



The missing foundation

Unlocking workforce intelligence for smarter talent investments



Why many of today's talent investments fall short

Organizations understand that growth depends on their people's ability to develop new skills and adapt. But while learning programs and talent initiatives are being deployed at scale, they often fail to deliver tangible impact. Why?

The problem isn't the intent — it's the foundation. Leaders can't accurately assess:

- ✦ What skills they need for today and tomorrow
- ✦ How those skills connect to roles, career pathways, and business objectives
- ✦ Where workforce gaps exist and how to address them strategically

Without this foundation, companies are flying blind. This is a fundamental problem.

As a result, workforce planning becomes reactive, talent gaps persist, and investments in skills development don't generate the expected ROI. Companies spend millions on training and reskilling, yet still struggle to fill critical roles, drive internal mobility, or prepare for future workforce needs.



Workforce plans are only as reliable as the foundation they're built on

Talent architecture is the backbone of workforce planning. It aligns skills, jobs, career paths, and people within an organization. But building and maintaining it can be more complex than it seems.

You need clear, up-to-date job definitions and required skills - not just by title but by proficiency and importance. When you scale this by tens of thousands of jobs, the complexity (and the maintenance!) can quickly become overwhelming.

Beyond defining jobs, organizations also need a clear picture of workforce capabilities. This includes not only the skills employees use daily but also adjacent and transferable skills that are often overlooked.

- ✦ Workforce plans become outdated, requiring constant rework
- ✦ Your organization lacks real-time, integrated internal workforce intelligence and external labor market data
- ✦ Yet, employees often underestimate their skills or fail to report them accurately, leaving gaps in the data that should inform workforce planning.
- ✦ Adding to the complexity, organizations need a consistent framework that aligns skills and jobs across teams, business units, and external labor markets. However, no universal standard exists - each company, industry, and even government agency may define roles and skills differently.
- ✦ This lack of standardization results in fragmented, inconsistent workforce data that makes planning and decision-making even more difficult.
- ✦ Your people operate in silos, disconnected from broader HR and business data



Traditional workforce models can't keep pace

To bring structure to talent architecture, organizations have long relied on skills taxonomies, ontologies, and competency models. While these models help categorize skills and jobs, they are inherently static, requiring manual updates to remain relevant. A taxonomy organizes skills into a hierarchy, but it lacks the flexibility to show deeper relationships between skills. Ontologies go a step further, linking related skills and jobs, but still lag behind external labor market shifts.

This static nature creates significant problems. Job roles and required skills evolve rapidly, yet taxonomies and ontologies remain fixed unless manually updated — a time-consuming and resource-intensive process.

These models also fail to incorporate broader economic trends, real-life career pathways, and the impact of new technologies. The result is a workforce planning system that is reactive rather than forward-looking.

Instead of simplifying talent decisions, outdated models often add complexity, forcing organizations to work with incomplete and disconnected workforce data. Without real-time intelligence, organizations struggle to make informed hiring and reskilling decisions, leading to persistent skill gaps and inefficiencies.





The dynamic advantage

To solve the workforce issues of today and tomorrow, you need a workforce model that's adaptive, reliable, and connected. That's why Cornerstone's knowledge graph, powered by SkyHive, is the most sophisticated tool for talent architecture. Build a stronger workforce with a foundational taxonomy that draws on real-time labor data but is continually updated to capture the latest job titles and skills based on those insights. Using our knowledge graph, you capture additional sources that impact the labor market — corporate reports, patent applications, academic papers, etc. — to ensure you're never caught by surprise when new roles and skills emerge.

A taxonomy helps organize skills, but a knowledge graph takes it further, using real-time data to uncover relationships between skills, jobs, and workforce trends.

The most significant sources of data used by Cornerstone's knowledge graph are job postings and resumes available publicly online — job boards, corporate career sites, professional networking sites, and more. This data provides insight on how employers and workers are describing their skills right now, not when they've completed a survey in several months or years. That has big advantages in both speed and detail.

But these data sources go beyond the labor market itself to include everything from recent patent applications to scholarly journals, so you have the most relevant, up-to-

date information on emerging skills that may reshape work in the future. When aggregated, these insights allow your organization to more accurately anticipate changes and prepare for future skill demands.

Unless a taxonomy represents the actual roles that employers are hiring for, it can't be detailed enough to be useful. That's why your organization needs a dynamic knowledge graph, to separate out the real-world roles that would otherwise be lumped together under broad terms or categories, giving you a map you can actually use.

For example, our knowledge graph identifies more than 50 alternative real-world job titles under O*NET's single information security analyst occupation, each with distinct skill requirements and responsibilities.

What is a knowledge graph?

Taxonomy vs ontology vs knowledge graph

✦ Taxonomy

A taxonomy is a system of classification that organizes data into a hierarchy to make it easier to understand. For example, the Dewey Decimal System turns a pile of books into an organized library. A skills taxonomy categorizes skills to provide structure and clarity. However, taxonomies are relatively static and lack multi-dimensional connections to other skills or jobs.

✦ Ontology

An ontology, rooted in computer science, creates multiple relationships with other data. While a taxonomy might organize a set of cookbooks, an ontology can link recipes to their ingredients, preparation methods, or cultural origins. A skills ontology can connect skills to related job roles, training programs, or multiple other skills.

✦ Knowledge graph

A knowledge graph is similar to an ontology but goes a step further by mapping relationships dynamically and at scale. If an ontology can link recipes to their

ingredients, a knowledge graph can identify stores selling ingredients, trace their origins to exporting countries, and calculate their economic impact.

When Amazon recommends products based on your purchase history or Netflix suggests shows you might like, a knowledge graph is at work.

In the labor market context, a knowledge graph draws on diverse data sources to uncover patterns and insights in real time, enabling data-driven talent decisions. SkyHive by Cornerstone's knowledge graph, powering all of Cornerstone Galaxy, integrates your internal talent intelligence with real-time labor market, economic, and educational data to provide an unparalleled foundation for your talent architecture and dynamic workforce planning.





Three questions to consider about your taxonomy

- Is it current enough?
- Is it detailed enough?
- Can we maintain it?

Figure 1 Comparing classification systems

Classification System	Occupations	Skills
O*NET	1,016	11,000+
ESCO	2,942	13,485
SkyHive by Cornerstone	5,000+	50,000+



SkyHive by Cornerstone’s knowledge graph provides up-to-date coverage of occupations and skills, offering the depth needed to navigate the dynamic labor market.

Traditional taxonomies vs dynamic knowledge graphs

A typical taxonomy classifies information. A dynamic knowledge graph, like the one used for Cornerstone Skill Transformation, uses AI to map connections. And making fast, accurate connections is at the heart of skills-based workforce planning and strategy.

Governments and organizations worldwide have created widely recognized taxonomies to classify jobs and skills. In the United States, examples include the O*NET system and the Standard Occupational Classification, while the European Union uses the ESCO taxonomy.

Government taxonomies often have long histories, and they’re free. Private companies also create taxonomies, either for internal use or as commercial offerings. However, these conventional taxonomies often struggle to keep pace with change.

New technologies and evolving industries are reshaping the world of work at an unprecedented pace. According to the World Economic Forum, the skills needed for the average job are likely to change by 40% within just five years.

That poses a challenge for taxonomies like O*NET, which rely on surveys of workers and employers, often conducted in partnership with trade or professional associations.



[You can see a sample survey here.](#)

This makes sense: why not ask the people who actually work in the field what skills are needed? But surveys take time to field and assess, which means that occupations can go years without being reviewed or even identified.

Situations where traditional taxonomies struggle

New technologies and roles

Many taxonomies can be slow to include new and emerging technologies, like Generative AI. For example, O*NET currently lacks many occupations or skills for artificial intelligence roles, including Generative AI and Large Language Models, despite the intense competition for talent in these rapidly growing fields. The same issue applies to newer job titles such as machine learning engineer, AI developer, and machine learning researcher. The gaps in most taxonomies are particularly problematic for HR teams and employees, who rely on accurate, up-to-date data to guide their decisions in precisely these areas.

Detailed skill analysis

Conventional taxonomies often categorize skills at the occupational level but lack the ability to drill down into specific contexts, such as individual

firms, industries, or geographical locations. A software developer at Microsoft in Seattle might need very different skills than one at General Motors in Detroit. This limits how effective data can be for targeted talent development or industry-specific strategic planning.

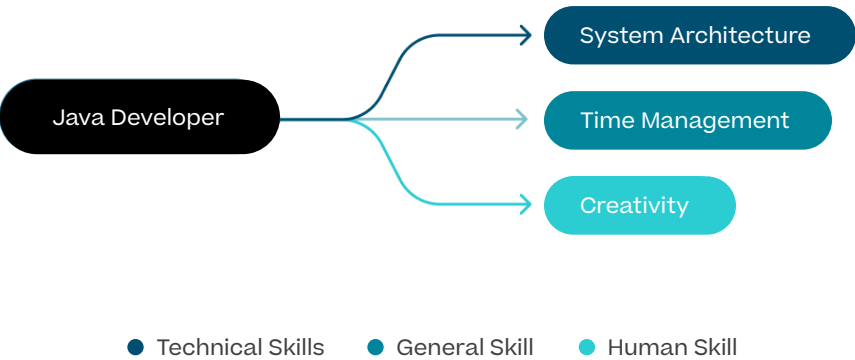
Analysis of complementary skills for emerging roles

As job roles evolve, identifying complementary skills, like human and general skills alongside technical ones, becomes increasingly important (Figure 2). Traditional taxonomies often struggle to map these skills effectively, limiting their ability to support agile workforce planning in a rapidly evolving labor market. Even private companies that build their own taxonomies face challenges in keeping them up to date. Without a long-term commitment to regular updates, their taxonomies risk becoming

outdated, reducing their accuracy and value over time.

Figure 2

SkyHive by Cornerstone breaks job profiles into specific technical, general, and human skills.



What makes our knowledge graph different?

A knowledge graph doesn't just classify — it connects. SkyHive by Cornerstone's knowledge graph takes a state-of-the-art approach to data architecture, synthesizing vast amounts of labor market information into a coherent structure.

◆ Comprehensive and dynamic data

Our knowledge graph aggregates data from diverse sources, such as job postings, resumes, and educational content, creating a detailed and dynamic map of the labor market. SkyHive by Cornerstone collects 24 terabytes of data daily.

- 200 countries and territories
- 16 languages
- 64 million companies
- 1 billion anonymized career profiles
- 5 billion jobs

Most HR technologies provide either an internal view limited to your organization or external labor market data that lacks context on your workforce. With Cornerstone, you get both — seamlessly integrated — giving you a complete, connected view of skills, jobs, and talent.

◆ Scalable architecture and data harmonization

Cornerstone's knowledge graph is built on a scalable and flexible architecture, allowing it to adapt to diverse applications, tools, and user-defined functions. It seamlessly connects and harmonizes data from both external and internal sources, ensuring you have a unified, consistent foundation.

◆ Enhanced decision-making with strategic insights

With billions of skills, relationships, and job titles mapped, our knowledge graph supports sophisticated queries

and analytics. This allows organizations to identify skill gaps, align training programs with current and future market demands, and leverage career pathways for strategic workforce planning.

◆ Sophisticated AI and machine learning capabilities

Our knowledge graph continuously learns from new job postings and labor market data, automatically adapting to changes. Using ethical AI technology, the knowledge graph updates in real time as new skills and jobs emerge.

Powered by ethical AI, our knowledge graph continuously evolves by learning from new job postings and labor market data — updating in real time as skills and job roles emerge. This adaptive capability enables a unique view of the labor market, uncovering skill overlaps across different roles and industries. It enables learning

and development programs to pinpoint skills gaps and address them with targeted training.

◆ Ethical and responsible AI practices

This is the first AI technology in the HR space to receive independent third-party certification for ethical AI. This means every stage of the process — from data collection to algorithms to final outputs — is transparent, explainable, and designed to minimize bias. This helps you make responsible, accurate AI-driven workforce decisions with confidence.



How our knowledge graph works

Figure 3 SkyHive by Cornerstone processes 24TB+ of data each day from over 200 countries and territories.



Extracting skills and jobs data

SkyHive by Cornerstone uses advanced techniques to transform raw job posting data into actionable insights.



Natural language processing (NLP)

Cornerstone applies NLP to parse and analyze the text in job postings. This process breaks text into smaller components, such as sentences and words, to extract meaningful information efficiently.



Semantic analysis

Through semantic analysis, Cornerstone understands the context of words and phrases. For example, it differentiates between “Java” as a programming language and “Java” as a location, ensuring precise identification of skills in various contexts.



Machine learning models

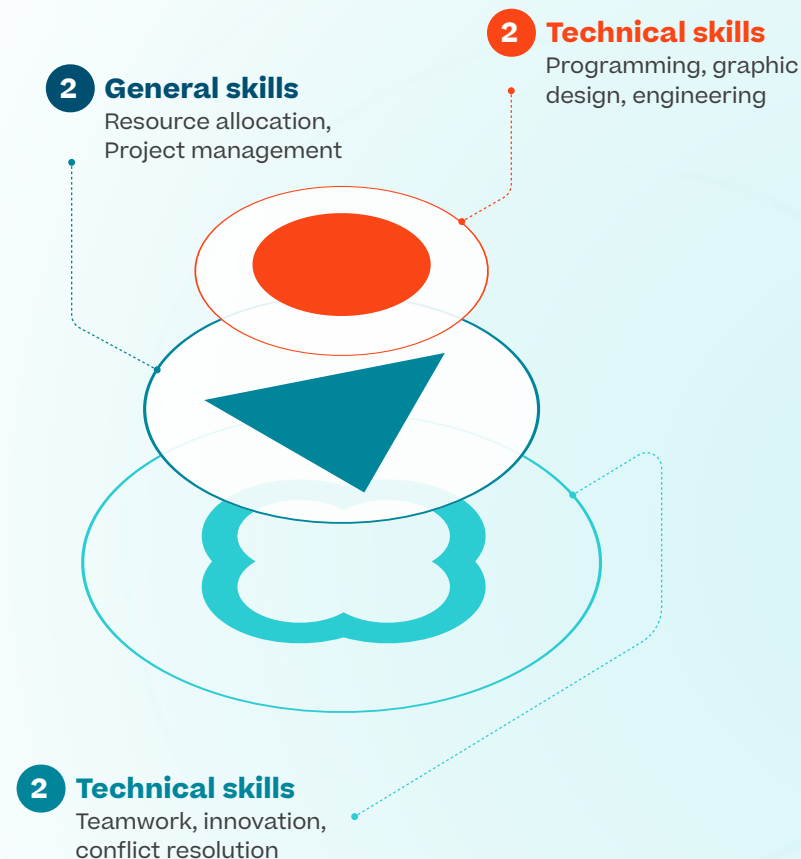
Cornerstone leverages machine learning to identify and categorize skills within job postings. These models, trained on large datasets, detect patterns and associations between terms and the skills they represent.



Taxonomy mapping

Once extracted, skills are mapped using SkyHive by Cornerstone’s taxonomy, which serves as the foundational structure for our knowledge graph. The dynamic integration of real-time labor market data through the knowledge graph ensures that skills are always organized in a searchable and up-to-date format.

Figure 4 Each role combines technical, general, and human skills.



SkyHive by Cornerstone categorizes skills into human, technical, and general to reveal how each role blends technical requirements with the “soft skills” needed for collaboration and business success (Figure 4).

Mapping skills across roles and job titles

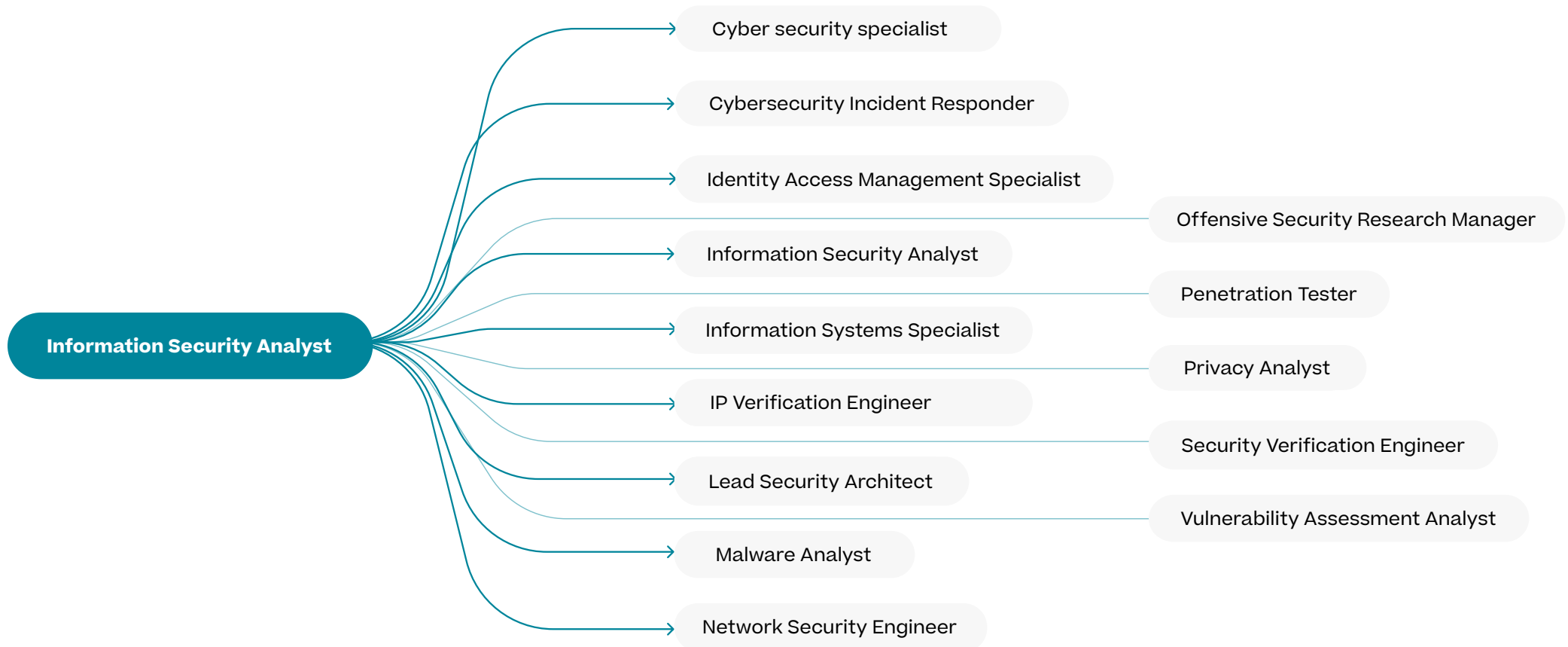
Figure 5 Skill proximity analysis for three individual roles.



SkyHive by Cornerstone maps skills across specific job titles and related roles, highlighting how diverse skills are interconnected and transferable across the labor market.

Identifying jobs titles overlooked by traditional taxonomies

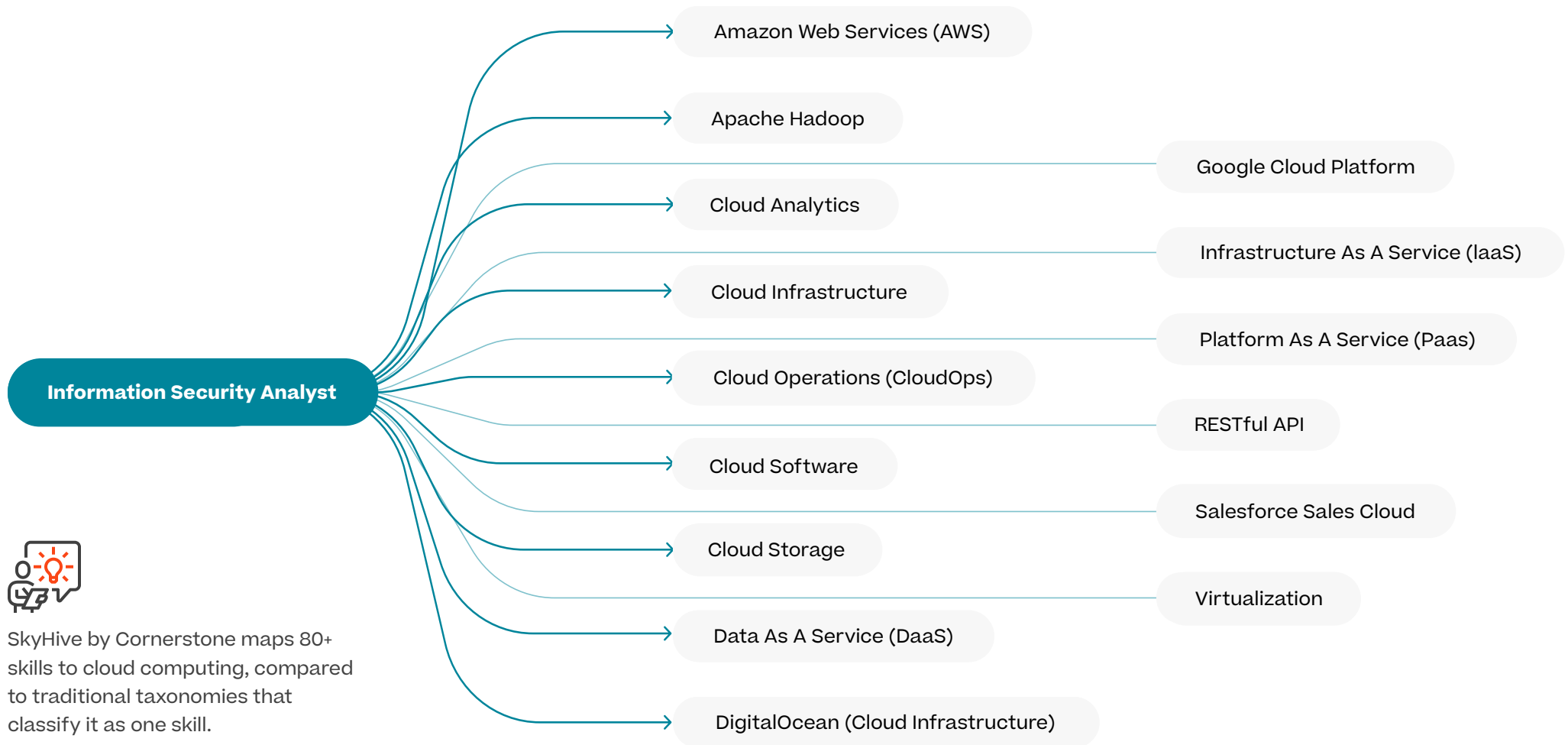
Figure 6 Breaking down the information security analyst job title.



SkyHive by Cornerstone maps 50+ distinct roles under O*NET's information security analyst classification, highlighting the gaps in traditional taxonomies.

Identifying skills overlooked by traditional taxonomies

Figure 7 Breaking down the cloud computing skill.



On the previous page, we saw how traditional taxonomies can oversimplify occupations, missing out on new job titles. The same issue applies to skills but the stakes are higher. As the job market evolves, the skills required to succeed are changing even faster. Take cloud computing: traditional taxonomies often treat it as a single skill, but it encompasses a wide range of specialized skills critical to different roles.

Enabling automated, skills-based career pathways

Figure 8 Skills-based career pathways for software engineers.

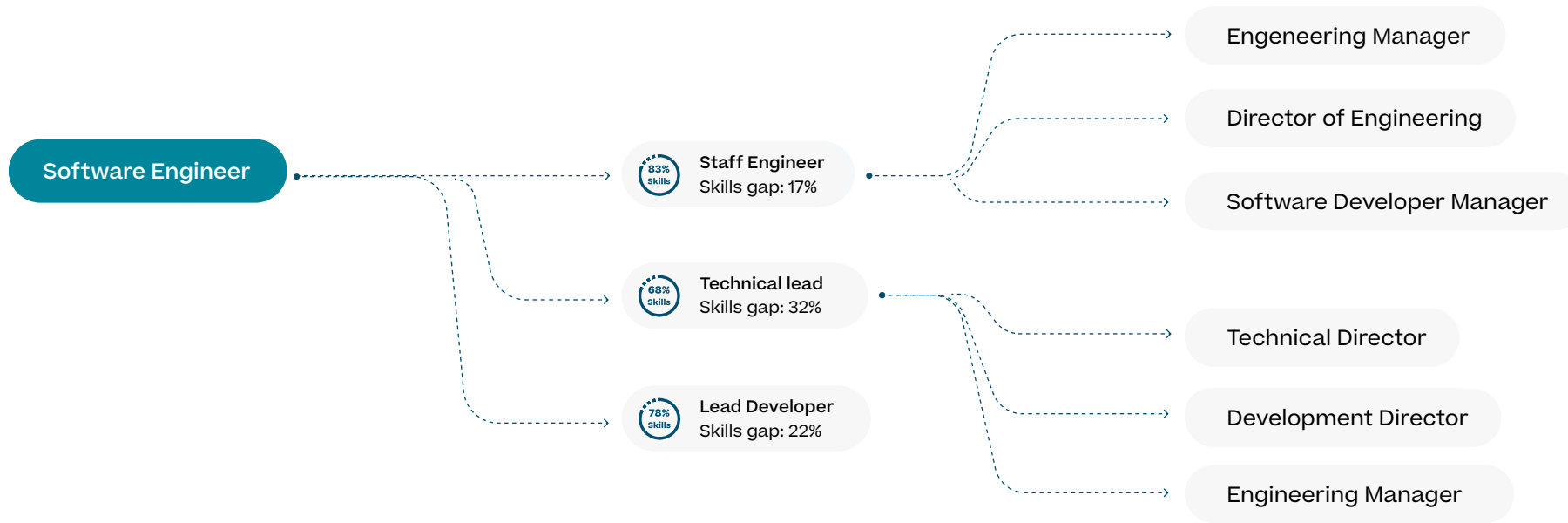
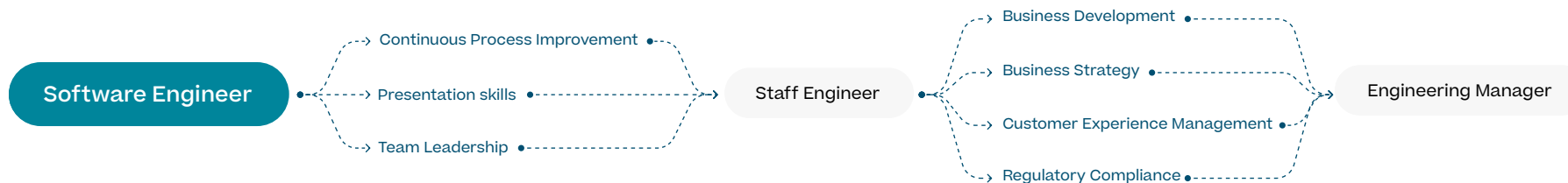


Figure 9 Top skills required to advance from software engineer to engineering manager.



A software engineer may have many of the skills needed to become an engineering manager. A dynamic knowledge graph identifies key skill gaps at every step of the career path, enabling a more targeted approach to upskilling.

SkyHive by Cornerstone global reach

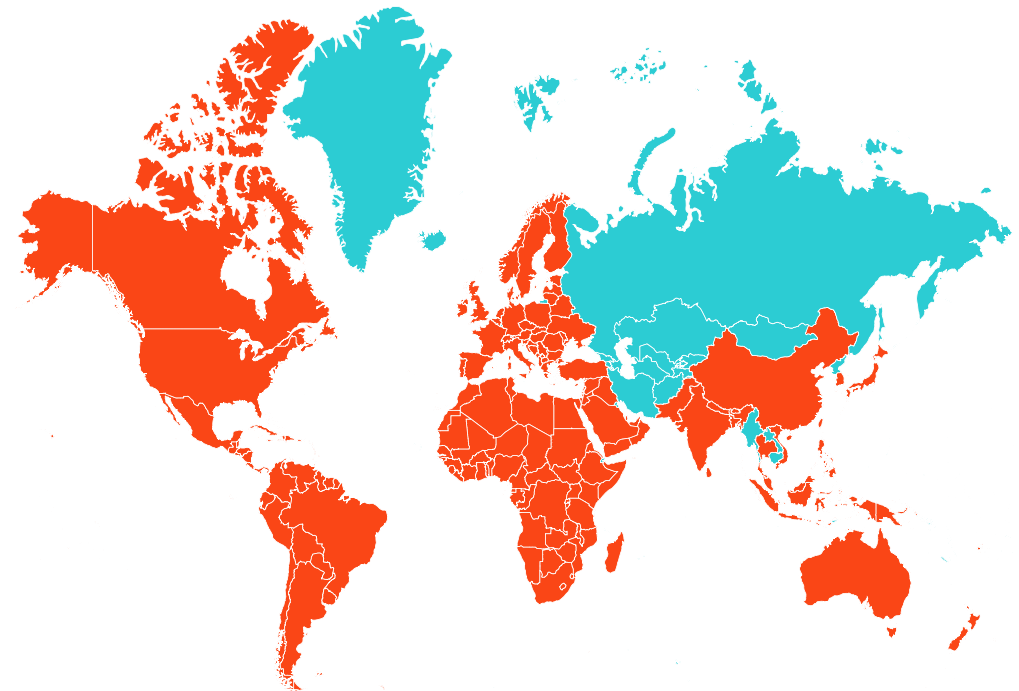
SkyHive by Cornerstone operates globally, analyzing skills and occupations across languages, industries, and geographies. Its knowledge graph seamlessly interprets and contextualizes skills across 16+ languages and over 200 countries and territories, ensuring accurate and consistent classification to support talent strategies worldwide.

- ✦ Arabic
- ✦ Chinese (Simplified, Traditional)
- ✦ Dutch
- ✦ French (Canada, France)
- ✦ German
- ✦ Italian
- ✦ Japanese
- ✦ Korean
- ✦ Portuguese (Brazil, Portugal)
- ✦ Spanish (Latin America, Spain)
- ✦ English (U.K., U.S.)

Figure 10

SkyHive by Cornerstone data footprint

● Covered



SkyHive by Cornerstone processes data in 16+ languages, spanning over 200 countries and territories.

Conclusion

SkyHive by Cornerstone's industry leading knowledge graph goes beyond standard taxonomies, delivering structured, real-time intelligence to help you understand jobs, skills, and the labor market at scale.

By integrating both internal workforce data and external labor market insights, it creates a dynamic system that can continuously align skills, roles, and career pathways with your business strategy.

With a real-time view of workforce supply and demand, you can anticipate change, deploy talent more effectively, and ensure skilling and talent programs are directly tied to business growth. In today's fast-moving economy, success depends on more than just keeping up — it requires building a workforce that is always ready for what's next.

About SkyHive by Cornerstone

A leading provider of labor market intelligence and AI skills technology for organizations and communities worldwide, SkyHive by Cornerstone creates a more inclusive economy where skills become pathways to success. SkyHive by Cornerstone has enabled over 100 organizations across 200 countries and territories to transition from jobs to skills. We have been recognized for our innovation and best practices in ethical AI by Fast Company, Forbes, the World Economic Forum, and Gartner.

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