **Manual Data Entry** | Automation of data entry processes and the integration of electronic health record (EHR) systems have reduced the need for manual data entry skills in healthcare settings. |
| **Traditional Phone Skills** | Increasing use of digital communication tools such as email, messaging apps, and teleconferencing has reduced the reliance on traditional phone-based communication skills. |
| **Basic Spreadsheet Skills** | While still useful, the availability of advanced data analytics tools and specialized software has diminished the need for basic spreadsheet skills in healthcare analytics. |
| **Manual Inventory Management** | Implementation of automated inventory management systems and barcode technology has reduced the need for manual tracking and management of medical supplies and inventory. |
| **Film X-ray Processing** | Digital radiography and picture archiving and communication systems (PACS) have replaced traditional film-based X-ray processing methods, reducing the need for this skill. |
| **Manual Claims Processing** | Automation of claims processing through electronic health record (EHR) systems and electronic billing platforms has diminished the need for manual claims processing skills. |
| **Paper-Based Reporting** | Transition to electronic reporting systems and data analytics tools has decreased the demand for skills related to preparing and generating paper-based reports in healthcare. |
| **Manual Record Retrieval** | Implementation of electronic health record (EHR) systems and centralized databases has reduced the need for manual retrieval of patient records from physical filing systems. |
| **Physical Filing** | Transition to electronic health record (EHR) systems and digital document management has reduced the demand for skills related to physical filing and organization of records. |
| **Basic Coding (ICD-9, CPT)** | Shift to more advanced coding systems such as ICD-10 and ICD-11, as well as the increasing use of automated coding tools, has reduced the need for basic manual coding skills. |

# Healthcare: Top Declining Roles

| Role | Reason for Decline |
|---|---|
| **Medical Transcriptionist** | Advancements in speech recognition technology and the widespread adoption of electronic health records (EHRs) have reduced the need for manual transcription services. |
| **Medical Billing Clerk** | Automation of billing processes and the use of centralized billing systems have diminished the demand for manual billing clerks in healthcare organizations. |
| **Pharmacy Technician** | Increased automation in pharmacies, centralization of prescription filling, and the adoption of automated medication dispensing systems have impacted demand for pharmacy technicians. |
| **Radiology Technician** | Outsourcing of radiology services, automation in imaging technology, and changes in radiology workflows have affected demand for traditional radiology technicians. |
| **Medical Records Clerk** | Transition from paper-based to electronic health records (EHRs) has reduced the need for manual management of paper records and hence, the demand for medical records clerks. |
| **Medical Receptionist** | Automation of financial management processes and the use of specialized accounting software have reduced the demand for manual bookkeeping skills in healthcare finance. |
| **Mailroom Clerk** | Digital communication and electronic document management have minimized the need for physical mail handling in healthcare organizations, affecting mailroom clerk roles. |
| **Hospital Admissions Clerk** | Adoption of electronic admission systems and streamlined processes have reduced the need for manual admissions clerks in hospitals and other healthcare facilities. |
| **Home Health Aide** | Shifts towards community-based care, telehealth services, and changes in reimbursement models have impacted demand for traditional home health aide roles in some regions. |
| **Ward Clerk/Unit Secretary** | Automation and integration of electronic systems for patient records and communication have reduced the need for manual ward clerks or unit secretaries in healthcare settings. |

# Healthcare: Most Popular Roles

### Registered Nurse (RN)

RNs provide and coordinate patient care, educate patients and the public about various health conditions, and provide advice and emotional support to patients and their families. They work in various healthcare settings, including hospitals, clinics, and long-term care facilities.

### Pharmacist

Pharmacists dispense prescription medications, provide advice on the safe use of medications, and offer expertise in the selection and dosing of medications. They work in pharmacies, hospitals, clinics, and other healthcare settings, collaborating with healthcare providers to optimize patient care.

### Radiologic Technologist

Radiologic Technologists perform diagnostic imaging examinations, such as X-rays, CT scans, and MRIs, to help physicians diagnose and treat medical conditions. They operate imaging equipment, position patients, and ensure image quality and patient safety. Radiologic Technologists work in hospitals, imaging centers, and other healthcare facilities.

### Medical Assistant

Medical Assistants perform administrative and clinical tasks to support healthcare providers. They may greet patients, take medical histories, prepare patients for exams, and assist with procedures. Medical Assistants work in various healthcare settings, including clinics, hospitals, and physicians' offices.

### Nurse Practitioner (NP)

NPs are advanced practice nurses who assess patients, diagnose illnesses, prescribe medications, and develop treatment plans. They often specialize in areas such as family practice, pediatrics, or gerontology and may work independently or collaboratively with physicians.

### Physical Therapist (PT)

PTs help patients manage pain and improve or restore mobility through therapeutic exercises, manual therapy, and other interventions. They work with patients of all ages who have injuries, illnesses, or disabilities, typically in hospitals, clinics, rehabilitation centers, or private practices.

### Medical and Health Services Manager

Medical and Health Services Managers plan, direct, and coordinate medical and health services. They oversee administrative tasks, budgeting, staffing, and compliance with regulations. Medical and Health Services Managers work in hospitals, clinics, nursing homes, and other healthcare settings.

### Certified Nursing Assistant (CNA)

CNAs provide basic care to patients, such as bathing, dressing, and feeding, and assist with activities of daily living. They may also measure vital signs, assist with mobility, and report patient status to nurses. CNAs work in nursing homes, hospitals, and other long-term care facilities.

### Physician Assistant (PA)

PAs practice medicine under the supervision of physicians and surgeons. They conduct physical exams, diagnose and treat illnesses, order and interpret tests, and prescribe medications. PAs work in various healthcare settings, including hospitals, clinics, and primary care offices.

### Occupational Therapist (OT)

OTs help patients develop, recover, and improve the skills needed for daily living and working. They may work with individuals who have physical, developmental, or emotional challenges, providing interventions and adaptations to promote independence and quality of life. OTs work in various settings, including hospitals, schools, and rehabilitation centers.

### Clinical Research Coordinator

CRCs oversee clinical trials and research studies, ensuring compliance with protocols, recruiting and enrolling participants, collecting and analyzing data, and maintaining accurate records. They work in academic institutions, hospitals, pharmaceutical companies, and research organizations.

### Licensed Practical Nurse (LPN)

LPNs provide basic nursing care under the supervision of RNs and physicians. They may administer medications, monitor patients' vital signs, and assist with wound care and other treatments. LPNs work in hospitals, nursing homes, and other healthcare facilities.

### Medical Doctor (MD)

MDs diagnose and treat illnesses, injuries, and medical conditions. They may specialize in various areas such as family medicine, internal medicine, surgery, or psychiatry. MDs typically work in hospitals, clinics, private practices, or academic institutions.

### Medical Laboratory Technician (MLT)

MLTs collect samples and perform tests to analyze body fluids, tissues, and other substances. They operate sophisticated laboratory equipment and ensure accurate and timely test results. MLTs work in hospitals, clinics, diagnostic laboratories, and research institutions.

### Health Information Technician

Health Information Technicians organize and manage health information data, including medical histories, diagnostic tests, and treatment plans. They ensure the accuracy, accessibility, and security of patient records using electronic health record (EHR) systems and coding procedures. Health Information Technicians work in hospitals, clinics, and other healthcare facilities.

### Nurse Anesthetist (CRNA)

CRNAs administer anesthesia and monitor patients during surgical procedures. They assess patients' health status, develop anesthesia plans, administer anesthesia medications, and manage patients' post-anesthesia recovery. CRNAs work in hospitals, surgical centers, and other healthcare settings.

INDUSTRY ANALYSIS

# Life Sciences

Pharmacy, Biotechnology, Medical Devices

SUMMARY

The **Life Sciences industry** covers companies that are involved in the research and development (and potentially distribution) of pharmaceuticals, biotechnological products (food, supplements, medicines), and medical devices, as well as the manufacturing and delivery of established late-stage pharmaceuticals. Information about other life sciences is included, but the four areas listed above are the focus. Example organizations in this industry include Thermo Fisher Scientific, Roche, and Abbott Laboratories.*

Following suit with other industries, there is a heavy investment in AI to get products out the door faster to keep up with increasing demands from the public and healthcare providers. This desire is paired with a goal to reduce the time from **screening to trials in a matter of months** by 2030. For an already heavily regulated industry, this is adding increased pressure to build the right skill sets for managing compliance and regulatory affairs.

Hard skills in genomics, molecular biology, data analytics, regulatory compliance, and emerging technology are highly valued. But in this constantly evolving industry, soft skills that directly impact the company's ability to scale and shift quickly to respond to emerging marketing needs and novel diseases are driving assessment of team leadership, market research, and strategic planning skills in effective frontline leaders, managers, and R&D teams. Pharmaceutical industry knowledge is in high demand to support these efforts and ensure differentiation is strong in a crowded market.



*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.

# Life Sciences: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Gene Editing (e.g., CRISPR) | Manipulation of genes within an organism's genome, enabling precise modifications for various purposes such as disease treatment or agricultural improvements. | Tech | Molecular Biology, Biochemistry, Genetics, Cell Culture, Drug Development |
| Computational Biology | Application of computer algorithms and mathematical models to analyze biological data, such as DNA sequences or protein structures, for research and discovery. | Tech | Biology, Computer Science, Statistics, Bioinformatics, Programming (Python, R) |
| High-Throughput Screening | Screening large numbers of chemical compounds or genetic variations quickly and efficiently to identify potential drug candidates or functional genes. | Tech | Laboratory Techniques, Biochemistry, Pharmacology, Data Analysis |
| Pathway Analysis | Examination of biological pathways and networks to understand how genes and proteins interact, aiding in the identification of disease mechanisms and drug targets. | Tech | Bioinformatics, Molecular Biology, Statistics, Data Analysis |
| Structural Biology | Study of the three-dimensional structure of biological molecules, such as proteins and nucleic acids, to understand their function and interactions. | Tech | Biochemistry, Molecular Biology, X-ray Crystallography, NMR Spectroscopy |
| Chemoinformatics | Application of computational methods and data analysis techniques to study chemical compounds and their properties, aiding in drug discovery and design. | Tech | Chemistry, Computer Science, Bioinformatics, Data Mining, Machine Learning |
| High Performance Computing | Utilization of powerful computing systems to process large-scale biological data sets and simulations, enabling complex analyses and modeling in a timely manner. | Tech | Computer Science, Parallel Programming, Algorithms, Data Structures, System Architecture |
| Biomarker Discovery | Identification and characterization of biological markers (biomarkers) that indicate normal or pathological processes, useful in disease diagnosis and treatment. | Tech | Biochemistry, Molecular Biology, Statistics, Data Analysis, Clinical Research |
| Regulatory Compliance | Adherence to regulations and standards set by government agencies or regulatory bodies governing the development, testing, and marketing of pharmaceutical products. | Soft | Regulatory Affairs, Legal Knowledge, Healthcare Regulations, Quality Management |
| Precision Medicine | Approach to healthcare that considers individual variability in genes, environment, and lifestyle for disease prevention and treatment. | Soft | Genetics, Genomics, Pharmacology, Clinical Medicine, Bioinformatics |
| Consulting | Providing expert advice and guidance to organizations or individuals on matters related to bioinformatics, pharmaceuticals, or life sciences. | Soft | Industry Knowledge, Problem-Solving, Communication, Analytical Skills |
| Regulatory Affairs | Management of regulatory processes and compliance requirements for pharmaceutical and medical products to ensure their safety, efficacy, and legality. | Soft | Legal Knowledge, Healthcare Regulations, Compliance, Quality Management |
| Market Research | Gathering and analyzing data on market trends, customer preferences, and competitive landscapes in the pharmaceutical and life sciences industries. | Soft | Data Analysis, Consumer Behavior, Statistical Analysis, Survey Design |
| Strategic Planning | Development and implementation of long-term goals and strategies to achieve organizational objectives in the context of bioinformatics or life sciences. | Soft | Business Strategy, Data Analysis, Decision Making, Market Analysis |
| Team Leadership | Guiding and motivating a team of individuals to work collaboratively toward common goals and objectives in bioinformatics or life sciences projects. | Soft | Leadership, Communication, Conflict Resolution, Team Building, Project Management |
| Protein Engineering | Design and modification of proteins to enhance their properties or create novel functionalities for various applications, such as drug delivery or biotechnology. | Tech | Biochemistry, Molecular Biology, Protein Structure Prediction, Protein Design |
| Immunology | Study of the immune system and its responses to foreign substances or pathogens, essential for understanding diseases and developing vaccines or immunotherapies. | Tech | Biology, Molecular Biology, Microbiology, Immunotherapy, Disease Pathology |

# Life Sciences: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Next-Generation Sequencing | Advanced DNA sequencing technologies that enable rapid, high-throughput sequencing of entire genomes or targeted regions, revolutionizing genomic research. | Tech | Molecular Biology, Genomics, Bioinformatics, Laboratory Techniques, Data Analysis |
| Pharmaceutical Industry Knowledge | Understanding of the pharmaceutical industry landscape, including drug development processes, regulatory requirements, and market dynamics. | Soft | Pharmaceutical Science, Drug Development Process, Regulatory Environment, Market Trends |
| Drug Design | Design and optimization of chemical compounds or biologics to interact with specific targets in the body for therapeutic purposes, often using computer-aided methods. | Tech | Medicinal Chemistry, Pharmacology, Molecular Modeling, Computational Chemistry |
| Clinical Trials | Conducting scientific studies to evaluate the safety and efficacy of new drugs, treatments, or medical devices in human subjects, following rigorous protocols. | Tech | Clinical Research, Protocol Design, Data Management, Regulatory Compliance |
| Database Management | Organizing, storing, and maintaining large volumes of biological or clinical data in databases, ensuring data integrity, accessibility, and security. | Tech | Database Administration, Data Modeling, SQL, Data Warehousing, Data Security |
| Artificial Intelligence (AI) in Drug Discovery | Utilization of AI algorithms and machine learning techniques to accelerate drug discovery processes, from target identification to lead optimization. | Tech | Machine Learning, Data Science, Bioinformatics, Computational Biology, Drug Development |
| Medical Imaging Analysis | Analysis and interpretation of medical images, such as MRI or CT scans, using computational techniques to aid in diagnosis, treatment planning, and research. | Tech | Medical Imaging Techniques, Image Processing, Data Analysis, Machine Learning |
| Regulatory Affairs in Life Sciences | Management of regulatory processes and compliance requirements specific to the life sciences industry, encompassing pharmaceuticals, biotechnology, and medical devices. | Soft | Regulatory Compliance, Healthcare Regulations, Quality Management, Legal Knowledge |

# Life Sciences: Top Emerging Roles

| Emerging Role | Description |
|---|---|
| Computational Biologist | Applies computational techniques and algorithms to analyze biological data, such as genomics and proteomics, for drug discovery and personalized medicine. |
| AI Drug Discovery Scientist | Utilizes AI and machine learning algorithms to identify potential drug candidates, predict their efficacy, and optimize molecular structures. |
| Bioinformatics Specialist | Analyzes biological data using computational tools and methods to uncover insights into genetics, disease mechanisms, and drug targets. |
| Precision Medicine Consultant | Provides expertise in precision medicine approaches, including genomic analysis and personalized treatment plans for patients. |
| Gene Editing Scientist | Conducts research and develops gene editing technologies, such as CRISPR/Cas9, for modifying DNA sequences to treat genetic diseases. |
| Regenerative Medicine Specialist | Focuses on developing therapies and treatments using regenerative medicine techniques, such as stem cell therapy and tissue engineering. |
| Digital Health Strategist | Develops strategies for integrating digital technologies, such as wearables, mobile apps, and telemedicine, into healthcare delivery and patient care. |
| Clinical Data Scientist | Applies data science techniques to analyze clinical trial data, identify trends, and optimize trial design and patient recruitment strategies. |
| Immunotherapy Researcher | Conducts research on immunotherapy treatments, including monoclonal antibodies, checkpoint inhibitors, and CAR-T cell therapies. |
| Pharmacogenomics Expert | Specializes in the study of how genes affect a person's response to drugs, informing personalized treatment decisions and drug dosing strategies. |
| Cell Therapy Scientist | Develops cell-based therapies, such as stem cell transplantation and gene-modified cell therapies, for treating diseases and regenerating tissues. |
| Medical AI Ethicist | Addresses ethical considerations and implications of AI applications in healthcare, ensuring patient privacy, equity, and informed consent. |
| Digital Biomarker Scientist | Identifies and validates digital biomarkers from wearable devices and digital health platforms to monitor and predict disease progression. |
| Clinical Trial Coordinator | Manages and coordinates clinical trial activities, including protocol development, patient recruitment, and regulatory compliance. |
| Health Informatics Analyst | Analyzes healthcare data from electronic health records (EHRs), wearables, and other sources to derive insights for improving patient care and outcomes. |
| Gene Therapy Specialist | Develops and implements gene therapy treatments for genetic disorders, leveraging viral vectors, gene editing tools, and delivery systems. |
| Medical IoT Engineer | Designs and implements IoT (Internet of Things) solutions for remote patient monitoring, medical device connectivity, and healthcare analytics. |
| Biomaterials Engineer | Designs and develops biomaterials for medical implants, drug delivery systems, and tissue engineering applications in regenerative medicine. |
| Clinical AI Researcher | Conducts research on AI applications in clinical settings, such as diagnostic imaging analysis, predictive modeling, and treatment optimization. |
| Telemedicine Specialist | Provides medical care and consultations remotely using telecommunication technologies, enabling access to healthcare services from anywhere. |
| Neurotechnology Researcher | Conducts research on neurotechnologies, such as brain-computer interfaces and neuromodulation devices, for treating neurological disorders. |
| Digital Therapeutics Developer | Designs and develops software-based therapies and interventions, such as mobile apps and virtual reality programs, for managing chronic diseases. |
| Health Data Privacy Officer | Ensures compliance with data privacy regulations and safeguards patient confidentiality and security in healthcare data management. |
| Synthetic Biology Engineer | Engineers biological systems and constructs synthetic DNA sequences for applications in drug development, biofuel production, and biomanufacturing. |
| Nanomedicine Researcher | Investigates the use of nanoparticles and nanotechnology for targeted drug delivery, imaging, and diagnostics in medical applications. |

# Life Sciences: Required Skills for Emerging Roles

## COMPUTATIONAL BIOLOGIST

- Bioinformatics
- Genomics
- Proteomics
- Computational Biology
- Drug Discovery
- Next Generation Sequencing
- Pharmacogenomics
- Systems Biology
- Molecular Modeling
- Data Analysis
- Machine Learning
- Statistical Analysis
- High Performance Computing
- Biomarker Discovery
- Clinical Trials
- Drug Development
- Gene Expression Analysis
- Pathway Analysis
- Structural Biology
- Pharmaceutical Industry

## AI DRUG DISCOVERY SCIENTIST

- Artificial Intelligence
- Drug Discovery
- Machine Learning
- Data Analysis
- Bioinformatics
- Chemoinformatics
- Pharmacology
- Molecular Biology
- Genomics
- Proteomics
- High-throughput Screening
- Drug Design
- Chemistry
- Biomarker Discovery
- Clinical Trials
- Data Mining
- Statistical Analysis
- Biochemistry
- Biostatistics
- Medical Imaging

## BIOINFORMATICS SPECIALIST

- Bioinformatics
- Pharmaceuticals
- Biotechnology
- Life Sciences
- Genomics
- Proteomics
- Next-Generation Sequencing
- Data analysis
- Machine learning
- Data mining
- Statistical Analysis
- Programming Languages (Python, R, Java)
- Database Management
- Bioinformatics Tools (BLAST, CLC Genomics Workbench, etc.)
- Genetic Variation Analysis
- Gene Expression Analysis
- Pathway Analysis
- Drug Discovery
- Clinical Trials
- Regulatory Compliance

## PRECISION MEDICINE CONSULTANT

- Precision Medicine
- Consulting
- Pharma
- Biotech
- Life Sciences
- Industry Knowledge
- Data Analysis
- Clinical Trials
- Drug Development
- Regulatory Affairs
- Market Research
- Project Management
- Strategic Planning
- Communication
- Teamwork
- Problem Solving
- Critical Thinking
- Leadership
- Time Management
- Adaptability
- Innovation

# Life Sciences: Required Skills for Emerging Roles

## GENE EDITING SCIENTIST

- Gene Editing
- CRISPR
- Molecular Biology
- Biochemistry
- Genetics
- Cell Culture
- Drug Development
- Pharmaceuticals
- Biotechnology
- Life Sciences
- Next Generation Sequencing
- Protein Engineering
- Immunology
- Bioinformatics
- Clinical Trials
- Regulatory Affairs
- Data Analysis
- Project Management
- Team Leadership
- Communication

## DIGITAL HEALTH STRATEGIST

- Digital Health Strategy
- Pharma Industry Knowledge
- Biotech Industry Knowledge
- Life Sciences Industry Knowledge
- Data Analytics
- Market Research
- Business Development
- Project Management
- Healthcare Regulations
- Healthcare Technology
- Digital Marketing
- Customer Relationship Management
- Strategic Planning
- Product Development
- Clinical Trials
- Healthcare Data Management
- Healthcare Compliance
- Healthcare Consulting
- Healthcare Innovation
- Healthcare Finance

## CLINICAL DATA SCIENTIST

- Data Analysis
- Statistical Modeling
- Machine Learning
- Data Mining
- Data Visualization
- Clinical Research
- Pharmaceutical Industry Knowledge
- Biotechnology Knowledge
- Life Sciences Knowledge
- Clinical Trial Design
- Clinical Data Management
- Clinical Data Standards
- Clinical Data Analysis
- Clinical Data Quality
- Clinical Data Integration
- Clinical Data Validation
- Clinical Data Reporting
- Clinical Data Governance
- Clinical Data Privacy
- Clinical Data Security

## IMMUNO-THERAPY RESEARCHER

- Immunology
- Research
- Biotechnology
- Life Sciences
- Pharmaceuticals
- Drug Development
- Clinical Trials
- Molecular Biology
- Cell Culture
- Biochemistry
- Genetics
- Immunotherapy
- Cancer Biology
- Immunohistochemistry
- Flow Cytometry
- Cellular Assays
- Data Analysis
- Project Management
- Team Leadership
- Communication

# Life Sciences: Required Skills for Emerging Roles

## PHARMACOGENOMICS EXPERT

- Pharmacogenomics
- Drug Development
- Clinical Trials
- Genomics
- Bioinformatics
- Pharmaceutical Industry
- Molecular Biology
- Precision Medicine
- Drug Discovery
- Next Generation Sequencing
- Biomarkers
- Pharmacology
- Clinical Research
- Data Analysis
- Biotechnology
- Pharmacokinetics
- Drug Metabolism
- Pharmacodynamics
- Regulatory Affairs
- Medical Writing

## CELL THERAPY SCIENTIST

- Cell Culture Techniques
- Cell Therapy Development
- Biopharmaceuticals
- GMP Regulations
- Quality Control
- Process Ooptimization
- Regulatory Compliance
- Clinical Trials
- Bioprocessing
- Stem Cell Research
- Immunology
- Molecular Biology
- Biochemistry
- Pharmaceutical Manufacturing
- Drug Development
- Good Laboratory Practices
- Data Analysis
- Project management
- Team Leadership
- Communication Skills

## MEDICAL AI ETHICIST

- Ethics
- Artificial Intelligence
- Medical Ethics
- Pharmaceutical Industry
- Biotechnology
- Life Sciences
- Data Privacy
- Regulatory Compliance
- Data Governance
- Risk Management
- Data Analysis
- Critical Thinking
- Problem Solving
- Communication
- Collaboration
- Research
- Legal Knowledge
- Medical Terminology
- Healthcare Industry
- Policy Development
- Project Management

## DIGITAL BIOMARKER SCIENTIST

- Data Analysis
- Machine Learning
- Biomarker Discovery
- Pharmaceutical Industry Knowledge
- Biotechnology Industry Knowledge
- Life Sciences Industry Knowledge
- Clinical Trial Design
- Statistical Modeling
- Data Visualization
- Bioinformatics
- Genomics
- Proteomics
- Drug Development
- Regulatory Compliance
- Medical Writing
- Project Management
- Team Leadership
- Communication Skills
- Critical Thinking
- Problem-Solving

# Life Sciences: Required Skills for Emerging Roles

## CLINICAL TRIAL COORDINATOR

- Clinical Research
- Clinical Trials
- Pharmaceutical Industry
- Biotechnology
- Life Sciences
- Regulatory Affairs
- GCP (Good Clinical Practice)
- FDA Regulations
- Protocol Development
- Data Management
- Project Management
- Patient Recruitment
- Clinical Data Analysis
- Medical Writing
- Budget Management
- Risk Management
- Quality Assurance
- Team Leadership
- Communication Skills
- Time Management
- Attention to Detail

## HEALTH INFORMATICS ANALYST

- Data Analysis
- Healthcare Information Technology
- Electronic Health Records (EHR)
- Clinical Informatics
- Healthcare Data Management
- Data Mining
- Database Management
- Data Visualization
- Statistical Analysis
- Healthcare Quality Improvement
- Healthcare Regulations and Compliance
- Healthcare Analytics
- Healthcare Terminology and Coding
- Project Management
- Process Improvement
- Healthcare Workflow Optimization
- Data Governance
- Data Security
- Healthcare Business Intelligence
- Healthcare Information Systems

## GENE THERAPY SPECIALIST

- Gene Therapy
- Pharma
- Biotech
- Life Sciences
- Research
- Clinical Trials
- Drug Development
- Regulatory Affairs
- Molecular Biology
- Cell Culture
- Biochemistry
- Immunology
- Genomics
- Protein Engineering
- Biopharmaceuticals
- Quality Control
- Data Analysis
- Project Management
- Leadership
- Communication

## MEDICAL IoT ENGINEER

- Medical Device Development
- Internet of Things (IoT)
- Biomedical Engineering
- Pharmaceutical Industry Knowledge
- Life Sciences Industry Knowledge
- Data Analytics
- Machine Learning
- Artificial Intelligence
- Regulatory Compliance
- Medical Device Regulations
- Quality Management Systems
- Risk Management
- Clinical Trials
- Medical Imaging
- Signal Processing
- Embedded Systems
- Wireless Communication
- Cloud Computing
- Cybersecurity
- Project Management

# Life Sciences: Required Skills for Emerging Roles

## BIOMATERIALS ENGINEER

- Biomaterials
- Biomedical Engineering
- Materials Science
- Tissue Engineering
- Biomaterials Characterization
- Biomaterials Testing
- Biocompatibility
- Biomaterials Synthesis
- Biomaterials Processing
- Biomaterials Design
- Regenerative Medicine
- Drug Delivery
- Biomedical Device Design
- Biomedical Materials
- Biomaterials Manufacturing
- Biomaterials Analysis
- Biomaterials Research
- Biomaterials Quality Control
- Biomaterials Safety
- Biomaterials Regulations

## CLINICAL AI RESEARCHER

- Artificial Intelligence
- Machine Learning
- Data Science
- Clinical Research
- Pharmaceuticals
- Biotechnology
- Life Sciences
- Medical Terminology
- Clinical Trials
- Drug Development
- Statistical Analysis
- Research Methodology
- Data Analysis
- Natural Language Processing
- Deep Learning
- Genomics
- Bioinformatics
- Medical Imaging
- Healthcare Industry
- Regulatory Compliance

## TELEMEDICINE SPECIALIST

- Telemedicine
- Medical Technology
- Healthcare
- Pharmaceuticals
- Biotechnology
- Life Sciences
- Clinical Research
- Medical Devices
- Digital Health
- E-Health
- Remote Patient Monitoring
- Telehealth
- Virtual Care
- Teleconsultation
- Telepharmacy
- Teleoncology
- Telepsychiatry
- Telecardiology
- Telestroke
- Healthcare Information Technology

## NEURO-TECHNOLOGY RESEARCHER

- Neuroscience
- Research
- Neurotechnology
- Pharmaceuticals
- Biotechnology
- Life Sciences
- Data Analysis
- Experimental Design
- Clinical Trials
- Neuroimaging
- Molecular Biology
- Genetics
- Bioinformatics
- Drug Development
- Neurophysiology
- Neuroanatomy
- Neurochemistry
- Neuropharmacology
- Neurodegenerative Diseases

# Life Sciences: Required Skills for Emerging Roles

## DIGITAL THERAPEUTICS DEVELOPER

- Software Development
- Digital Therapeutics
- Pharma Industry Knowledge
- Biotech Industry Knowledge
- Life Sciences Industry Knowledge
- Mobile Application Development
- User Experience Design
- Data Analysis
- Clinical Research
- Regulatory Compliance
- Quality Assurance
- Project Management
- Agile Methodologies
- Data Privacy and Security
- Cloud Computing
- Artificial Intelligence
- Machine Learning
- Natural Language Processing
- Data Visualization
- Medical Device Development

## HEALTH DATA PRIVACY OFFICER

- Data Privacy
- Healthcare Regulations
- Risk Management
- Compliance
- HIPAA
- GDPR
- Data Security
- Privacy Laws
- Data Governance
- Data Protection
- Pharmaceutical Industry
- Biotechnology
- Life Sciences
- Healthcare Industry
- Legal Compliance
- Privacy Policies
- Data Breach Response
- Privacy Impact Assessments
- Data Privacy Training
- Privacy by Design

## SYNTHETIC BIOLOGY ENGINEER

- Synthetic Biology
- Genetic Engineering
- Molecular Biology
- Bioinformatics
- Protein Engineering
- Cell Culture
- Microbiology
- Biochemistry
- Biotechnology
- Drug Discovery
- Gene Editing
- CRISPR
- Next Generation Sequencing
- High Throughput Screening
- Metabolic Engineering
- Systems Biology
- Bioethics
- Regulatory Affairs
- Quality Control
- Project Management

## NANOMEDICINE RESEARCHER

- Research
- Pharma
- Biotech
- Life Sciences
- Drug Development
- Biomaterials
- Nanotechnology
- Cell Biology
- Molecular Biology
- Biochemistry
- Pharmacology
- Drug Delivery
- Nanoparticles
- Nanofabrication
- Nanotoxicology
- Nanoparticle Characterization
- Nanoparticle Synthesis
- Nanoparticle Formulation
- Nanoparticle Targeting

# Life Sciences: Required Skills for Emerging Roles

## COLLABORATIVE TECHNOLOGIES SPECIALIST

- Collaboration Tools
- Project Management Tools
- Communication Platforms
- Video Conferencing
- Document Management
- Workflow Automation
- Virtual Whiteboarding
- Version Control Systems
- Knowledge Management
- Remote Team Collaboration
- Cloud Collaboration
- Task Management
- Team Leadership
- Cross-functional Collaboration
- Problem-solving
- Communication Skills
- Security Awareness
- Continuous Improvement
- Change Management
- Customer Relationship Management (CRM)

## DIGITAL TRANSFORAMTION STRATEGIST

- Digital Transformation Strategies
- Business Process Analysis
- Change Management
- Innovation Management
- Strategic Planning
- Leadership and Influence
- Technology Trends Analysis
- Customer Experience Design
- Data-driven Decision Making
- Agile Methodologies
- Stakeholder Management
- Project Management
- Digital Literacy
- Collaboration and Communication
- Risk Management
- Performance Measurement
- Vendor Management
- Continuous Improvement
- Problem-solving
- Organizational Development

# Life Sciences: Evolving Roles

| | |
|---|---|
| Biologist, Bioinformatician, Data Scientist | Computational Biologist |
| Pharmaceutical Scientist, Chemoinformatician, AI Engineer | AI Drug Discovery Scientist |
| Biostatistician, Computational Biologist, Data Analyst | Bioinformatics Specialist |
| Medical Geneticist, Oncologist, Personalized Medicine Specialist | Precision Medicine Consultant |
| Molecular Biologist, Geneticist, CRISPR Specialist | Gene Editing Scientist |
| Stem Cell Researcher, Tissue Engineer, Biomedical Engineer | Regenerative Medicine Specialist |
| Healthcare Consultant, Digital Transformation Specialist, Health IT Manager | Digital Health Strategist |
| Clinical Researcher, Data Analyst, Biostatistician | Clinical Data Scientist |
| Immunologist, Oncologist, Biomedical Scientist | Immunotherapy Researcher |
| Pharmacologist, Geneticist, Clinical Pharmacologist | Pharmacogenomics Expert |
| Stem Cell Biologist, Immunologist, Tissue Engineer | Cell Therapy Scientist |
| Medical Ethicist, AI Ethics Researcher, Regulatory Affairs Specialist | Medical AI Ethicist |
| Biomedical Engineer, Data Scientist, Medical Technologist | Digital Biomarker Scientist |
| Clinical Research Coordinator, Research Nurse, Clinical Project Manager | Clinical Trial Coordinator |
| Health Data Analyst, Healthcare Informatics Specialist, Epidemiologist | Health Informatics Analyst |
| Molecular Geneticist, Gene Therapist, Clinical Research Scientist | Gene Therapy Specialist |
| Biomedical Engineer, IoT Developer, Medical Device Engineer | Medical IoT Engineer |
| Materials Scientist, Biomedical Engineer, Tissue Engineer | Biomaterials Engineer |
| Clinical Research Scientist, AI Engineer, Data Scientist | Clinical AI Researcher |
| Telehealth Nurse, Virtual Care Coordinator, Telemedicine Physician | Telemedicine Specialist |
| Neuroscientist, Biomedical Engineer, Neurologist | Neurotechnology Researcher |
| Software Engineer, Health App Developer, Digital Health Innovator | Digital Therapeutics Developer |
| Privacy Compliance Officer, Healthcare Privacy Specialist, Data Protection Officer | Health Data Privacy Officer |
| Biomedical Engineer, Genetic Engineer, Biochemist | Synthetic Biology Engineer |
| Nanotechnologist, Biomedical Engineer, Pharmaceutical Scientist | Nanomedicine Researcher |

# Life Sciences: Top Declining Skills

| Skill | Reason for Decline |
|---|---|
| **Manual Laboratory Techniques** | Automation of laboratory processes and advancements in robotics reduce the need for manual manipulation and testing. |
| **Paper-based Documentation** | Transition to electronic document management systems eliminates the need for physical documentation and filing. |
| **Manual Bioprocessing Skills** | Adoption of automated bioprocess technologies and advancements in bioreactors decrease the demand for manual operations. |
| **Basic Animal Husbandry** | Increasing use of automated animal care systems and advancements in animal welfare practices reduce manual labor needs. |
| **Manual Manufacturing Processes** | Implementation of automated manufacturing technologies and robotics reduces the need for manual production operations. |
| **Manual Quality Control** | Implementation of automated quality control systems and machine learning algorithms decreases reliance on manual inspection. |
| **Manual Data Entry** | Automation of data capture and management systems eliminates the need for manual data entry and record keeping. |
| **Traditional Paper-based Regulatory Compliance** | Advancements in regulatory software and digital submission platforms reduce reliance on manual regulatory compliance tasks. |
| **Manual Packaging Techniques** | Automation of packaging processes and advancements in packaging technology decrease the demand for manual packaging skills. |
| **Manual Clinical Data Management** | Implementation of electronic data capture systems and cloud-based data management reduces the need for manual data management. |

| Skill | Reason for Decline |
|---|---|
| **Basic Laboratory Instrumentation** | Automation and integration of laboratory instrumentation reduce the need for manual operation and monitoring. |
| **Handwritten Note-taking** | Digitalization of note-taking and documentation processes reduces reliance on handwritten records and notes. |
| **Basic Biostatistical Analysis** | Adoption of advanced statistical software and machine learning algorithms decreases the need for manual statistical analysis. |
| **Manual Experiment Documentation** | Adoption of electronic lab notebooks and digital record-keeping systems eliminates the need for manual experiment documentation. |
| **Manual Inventory Management** | Adoption of inventory management software and RFID technology reduces reliance on manual inventory tracking and management. |
| **Traditional Animal Handling** | Increasing use of automated animal care systems and improvements in animal welfare practices reduce manual handling needs. |
| **Manual Protocol Preparation** | Adoption of electronic protocol management systems and standardized templates reduces the need for manual protocol preparation. |
| **Basic Data Analysis** | Adoption of data analysis software and machine learning algorithms decreases reliance on manual data analysis techniques. |
| **Basic Molecular Biology Techniques** | Automation of molecular biology processes and advancements in lab automation reduce reliance on manual manipulation skills. |
| **Manual Tissue Culture** | Automation of tissue culture techniques and advancements in cell culture technology decrease the need for manual tissue culture skills. |

# Life Sciences: Top Declining Roles

| Role | Reason for Decline |
|---|---|
| **Laboratory Technician** | Automation of laboratory processes and advancements in robotics reduce the need for manual lab technicians. |
| **Bioprocess Technician** | Automation of bioprocesses and advancements in bioreactors decrease the demand for manual bioprocess technicians. |
| **Clinical Research Coordinator** | Implementation of electronic data capture systems and centralized monitoring reduces the need for manual coordinators. |
| **Animal Care Technician** | Increasing use of animal care automation systems and advancements in animal husbandry techniques decrease manual labor. |
| **Manufacturing Operator** | Adoption of automated manufacturing technologies and robotics reduces the need for manual operators on production lines. |
| **Quality Control Inspector** | Implementation of automated quality control systems and machine vision technology decreases the need for manual inspection. |
| **Regulatory Affairs Specialist** | Advancements in regulatory software and digital submission platforms decrease the need for manual regulatory specialists. |
| **Packaging Technician** | Automation of packaging processes and advancements in packaging technology decrease the demand for manual packaging technicians. |
| **Clinical Data Manager** | Implementation of electronic data capture systems and cloud-based data management reduces the need for manual data managers. |
| **Pharmacy Technician** | Automation of pharmacy dispensing systems and advancements in medication management decrease the demand for manual technicians. |

# Life Sciences: Most Popular Roles

### Research Scientist

Conducts laboratory experiments and research to discover new drugs, therapies, and medical treatments.

### Regulatory Affairs Specialist

Manages regulatory submissions, compliance, and approvals for pharmaceutical products with regulatory agencies.

### Clinical Data Manager

Manages and oversees the collection, storage, and analysis of clinical trial data, ensuring accuracy and compliance.

### Process Development Scientist

Develops and optimizes manufacturing processes for pharmaceutical products, ensuring scalability and efficiency.

### Biomedical Engineer

Designs and develops medical devices, equipment, and prosthetics, applying principles of engineering and biology.

### Quality Control Analyst

Performs quality control testing and analysis on pharmaceutical products to ensure compliance with quality standards.

### Pharmacologist

Studies the effects and mechanisms of drugs and medications on biological systems, including drug interactions and toxicity.

### Clinical Research Associate

Monitors and manages clinical trials, ensuring adherence to protocols, regulatory requirements, and participant safety.

### Clinical Research Coordinator

Coordinates and manages clinical trials, ensuring compliance with regulatory requirements and ethical standards.

### Medical Science Liaison

Acts as a bridge between pharmaceutical companies and healthcare professionals, providing scientific and medical information.

### Regulatory Affairs Manager

Leads regulatory affairs teams, develops regulatory strategies, and ensures compliance with global regulatory requirements.

### Biochemist

Studies the chemical processes and interactions within living organisms, including drug metabolism and protein synthesis.

### Pharmaceutical Sales Representative

Promotes and sells pharmaceutical products to healthcare professionals, physicians, and hospitals.

### Biostatistician

Analyzes and interprets data from clinical trials and research studies to support decision-making in drug development.

### Medical Writer

Creates scientific and medical documents, including regulatory submissions, clinical trial reports, and research manuscripts.

### Pharmacovigilance Specialist

Monitors and evaluates the safety and effectiveness of pharmaceutical products, identifying and reporting adverse reactions.

# Life Sciences: Most Popular Roles

### Medical Affairs Manager

Oversees medical affairs activities, including medical education, publications, and scientific communications within a pharmaceutical company.

### Regulatory Compliance Officer

Ensures compliance with regulatory requirements and industry standards in manufacturing, distribution, and marketing of pharmaceutical products.

### Genetic Counselor

Provides genetic counseling to individuals and families, assessing genetic risks, interpreting test results, and offering guidance on medical decisions.

### Clinical Operations Manager

Manages clinical operations teams, oversees trial planning and execution, and ensures compliance with protocols and regulations.

### Microbiologist

Studies microorganisms and their interactions with humans, including their role in disease, drug development, and biotechnology.

### Clinical Pharmacologist

Studies the pharmacokinetics and pharmacodynamics of drugs in humans, including drug metabolism, interactions, and dosing optimization.

### Medical Illustrator

Provides genetic counseling to individuals and families, assessing genetic risks, interpreting test results, and offering guidance on medical decisions.

### Biotechnology Research Scientist

Monitors and manages clinical trials, ensuring adherence to protocols, regulatory requirements, and participant safety.

INDUSTRY ANALYSIS

# Manufacturing

SUMMARY

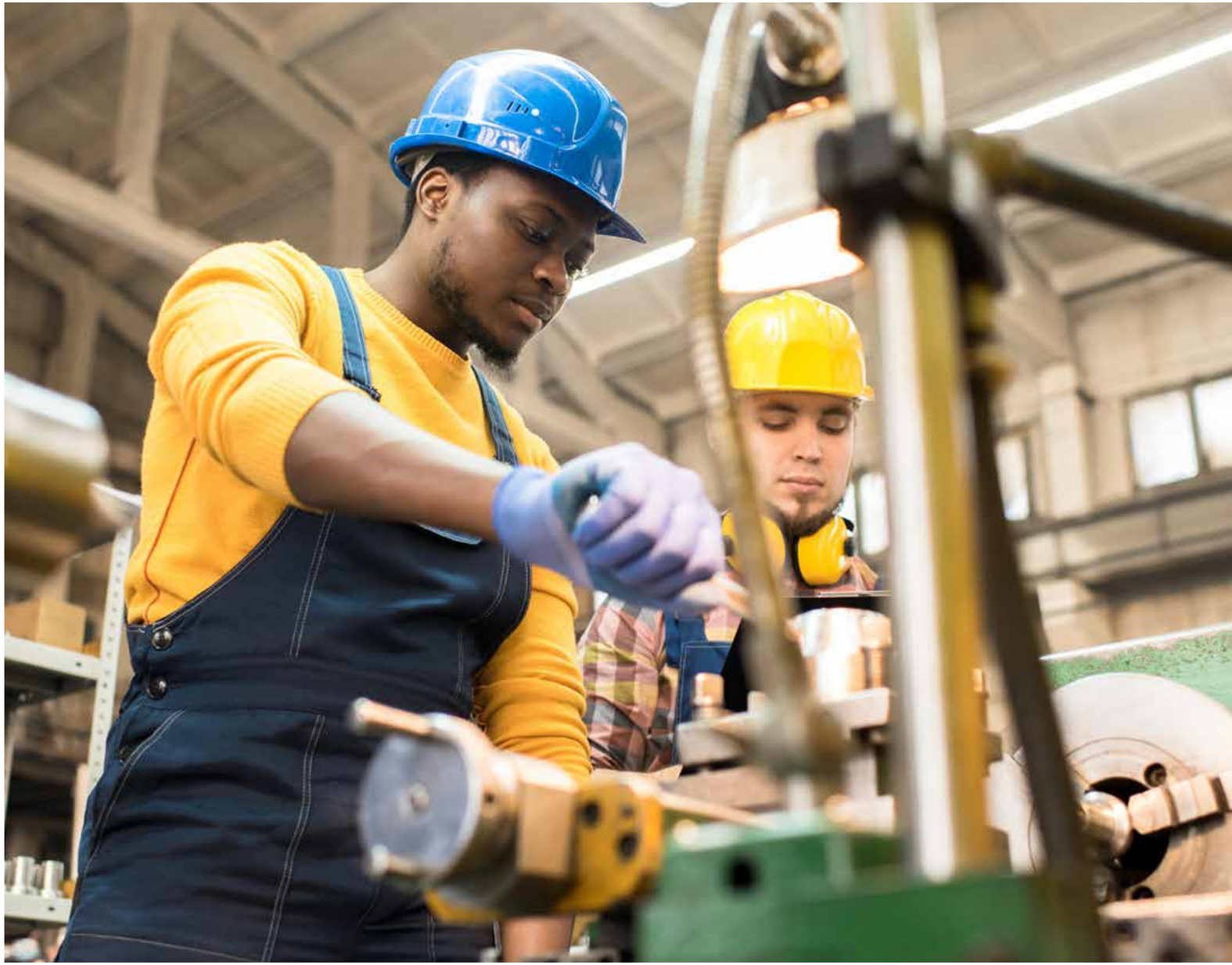
The **Manufacturing sector** is a cornerstone of economic development and comprises a wide array of businesses dedicated to the transformation of raw materials into new products.

This sector has a unique set of challenges due to diverse and sometimes custom processes for fabricating products, including mechanical, physical, or chemical transformations. While some skills are the same across the industry, many skills are unique to the process they support. Many of the organizations in other industries have manufacturing operations so the data would be relevant to that sector of their business as well as contract manufacturers.

Manufacturing is complex and multifaceted, involving businesses that range from large-scale plants and factories to smaller, specialized workshops. Whether through advanced, power-driven machinery or meticulously handcrafted techniques, this sector thrives on the ingenuity and skill of its workforce to convert raw materials into products essential for countless other industries.

Workers in this industry may be focused on one of hundreds of different processes, including creating high-tech electronic components, crafting precision metal parts, or assembling complex machinery. Each of these areas requires specific skills and expertise and has a very distinct career path.

Many of the traditional “floor” skills are on the decline with the advent of automation, vision technology, and AI. However, much like the first industrial revolution, the fourth industrial revolution opens up an opportunity to learn an entirely new set of skills to maintain the latest machines. Blockchain is prevalent again in this industry as an emerging skill, as is augmented reality.





*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.

The continued enhancements to 3D printing for prototyping and finished products have given rise to specialized roles that can continue to enhance printing capabilities. As manufacturing processes become more automated and data-driven, professionals in this sector need a unique blend of technical, digital, and interpersonal skills. Expertise in advanced manufacturing technologies, such as robotics, AI, and the Internet of Things (IoT), is in high demand. These technologies are not just transforming production lines but also influencing the strategic decision-making process, driving companies to invest in a workforce that is skilled at leveraging digital tools to enhance operational efficiency and innovation.

Like in banking and financial services and healthcare, the demand for skills in data analytics and cybersecurity within the manufacturing sector is surging. As companies continue to innovate in smart manufacturing, there is a growing need for professionals who can analyze vast amounts of data to optimize production processes, predict maintenance, and ensure product quality. As manufacturing companies become more interconnected and reliant on digital networks, and a diverse supply chain, the importance of cybersecurity professionals that can safeguard digital infrastructure and respond to cyber threats are critical in maintaining the integrity and resilience of manufacturing operations.

Soft skills like leadership, problem-solving, and adaptability are increasingly vital in the manufacturing industry. The dynamic nature of modern manufacturing environments requires professionals who can lead teams effectively, navigate complex challenges, and drive continuous improvement. The most sought-after individuals in the manufacturing sector are those who not only possess technical expertise but also demonstrate strong leadership and adaptability in the face of rapid technological change.

# Manufacturing: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Quantum Computing | Utilizing principles of quantum mechanics to perform computations exponentially faster than classical computers. | Technical | Mathematics, especially linear algebra and calculus; Programming languages like Python or Java; Understanding of quantum mechanics |
| IoT Architecture | Designing and implementing architectures for Internet of Things (IoT) systems, integrating devices and sensors. | Technical | Networking fundamentals; Understanding of hardware and sensors; Knowledge of communication protocols like MQTT or HTTP |
| Big Data Analytics | Analyzing large and complex datasets to extract valuable insights using various statistical and computational methods. | Technical | Data analysis and statistical skills; Programming languages like Python or R; Familiarity with data visualization tools like Tableau |
| Digital Twin Development | Creating virtual representations of physical assets or processes, enabling simulation, monitoring, and analysis. | Technical | Software development; Knowledge of CAD software; Understanding of data modeling and simulation techniques |
| Blockchain Technology | Implementing decentralized and secure distributed ledger systems for transparent and immutable transaction records. | Technical | Cryptography; Distributed systems; Programming languages like Solidity for smart contract development |
| Sustainable Finance | Integrating environmental, social, and governance (ESG) factors into financial decision-making and investment. | Soft | Financial literacy; Knowledge of environmental, social, and governance (ESG) factors; Understanding of investment strategies |
| Smart Manufacturing | Implementing advanced technologies like IoT, AI, and robotics to optimize manufacturing processes and operations. | Technical | Industrial engineering; Automation and robotics; Data analytics and optimization techniques |
| Environmental Science | Studying the interactions between organisms and their environment, addressing environmental challenges and risks. | Soft | Biology, chemistry, and ecology; Environmental policy and regulations; Data analysis and research skills |
| Renewable Energy | Generating energy from natural sources like sunlight, wind, or water, reducing reliance on fossil fuels. | Technical | Energy systems and technologies; Knowledge of physics and engineering principles; Environmental science |
| Green Building | Designing and constructing sustainable buildings that minimize environmental impact and resource consumption. | Technical | Architecture and design principles; Sustainability concepts and practices; Construction and materials science |
| Augmented Reality | Overlaying digital information onto the physical world, enhancing user experiences in various applications. | Technical | Computer graphics and programming; Understanding of AR development platforms like Unity or ARKit; UI/UX design |
| Virtual Reality | Creating immersive simulated environments, often used for training, simulation, gaming, or virtual tours. | Technical | 3D modeling and animation; Game development; VR hardware and software platforms |
| 3D Modeling | Creating three-dimensional digital representations of objects or spaces, used in design, animation, and visualization. | Technical | CAD software proficiency (e.g., AutoCAD, SolidWorks); Understanding of geometry and spatial relationships |
| Machine Learning | Developing algorithms that enable computers to learn from and make predictions or decisions based on data. | Technical | Statistics and probability theory; Programming languages like Python or R; Data preprocessing and modeling techniques |
| Artificial Intelligence | Simulating human intelligence in machines, enabling them to perform tasks that typically require human cognition. | Technical | Machine learning; Neural networks; Deep learning frameworks like TensorFlow or PyTorch |
| Robotics | Designing, building, and programming mechanical devices capable of performing tasks autonomously or semi-autonomously. | Technical | Mechanics and kinematics; Control systems theory; Programming languages like C++ or Python for robot control |
| Internet of Things (IoT) | Connecting and controlling physical devices or objects via the internet, enabling data collection and automation. | Technical | Networking concepts (TCP/IP, HTTP); Embedded systems programming; Sensor technology and data acquisition |

# Manufacturing: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Digital Transformation Strategies | Planning and executing strategies to leverage digital technologies for transforming business processes and operations. | Soft | Business process analysis; Change management; IT infrastructure and cloud computing knowledge |
| Data-driven Decision Making | Making decisions based on data analysis and insights rather than intuition or gut feelings. | Soft | Data analysis and interpretation; Critical thinking and problem-solving; Communication and presentation skills |
| Industry 4.0 Technology | Embracing technologies like IoT, AI, cloud computing, and robotics to drive digital transformation in industries. | Technical | IoT and sensor technology; Cloud computing and edge computing; Data analytics and predictive maintenance |
| Predictive Maintenance | Anticipating equipment failures or maintenance needs based on data analysis, minimizing downtime and costs. | Technical | Sensor technology and data acquisition; Data analytics and machine learning; Understanding of maintenance processes and workflows |
| Nanotechnology | Manipulating matter at the atomic or molecular scale to create materials, devices, or systems with novel properties. | Technical | Nanomaterials and nanostructures; Physics and chemistry principles at the nanoscale; Nanofabrication techniques |
| Cybersecurity Resilience | Implementing measures to protect systems and data from cyber threats, ensuring continuity and resilience. | Technical | Information security principles; Network security protocols and technologies; Incident response and risk management |
| Data Governance | Establishing policies, procedures, and controls for managing and ensuring the quality, integrity, and security of data. | Soft | Data management and quality assurance; Regulatory compliance; Privacy and security standards |
| Behavioral Economics Analysis | Analyzing how psychological, cognitive, and emotional factors influence economic decisions and behaviors. | Soft | Economics principles; Psychology and behavioral science; Data analysis and statistical modeling |

# Manufacturing: Top Emerging Roles

| Emerging Role | Description |
|---|---|
| AI Integration Specialist | Integrates AI technologies into manufacturing processes for optimization and automation. |
| Robotics Engineer | Designs, develops, and maintains robotic systems used in manufacturing operations. |
| Data Science Engineer | Utilizes data analysis and machine learning techniques to improve manufacturing efficiency and product quality. |
| IoT Solutions Architect | Designs and implements Internet of Things (IoT) solutions to enhance connectivity and automation in manufacturing. |
| Additive Manufacturing Technician | Operates and maintains 3D printers and additive manufacturing equipment for rapid prototyping and production. |
| Digital Twin Developer | Develops digital twin models to simulate and optimize manufacturing processes in virtual environments. |
| Cybersecurity Analyst | Implements cybersecurity measures to protect manufacturing systems and data from cyber threats. |
| Supply Chain Analyst | Analyzes and optimizes supply chain processes using data-driven insights to enhance efficiency and reduce costs. |
| Smart Factory Manager | Oversees the implementation and operation of smart manufacturing technologies to improve production efficiency. |
| Augmented Reality Technician | Integrates augmented reality (AR) technologies into manufacturing workflows for training and visualization. |
| Blockchain Integration Specialist | Implements blockchain technology for secure and transparent transactions within the manufacturing supply chain. |
| Sustainability Engineer | Designs and implements sustainable manufacturing practices to reduce environmental impact and resource usage. |
| Human-Machine Interaction Designer | Designs user interfaces and experiences for human-machine interaction in manufacturing environments. |
| Predictive Maintenance Analyst | Utilizes predictive analytics to forecast equipment failures and optimize maintenance schedules for minimal downtime. |
| Autonomous Vehicles Operator | Operates and maintains autonomous vehicles used for material handling and transportation within manufacturing facilities. |
| Quantum Computing Specialist | Explores and develops applications of quantum computing for solving complex manufacturing optimization problems. |
| Digital Supply Chain Manager | Manages digital supply chain initiatives, including inventory optimization, demand forecasting, and supplier collaboration. |
| Energy Efficiency Specialist | Implements energy-efficient technologies and practices to reduce energy consumption and costs in manufacturing operations. |
| Cloud Computing Engineer | Implements and manages cloud computing infrastructure for scalable data storage, processing, and analytics in manufacturing. |
| Remote Operations Coordinator | Coordinates and supervises remote manufacturing operations using advanced communication and control technologies. |
| Cognitive Automation Engineer | Develops cognitive automation solutions using AI and machine learning to streamline decision-making processes in manufacturing. |
| Adaptive Learning Trainer | Designs and delivers adaptive learning programs to upskill manufacturing workforce in response to changing technology trends. |
| Virtual Commissioning Engineer | Conducts virtual commissioning of manufacturing systems to optimize performance and validate processes before physical deployment. |
| Industrial Network Architect | Designs and maintains industrial networks for secure and reliable communication between machines and systems in manufacturing. |
| 3D Printing Material Scientist | Researches and develops new materials for 3D printing applications to enhance product performance and manufacturing efficiency. |

# Manufacturing: Required Skills for Emerging Roles

## AI INTEGRATION SPECIALIST

- Artificial Intelligence
- Machine Learning
- Data Science
- Natural Language Processing
- Computer Vision
- Deep Learning
- Big Data Analytics
- Cloud Computing
- Programming Languages (Python, Java, C++)
- Data Mining
- Statistical Analysis
- Predictive Modeling
- Data Visualization
- Database Management
- Business Intelligence
- Process Automation
- Project Management
- Domain Knowledge in Specialized Manufacturing
- Communication Skills
- Problem Solving

## ROBOTICS ENGINEER

- Robotics
- Engineering
- Manufacturing
- Automation
- Programming
- Mechanical Design
- Electrical Engineering
- Control Systems
- Sensors
- Machine Learning
- Artificial Intelligence
- Computer Vision
- CAD/CAM
- PLC Programming
- Industrial Robotics
- Process Optimization
- Project Management
- Quality Assurance
- Data Analysis
- Problem Solving

## DATA SCIENCE ENGINEER

- Data Analysis
- Machine Learning
- Python
- R
- SQL
- Data Visualization
- Statistical Modeling
- Big Data
- Data Mining
- Predictive Modeling
- Natural Language Processing
- Deep Learning
- Data Engineering
- Cloud Computing
- Data Warehousing
- ETL
- Data Governance
- Data Quality
- Data Security
- Domain Knowledge in Specialized Manufacturing

## IoT SOLUTIONS ARCHITECT

- IoT Architecture
- Cloud Computing
- Big Data Analytics
- Machine Learning
- Artificial Intelligence
- Industrial Automation
- Sensor Technology
- Data Security
- Network Infrastructure
- Project Management
- Business Development
- Supply Chain Management
- Quality Control
- Risk Management
- Regulatory Compliance
- Industry 4.0
- Smart Manufacturing
- Predictive Maintenance
- Process Optimization
- Customer Relationship Management

# Manufacturing: Required Skills for Emerging Roles

## ADDITIVE MANUFACTURING TECHNICIAN

- 3D Printing
- CAD Software
- Material Science
- Quality Control
- Troubleshooting
- Blueprint Reading
- Machining
- Robotics
- Computer-Aided Manufacturing (CAM)
- Process Improvement
- Project Management
- Teamwork
- Communication
- Problem Solving
- Attention to Detail
- Time Management
- Safety Protocols
- Technical Writing
- Data Analysis
- Continuous Learning

## DIGITAL TWIN DEVELOPER

- Digital Twin Development
- Specialized Manufacturing
- Industry Knowledge
- Software Development
- Data Analytics
- Cloud Computing
- Internet of Things (IoT)
- Artificial Intelligence (AI)
- Machine Learning
- Virtual Reality (VR)
- Augmented Reality (AR)
- 3D Modeling
- Simulation
- Data Visualization
- Programming Languages (e.g. Java, Python, C++)
- Database Management
- Project Management
- Communication Skills
- Problem Solving
- Critical Thinking

## CYBERSECURITY ANALYST

- Network Security
- Vulnerability Assessment
- Penetration Testing
- Security Information and Event Management (SIEM)
- Intrusion Detection and Prevention
- Threat Intelligence
- Risk Management
- Incident Response
- Security Operations Center (SOC)
- Identity and Access Management (IAM)
- Cloud Security
- Data Loss Prevention (DLP)
- Encryption
- Security Auditing
- Compliance and Regulatory Standards
- Forensics
- Malware Analysis
- Application Security
- Mobile Security
- Industrial Control Systems (ICS) SecurityWWW

## SUPPLY CHAIN ANALYST

- Supply Chain Management
- Data Analysis
- Inventory Management
- Logistics
- Forecasting
- Procurement
- Cost Analysis
- Process Improvement
- Project Management
- Lean Six Sigma
- ERP Systems
- Supplier Relationship Management
- Demand Planning
- Risk Management
- Quality Management
- Supply Chain Optimization
- Cross-functional Collaboration
- Market Analysis
- Negotiation
- Continuous Improvement

# Manufacturing: Required Skills for Emerging Roles

## SMART FACTORY MANAGER

- Leadership
- Project Management
- Data Analysis
- Process Improvement
- Supply Chain Management
- Quality Management
- Lean Manufacturing
- Six Sigma
- Budget Management
- Team Building
- Strategic Planning
- Risk Management
- Change Management
- Continuous Improvement
- Manufacturing Operations
- Inventory Management
- Production Planning
- Quality Control
- Root Cause Analysis
- Industry 4.0 Technology

## AUGMENTED REALITY TECHNICIAN

- Augmented Reality
- Virtual Reality
- 3D Modeling
- Computer-Aided Design (CAD)
- Computer-Aided Manufacturing (CAM)
- Industrial Design
- User Experience (UX) Design
- User Interface (UI) Design
- Human-Computer Interaction (HCI)
- Programming Languages (C++, Java, Python)
- Computer Graphics
- Animation
- Game Development
- Mobile Development
- Web Development
- Machine Learning
- Artificial Intelligence
- Robotics
- Electronics
- Mechanical Engineering

## BLOCKCHAIN INTEGRATION SPECIALIST

- Blockchain Technology
- Smart Contracts
- Distributed Ledger
- Cryptocurrency
- Hyperledger
- Ethereum
- Solidity
- Smart Contract Development
- Blockchain Security
- Decentralized Applications
- Consensus Algorithms
- Tokenization
- Supply Chain Management
- Internet of Things (IoT)
- Data Privacy and Security
- Cloud Computing
- Artificial Intelligence
- Machine Learning
- Big Data Analytics
- Industry-specific knowledge (e.g. manufacturing, supply chain, logistics)

## SUSTAINABILITY ENGINEER

- Sustainability
- Engineering
- Specialized Manufacturing
- Environmental Science
- Renewable Energy
- Green Building
- Sustainable Design
- Life Cycle Assessment
- Circular Economy
- Waste Management
- Energy Efficiency
- Carbon Footprint
- Sustainable Materials
- Environmental Regulations
- Project Management
- Data Analysis
- Risk Assessment
- Supply Chain Management
- Stakeholder Engagement
- Communication Skills
- Teamwork

# Manufacturing: Required Skills for Emerging Roles

## HUMAN-MACHINE INTERACTION DESIGNER

- User Experience Design
- Human-Computer Interaction
- User Research
- Interaction Design
- Usability Testing
- Information Architecture
- Prototyping
- Wireframing
- User-Centered Design
- Design Thinking
- Cognitive Psychology
- Visual Design
- User Interface Design
- Data Analysis
- Agile Methodologies
- Project Management
- Product Design
- Industrial Design
- Human Factors Engineering
- Virtual Reality Design

## PREDICTIVE MAINTENANCE ANALYST

- Data Analysis
- Predictive Maintenance
- Statistical Modeling
- Machine Learning
- Python
- R
- SQL
- Data Visualization
- Root Cause Analysis
- Reliability Engineering
- Fault Detection and Diagnosis
- Condition Monitoring
- Predictive Analytics
- Industry Knowledge - Specialized Manufacturing
- Maintenance Management
- Risk Assessment
- Failure Mode and Effects Analysis (FMEA)
- Process Improvement
- Project Management
- Communication Skills

## AUTONOMOUS VEHICLES OPERATOR

- Autonomous Vehicle Operation
- Specialized Manufacturing
- Vehicle Maintenance
- Route Planning
- Safety Protocols
- Data Analysis
- Problem Solving
- Communication
- Teamwork
- Attention to Detail
- Technical Knowledge
- Quality Control
- Risk Management
- Emergency Response
- Regulatory Compliance
- Customer Service
- Time Management
- Adaptability
- Continuous Learning
- Critical Thinking

## QUANTUM COMPUTING SPECIALIST

- Quantum Computing
- Specialized Manufacturing
- Data Analysis
- Machine Learning
- Programming Languages (Python, C++, Java)
- Quantum Algorithms
- Quantum Mechanics
- Quantum Information Theory
- Quantum Simulation
- Quantum Error Correction
- Quantum Cryptography
- Quantum Networking
- Quantum Sensing
- Quantum Metrology
- Quantum Optics
- Quantum Materials
- Nanotechnology
- Advanced Mathematics
- Statistical Analysis
- Project Management

# Manufacturing: Required Skills for Emerging Roles

## DIGITAL SUPPLY CHAIN MANAGER

- Supply Chain Management
- Digital Transformation
- Data Analytics
- Project Management
- Process Improvement
- Inventory Management
- Logistics
- ERP Systems
- Lean Six Sigma
- Change Management
- Vendor Management
- Forecasting
- Cost Reduction
- Risk Management
- Strategic Planning
- Cross-functional Collaboration
- Budget Management
- Quality Management
- Supply Chain Optimization
- Industry Knowledge in Specialized Manufacturing

## ENERGY EFFICIENCY SPECIALIST

- Energy Management
- Energy Auditing
- Energy Efficiency Analysis
- Energy Conservation
- Energy Modeling
- Sustainable Design
- Renewable Energy
- Building Automation Systems
- HVAC Systems
- Lighting Systems
- Energy Policy
- Energy Regulations
- Energy Codes
- Energy Efficiency Standards
- Energy Performance Contracting
- Life Cycle Cost Analysis
- Project Management
- Data Analysis
- Technical Writing
- Presentation Skills

## CLOUD COMPUTING ENGINEER

- Cloud Computing
- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)
- Virtualization
- Containerization
- Automation
- DevOps
- Networking
- Security
- Data Management
- Big Data
- Machine Learning
- Artificial Intelligence
- Internet of Things (IoT)
- Microservices
- Agile Methodologies
- Project Management
- Vendor Management
- Cost Optimization
- Industry Knowledge (Specialized Manufacturing)

## REMOTE OPERATIONS COORDINATOR

- Remote Operations
- Coordination
- Manufacturing
- Specialized Manufacturing
- Industry Knowledge
- Communication
- Problem Solving
- Time Management
- Teamwork
- Leadership
- Project Management
- Data Analysis
- Process Improvement
- Quality Control
- Supply Chain Management
- Logistics
- Inventory Management
- Risk Management
- Budgeting
- Vendor Management

# Manufacturing: Required Skills for Emerging Roles

## COGNITIVE AUTOMATION ENGINEER

- Artificial Intelligence
- Machine Learning
- Natural Language Processing
- Robotics
- Process Automation
- Data Analytics
- Programming Languages (Python, Java, etc.)
- Cognitive Computing
- Computer Vision
- Deep Learning
- Big Data
- Cloud Computing
- Internet of Things (IoT)
- Data Mining
- Statistical Analysis
- Predictive Modeling
- Business Process Management
- Industrial Automation
- Manufacturing Processes
- Quality Control

## ADAPTIVE LEARNING TRAINER

- Adaptive Learning
- Training
- Specialized Manufacturing
- Industry Knowledge
- Instructional Design
- Curriculum Development
- E-Learning
- Learning Management Systems
- Needs Assessment
- Performance Management
- Project Management
- Team Management
- Communication
- Problem Solving
- Critical Thinking
- Data Analysis
- Quality Assurance
- Process Improvement
- Technical Writing
- Time Management

## VIRTUAL COMMISSIONING ENGINEER

- Virtual Commissioning
- Engineering Design
- PLC Programming
- Robotics
- Automation
- Simulation Software
- Control Systems
- Process Optimization
- Industrial Communication Protocols
- Machine Learning
- Data Analysis
- Project Management
- Troubleshooting
- Electrical Systems
- Mechanical Systems
- CAD Software
- Manufacturing Processes
- Quality Control
- Risk Assessment
- Team Leadership

## INDUSTRIAL NETWORK ARCHITECT

- Industrial Network Design
- Network Security
- Industrial Automation
- Industrial Protocols
- Network Architecture
- Industrial Control Systems
- Industrial Ethernet
- SCADA
- PLC Programming
- Industrial Communication Protocols
- Industrial Control Networks
- Industrial IoT
- Industrial Wireless Networks
- Industrial Cybersecurity
- Industrial Network Troubleshooting
- Industrial Network Monitoring
- Industrial Network Optimization
- Industrial Network Management
- Industrial Network Integration
- Industrial Network Protocols

## 3D PRINTING MATERIAL SCIENTIST

- 3D Printing
- Material Science
- Specialized Manufacturing
- Research and Development
- Product Design
- Prototyping
- CAD Software
- Material Testing
- Quality Control
- Project Management
- Data Analysis
- Problem Solving
- Innovation
- Teamwork
- Communication
- Time Management
- Attention to Detail
- Technical Writing
- Budget Management
- Supply Chain Management
- Industry Trends

# Manufacturing: Evolving Roles

| | |
|---|---|
| Manufacturing Engineer, Automation Engineer, Systems Integration Engineer | AI Integration Specialist |
| Mechanical Engineer, Electrical Engineer, Control Systems Engineer | Robotics Engineer |
| Data Analyst, Business Intelligence Analyst, Data Engineer | Data Science Engineer |
| Embedded Systems Engineer, Network Engineer, IoT Developer | IoT Solutions Architect |
| Machinist, Manufacturing Technician, CAD Designer | Additive Manufacturing Technician |
| Simulation Engineer, Software Developer, Virtual Reality Developer | Digital Twin Developer |
| IT Security Specialist, Network Security Engineer, Information Security Analyst | Cybersecurity Analyst |
| Logistics Coordinator, Operations Analyst, Procurement Specialist | Supply Chain Analyst |
| Production Supervisor, Operations Manager, Manufacturing Director | Smart Factory Manager |
| IT Support Specialist, Multimedia Designer, User Interface Designer | Augmented Reality Technician |
| Blockchain Developer, Cryptocurrency Analyst, Distributed Systems Engineer | Blockchain Integration Specialist |
| Environmental Engineer, Green Energy Specialist, Sustainable Design Engineer | Sustainability Engineer |
| User Experience Designer (UX), User Interface Designer (UI), Industrial Designer | Human-Machine Interaction Designer |
| Maintenance Technician, Reliability Engineer, Equipment Inspector | Predictive Maintenance Analyst |
| Forklift Operator, Material Handler, Warehouse Associate | Autonomous Vehicles Operator |
| Quantum Physicist, Quantum Computing Researcher, Quantum Algorithm Developer | Quantum Computing Specialist |
| Supply Chain Manager, Operations Manager, Logistics Manager | Digital Supply Chain Manager |
| Energy Auditor, Sustainability Consultant, HVAC Engineer | Energy Efficiency Specialist |
| Systems Administrator, DevOps Engineer, Cloud Architect | Cloud Computing Engineer |
| Operations Coordinator, Remote Support Specialist, Field Service Technician | Remote Operations Coordinator |
| Process Engineer, Software Engineer, AI Developer | Cognitive Automation Engineer |
| Training Specialist, Learning and Development Coordinator, Instructional Designer | Adaptive Learning Trainer |
| Control Systems Engineer, Automation Technician, PLC Programmer | Virtual Commissioning Engineer |
| Network Engineer, Systems Architect, Industrial Control Systems Engineer | Industrial Network Architect |
| Materials Engineer, Polymer Chemist, Materials Scientist | 3D Printing Material Scientist |

# Manufacturing: Top Declining Skills

| Skill | Reason for Decline |
|---|---|
| **Manual Machining** | Automation and CNC technology advancements reduce the need for manual machining skills. |
| **Hand Assembly** | Increasing automation and robotics in manufacturing processes decrease the demand for manual assembly skills. |
| **Quality Inspection** | Automated inspection technologies, such as machine vision systems, improve accuracy and efficiency, reducing manual inspection needs. |
| **Manual Welding** | Welding automation technologies, like robotic welding systems, offer higher precision and productivity, reducing the demand for manual welders. |
| **Manual Material Handling** | Automation technologies, like conveyor systems and robotic solutions, improve material handling efficiency, reducing the need for manual laborers. |
| **Forklift Operation** | Adoption of automated guided vehicles (AGVs) and material handling automation technologies diminishes the demand for manual forklift operation. |
| **Hand Tools Operation** | Increasing use of automated and powered tools reduces the need for manual hand tool operation skills. |
| **Inspection and Testing** | Automation and digitalization of testing processes decrease the need for manual inspection and testing skills. |
| **Physical Dexterity** | Advancements in automation and robotics minimize the requirement for manual dexterity skills in manufacturing tasks. |
| **Packaging** | Automated packaging systems and robotic solutions reduce the need for manual packaging skills. |

| Skill | Reason for Decline |
|---|---|
| **Soldering** | Automation and soldering robotics decrease the demand for manual soldering skills. |
| **Machine Tool Setting** | Automation and CNC technology advancements diminish the need for manual machine tool setting skills. |
| **Manual Labor** | Increasing automation and robotics in manufacturing replace many manual labor tasks, reducing the demand for manual laborers. |
| **Inventory Management** | Adoption of automated inventory tracking systems decreases the need for manual inventory management skills. |
| **Calibration** | Automation and digitalization of calibration processes reduce the demand for manual calibration skills. |
| **Hand Finishing** | Automation of finishing processes, such as sanding and polishing, diminishes the need for manual hand finishing skills. |
| **Mold Making** | Advances in CNC machining and additive manufacturing technologies decrease the need for manual mold making skills. |
| **Tool Maintenance** | Automation and self-maintenance features in machinery reduce the need for manual tool maintenance skills. |
| **Manual Grinding** | Automation and CNC technology advancements decrease the need for manual grinding skills. |
| **Manual Assembly Line Operation** | Increasing automation and robotics in assembly line processes decrease the demand for manual assembly line operation skills. |

# Manufacturing: Top Declining Roles

| Role | Reason for Decline |
|---|---|
| **Manual Machinist** | Automation and CNC technology advancements reduce the demand for manual machining skills. |
| **Assembly Line Worker** | Increasing automation and robotics in manufacturing processes decrease the need for manual assembly line workers. |
| **Production Line Supervisor** | Automation of production processes reduces the requirement for direct supervision of production lines. |
| **Quality Control Inspector** | Automated inspection technologies, such as machine vision systems, improve accuracy and efficiency, reducing manual inspection. |
| **Manual Welder** | Welding automation technologies, like robotic welding systems, offer higher precision and productivity, reducing the need for manual welders. |
| **Forklift Operator** | Adoption of automated guided vehicles (AGVs) and material handling automation technologies diminishes the demand for manual forklift operation. |
| **Manual Laborer** | Automation and robotics replace many manual labor tasks in manufacturing, reducing the need for manual laborers. |
| **Machine Tool Setter** | Automation and CNC technology advancements diminish the need for manual machine tool setting. |
| **Packaging Operator** | Automated packaging systems, including robotic solutions, offer faster and more efficient packaging processes, reducing the demand for manual operators. |
| **Manual Material Handler** | Automation technologies, like conveyor systems and robotic solutions, improve material handling efficiency, reducing the need for manual laborers. |

# Manufacturing: Most Popular Roles

### Manufacturing Engineer

Designs, develops, and improves manufacturing processes and systems to optimize efficiency and product quality.

### Electrical Engineer

Designs, develops, and maintains electrical systems and equipment used in manufacturing facilities.

### Operations Manager

Oversees daily operations of manufacturing facilities, including production planning, resource allocation, and workflow optimization.

### Logistics Coordinator

Coordinates the transportation, storage, and distribution of materials and finished products to ensure timely delivery and cost efficiency.

### Quality Assurance Specialist

Ensures that products meet quality standards through inspections, testing, and implementation of quality management systems.

### Process Improvement Engineer

Identifies opportunities for process optimization and implements improvements to enhance productivity and reduce waste.

### Supply Chain Manager

Manages the end-to-end supply chain process, including procurement, logistics, inventory management, and supplier relationships.

### CAD/CAM Programmer

Creates and modifies computer-aided design (CAD) and computer-aided manufacturing (CAM) programs to guide machining and production processes.

### Production Supervisor

Manages and coordinates production activities, ensuring that schedules are met, and resources are utilized efficiently.

### CNC Machinist

Operates computer numerical control (CNC) machines to fabricate precision parts according to engineering specifications.

### Automation Engineer

Designs, implements, and maintains automated systems and robotics to streamline manufacturing processes and improve efficiency.

### Materials Engineer

Researches and develops materials with specific properties for use in manufacturing processes and product design.

### Mechanical Engineer

Designs, develops, and tests mechanical systems and equipment used in manufacturing processes.

### Industrial Designer

Develops concepts and designs for products, equipment, and systems, focusing on functionality, aesthetics, and user experience.

### Maintenance Technician

Performs routine maintenance, repairs, and troubleshooting on machinery and equipment to ensure smooth operation and minimize downtime.

### Lean Six Sigma Specialist

Implements Lean Six Sigma methodologies to identify and eliminate process inefficiencies and defects, improving overall quality and efficiency.

# Manufacturing: Most Popular Roles

### Industrial Engineer

Analyzes and optimizes manufacturing processes, layouts, and workflow to maximize productivity and minimize costs.

### Environmental Health and Safety (EHS) Specialist

Develops and implements safety programs, policies, and procedures to ensure compliance with regulations and minimize workplace hazards.

### Research and Development (R&D) Engineer

Conducts research and experimentation to develop new products, processes, and technologies for manufacturing applications.

### Robotics Technician

Installs, maintains, and repairs robotic systems and automated equipment used in manufacturing operations.

### Project Manager

Plans, coordinates, and executes manufacturing projects, ensuring that they are completed on time, within budget, and meet quality standards.

### Machine Operator

Operates machinery and equipment used in manufacturing processes, monitoring performance and making adjustments as necessary.

### Tool and Die Maker

Fabricates and repairs precision tools, dies, and molds used in manufacturing processes, ensuring accuracy and quality of finished parts.

### Technical Sales Engineer

Provides technical expertise and support to customers, helping them select and implement manufacturing solutions that meet their needs.

### Production Planner/Scheduler

Plans and schedules production activities, allocating resources and coordinating workflow to meet production targets and customer demands.

INDUSTRY ANALYSIS

# Technology & IT

SUMMARY

The **Technology & IT industry** includes companies that create computer hardware and software, and provide computer services for consumption by businesses and consumers. Example organizations in this industry include Adobe, Hewlett Packard Enterprise, and Microsoft.*

As you've read, IT skills have been prevalent in all the other industries to keep up with the proliferation of AI and automation. For the providers of this technology, those same skills (blockchain, quantum computing, etc.) are emerging — but there is an even heavier concentration on AI ethics, transparency, policy creation, and regulatory knowledge to make sure that technology can allay fears around AI and be adopted easily by businesses and consumers.

There is also a continued prioritization of data privacy while the changing dynamics of work are driving more emerging skills around cybersecurity, including skills like blockchain security and quantum cryptography. Anyone who started their career in computer programming might notice a bittersweet decline in the need for languages like Assembly and Visual Basic 6, but time marches on.

Skills requirements for these roles differ significantly from each other, with top companies looking for a unique blend of technical skills and domain knowledge. For instance, cybersecurity analysts require a deep understanding of security protocols and threat detection, while data scientists need expertise in data analysis and statistical methods. DevOps engineers combine knowledge of software development and IT operations, while cloud engineers focus on cloud service management and infrastructure.



*Example companies are provided for illustrative purposes of the given industry, and not as an indication that their data is included in this report.

# Technology & IT: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Edge Computing | Edge computing refers to the practice of processing data near the edge of the network, closer to the source of data generation, rather than relying on a centralized data-processing warehouse. | Technical | Networking fundamentals, cloud computing, understanding of data processing principles |
| AI Policy and Regulation | AI policy and regulation involve the development and implementation of rules, laws, and guidelines governing the ethical and legal use of artificial intelligence technologies. | Soft | Legal knowledge, understanding of AI technologies and their implications, familiarity with regulatory frameworks |
| Quantum Computing | Quantum computing is a field of computing that utilizes the principles of quantum mechanics to perform operations on data. | Technical | Knowledge of linear algebra, quantum mechanics principles, programming skills (e.g., Python) |
| Quantum Machine Learning | Quantum machine learning involves the application of quantum computing techniques to enhance machine learning algorithms and processes. | Technical | Proficiency in machine learning algorithms and techniques, understanding of quantum computing concepts |
| Edge Security | Edge security refers to the protection of data and systems at the edge of a network, where devices connect to the internet, ensuring secure communication and data integrity. | Technical | Cybersecurity fundamentals, networking protocols, encryption techniques |
| Quantum Cryptography | Quantum cryptography is a method of secure communication that utilizes quantum mechanics principles, such as quantum key distribution, to provide cryptographic security. | Technical | Understanding of quantum mechanics, cryptography principles, mathematical skills |
| Privacy and Data Protection | Privacy and data protection involve safeguarding sensitive information and ensuring compliance with privacy regulations and policies to protect individuals' privacy rights. | Soft | Legal and regulatory knowledge, cybersecurity awareness, understanding of data privacy laws and regulations |
| Threat Intelligence | Threat intelligence refers to the analysis and understanding of cyber threats, including potential attackers, methods, and vulnerabilities, to enhance cybersecurity defenses. | Technical | Cybersecurity fundamentals, data analysis skills, knowledge of threat actors and attack vectors |
| Smart Contract Auditing | Smart contract auditing involves reviewing and assessing the code and logic of smart contracts to identify vulnerabilities, bugs, or security flaws before deployment on a blockchain network. | Technical | Proficiency in blockchain technology, programming skills (e.g., Solidity), security auditing techniques |
| Privacy and Security | Privacy and security encompass the practices and measures implemented to safeguard data and systems from unauthorized access, breaches, and other security threats, while also ensuring privacy compliance. | Soft | Cybersecurity basics, risk management principles, familiarity with security tools and practices |
| Ethical AI Principles | Ethical AI principles involve guiding principles and frameworks for the responsible development and deployment of artificial intelligence technologies, ensuring fairness, transparency, and accountability. | Soft | Understanding of AI technologies and their ethical implications, critical thinking skills, knowledge of ethical frameworks |
| Fairness and Transparency | Fairness and transparency in AI refer to the principles and practices aimed at ensuring that AI systems are unbiased, accountable, and provide clear explanations for their decisions and actions. | Soft | Awareness of biases in AI algorithms, statistical analysis skills, familiarity with fairness metrics and explainability techniques |
| Cloud Integration | Cloud integration involves connecting various cloud-based applications, data, and services to enable seamless communication, data sharing, and interoperability across different cloud platforms. | Technical | Knowledge of cloud computing platforms (e.g., AWS, Azure, Google Cloud), networking fundamentals, API integration skills |
| Conversational UX/UI Design | Conversational UX/UI design focuses on creating intuitive and user-friendly interfaces for conversational agents, such as chatbots or virtual assistants, to enhance user experience and engagement. | Technical | User experience (UX) design principles, understanding of human-computer interaction, proficiency in design tools (e.g., Sketch, Figma) |
| Continuous Integration/Continuous Deployment (CI/CD) | CI/CD is a software development practice that involves automating the process of integrating code changes into a shared repository (CI) and deploying code to production environments (CD) frequently and reliably. | Technical | Software development lifecycle understanding, proficiency in version control systems (e.g., Git), automation skills |
| Containerization (e.g., Docker) | Containerization is a form of virtualization that allows applications and their dependencies to be packaged into lightweight, portable containers, enabling consistent deployment across different environments. | Technical | Understanding of virtualization concepts, familiarity with Linux command line, knowledge of container orchestration tools (e.g., Kubernetes) |
| Predictive Modeling | Predictive modeling involves using statistical techniques and machine learning algorithms to analyze historical data and make predictions about future outcomes or trends. | Technical | Statistical analysis skills, proficiency in machine learning algorithms, data preprocessing techniques |

# Technology & IT: Top Emerging Skills

| Skills | Description | Type | Base Skills |
|---|---|---|---|
| Compliance Training | Compliance training involves educating employees on regulatory requirements, industry standards, and company policies to ensure adherence to legal and ethical guidelines in their roles. | Soft | Knowledge of industry regulations and standards, instructional design skills, communication abilities |
| Blockchain Governance | Blockchain governance refers to the processes, rules, and decision-making structures governing the operation and evolution of blockchain networks and decentralized applications (DApps). | Technical | Understanding of blockchain technology, governance frameworks, legal and regulatory knowledge, consensus mechanisms |
| User Interaction in AR/VR | User interaction in AR/VR focuses on designing immersive and intuitive user interfaces and experiences for augmented reality (AR) and virtual reality (VR) applications and environments. | Technical | User interface (UI) design principles, familiarity with AR/VR development platforms (e.g., Unity, Unreal Engine), 3D modeling and animation skills |
| Security Awareness Training | Security awareness training educates individuals about cybersecurity risks, best practices, and procedures to help them recognize and mitigate security threats effectively. | Soft | Cybersecurity awareness, communication skills, instructional design knowledge |
| Compliance | Compliance involves ensuring adherence to laws, regulations, standards, and policies relevant to an organization's operations, products, services, and interactions with stakeholders. | Soft | Understanding of regulatory requirements, legal knowledge, risk management skills |
| AI Ethics | AI ethics involves the study and application of ethical principles and guidelines in the development, deployment, and use of artificial intelligence technologies to ensure responsible and ethical outcomes. | Soft | Knowledge of ethical theories and principles, understanding of AI technologies and their societal impacts, critical thinking skills |
| Blockchain Security | Blockchain security encompasses the measures and protocols implemented to protect blockchain networks, transactions, and digital assets from unauthorized access, manipulation, or fraud. | Technical | Understanding of blockchain technology, cybersecurity fundamentals, cryptography knowledge |
| Health Informatics | Health informatics is the interdisciplinary field that involves the acquisition, storage, retrieval, and use of healthcare data, information, and knowledge for clinical and research purposes. | Technical | Healthcare domain knowledge, data management skills, understanding of healthcare information systems |

# Technology & IT: Top Emerging Roles

| Emerging Role | Description |
|---|---|
| AI/Machine Learning Specialist | Designs and implements AI and machine learning solutions. |
| Data Science Architect | Shapes and oversees data science strategies and architectures. |
| Cybersecurity Specialist | Specializes in safeguarding computer systems and networks. |
| Cloud Solutions Engineer | Develops and manages solutions on cloud platforms. |
| DevOps Specialist | Focuses on collaboration and automation in software development and IT operations. |
| Blockchain Solutions Architect | Designs and implements solutions using blockchain technology. |
| IoT Solutions Engineer | Creates and manages solutions for the Internet of Things. |
| Automation Process Engineer | Develops and optimizes automated processes using RPA tools. |
| Edge Solutions Architect | Designs solutions for edge computing technologies. |
| Full Stack Development Specialist | Specializes in both front-end and back-end development. |
| Experience Design Engineer | Designs user interfaces and experiences for applications and websites. |
| Immersive Technologies Developer | Creates interactive experiences using AR, VR, and other immersive technologies. |
| 5G Network Solutions Architect | Designs and optimizes solutions for 5G networks. |
| Quantum Solutions Scientist | Researches and develops applications for quantum computing. |
| Digital Marketing Specialist | Utilizes digital platforms for marketing strategies. |
| Compliance and Risk Management Specialist | Manages compliance with regulations and assesses associated risks. |
| AI Ethics and Responsible AI Specialist | Addresses ethical considerations in AI development and deployment. |
| Conversational AI Developer | Creates and maintains conversational interfaces like chatbots. |
| Healthcare Data Science Specialist | Applies data science techniques to healthcare data for insights. |
| IT Project Management Specialist | Manages and oversees IT projects from planning to execution. |
| Business Intelligence Specialist | Utilizes data for business insights and decision-making. |
| Cybersecurity Consulting Specialist | Provides expertise in cybersecurity consulting and solutions. |
| Immersive Content Developer | Develops content for augmented and virtual reality platforms. |
| Collaborative Technologies Specialist | Focuses on human-machine collaboration and user experience. |
| Digital Transformation Strategist | Leads strategic initiatives for adopting digital technologies. |
| Product Strategy and Management Specialist | Shapes and manages the strategy and development of products. |

# Technology & IT: Required Skills for Emerging Roles

## AI/MACHINE LEARNING SPECIALIST

- Python
- TensorFlow
- PyTorch
- Machine Learning Algorithms
- Deep Learning
- Natural Language Processing (NLP)
- Statistics
- Data Modeling
- Neural Networks
- Computer Vision
- Algorithm Design
- Data Mining
- SQL
- Cloud Platforms
- Software Development
- Data Preprocessing
- Big Data
- Feature Engineering
- Model Evaluation
- Problem-solving

## DATA SCIENCE ARCHITECT

- Python/R
- Statistics
- Machine Learning
- Data Analysis
- Data Visualization
- SQL
- Big Data Technologies
- Hadoop/Spark
- Data Cleaning and Preprocessing
- Data Mining
- Predictive Modeling
- Time Series Analysis
- A/B Testing
- Data Interpretation
- Advanced Excel
- Business Acumen
- Communication Skills
- Problem-solving
- Data Storytelling
- Agile Methodologies

## CYBERSECURITY SPECIALIST

- Network Security
- Firewall Management
- Intrusion Detection Systems (IDS)
- Encryption
- VPNs
- Incident Response
- Security Auditing
- Risk Management
- Security Policies
- Security Compliance
- Endpoint Security
- Penetration Testing
- Ethical Hacking
- Security Analytics
- Cloud Security
- Threat Intelligence
- Security Awareness Training
- Security Information and Event Management (SIEM)
- Security Architecture

## CLOUD SOLUTIONS ENGINEER

- Cloud Platforms
- Infrastructure as Code (IaC)
- Networking
- Security
- Containerization
- Serverless Computing
- Microservices Architecture
- Scalability
- Load Balancing
- DevOps Practices
- Automation
- Hybrid Cloud Solutions
- Cloud Storage
- Cloud Databases
- Cloud Cost Management
- Monitoring and Logging
- Cloud Governance
- Solution Architecture
- Deployment and Hosting
- Testing (Unit, Integration)

# Technology & IT: Required Skills for Emerging Roles

## DEVOPS SPECIALIST

- Continuous Integration/Continuous Deployment (CI/CD)
- Automation
- Containerization
- Orchestration (e.g., Kubernetes)
- Version Control (e.g., Git)
- Infrastructure as Code (IaC)
- Cloud Platforms
- Scripting (e.g., Python, Shell)
- Monitoring and Logging
- Agile and DevOps Methodologies
- Collaboration and Communication
- Security Best Practices
- Release Management
- Configuration Management
- Problem-solving
- Collaboration Tools (e.g., Jira)
- Security Automation
- Error Handling
- Version Control (e.g., Git)

## BLOCKCHAIN SOLUTIONS ARCHITECT

- Blockchain Platforms
- Smart Contracts (e.g., Solidity)
- Cryptography
- Consensus Algorithms
- Distributed Ledger Technology
- Tokenomics
- Decentralized Applications (DApps)
- Blockchain Security
- Peer-to-Peer Networks
- Hash Functions
- Cryptocurrency
- Web3 Technologies
- Smart Contract Auditing
- Blockchain Governance
- Interoperability
- Legal and Regulatory Understanding
- Problem-Solving
- Cross-Functional Collaboration
- Communication Skills
- Innovation

## IOT SOLUTIONS ENGINEER

- Embedded Systems
- Sensor Networks
- Communication Protocols (e.g., MQTT, CoAP)
- Edge Computing
- IoT Platforms
- Security for IoT Devices
- Data Analytics for IoT
- Connectivity (Wi-Fi, Bluetooth, Zigbee)
- Cloud Integration
- Device Management
- Machine-to-Machine Communication
- Real-time Data Processing
- IoT Standards and Protocols
- Firmware Development
- Power Management
- Problem-solving
- Stakeholder Management
- Test Automation
- Error Handling

## AUTOMATION PROCESS ENGINEER

- Robotic Process Automation Tools
- Process Automation
- Scripting (e.g., Python)
- Workflow Design
- Business Process Analysis
- Cognitive Automation
- OCR (Optical Character Recognition)
- NLP (Natural Language Processing)
- Decision Trees
- Problem-solving
- Stakeholder Management
- Test Automation
- Error Handling
- Version Control
- Compliance
- Continuous Improvement
- Documentation
- Analytics
- Collaboration and Communication
- Cloud Computing

# Technology & IT: Required Skills for Emerging Roles

## EDGE SOLUTIONS ARCHITECT

- Edge Computing Technologies
- IoT Integration
- Edge Analytics
- Containerization (e.g., Docker)
- Edge Security
- Edge-to-Cloud Integration
- Low Latency Networking
- Distributed Computing
- Edge Devices and Gateways
- Edge Computing Standards
- Data Compression
- Real-time Data Processing
- Machine Learning at the Edge
- Edge Architecture
- Problem-Solving
- Stakeholder Management
- Test Automation
- Error Handling
- Cloud Computing
- Networking Protocols

## FULL STACK DEVELOPMENT SPECIALIST

- Front-end Development (e.g., HTML, CSS, JavaScript)
- Back-end Development (e.g., Node.js, Python, Java)
- Database Management (e.g., SQL, NoSQL)
- Web Frameworks (e.g., React, Angular, Flask)
- RESTful APIs
- Version Control (e.g., Git)
- Deployment and Hosting
- Testing (Unit, Integration)
- UI/UX Design Principles
- Security Best Practices
- Problem-Solving
- Agile Development Methodologies
- Collaboration and Communication
- Responsive Design
- Cross-browser Compatibility
- Performance Optimization
- Accessibility
- Mobile Development
- DevOps Practices

## EXPERIENCE DESIGN ENGINEER

- User Interface Design
- User Experience Design
- Prototyping Tools (e.g., Sketch, Figma)
- Wireframing
- Usability Testing
- Information Architecture
- Interaction Design
- Visual Design
- Responsive Design
- Design Thinking
- User Research
- Accessibility
- Front-end Development Skills
- Collaboration and Communication
- UI/UX Trends
- Problem-solving
- Creative Thinking
- Branding
- Motion Design
- Content Strategy
- Copywriting

## IMMERSIVE TECHNOLOGIES DEVELOPER

- 3D Modeling
- Virtual Reality Development (Unity, Unreal Engine)
- Augmented Reality Development (ARKit, ARCore)
- Cross-platform Development
- Spatial Computing
- User Interaction in AR/VR
- Game Development Principles
- Graphics Programming
- Motion Tracking
- VR/AR Hardware Knowledge
- UX/UI Design for AR/VR
- Stereoscopic Vision
- Problem-solving
- Cross-functional Collaboration
- Communication Skills
- Interactive Media
- Simulation Development
- Multisensory Design
- XR Experience Design
- Animation
- Real-world Integration

# Technology & IT: Required Skills for Emerging Roles

## 5G NETWORK SOLUTIONS ARCHITECT

- 5G Standards and Protocols
- Network Slicing
- MIMO (Multiple Input Multiple Output)
- Network Function Virtualization (NFV)
- Software-Defined Networking (SDN)
- Mobile Edge Computing (MEC)
- Network Security in 5G
- IoT Integration with 5G
- Radio Frequency Engineering
- Antenna Design
- Network Performance Optimization
- Problem-solving
- Stakeholder Management
- Test Automation
- Error Handling
- Cloud Integration
- Network Management
- Spectrum Management
- IoT Standards and Protocols
- Cloud Computing

## QUANTUM SOLUTIONS SCIENTIST

- Quantum Physics
- Quantum Algorithms
- Quantum Programming Languages (e.g., Qiskit, Cirq)
- Quantum Circuit Design
- Quantum Error Correction
- Quantum Cryptography
- Quantum Hardware Understanding
- Superposition and Entanglement
- Quantum Information Theory
- Quantum Machine Learning
- Problem-solving
- Mathematics (Linear Algebra, Probability)
- Communication Skills
- Collaboration and Teamwork
- Innovation
- Research Skills
- Experiment Design
- Data Analysis
- Publication Writing
- Presentation Skills

## DIGITAL MARKETING SPECIALIST

- SEO (Search Engine Optimization)
- SEM (Search Engine Marketing)
- Social Media Marketing
- Content Marketing
- Email Marketing
- Digital Advertising
- Google Analytics
- Marketing Automation
- Conversion Rate Optimization (CRO)
- Data Analysis and Interpretation
- Copywriting
- Graphic Design
- Brand Management
- Customer Relationship Management (CRM)
- A/B Testing
- Marketing Strategy Development
- Market Research
- Communication Skills
- Creative Thinking
- Project Management

## COMPLIANCE AND RISK MANAGEMENT SPECIALIST

- Regulatory Compliance
- Risk Assessment and Management
- Audit and Assurance
- Legal and Regulatory Knowledge
- Policy Development and Implementation
- Internal Controls
- Corporate Governance
- Ethics and Integrity
- Financial Compliance
- Data Privacy and Protection
- Crisis Management
- Compliance Training
- Investigative Skills
- Change Management
- Reporting and Documentation
- Communication Skills
- Problem-Solving
- Cross-Functional Collaboration
- Continuous Improvement
- Attention to Detail

# Technology & IT: Required Skills for Emerging Roles

## AI ETHICS AND RESPONSIBLE AI SPECIALIST

- Ethical AI Principles
- Bias Detection and Mitigation
- Fairness and Transparency
- Privacy and Data Protection
- Ethical Decision-making
- Regulatory Compliance
- Stakeholder Engagement
- Risk Assessment and Management
- Human-Centered Design
- Explainable AI
- Accountability and Governance
- AI Policy and Regulation
- Cross-cultural Competence
- Communication Skills
- Critical Thinking
- Collaboration and Teamwork
- Continuous Learning
- Public Engagement
- Project Management
- Problem-Solving

## CONVERSATIONAL AI DEVELOPER

- Natural Language Processing (NLP)
- Machine Learning
- Dialog Management
- Speech Recognition
- Text-to-Speech (TTS)
- Intent Recognition
- Context Awareness
- Sentiment Analysis
- Conversational UX/UI Design
- API Integration
- Multi-turn Conversations
- Personality Design
- Error Handling
- Language Understanding
- Collaboration and Communication
- Continuous Learning
- Testing and Validation
- Speech Synthesis
- Privacy and Security
- Problem-Solving

## HEALTHCARE DATA SCIENCE SPECIALIST

- Healthcare Data Analytics
- Electronic Health Records (EHR)
- Clinical Research Methodologies
- Medical Terminology
- Predictive Modeling
- Data Visualization
- Statistical Analysis
- Machine Learning
- Natural Language Processing (NLP)
- Healthcare Informatics
- Public Health
- Regulatory Compliance
- Privacy and Security
- Healthcare Data Management
- Clinical Decision Support Systems
- Healthcare Quality Improvement
- Collaboration and Communication
- Problem-solving
- Continuous Learning
- Project Management

## IT PROJECT MANAGEMENT SPECIALIST

- Project Planning and Scheduling
- Agile Methodologies
- Waterfall Methodology
- Stakeholder Management
- Risk Management
- Budgeting and Cost Management
- Resource Management
- Communication Skills
- Change Management
- Conflict Resolution
- Quality Management
- Scope Management
- Procurement Management
- Team Leadership
- Vendor Management
- Performance Monitoring and Reporting
- Problem-solving
- Decision-making
- Documentation
- Continuous Improvement

## BUSINESS INTELLIGENCE SPECIALIST

- Data Analysis
- Data Visualization
- SQL (Structured Query Language)
- Business Intelligence Tools (e.g., Tableau, Power BI)
- Data Warehousing
- Dashboard Development
- ETL (Extract, Transform, Load)
- Statistical Analysis
- Machine Learning
- Reporting and Dashboards
- Data Mining
- Predictive Analytics
- Business Acumen
- Communication Skills
- Problem-solving
- Collaboration and Teamwork
- Data Governance
- Continuous Learning
- Project Management
- Decision-making

# Technology & IT: Required Skills for Emerging Roles

## CYBERSECURITY CONSULTING SPECIALIST

- Cybersecurity Principles
- Risk Assessment and Management
- Security Architecture Design
- Incident Response and Management
- Penetration Testing
- Vulnerability Assessment
- Security Compliance
- Security Auditing
- Security Awareness Training
- Network Security
- Application Security
- Identity and Access Management
- Cryptography
- Security Monitoring and Analysis
- Cloud Security
- Mobile Security
- Endpoint Security
- Regulatory Compliance
- Collaboration and Communication
- Problem-solving

## IMMERSIVE CONTENT DEVELOPER

- 3D Modeling and Animation
- Virtual Reality Development (Unity, Unreal Engine)
- Augmented Reality Development (ARKit, ARCore)
- Cross-platform Development
- Unity Development
- Unreal Engine Development
- Interactive Storytelling
- Game Design Principles
- Graphics Programming
- User Interaction Design
- Sound Design
- Creative Thinking
- Collaboration and Communication
- Problem-solving
- Virtual Production
- Motion Capture
- Spatial Computing
- XR Experience Design
- Animation
- Storyboarding

## COLLABORATIVE TECHNOLOGIES SPECIALIST

- Collaboration Tools
- Project Management Tools
- Communication Platforms
- Video Conferencing
- Document Management
- Workflow Automation
- Virtual Whiteboarding
- Version Control Systems
- Knowledge Management
- Remote Team Collaboration
- Cloud Collaboration
- Task Management
- Team Leadership
- Cross-functional Collaboration
- Problem-solving
- Communication Skills
- Security Awareness
- Continuous Improvement
- Change Management
- Customer Relationship Management (CRM)

## DIGITAL TRANSFORMATION STRATEGIST

- Digital Transformation Strategies
- Business Process Analysis
- Change Management
- Innovation Management
- Strategic Planning
- Leadership and Influence
- Technology Trends Analysis
- Customer Experience Design
- Data-driven Decision Making
- Agile Methodologies
- Stakeholder Management
- Project Management
- Digital Literacy
- Collaboration and Communication
- Risk Management
- Performance Measurement
- Vendor Management
- Continuous Improvement
- Problem-solving
- Organizational Development

# Technology & IT: Evolving Roles

| | |
|---|---|
| Data Scientist, Software Engineer, Research Scientist | AI/Machine Learning Specialist |
| Data Scientist, Analyst, Machine Learning Engineer | Data Science Architect |
| Network Security Engineer, Security Analyst, Cybersecurity Engineer | Cybersecurity Specialist |
| Systems Architect, Infrastructure Architect, Cloud Solutions Architect | Cloud Solutions Engineer |
| Release Engineer, Automation Engineer, DevOps Engineer | DevOps Specialist |
| Full Stack Developer, Smart Contract Developer, Blockchain Developer | Blockchain Solutions Architect |
| Embedded Systems Engineer, Network Engineer, IoT Engineer | IoT Solutions Engineer |
| RPA Engineer, Automation Developer, Process Improvement Specialist | Automation Process Engineer |
| Cloud Engineer, IoT Engineer, Systems Architect | Edge Solutions Architect |
| Front-end Developer, Back-end Developer, Full Stack Engineer | Full Stack Development Specialist |
| UX/UI Designer, Interaction Designer, Front-end Developer | Experience Design Engineer |
| Game Developer, 3D Modeler, AR/VR Engineer | Immersive Technologies Developer |
| Network Engineer, Wireless Communications Engineer, 5G Network Engineer | 5G Network Solutions Architect |
| Quantum Researcher, Quantum Software Engineer, Quantum Computing Engineer | Quantum Solutions Scientist |
| SEO Specialist, Social Media Manager, Digital Marketing Engineer | Digital Marketing Specialist |
| Compliance Analyst, Regulatory Affairs Specialist, Compliance Engineer | Compliance and Risk Management Specialist |
| Ethics Consultant, Data Governance Specialist, AI Ethics Engineer | AI Ethics and Responsible AI Specialist |
| Natural Language Processing Engineer, UX/UI Designer, Chatbot Engineer | Conversational AI Developer |
| Data Analyst, Health IT Specialist, Health Informatics Engineer | Healthcare Data Science Specialist |
| Project Manager, IT Program Manager, IT Project Engineer | IT Project Management Specialist |
| Data Warehouse Engineer, Analytics Specialist, BI Engineer | Business Intelligence Specialist |
| Cybersecurity Consultant, Security Solutions Architect, Cybersecurity Consultant Engineer | Cybersecurity Consulting Specialist |
| Multimedia Developer, Content Creator, AR/VR Content Engineer | Immersive Content Developer |
| Human Factors Engineer, User Experience Specialist, Human-Machine Teaming Engineer | Collaborative Technologies Specialist |
| Digital Transformation Manager, Innovation Specialist, Digital Transformation Engineer | Digital Transformation Strategist |
| Product Owner, Product Strategist, Product Manager | Product Strategy and Management Specialist |

# Technology & IT: Top Declining Skills

| Skill | Reason for Decline |
|---|---|
| **COBOL** | Legacy language with declining usage in modern software development. |
| **Fortran** | Legacy language primarily used in scientific computing, with decreasing demand in other IT sectors. |
| **Assembly Language** | Low-level programming language less commonly used due to higher-level languages and abstraction layers. |
| **Mainframe** | Decline in mainframe computing environments with the adoption of distributed computing and cloud technologies. |
| **Windows XP** | Outdated operating system with declining support and usage in favor of newer Windows versions or alternative operating systems. |
| **Flash** | Adobe Flash deprecated and discontinued in favor of HTML5 and other web technologies for multimedia content. |
| **Microsoft Excel Macros** | Declining usage due to security concerns and shifts towards more robust automation and scripting solutions. |
| **ColdFusion** | Declining popularity of the ColdFusion web development platform in favor of more modern and versatile alternatives. |
| **Perl** | Declining demand for Perl programming skills in favor of more modern scripting languages like Python or Ruby. |
| **Microsoft Access** | Declining usage of Microsoft Access databases in enterprise environments due to scalability and security concerns. |

| Skill | Reason for Decline |
|---|---|
| **SVN (Subversion)** | Declining popularity of SVN version control system in favor of distributed version control systems like Git. |
| **Rational ClearCase** | Decline in usage of Rational ClearCase for software configuration management due to the availability of more modern and flexible alternatives. |
| **Windows Server 2003** | Outdated server operating system with declining support and usage in favor of newer Windows Server versions or alternative server platforms. |
| **Microsoft Silverlight** | Deprecated web framework with declining support and usage in favor of HTML5, JavaScript, and other modern web technologies. |
| **Microsoft Visual Basic 6** | Legacy programming language with declining usage in modern software development, replaced by .NET Framework and other technologies. |
| **Hadoop** | Declining demand for standalone Hadoop skills as cloud-based big data services and managed analytics platforms gain popularity. |
| **SOAP (Simple Object Access Protocol)** | Declining usage of SOAP for web services due to the adoption of RESTful APIs and microservices architecture. |
| **Microsoft Windows Server 2008** | Outdated server operating system with declining support and usage in favor of newer Windows Server versions or alternative server platforms. |
| **Oracle Forms** | Declining demand for Oracle Forms development skills as organizations migrate to more modern web-based application frameworks. |
| **Microsoft SharePoint** | Declining popularity of Microsoft SharePoint for document management and collaboration due to the availability of alternative cloud-based solutions. |

# Technology & IT: Top Declining Roles

| Role | Reason for Decline |
| --- | --- |
| **IT Support Technician** | Automation and self-service options reduce the need for hands-on support. |
| **Data Entry Clerk** | Automation and advances in data management systems decrease the need for manual data entry. |
| **Desktop Support Specialist** | Shift towards cloud-based and remote IT infrastructure reduces the need for on-site support for individual desktops. |
| **Hardware Technician** | Advances in hardware reliability and remote diagnostics reduce the need for specialized hardware repair services. |
| **Systems Administrator** | Increasing adoption of cloud services and automation tools decreases the demand for traditional systems administration roles. |
| **Network Technician** | Improved networking technologies and centralized network management reduce the need for on-site troubleshooting and maintenance. |
| **IT Trainer** | Shift towards online learning platforms and self-paced training modules decreases demand for traditional classroom-style IT training. |
| **Technical Writer** | Consolidation of technical documentation and use of automated documentation tools reduce the need for dedicated technical writers. |
| **Quality Assurance Tester** | Increased adoption of agile development methodologies with integrated testing reduces the need for separate quality assurance roles. |
| **Systems Analyst** | Emergence of low-code and no-code platforms allows business users to directly create and modify systems, reducing the demand for traditional systems analysis roles. |

# Technology & IT: Most Popular Roles

### Software Engineer

Designs, develops, and maintains software applications, ranging from desktop to mobile and web applications.

### Cybersecurity Analyst

Protects an organization's computer systems and networks from cyber threats, monitors for security breaches, and implements security measures.

### DevOps Engineer

Combines development and operations roles, automating and streamlining the software delivery process and improving collaboration between development and IT operations teams.

### Quality Assurance Engineer

Ensures the quality of software products through testing, identifying defects, and implementing quality improvement processes.

### Data Scientist

Utilizes statistical analysis, machine learning techniques, and programming skills to extract insights and knowledge from large datasets.

### Database Administrator

Manages and maintains databases, ensuring data integrity, security, and availability.

### Cloud Architect

Designs and manages cloud computing strategies, including cloud application architectures, cloud deployment models, and cloud service delivery.

### Business Analyst

Analyzes business processes, identifies areas for improvement, and translates business requirements into IT solutions.

### Systems Analyst

Analyzes business requirements and designs information systems solutions, bridging the gap between technical and business teams.

### Web Developer

Designs and develops websites and web applications, implementing client-side and server-side functionalities.

### Artificial Intelligence/Machine Learning Engineer

Develops and implements AI and machine learning algorithms and models to solve complex problems and automate tasks.

### IT Support Specialist

Provides technical support to end-users, troubleshooting hardware and software issues, and resolving technical problems.

### Network Administrator

Manages and maintains an organization's computer networks, ensuring smooth operation, security, and connectivity.

### IT Project Manager

Oversees IT projects from initiation to completion, managing resources, budgets, and timelines to ensure successful delivery.

### IT Consultant

Provides expert advice and solutions to organizations on various IT-related issues, such as technology selection, system implementation, and strategy planning.

### UX/UI Designer

Designs user interfaces and user experiences for digital products, ensuring intuitive and engaging interactions.

# Technology & IT: Most Popular Roles

### Systems Engineer

Designs and manages complex systems infrastructure, including hardware, software, networks, and storage.

### IT Auditor

Evaluates an organization's IT systems and controls to ensure compliance with regulations and industry standards, and to identify potential risks and vulnerabilities.

### Technical Writer

Creates technical documentation, including manuals, guides, and tutorials, to communicate complex technical information effectively.

### Blockchain Developer

Designs and develops decentralized applications (dApps) and smart contracts on blockchain platforms, such as Ethereum and Hyperledger.

### Network Engineer

Designs and implements computer networks, including LANs, WANs, and intranets, to meet an organization's communication needs.

### Mobile App Developer

Designs and develops mobile applications for various platforms, such as iOS and Android, using programming languages and development frameworks.

### Big Data Engineer

Designs and implements systems to process and analyze large volumes of data efficiently, using big data technologies and analytics tools.

### IT Trainer

Delivers training programs and workshops to educate employees on IT systems, tools, and best practices.

### Enterprise Architect

Develops and maintains an organization's IT architecture, aligning IT strategy with business goals and ensuring the integrity, scalability, and security of IT systems and infrastructure.

# KEY FINDINGS

Now that we've had an opportunity to uncover the Top Emerging Skills and Roles, Required Skills for Emerging Roles, Evolving Roles, Top Declining Skills, Top Declining Roles, and Most Popular Roles across five distinct industries — let's unpack some of the key trends and findings that have surfaced from our analysis.

## Vision Technology Expansion

The continued advancement of vision technology and image processing is obviating the need for more and more skills across industries. For example, in our analysis of the skills data from the manufacturing industry, skills are on the rise that will make it possible for workers of tomorrow to work in concert with present and emerging technologies.

Manual Data Entry, Manual Material Handling, Manual Quality Control, and Manual Inventory Management roles are on the decline as companies inject vision systems and automation into many of their previously manual processes. A byproduct of this is the emergence of skills needed to integrate these systems into those processes and maintain them. Virtual and augmented reality skills are also starting to pop up to take these applications to the next level.

## Digital Transformation

With paper being mostly relegated to wedding invites and checks for local tax collection alongside the decline in manual processes in favor of automation, there is a need in all industries for people skilled at moving the organization forward with new processes and technology.

For example, in the financial services industry, customer-facing skills are taking a backseat to skills that enable customers to have a world-class experience with every touchpoint. This is manifesting itself not only in specific AI-related skills for different processes across industries, but also in the need for an overarching strategist that can help with planning for change management and adoption.

Blockchain is also a hot skill for a lot of industries as they figure out ways to securely link data across a distributed enterprise or ecosystem of different care providers.

## Security and Compliance

With the advent of these new technologies and processes, as well as the change from a mostly office-based workforce to one that is more hybrid, there has been a rise in regulations, legislation, and general concern about their usage, output, and security. This was the case in highly regulated industries we analyzed, such as healthcare, where preserving the privacy and security of client data is of the utmost importance.

AI and data governance boards are being assembled to not only inject ethical and compliant procedures into the use of these technologies but also participate in the buying process to proactively mitigate risks. The strain on cybersecurity has increased as practitioners grapple with protecting assets within their four walls, every remote worker's four walls, and a plethora of personal devices used in the flow of work.

## Quantum Leap

With this huge digital transformation comes a need for not only huge computing power but also faster decision-making. Quantum computing has popped up as a necessary skill across all these industries to help address the problem of building a robust computational system that can react at the speed businesses need.

SECTION 6

# MAKING THIS DATA RELEVANT IN YOUR ORGANIZATION

Skills aren't only for talent management and development. They can be leveraged across the talent lifecycle to provide relevant information to your sourcers, recruiters, managers, HR business partners, workforce planners, and executives. They can also be used to power a more personalized experience for all your candidates, whether they're external or internal.

Skills-based development, planning, and hiring allow the organization to understand its talent supply and demand at a much more granular level, unlocking the ability to comprehensively support talent agility. In this section, we'll outline the skills applications we see in use in the market (some of which you're hopefully already doing), and talk about how the data in this report can influence those applications to help drive better alignment to goals.

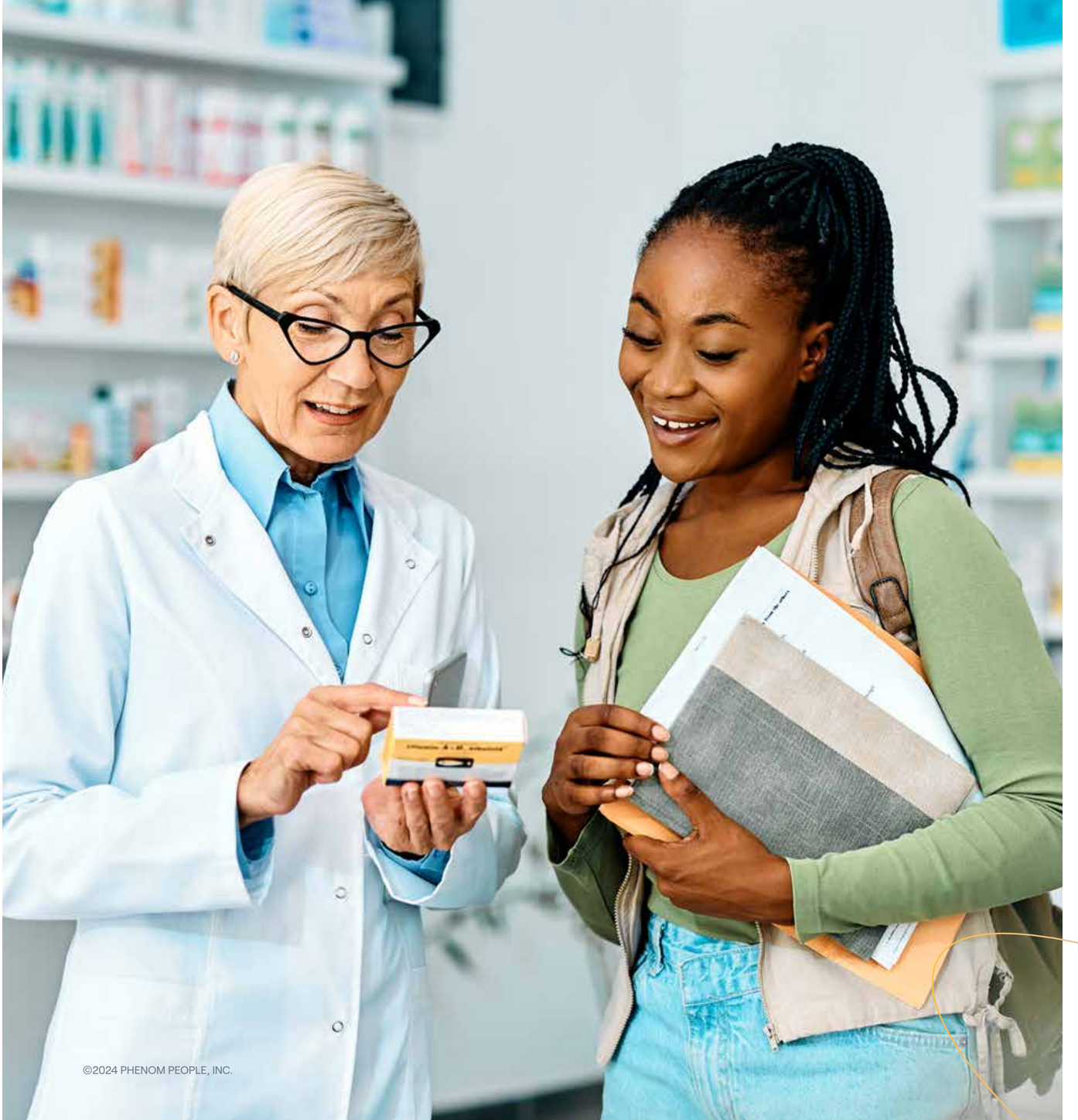
All of the following applications are enabled by a comprehensive role and skill architecture. Not only does this provide a deep understanding of what skills are required for all roles, but it also illuminates which skills employees in those roles have and what skills candidates hired into those roles could bring to the organization.

# Executives and Managers

## Data-Driven Decision Making

Organizational leaders can leverage skills data to ensure they have a comprehensive understanding of how to resource plan for alignment with strategic objectives. If business strategy calls for emerging roles that require specific skills, skills data can inform decision-making processes, such as resource allocation, project planning, training, staffing, and performance evaluation.

Business leaders are empowered with insights that bring visibility into where talent already exists and where additional headcount is needed to support the overall business strategy. They also get insight into the current employee infrastructure to identify top performers, see which skills they possess, and mark them for potential advancement. This information streamlines how leaders identify employees to upskill, engage top talent, and confidently determine when it is necessary to hire externally.



Specifically leveraging the data in this report, leaders in the company can help direct talent management and talent acquisition activities. For example, leadership can communicate which roles the company will need to fill to meet a strategic initiative and what skills are required of that role so the teams can figure out the best location to source (internally or externally). This enables them to either initiate upskilling, start sourcing on the open market, or do both to mitigate risk.

For instance, an executive in the financial services industry has a strategic initiative to improve the customer experience with their online advice platform and may be interested in incorporating an AI-powered chatbot on the site to improve engagement and get people to where they need to be faster.

From the report, they can see that software developers are evolving into chatbot developers, so they can task their talent management team to see if there is any natural language processing (NLP) expertise internally — or if someone can be upskilled relatively easily. From there, they can task their talent acquisition team to source for that skill externally if it turns out there aren't any internal options.

## Better Collaboration

Skills data provides a common language for all business leaders, executives, and managers. This opens the door for more effective cross-collaboration between talent management, talent acquisition, team managers, and C-level leaders. With skills data, you can encourage managers to identify skill gaps among teams and develop targeted training or hiring strategies to address these gaps.

# Strategic Workforce Planning

## Future Skills Forecasting

Strategic Workforce Planning expands upon the individual leader's use case by looking at the needs of the entire organization. This doesn't solely focus on the short term, but also on what might be necessary to support the business's three, five, or 10-year strategy. Skills-forward planning allows practitioners to create more detailed planning scenarios, opening up additional options for talent internally and externally.

You can gain further granularity into your current workforce by segmenting talent based on critical skills profiles and analyzing the composition of each segment in terms of experience and tenure. This provides actionable insights that help you plan and staff effectively.

Emerging roles and skills in this report are especially useful to support this type of planning. A planner in the life sciences industry, for example, can see that the highly competitive market is driving the need for more strategic planning and market research skills. Even if these specific skills don't exist in the company, related skills like data or market analysis, statistical analysis, or survey design likely do. These can easily be augmented with upskilling to cultivate expertise in market research and planning. However, gene editing requires more specialization, and the company will likely need to shop around for the required talent to fill that skills gap.

## Scenario Planning

Having insight into how your organization will respond to a specific challenge is a tremendous benefit. Let's say you are in the mortgage industry, and you want to know how many employees you can keep during lean times of high-interest rates, but you want to keep your top talent that has the skills needed for future success.

Now, you can utilize skills data to model different workforce scenarios — based on factors such as market fluctuations, regulatory changes, or technological disruptions — and evaluate the impact of these scenarios on talent availability to develop contingency plans accordingly.

Declining roles can be useful here to support a scenario where you could identify a population of employees currently in these roles that can be upskilled or reskilled to fill other needs instead of hiring externally in a potentially tight talent market. As the demand for mortgage underwriters decreases due to the advancement of AI-based risk assessment tools, these people can fill emerging roles that need risk management skills like an AI Risk Analyst or Data Privacy Officer.

# Talent Management

## Learning & Development

Skills have always been central to learning programs. The hard part has been engagement: how to get people to take the courses they need when they need them. Career pathing and internal mobility initiatives that include intelligence about skill requirements and where employees have gaps are proving to be very successful in driving higher engagement in learning programs. There is a clear line to outcomes, which helps employees see the immediate value in taking different courses, participating in gigs, or even securing a mentor.

With this type of program in place, talent managers can leverage the data in this report to identify which roles will be hardest to source externally and put together targeted development plans to identify best-fit employees and upskill them appropriately. Employees in declining roles in manufacturing like Machine Tool Setter can move into more in-demand roles like Machine Operator or Project Manager.

The evolving role information will also guide how to tackle emerging role needs by looking at what base roles can easily move to an emerging role and creating the necessary upskilling plan to cover the need. For example, your Control Systems Engineers can move into robotics engineering roles and your Operations Manager can become a Smart Factory Manager.





## Succession Planning

Another added benefit to improved skills data is succession planning. By leveraging skills, leaders can identify high-potential employees and groom them for future leadership roles.

Being a business leader doesn't just mean ensuring success today, but also when you're no longer in the role. Skills data helps expand the pool of potential successors by looking at the skills required for key positions, and then looking at where those skills might exist in the organization versus just looking at job titles.

Again, looking at the popular role data in this report can help prioritize succession plans for those roles in the organization to avoid the risk of someone moving on and having to source externally. In the healthcare space, Administrators and Medical and Health Services Managers are in-demand, so making sure these positions have solid succession is critical to mitigating risk while ensuring seamless transitions.

## Performance Management

Integrating skills data into performance management systems provides employees and managers with phenomenal experiences that highlight objective insights into employee strengths, weaknesses, and growth opportunities. Talent managers now have this information to tailor career development plans and succession strategies. This capability assists with keeping current talent engaged while reducing the cost of churn in your workforce.

There's an opportunity to leverage the declining skill and role data in this report to allow talent management to work closely with team managers to create personalized plans for their team members. This can include upskilling to a more in-demand or emerging position so these employees can make a larger impact in the organization and force reductions can be avoided.

As manual data analysis continues to decline, people with this skill could be candidates for building skills like database management or assisting in clinical trials.

# Talent Acquisition

## Skills-Based Recruitment

Injecting skills into the sourcing and recruiting of external talent opens up a larger pool of potential candidates for open positions.

Backed by a robust AI-driven matching process, recruiters can get candidate recommendations based on the AI analysis of the candidate's current job title, education, and experience to determine if the skill profile of the candidate matches the skill requirements of the job — regardless if the skills are explicitly added to job descriptions or if the candidate's current title isn't an exact match.

Of course, for critical roles, it may be necessary to be extremely detailed in the job description to ensure the right skills are part of the talent pool. That's why, for emerging roles, we have provided a breakdown of the specific skills that the TA team should consider as they build out their descriptions and evaluate applicants.

If you're recruiting in the technology & IT industry for a Data Science Specialist, and your company makes software for the healthcare industry, then you better ensure that specialist has some history with electronic health records and how HIPAA might impact data privacy differently than in other industries to make sure they don't chase the wrong data strategy.

## Hard-To-Fill Roles & Internal Mobility

Skills-based talent strategies can foster better collaboration by providing a common language among teams for evaluation. Talent acquisition teams can maximize their effectiveness by leveraging a system that consolidates all talent in one place — internal and external — and uses that common language to provide a consistent measuring stick.

Looking at the popular role data in this report, TA leaders can see where they should put more effort into sourcing internally to avoid competition for external talent. The evolving role information is also useful to assist the talent acquisition team in pipelining, allowing them to work with their talent management team to create development plans for upcoming needs. That way, when their business is ready to move forward with virtual reality (VR) offerings, their on-staff therapists have the necessary technology literacy to make VR therapy as engaging for patients as the in-person experience.

# Real-World Impact —
## The Cigna Group and Merck KGaA, Darmstadt, Germany

The Cigna Group's multifaceted use of innovative talent management and recruitment strategies to foster impactful experiences highlights the value one unified system can have across cross-functional teams. Using their talent marketplace and career pathing, the team witnessed 37% hires from internal moves, more than 1500 career paths built by employees in less than 10 months, a significant increase in overall learning activity, and increased retention.

Read more about it here.

By leveraging AI-based candidate matching and introducing an external Talent Zone with over 20,000 registrations to date, Merck KGaA, Darmstadt, Germany is elevating talent acquisition to the next level and expanding access to talent. Additionally, the multinational organization worked to incorporate an internal talent marketplace with AI-based matching for internal jobs, learning and mentoring — which launched in record time to a subset of their employees. These transformative solutions are propelling Merck KGaA, Darmstadt, Germany's journey to be future ready.

Read more about it here.

SECTION 7

# CURIOUS ABOUT YOUR COMPANY'S DATA?


There is a lot of valuable industry data in this report to help your team understand where skills and roles are emerging and declining, but you may still be early in your skills journey and wondering whether your company's data would even support the usefulness of the examples outlined in the previous section.

If that's the case, we can provide you with a Skills Snapshot of a few of your roles from our public data set and the associated skills our AI was able to map to those roles. This helps paint the picture of how you can realistically move from theory to practice with skills-based planning, development, and hiring.

Learn more here, including how to request your own Skills Snapshot.

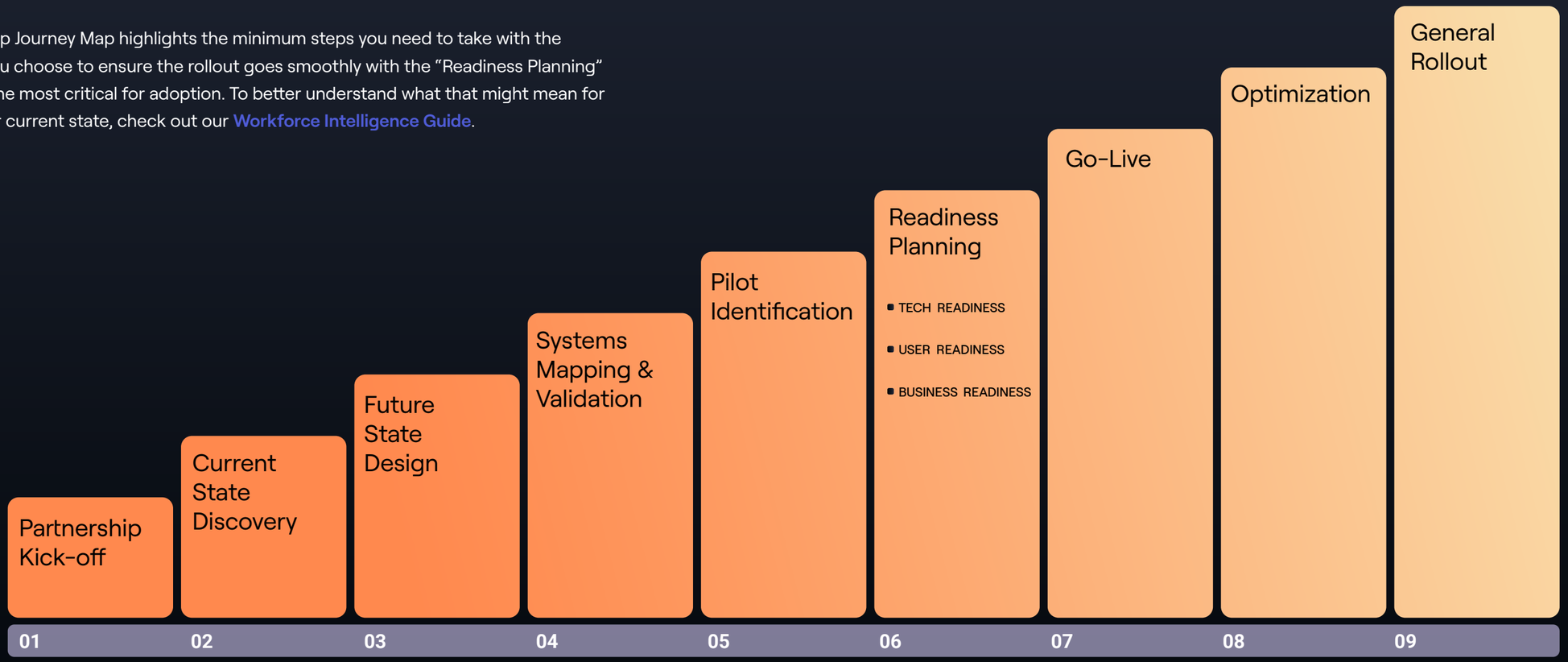
SECTION 8

# HOW CAN I BECOME SKILLS-FORWARD?

# Partnership Journey Map

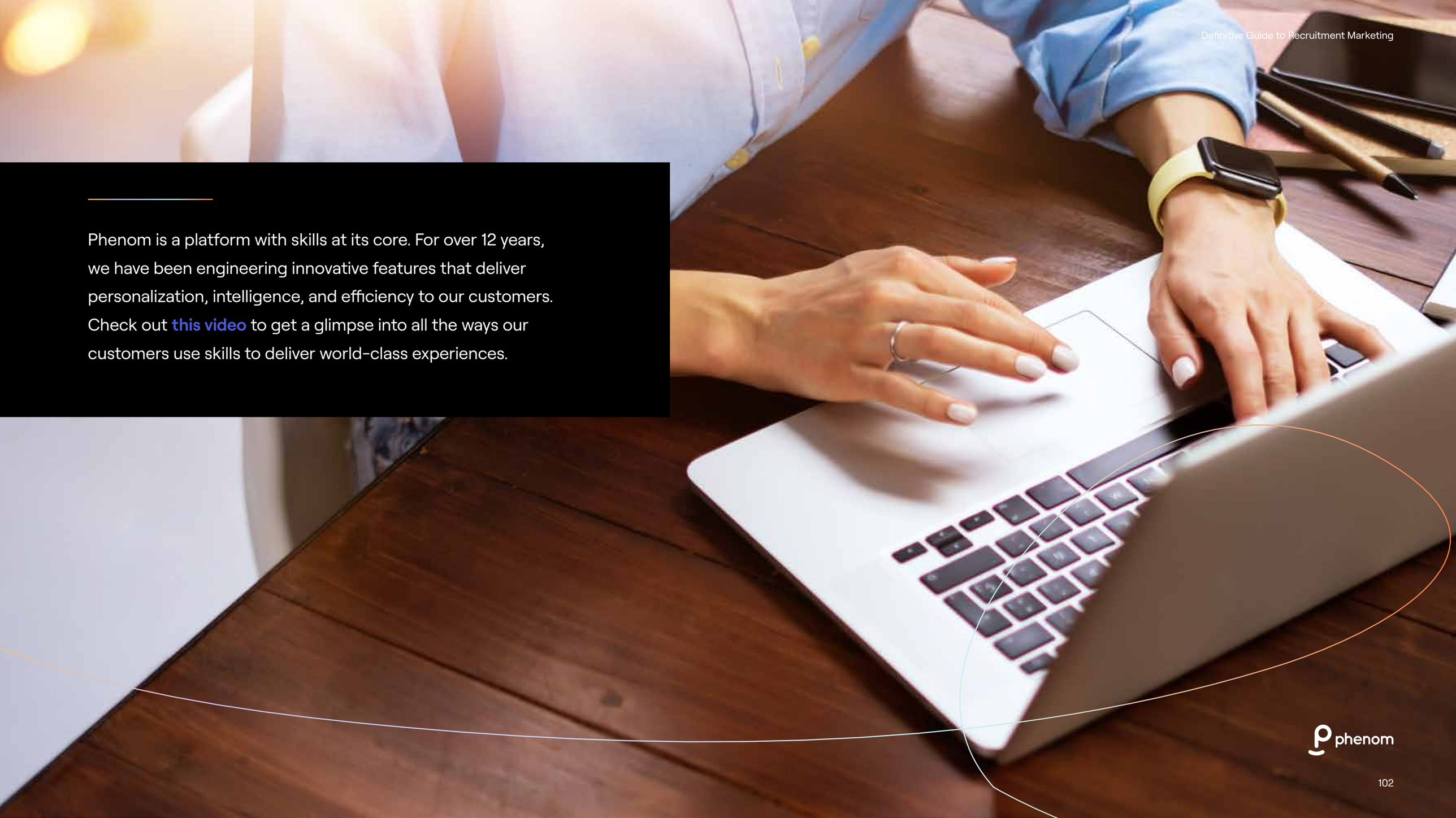
There are impactful benefits to be had by making your organization skills-centric, but there are big rocks to move to get there. Your big rocks will depend on your current state and level of maturity. You need prescriptive guidance on what technology to choose and how best to roll it out based on this moment in time for your company. You also need a change management strategy that matches your intended pace of innovation.

The Partnership Journey Map highlights the minimum steps you need to take with the technology you choose to ensure the rollout goes smoothly with the "Readiness Planning" phase being the most critical for adoption. To better understand what that might mean for you given your current state, check out our Workforce Intelligence Guide.



SECTION 9

# PHENOM & SKILLS: A LONG HISTORY



Phenom is a platform with skills at its core. For over 12 years, we have been engineering innovative features that deliver personalization, intelligence, and efficiency to our customers. Check out **this video** to get a glimpse into all the ways our customers use skills to deliver world-class experiences.

# ABOUT PHENOM

Phenom has the purpose of helping a billion people find the right work. Through AI-powered talent experiences, employers are using Phenom to hire employees faster, develop them to their full potential, and retain them longer. The Phenom Intelligent Talent Experience platform seamlessly connects candidates, employees, recruiters, hiring managers, HR, and HRIS — empowering over 600 diverse and global enterprises with innovative products including Phenom Career Site, Chatbot, Design Studio, Talent CRM, Automated Interview Scheduling, One-Way Interviews, Campaigns, Recruiting Events, University Recruiting, Hiring Manager, Employee Relationship Management, Succession Planning, Talent Marketplace, Career Pathing, Gigs, Mentoring, and Referrals.

Book a demo

# About Intelligent Talent Experience

Powered by artificial intelligence, the Phenom Intelligent Talent Experience platform connects data, people, and interactions to deliver phenomenal moments with maximum efficiency throughout the talent journey. With Phenom, candidates find and choose you faster, employees develop their skills and evolve, recruiters become wildly productive, managers build stronger-performing teams, HR aligns employee development with company goals, and HRIS creates a holistic tech infrastructure through seamless integrations.

## Candidate Experience

Connect the right talent to the right job

- Career Site
- Chatbot
- CMS
- Events & University Recruiting
- Hosted Apply
- Assessments

## Recruiter Experience

Discover and engage top talent with AI

- Talent CRM
- Campaigns
- SMS and 1:1 Messaging
- One-Way Interviews
- Automated Interview Scheduling

## HR Experience

Align employee development with company goals

- Workforce Intelligence
- Skill and Competency Gaps
- Employee Relationship Management
- Career Architecture

## Employee Experience

Upskill, evolve, and retain your workforce

- Talent Marketplace
- Career Pathing
- Gigs
- Mentoring
- Employee Resource Groups
- Referrals

## Manager Experience

Build better teams faster

- Hiring Manager
- People Analytics
- Interview Evaluations
- People Manager
- Talent Gaps

## HRIS Experience

Create a holistic tech infrastructure

- Integrations
- Service Hub
- Flow Studio
- Forms Studio
- Process Mining
- Automation Engine