



U.S. Chamber of Commerce
Foundation



SKILLS-BASED HIRING AND ADVANCEMENT PROJECT REPORT

THE T3 INNOVATION NETWORK'S JOBS AND WORKFORCE DATA NETWORK

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SKILLS-BASED HIRING AND ADVANCEMENT EXPANDS OPPORTUNITIES

While innovation makes our world better, the benefits are often uneven. The OECD determined one third of jobs worldwide are at risk of radical transformation by technology in the next decade. Hiring requirements are changing rapidly, and nearly two thirds of employers already see a skills gap in their companies¹. This widening gap threatens to leave some of us behind. Morphing economic and technical landscapes are igniting international interest in the advantages and equity impacts of human capital management. Many employers are exploring skills-based hiring and advancement to close the skills gap, increase the diversity of their workforces, and expand access for all to the opportunities of the future.

Skills-Based Hiring and Advancement

(SBHA) is the process by which employers and their HR service providers identify, recruit, hire, and advance candidates based on the match between a work opportunity's skill requirements and a candidate's skills. SBHA processes produce well-crafted and debiased job requirements and trustworthy candidate information backed by evidence. This candidate information is communicated through new types of resumes and learning and employment records (LERs) that embed proof of their accuracy to accelerate verification. **SBHA reduces reliance on indirect indicators of skills (e.g., four-year college degrees, years of experience) that traditionally do not provide evidence of specific skills and can create barriers for candidates qualified through alternative means (e.g. microcredentials, life experiences, and endorsements).** Candidates also benefit by using skills-powered guidance services and technologies which recommend opportunities, support decision making, and provide fairer hiring and advancement experiences.

THE T3 NETWORK SUPPORTS DIGITAL TRANSFORMATION

The U.S. Chamber of Commerce Foundation's T3 Network is made up of over 1,500 professionals working to facilitate the digital transformation of the talent marketplace to (1) make all learning count; (2) enable competencies and skills to function like currency; and (3) empower learners and workers with data. The T3 Jobs and Workforce Data Network (JWDN) is one of four T3 networks dedicated to improving the development and use of jobs and workforce data. The JWDN launched the Skills-Based Hiring and Advancement (SBHA) Project to:

- Develop a comprehensive set of end-to-end use cases for skills-based hiring and advancement with success metrics; and
- Explore their implications for T3 Networks and their ongoing workgroups and projects as well as the work of T3 partners and other stakeholders.

ASPIRATIONAL USE CASES AND FAILURE ANALYSIS

This report is the product of that project, developing aspirational use cases to align leading employer practices in skills-based hiring and advancement that have the potential to achieve results for both employers and job candidates based on a balanced set of success metrics. This project includes aspirational learner / worker-centered use cases that empower them to use innovative developments in resumes, profiles, learning and employment records, and guidance services.

These future-oriented use cases take both the employer and candidate perspectives and identify likely failure points in implementation and scaling, including employer and candidate capacity, time and resource commitments, and the state of available data, technology and standards.

¹ Wiley Education Services & Future Workplace. *Closing the skills gap 2019*. Louisville, KY: Wiley edu, LLC, 2019.

² Wiley, *Closing the skills gap*.

³ LinkedIn Learning. *2022 Workplace Learning Report: The Transformation of L&D*. LinkedIn, 2022.

⁴ *Gen Zers and Millennials More Likely Than Older Generations to Embrace Continuous Learning*, 2020, https://www.prweb.com/releases/gen_zers_and_millennials_more_likely_than_older_generations_to_embrace_continuous_learning_also_feel_more_stressed_by_pressure_to_learn_new_skills/prweb16826874.htm

⁵ World Economic Forum, *The Future of Jobs Report 2020*. World Economic Forum, 2020.

⁶ Vivian Hunt et. al., *Diversity wins: How inclusion matters*, McKinsey & Company, May 2020.

⁷ Society for Human Resource Management, *The Rise Of Alternative Credentials In Hiring*, SHRM, 2022.

⁸ Adam Ozimek, *Freelance Forward Economist Report*, Upwork, 2021.



POTENTIAL SOLUTIONS AND IMPLICATIONS FOR T3 NETWORKS AND OTHER PARTNERS

The failure analysis also identified potential solutions and how they could be addressed by one or more T3 Networks and other partners. In particular, they were designed to explore implications for:

- Development and use of data and technology standards (in cooperation with **DTS Network**),
- Development and use of competency and skill frameworks (in cooperation with **OCFC**),
- Development of jobs and workforce data and public-private data sharing and collaboration (in cooperation with the **JWD Network**), and
- Use of learning and employment records (in cooperation with the **LER Network**)

This project explores how these use cases can provide context for aligning workgroup activities and projects across T3 networks to achieve results consistent with the chosen use case metrics.

SBHA ALIGNS INNOVATIONS FOR EMPLOYERS AND CANDIDATES

This project provides a framework and forum for aligning and scaling current and emerging employer practices and initiatives with related learner and worker-centered initiatives designed to empower candidates in pursuing work opportunities. The education to workforce landscape is changing rapidly:

- Employers are increasingly struggling to close their skills gaps, address changing workforce needs, and remain agile in a rapidly changing global economy. Employers are:
 - Turning to strategic workforce planning, conceptualizing their talent sources as supply chains, and rethinking how they communicate rapidly changing job requirements to potential job candidates and sourcing partners
 - Exploring hiring more gig or temporary workers and tapping new sources of talent by opening doors to applicants without four-year degrees²
 - Upskilling and reskilling workers and creating career progressions. Most learning and development programs put upskilling at the top of their priorities³, younger workers overwhelmingly demand learning opportunities on the job⁴, and half of all employees will require upskilling in the next five years⁵
 - Launching Diversity, Equity and Inclusion (DEI) initiatives to address slow progress⁶ in diversifying their workforces and expanding opportunity
 - Using more advanced HR analytics including Artificial Intelligence (AI) applications and redesigning their hiring and advancement processes
- Candidates are facing major challenges in navigating the dynamic talent marketplace. These challenges can be ameliorated through a new generation of resumes and learning and employment records (LERs) and new guidance services and initiatives to expand access to these opportunities, but adoption strategies are needed. Candidates are:
 - Using new guidance and search services to help them identify and obtain opportunities
 - Starting to see a new generation of resumes, credentials, and records that increase opportunity but require digital and data literacy
 - Enrolling in alternative credentials and pathways (e.g. microcredentials and badges) that offer more flexibility and lower costs but are often not recognized; nearly half of U.S. workers have them, yet less than a third of applicant tracking systems recognize them⁷
 - Providing their data for advanced analytics including AI applications but without yet seeing benefits at scale
 - Freelancing at higher rates, with over one third of the U.S. workforce having freelanced in 2021⁸, which increases the frequency at which they need to market their skills

Introduction and Overview

DATA AND ANALYTICS

This SBHA Project highlights major challenges in the use of data and advanced analytics that should receive more attention in future implementation and scaling. Leading practices in SBHA are using more and better data and advanced analytics tools like natural language processing to parse and organize unstructured data from job descriptions and resumes. In addition, they are building on traditional HR reporting and descriptive analytics with more advanced and consistent data structures and moving toward algorithms to recommend hiring and advancement actions. Similar AI applications are being used by career and job search guidance systems to make recommendations to job candidates. The increased use of algorithms raises significant concerns about bias, lack of transparency in how they work, and their potential disparate impact on underserved populations. These applications are described in the use cases and these concerns are raised in the potential failure analysis.

BALANCED SUCCESS METRICS: WHAT CAN BE ACHIEVED FOR EMPLOYERS AND CANDIDATES

Skills-based hiring and advancement has the potential to create shared value for both employers and job candidates through:

- **Reduced Time and Cost.** Reduce the time and cost of the identification of potential candidates/opportunities to actual hiring and advancement as well as the time and cost of candidates in pursuing work opportunities.
- **Improved Match Quality:** Improve the match between job skill requirements and job candidate skills resulting in successful job performance and employer and candidate satisfaction.
- **Improved Equity:** Reduce the gaps in hiring and advancement due to bias, overreliance on indirect indicators (e.g., traditional college degrees, years of work experience), and other factors that create barriers and have disparate impacts.

REPORT STRUCTURE

This project report first provides definitions of major terms and concepts introduced for the use cases and failure/solution analysis. It then summarizes eight general use cases based on the T3 Network template described in Appendix A and the related success metrics framework with references to more detailed use cases and metrics in Appendix B that contain descriptions of likely high-impact failures. The final report then summarizes the failure analysis and suggests potential solutions that could be explored by T3 Networks and other solution partners. This report concludes with a summary and next steps.



- **Advancement** includes upskilling and reskilling for changing job requirements and movement to lateral or higher level jobs from adjacent or gateway jobs within and outside the employer.
- **Candidates** are individuals who are potential or actual candidates for hiring and advancement opportunities. This includes people who are not necessarily aware of or actively considering a specific opportunity, but can be discovered as a potential applicant through the search of posted resumes and profiles or referral. They are sometimes called passive candidates. Active candidates are aware of and exploring specific opportunities that they may apply for in the near future, in which case they become applicants. Candidates broadly include candidates for posted job openings, candidates for promotion, workers potentially eligible for a project or program, and apprenticeship, internship, and education seekers.
- **Defining Skills in Skills-based Hiring and Advancement**
Skills-based hiring and advancement publications and initiatives do not define “skills” consistently and generally use the term more broadly than how it is defined in formal content models and taxonomies (e.g., O*NET Content Model, ESCO Skills/Competences) and professional and technical standards. As a result, we use skills broadly as shorthand for all types of measurable statements or assertions about what an individual knows and is able to do. From an employer job description perspective, this includes validated statements about critical work tasks or activities and the key worker attributes or capabilities (e.g., knowledge, skills, abilities, and other characteristics) needed to successfully perform them within a work context. From a job candidate perspective, this includes statements or assertions about previous job task performance and achievements in work histories with references and endorsements, credentialing assessment results verifying work task performance, knowledge, skills, and/or abilities, as well as learning outcomes assessed and verified by education and training providers. This broad definition of skills includes what some refer to as competencies from employer, educator, and job candidate perspectives.
- **Employers** are all types of public and private employers that may use a wide variety of public and private partners (e.g., Recruiters, HR Technology Service Providers) to carry out hiring and advancement. While the aspirational use cases can be best utilized by highly-resourced employers, those who do not use any HR providers (conducting their HR in-house) can benefit from the practices of skills-based hiring and advancement.
- **Hiring** is generally the offering or assignment of work opportunities and could include a wide range of employment relationships (e.g., full-time or part-time employment, independent or freelance work, staffing organization contract internship, and apprenticeship). It also could involve the project and role assignments for employees and contractors.
- **Job Analysis and Skills Validation** Effective skills-based hiring and advancement depends on rigorous job analysis methods (e.g., job task inventories/surveys, cognitive task analysis) that determine the most important work tasks and the most critical worker attributes or capabilities (e.g., knowledge, skills, abilities, and other characteristics) needed to successfully perform them within a given work context. Job analysis can be done for a variety of reasons including job design and developing job descriptions that include skill requirements that were confirmed or validated through systematic data collection involving subject matter experts. Job analysis and skills validation are also important for determining which skills are required for screening and hiring (pre-hire skill requirements) and those skills that can be acquired through further training and development (post-hire skill requirements). Finally, skills validation encourages employers to include only critical skill requirements set at the necessary levels of proficiency and discourages employers from adding additional or higher skill requirements that will unnecessarily reduce the number of potentially qualified candidates and reduce opportunities for underserved populations similar to the effects of unnecessary college degree and work experience requirements.
- **Job and Advancement Opportunities** include jobs, internships, apprenticeships, upskilling and reskilling training programs, professional development programs, stretch role assignments, experiential learning cohorts, and other experiences to accelerate career progression or pursue job opportunities.
- **Job Descriptions** include a broad range of documents including formal job descriptions, job postings and skill profiles that describe job roles, responsibilities, requirements, and related job information.

- **Verification** generally refers to the process by which employers and their HR service providers confirm the source and overall trustworthiness of the skill assertions and related evidence provided by candidates in their resumes and related learning and employment records. This work has historically been done through specialized verification services (e.g., background checking) at the later stages of the hiring process. Verifiable credentials are credentials including learning and employment records that are trustworthy because they are tamper-proof, cryptographically verified, and indicate expiration and revocation, for example.
- **Evidence-Based Skill Statements** generally refer to skill statements and assertions that are backed by some type of evidence which could include assessments, work products, and/or endorsements.
- **HR/People Data Analytics and AI Applications** refer to a broad range of descriptive, predictive and prescriptive data analysis methods and tools that include Artificial Intelligence (AI) applications and techniques such as machine learning.
- **Resumes** refer to formal documents that describe a job candidate. They usually provide a professional overview (what someone does professionally and/or career and job goals) and relevant qualifications, including work experience, skills, education, major accomplishments, and professional contact information. Resumes usually follow one or more widely used templates provided by resume service providers and systems. Resumes are similar to professional profiles although profiles are usually shorter with links to more comprehensive resumes. Resumes are also similar to more comprehensive curriculum vitae (CV) which are often used within Europe (e.g., Europass) and in more academic professional communities. Although resumes, related profiles, and CVs are usually electronic documents (e.g. Word, PDF), they are usually not provided as structured, machine-actionable data that can be easily processed and analyzed by employer systems without the use of application forms and parsing technologies and usually do not contain structured skills data of job candidates. Resumes are often transmitted with cover letters to an employer. The SBHA use cases refer to resumes both in their current state and anticipated future state.
- **Learning and Employment Records (LERs)** are structured digital records describing attributes of learning and work that can be linked to an individual. They may be combined with other structured digital records to apply to further education or work opportunities. An LER can document learning wherever it occurs, including informal activities or formal education experiences. These may occur in educational settings, such as school diploma or university degree or certificate programs, commercial licensing or military training. They can also describe the attributes of work experiences, on the job training, professional development, or simply characteristics of the work an individual has done, the positions they have been appointed, and salary earned while employed. The most secure, cryptographically signed form of LERs follow the W3C Verifiable Credential Data Model. LERs can be organized into tailored sets to share with a third party, such as an employer, a job site, or another educational institution. LERs and the family of standards-based credentials and protocols that enable their sharing are vendor agnostic when conformant to the preferred set of W3C Verifiable Credential standards, making them interoperable, portable, secure and cryptographically proof-based privacy preserving.
- **Digital wallets** LERs and other records are stored in digital wallets installed on personal devices or as services on the internet. Digital wallets store and access digital assets, including credentials, personal information, and other records.
- **Bias** refers to undesired preferences for some individuals over others due to their membership in a group. Skills-based hiring and advancement is one method that can reduce bias but is not a comprehensive approach to reducing bias. In finding the most qualified candidates, many employers do not want to eliminate or select candidates for reasons that perpetuate inequities, like gender and racial stereotypes, company affiliation (as a mark for or against a candidate), elite education, confirmation bias, and preference for candidates with shared hobbies and interests. Other biases that muddy the waters include recency effect (the last person you interviewed), halo effect (what is beautiful also seems good), and first impressions. They can be countered by consistent and careful interventions, including hiding candidate name, photo, and education institution name, and the language in job ads can be reviewed by AI to better appeal to minority candidates.

- **Skill and Competency Frameworks** which we will refer to as “skills frameworks,” are sets of logically-related skills and/or competencies. They may be organized as hierarchies/taxonomies (parent-child relationships) or ontologies (multidimensional relationships). They may be published openly or commercially by professional and industry organizations, education providers, government agencies, or employers and are a key data source. We also include word collections or lists of skills that may be more loosely organized.
- **HR Service Providers and Systems** refer to organizations that provide HR services (e.g., digital marketing, recruitment, assessment, training and development, data analytics) as well as HR software systems to assist employers throughout the end-to-end skills based hiring and advancement process.
- **Human capital management systems (HCM)** are offered by HR system providers as comprehensive cloud-based platforms that integrate the management of people, business processes, and data including: strategic workforce planning, compensation management, payroll, benefits administration, recruitment and hiring, onboarding, career guidance, competency management, training and development, time and attendance, performance management, employee self-service, reporting and compliance, and data analytics.
- **Human resource information systems (HRIS)** are typically exceeded in functionality by HCMs and focus more on employee data management.
- **Recruiting and applicant tracking systems (ATS)** are an HR system offering that are used directly in communicating opportunities, recruiting potential candidates, and compiling, analyzing, and making recommendations on job candidates and applicants. These more specialized systems can be integrated with HCMs and other specialized systems through partnership programs and open HR data standards such as those developed through the HR Open Standards Consortium. This project focuses on how leading HR service providers and comprehensive and specialized software systems assist employers in developing, sharing, and using skill requirement data (e.g., skills frameworks/ontologies, data analytics/AI tools) for hiring and advancement decision-making.
- **Career and Job Guidance Providers and Systems** refer to organizations that provide career guidance and job and opportunity search services (e.g., guidance counselors, professional coaches, resume consultants) and systems (e.g., career exploration and guidance systems, job search systems, resume development systems, job platform matching systems). These service providers and systems increasingly use advanced data analytics and AI tools to provide recommendations for developing and using resumes to pursue specific job and advancement opportunities.



Eight Priority Use Cases

Skills-based hiring and advancement requires a comprehensive end-to-end set of use cases from both the **employer and job candidate perspectives** that address at least:

- **Critical Skills Determination:** Employers with sufficient resources will conduct strategic workforce planning for critical capabilities or functions (what employers must do well), jobs and career progressions and determine and validate related skill requirements. Candidates determine current skills and what additional skills if any are needed to qualify for desired job and advancement opportunities.
- **Recruitment / Identifying Opportunities:** Identifying and recruiting potential internal and external candidates including passive candidates. Candidates opt in and out of passive recruitment and identify and explore job and advancement opportunities.
- **Application, Screening, Selection, and Development:** Processing applications and conducting initial screening, assessments and interviews and making hiring and advancement decisions followed by onboarding and development for success in job and advancement opportunities, with candidates participating in the process.
- **Evaluation and Improvement:** Success is evaluated at each stage of the process and the final bottom-line outcomes is based on success metrics. This provides the basis for the identification, testing and implementation of improvement opportunities by both employers and candidates.

		USER TYPES	
		EMPLOYER	INTERNAL AND EXTERNAL CANDIDATES
CATEGORIES	Critical Skills Determination	1.1 Employer Determines Critical Skill Requirements	2.1 Candidate Develops Critical Skills
	Recruitment / Identifying Opportunities	1.2 Employer Shares Job Opportunities and Recruits Candidates	2.2 Candidate Identifies Job Opportunities
	Application, Screening, Selection, and Development	1.3 Employer Screens, Selects, and Develops Candidate	2.3 Candidate Participates in Employer Screening, Selection, and Development
	Evaluation and Improvement	1.4 Employer Evaluates and Improves Outcomes	2.4 Candidate Evaluates and Improves Outcomes

USE CASE OVERVIEW



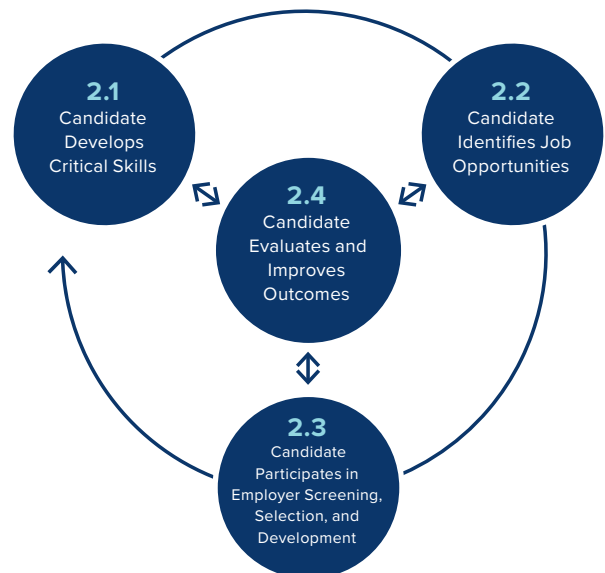
SUCCESS METRICS

- Reduced time
- Lower costs
- Increased quality of matches
- Improved equity and diversity outcomes

EMPLOYER USE CASES



JOB CANDIDATE USE CASES



Success Metrics Framework

Leading practices in skills-based hiring and advancement as described in the eight priority use cases have the potential to achieve results on four major categories of success metrics important to employers, candidates and other stakeholders. This framework provides the foundation for developing more concrete metrics as shown in the detailed use cases in Appendix A.



Time:

Reduce the time from the identification of potential candidates/opportunities to actual hiring and advancement.



Quality:

Improve the match between job skill requirements and job candidate skills resulting in successful job performance and employer and candidate satisfaction.



Cost:

Reduce the cost from identification of potential applicants/job opportunities to actual hiring and advancement.



Equity:

Reduce the gaps in hiring and advancement due to bias and over reliance on traditional proxies (e.g., traditional college degrees, work experience) that have disparate impacts. Barriers to equity far exceed those that can be addressed by skills-based hiring and advancement, but this report focuses on the areas of greatest potential impact and attempts to note where actions can perpetuate existing biases or introduce new ones unintentionally.

General Aspirational Use Cases

These use cases describe a future state of interactions between employers, candidates, and the systems they use based on leading guidance and practices that have the potential to achieve results on one or more success metrics. While some employers, HR service providers, and candidates with the assistance of their career and job search guidance service providers exemplify these leading practices, the set of steps outlined here taken together are largely aspirational. For more detail on the aspirational vs current state of each step of the use cases, see Appendix A.

1. CRITICAL SKILLS DETERMINATION

1.1 Employer Determines Critical Skill Requirements

Use Case Description:

Employers with sufficient resources will conduct strategic workforce planning and analysis, and update, align and validate the critical skill requirements for jobs across career progressions and share updated, standardized machine-readable job descriptions for executing talent management actions including upskilling/reskilling, career development, and external hiring.

2.1 Candidate Develops and Documents Critical Skills

Use Case Description:

Supported by counselors or coaches and guidance systems, candidates will develop career goals, explore job opportunities, compare their job skill requirements to their own current skills; take prior learning assessments (PLA) to document what they know; consider education, training, and credentialing options to bridge any gaps; and create a machine-readable updated resume referencing related learning and employment records as evidence that can be made discoverable to employers to communicate their skills.

This use case is similar to the T3 ILR Priority Use Case 1: Published Selected Elements of Professional Profile for Search and Discovery on the Web.

2. RECRUITMENT / IDENTIFYING OPPORTUNITIES

1.2 Employer Shares Opportunities and Recruits Candidates

Use Case Description:

Employers will communicate the descriptions of hiring and advancement opportunities based on validated and less biased job descriptions (see bias definition) and recruit internal and external job candidates to apply for these opportunities (active candidates/applicants). They may search passive candidates who have elected to have resumes stored in discoverable internal HR systems or on external job board platforms, social media sites, or other online sites.

2.2 Candidate Identifies Opportunities

Use Case Description:

Candidates will submit an updated, machine-readable, and skills-based resume to career and job search guidance providers for recommendations on job opportunities and may make their resume public to social media sites and job board platforms (e.g., resume banks) for discovery by employers and recruiters. Job candidates will identify job opportunities through their own search and identify other job opportunities based on job search recommendations from career and job search guidance providers and systems and recruiter outreach.

This use case is similar to the T3 ILR Priority Use Case 2: Explore Career Opportunities.

General Aspirational Use Cases

3. APPLICATION, SCREENING, SELECTION, AND DEVELOPMENT

1.3 Employer Screens, Selects, and Develops Candidate

Use Case Description:

Employers and their HR providers and systems will process job candidate applications to determine if they are potentially qualified, conduct additional screening including assessments and interviews for verifying applicants meet skill requirements, select one or more of the most qualified applicants, and onboard and provide additional training and development until those selected achieve successful job performance, engagement, and satisfaction. Screening and selection processes can be improved to meet diversity, equity, and inclusion (DEI) objectives.

2.3 Candidate Participates in Employer Screening, Selection, and Development

Use Case Description:

Internal and external applicants will participate in employer screening, selection, onboarding, and development with the goal of successful performance, employment duration, engagement, and satisfaction.

This use case is similar to the T3 ILR Priority Use Case 4: Apply for and Accept Employment Opportunities.

4. EVALUATION AND IMPROVEMENT

1.4 Employer Evaluates and Improves Outcomes

Use Case Description:

Employers with sufficient resources will evaluate the success of talent management strategies in addressing workforce needs and other organizational goals (e.g., DEI goals) and identify, test, and implement improvement opportunities including strategic workforce planning and job and pathway analysis; recruitment; screening and selection; training and development and performance management. Evaluation utilizes descriptive and ideally predictive analytics to increase employer decision-making capacity.

2.4 Candidate Evaluates and Improves Outcomes

Use Case Description:

Candidate will receive a continuous and guided evaluation of the success of efforts to identify and apply for job opportunities and complete screening, selection, and development to reach career goals and decide whether to continue to pursue career opportunities using the same strategy and tools or consider alternatives and implement chosen improvements for better outcomes. This evaluation will be based on acceptance/rejection data and, crucially, feedback from the planning, search, application and selection processes from a variety of stakeholders that help identify what went wrong and what went right, which is made available to the candidate, particularly in an analyzed form, via a system that integrates this information from disparate sources and actively prompts employers to share data into the system. The candidate will use this data to identify, test, and implement improvements.

Data Input and Output Diagram

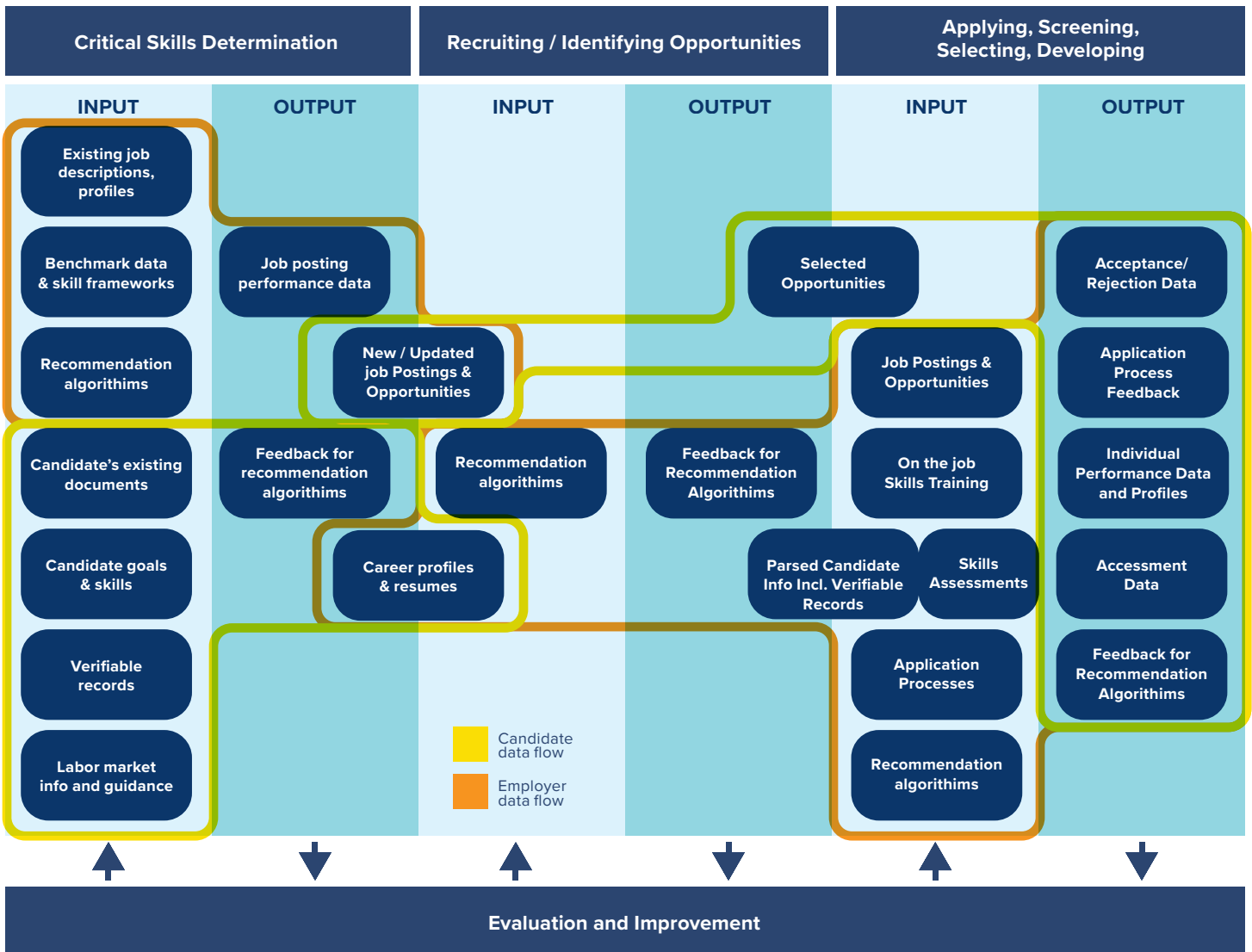
This diagram can help apply a data lens to the skills-based hiring and advancement process through a set of inputs and outputs. Outputs further on in the process depend on or are influenced by earlier inputs. This lens will help clarify the relative importance of these data for the overall end-to-end hiring and advancement process.

This illustrates the importance of the evaluation and improvement cycle, by showing how data inputs and outputs in each category of use case can feed into the ongoing evaluation. For example, feedback to improve algorithms and processes is an output of each use case category. Within each use case category, insights can be gleaned and applied continuously.

Data that sits at the borders of the input and output columns act both as an input and an output. There are four of these; new/ updated job postings and opportunities, resumes, a candidates'

selected opportunities, and parsed candidate information. In our swimlane diagrams, notice that these are key ending outputs and starting inputs. These are critical pieces of information that stand to gain tremendously from data infrastructure improvements.

Job postings and candidate profiles and resumes are handoff points between employers and candidates. Following the data flows, notice the paths switch so that the data in the job posting becomes the input for the rest of the candidate data flow and the data in the candidate profile/resume becomes the input for the rest of employer data flow. This is a reason to prioritize our resources on these two key sets of information. In our suggested T3 Network priorities below, we emphasize the importance of focusing on the first category of use cases (use cases 1.1 and 2.1) which produce these key sets of data.



Points of Failure Analysis

These aspirational general use cases and the more detailed use cases in Appendix A were designed to identify potential points of failure—where things are likely to go wrong—that will have major impacts. This table summarizes the main barriers to skills-based hiring and advancement, which use case events they impact, potential solutions, and potential solution providers. See the Points of Failure under each use case for detail on each point of failure that is relevant to that use case. The following table summarizes some of the most important points of failure that occur across multiple use cases in Appendix A and have major potential impacts on the success metrics.

POINTS OF FAILURE SUMMARY		
	POINT OF FAILURE	POTENTIAL SOLUTIONS
A	Job Data: Limited Access to and Use of High Quality Job Benchmark Data	Promote open access to structured data on jobs and job openings as well as related industry data.
B	Skill Frameworks: Limited Access to and Use of High Quality and Dynamic Open Competency and Skill Frameworks	Create guidance and tools for search and discovery for relevant competency and skill frameworks available through open networks.
C	Structured Data: Lack of Standards-based Machine-Readable Structured Data Including Skills Data	Promote the development and use of standards in creating machine-readable job descriptions/postings, resumes, LERs, and education/training program descriptions. Create resources, tutorials, and awareness campaigns to encourage the adoption and use of these standards.
D	Skill Descriptions: Skill Descriptions are Inadequate	Develop awareness and training resources that leverage standard recommended practices for well-defined competency definition including writing in standard formats that aid in computer processing and use of online skills networks and tools. While there will be no “common skills language,” people writing competencies can choose which standard recommended practices and formats work best for them.
E	Algorithms: Limited Development and Use of Translation and Analysis Algorithms	Improve algorithm and AI development and use for skills translation and analysis, particularly for the determination of matches between employer requirements and candidate skills.
F	Interoperability: Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics	Promote the alignment of standards for job descriptions/postings, resumes, LERs, and education/training program descriptions. Promote data sharing for improving feedback cycles for employers and candidates and advanced data analytics while protecting privacy.
G	Assessments: Lack of Reliable, Valid, and Aligned Assessments for Evaluation and Feedback	Improve the validity, reliability and alignment of assessments and how they may be better used for evaluation and feedback for employers and job candidates.
H	Employer Capacity: Limited Employer Leadership Commitment and HR Process Design and Management	Provide guidance and promote leading employer practices in skills-based hiring and advancement
I	Candidate Capacity: Limited Capacity of Job Candidates and Guidance Services and Systems	Promote leading practices in career guidance services and systems and build the capacity of job candidates to utilize them.

Proposed Priorities to Be Addressed

Based on this failure analysis, the T3 Network and its partners should explore at least four priorities in developing solutions for improving skills-based hiring and advancement. We think the following questions are most pertinent, organized by use case. The stakeholders listed for each priority hint at the complexity of the collaboration required for success and value of working at the infrastructure level to bring value to such a wide variety of stakeholders.

EMPLOYER SKILL REQUIREMENT DEVELOPMENT, VALIDATION AND EFFECTIVE COMMUNICATION

Supports use cases 1.1 and 1.2 and targets failure points A-D. Effective skills-based hiring and advancement depends on employers developing, validating and effectively communicating the most critical skill requirements at the right proficiency level for candidates.

- How can we encourage more employers to use leading practices and existing tools to develop and validate their job skill requirements?
- How can we encourage employers to share what skills are most important for success on the job?
- How can we encourage employers to clearly demarcate required vs acquirable skills so that requirements do not become overloaded?
- How can we update JDX and other related standards to more clearly communicate skill requirements?
- What is the role of benchmark data for determining and communicating requirements considering the accelerating pace of change of job requirements and the existing biases within this information?
- How can employers more clearly communicate these skills at the right level of specificity and using the best data structures for improving skills analysis and comparisons?
- How can employers communicate a position's advancement opportunities (career pathways) within a job description or posting, even so far as linking to other career pathways information?

Key stakeholders for this priority: Employers, HR systems, labor market information providers, skill and competency framework publishers, skill and competency framework infrastructure and tool developers, job data and document standards bodies, job boards and job board aggregators and other tools and platforms that ingest data from job boards, workers generating job performance data, users of job information, workforce boards and other employer consortia, regional chambers, professional and industry organizations, job search engines, applicant tracking systems, and recruiters.

DEVELOPING AND USING ALGORITHMS FOR SKILL COMPARISONS

Supports all use cases and targets failure point E. The skills-based hiring and advancement process from both the employer and candidate perspectives is increasingly being done with the assistance of algorithms.

- What are the most important machine algorithmic tasks in skill analysis and comparisons?
- What are the leading practices and remaining challenges in the development and use of machine algorithms including AI-driven algorithms?
- What are the skills data requirements including contextual data for developing and using machine algorithms and other tools for skills comparison?
- What are leading practices and remaining challenges in evaluating and auditing algorithms to provide assurances that they are transparent and don't perpetuate known biases?
- How can we update standards and provide guidance to improve employer screening around credentials and skills extraction?

Proposed Priorities to Be Addressed

Key stakeholders for this priority: Algorithm developers, algorithm audit services, users whose data are used or could be used by algorithms, tools and platforms that use or could use algorithms, including HR systems and career guidance systems, data use regulators and policymakers, designers of interfaces for interacting with algorithms.

CAREER GUIDANCE AND JOB SEARCH ASSISTANCE SERVICES AND SYSTEMS

Candidates will increasingly require career guidance and job search services and systems that utilize more and better data and advanced algorithms for making recommendations based on their records and preferences and help them apply to opportunities, ideally with the assistance of a career coach.

- How can we identify best practices for career guidance and job search assistance providers?
- What does the next generation of resumes look like? What is their role in the hiring process?
- How can resumes, LERs, digital wallets, and career guidance systems work together to make hiring and advancement fairer and more effective?
- How can we concisely and appealingly explain how they are used in the skills based hiring process in conjunction with job boards and matching platforms, and career guidance?
- What needs to happen before we can explain to candidates how future candidate documentation, guidance apps, job boards, and application processes work together for their benefit?
- How can digital and data literacy training supplement tutorials on these new hiring technologies?
- What solutions can we come up with for scaling informed consent for the sharing of records?
- Technology is a double-edged sword. How can we build the capacity of candidates to use these new tools without creating additional barriers?

Key stakeholders for this priority: Career guidance and job search assistance services and systems, opportunity seekers, job and career centers, community-based organizations, workforce agencies and service providers, job boards and job board aggregators, resume builders, resume aggregators, standards bodies for learner records, wallets, resumes, credentials, etc., digital wallet vendors, digital identity service providers, registrars, and background check providers.

DEVELOPING THE STANDARDS-BASED DATA INFRASTRUCTURE

Supports all use cases and targets failure points A-F This infrastructure supports all of the above categories of focus by making it easier to create and share data, particularly skills data which is a fundamental aspect of SBHA. It also makes sure that the outcomes data can be used by the systems and tools and to improve their operation long term.

- **Overall**
 - How does using open standards and datasets over proprietary solutions improve collaboration?
 - How can we increase the interoperability of employer and candidate systems by using APIs (e.g., resume, career profile, wallet, and LER systems, employer ATS, HRIS, job boards, LMS/CMS, and provider SIS systems)
 - What infrastructure would help support better everyday decision-making for employers and candidates? How can we balance using data about existing career pathways with what is possible, like matching individuals to jobs and career pathways based on their skills?
- **Machine-Readable Structured Skills Data and Frameworks**
 - How do we develop and promote the use of data and technology standards in creating more machine-readable structured data for algorithms including skills data?
 - What is the necessary content, structure/format, and contextual data needed for skills statements and how can we improve the use of open skill frameworks/ontologies in understanding the logical relationships between skills?
 - How do we encourage skills frameworks to be more responsive to real skills use and validation by employers?
 - How can employee skill information be shared with the employee who can then act on the information and elect to share it with others?

- **Feedback Data**

- How do we provide the necessary feedback data including outcome data that can improve the development and use of more accurate and unbiased algorithms, while protecting privacy?
- How do we provide recommendations for a balanced set of outcome data to employers (e.g., job performance, satisfaction, disparate impacts on underserved populations)?
- Could we recommend a key set of outcome measures that help determine successful infrastructure for candidates?
- How can we make sure feedback gets to hiring managers and candidates in a timely and actionable way?
- How can algorithms be more transparent by providing reasons (e.g. the skills matches and gaps) for recommendations?
- How can we communicate the results of ATS screening including skills matching algorithms to candidates so they can revise their resumes?

Key stakeholders for this priority: Career guidance and job search assistance services and systems, job boards and job board aggregators, resume builders, resume aggregators, standards bodies for learner records, wallets, resumes, credentials, etc, digital wallet vendors, digital identity service providers, algorithm developers, HRIS and ERP systems, skill and competency framework publishers, skill and competency framework infrastructure and tool developers, job data and document standards bodies, users generating usage and career trajectory data.

Conclusion

The Skills-based Hiring and Advancement (SBHA) project developed aspirational end-to-end use cases from both the employer and candidate perspectives based on leading guidance and practices. The four categories of use cases are steps in a cyclical hiring and advancement process. The employer determines critical skill requirements, recruits, screens, selects, and develops the candidate, then evaluates the process before starting again. The candidate determines their skills and qualifications, identifies opportunities, applies and advances, and evaluates the process on an ongoing basis.

The project conducted a failure analysis and identified potential solutions that could be explored by T3 Innovation Networks and other solution partners. The failure analysis resulted in the identification of four major priorities for the T3 Network and its partners in addressing failures and potential solutions that have the potential to have major impacts on the success of skills-based hiring and advancement for employers, job candidates and other stakeholders.

Acknowledgements

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CRITICAL SKILLS DETERMINATION

1.1 Employer Determines Critical Skills Requirements

Detailed Use Case 1.1

- **Goal of the Primary Actor: Employer: 1)** Determine skill requirements for the organization across roles, or for a subset of roles as a starting point. **2)** Align and update job roles and job descriptions and more clearly define career progressions to achieve organizational goals and execute talent management actions including upskilling/reskilling, advancement and hiring.

This use case is generic enough to serve the following personas in the role of the primary actor, for example:

- **Persona Example 1:** An energy and utilities company working toward a clean energy/sustainability strategy is implementing a digital transformation of work across the company that incorporates significant automation and, thus, involves new operations management work processes and systems requiring the upgrading of operations management, scheduling, and line crew employees as well as contractor capabilities and improving career progressions to address critical workforce needs. These efforts include the elimination of barriers for advancing into management positions that have historically required BA degrees and extensive work experience, as well as upskilling and reskilling the current workforce. First, they must undertake a project to name and validate the skills that will be needed of their workers.

- **Persona Example 2:** A manufacturing company is implementing a new total production maintenance system that will change work processes and roles for maintenance and operations managers and employees as well as contractors and utilize new data systems and tools to manage and improve manufacturing performance, including role hybridization. This also will include expanding the maintenance roles of machine operators and combining maintenance positions into new broader maintenance jobs as well as efforts to provide better internal advancement opportunities to address increased workforce demand and DEI goals that include elimination of barriers into advancement to management positions that have historically required BA degrees and extensive work experience.

- **Additional Persona Example Options:**

- Employers implementing new cybersecurity and network management systems.
- Employers implementing new coordinated care models in healthcare.

- **Actors:**

- **Humans:** Employers, HR professionals, and HR service providers, hereafter referred to as “Employers” .
- **Systems:** Strategic workforce planning systems, human capital management systems, training and development (e.g., LMS, LXP), work management, Applicant Tracking Systems (ATS)/recruiting systems, analytics software, skills frameworks.

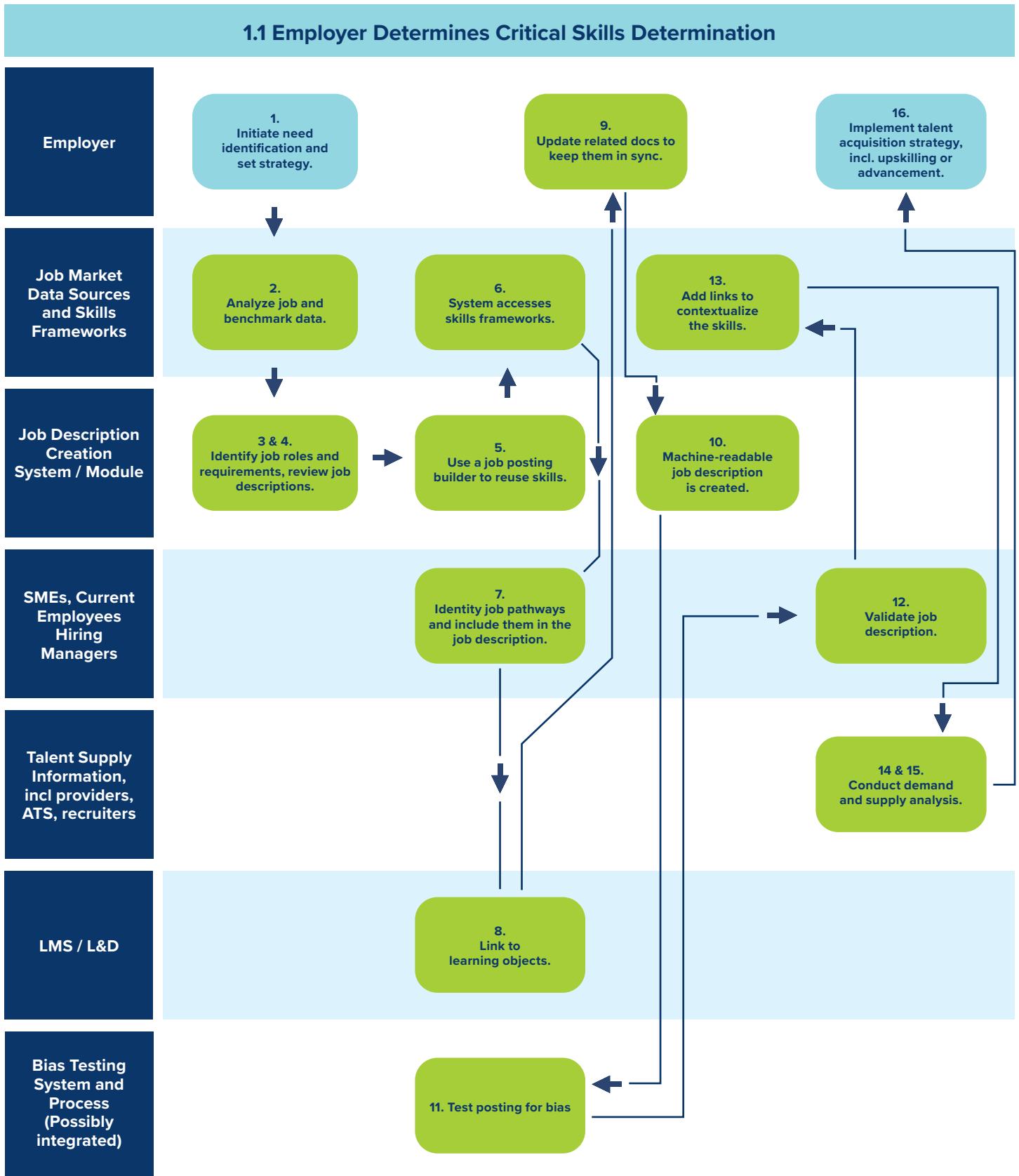
- **Preconditions:**

- Employers have access to strategic planning tools that are integrated with HCM systems and tools for updating and validating job descriptions.
- Employers have access to accurate, detailed, and machine-readable job posting data and competency and skill frameworks used in their industry for their relevant jobs for benchmarking and developing comparable job descriptions.
- Employers have access to market analyses and industry trends and projections.
- Employers have aggregated and analyzed performance data, strategic plans, and scenario planning on their current workforce; this work should not be done out of sync with top-level HR planning.

- **Flow of Events: Strategic workforce planning to the updating and validating of job descriptions, career progressions and critical skill requirements**

1. Employer reviews their organizational goals and strategies and analyzes their major capabilities and work processes (what employer must do well).
2. Employer finds or conducts benchmark analysis on industry and market trends and major organizational and technological innovations (e.g., digital transformation, green technologies, COVID) for their impact on major capabilities, work processes, job design, and skill requirements. This includes the analysis of recent job data.
3. Employer identifies current and potential job roles and examines their skill requirements, work methods, technologies, and how work is allocated across them.
4. Employer reviews existing job description(s) and hiring requirements that may be unnecessary barriers to skills-based hiring and advancement including college degrees and extensive work experience. Employer makes a distinction between required and acquirable skills. Ideally employer shares if these skills can be trained on the job or if the candidate would have to obtain them externally.
5. Employer uses a job posting builder to receive suggestions on skill frameworks to accelerate developing job descriptions and/or align to standards, reusing and/or deriving skills and competencies from existing ones.
6. Job posting builder accesses skills frameworks to accomplish step 5.
7. Employer adds job progressions by consulting knowledgeable staff. Progressions suggest possible steps between jobs such as training, skills, and other jobs.
8. Employer links the machine-readable objects (skills, tasks, qualifications, etc.) in the job posting to Learning Object Metadata in respective authoring and publishing platforms to enable personalization and specific individual searches.
9. Employer updates job descriptions and other documents with any changes based on the aligning with the learning object data.
10. Machine-readable posting is created.
11. Employer reviews postings for bias, through online tools or via testing the posting with potential candidates from underrepresented groups.
12. Employer validates job responsibilities, pre- and post-hire skill requirements, other hiring requirements, and progressions between jobs. Employer team includes hiring managers, workers and subject matter experts in the validation process.
13. Employer adds structured data on skills with unique identifiers that link to specific skills in competency and skill frameworks for any new skills that were added. The link has the precise skill definition that the employer intends for that skill to mean so that all parties have clarity on the definition.
14. Employer analyzes the characteristics of their own demand for determining future workforce needs based on updated job descriptions and skill analysis, while consulting existing strategic planning materials.
15. Employer conducts supply and cost analysis to identify gaps between internal and external supply and the new hiring needs, and respective budgetary considerations.
16. Employer implements talent management strategies including upskilling/reskilling, career pathway advancement which their existing workforce can use, and external hiring to close the gaps.

Appendix A: Detailed Use Cases



While almost all steps across all use cases are expected to see some effect of SBHA, use case steps in green are expected to see the most significant changes from the current state of hiring and advancement.

- **Post-Conditions/Success Criteria:** Job descriptions are updated and aligned to business requirements and critical skills are validated in a comparable language for clearly communicating hiring and advancement opportunities and executing talent management strategies. Note that more benefits are expected to flow from this use case later in the hiring and advancement process.
 - **Time and Cost:** Increased capacity to do strategic workforce planning more frequently in less time and cost to address workforce needs.
 - Reduced number of days in updating and validating job descriptions and skill requirements within the current strategic planning cycle.
 - Reduced cost in updating and validating job descriptions and skill requirements within the current strategic planning cycle.
 - **Quality:** Increased capacity to manage and transfer trusted and validated job description and skills data across internal and external systems at sufficient detail and clarity for successful talent management strategies.
 - Percent of critical jobs that have been updated and validated within the current strategic planning cycle.
 - Percent of job descriptions successfully transferred between systems without loss of information within the current strategic planning cycle, checked by viewing job descriptions from the candidate perspective.
 - Percent of job descriptions that attain an appropriate score for reading comprehension by the candidate population within the current strategic planning cycle.
 - Frequency of updates to organizational skill frameworks or to the organization's selection of frameworks.
- **Equity:** Workforce planning results in the identification of opportunities for increasing the hiring and advancement of underrepresented groups into higher level destination jobs.
 - Number and percent of job descriptions which include alternative requirements to degrees and/or years of experience.
 - Number and percent of job postings which had any changes to attempt to de-bias hiring language (beyond inclusion of alternative requirements.)
 - Percent of eligible candidates who determine themselves eligible for those opportunities (this could possibly be measured in a study of a sample of candidates from a target population whose resumes are a good fit being asked which of a sample of jobs they think they would apply for to better understand their perceptions of the offers.)
 - Percentage of underrepresented groups in identified talent pipelines/succession plans.
- **Points of Failure (for more detail see Appendix B):**
 - **Job Data:** Limited Access to and Use of High Quality Job Benchmark Data.
 - **Skill Frameworks:** Limited Access to and Use of High Quality and Dynamic Open Competency and Skill Frameworks.
 - **Structured Data:** Lack of Machine-Readable Structured Data Including Skills Data.
 - **Skill Descriptions:** Skill Descriptions are Inadequate and Need Formats.
 - **Employer Capacity:** Limited Employer Leadership Commitment and HR Process Design and Management.

Appendix A: Detailed Use Cases

2.1 Candidate Develops Critical Skills

Detailed Use Case 2.1

- **Goal of the Primary Actor: Job Candidate.** Candidate's primary goal is to find an employment opportunity. To do so, they are willing to create documentation and fill out application forms for the potential employers. They want to impress the employers enough to get hired, promoted, or other fill the open position. They are frequently but not always willing to make changes to their application documents to customize to the opportunity. Some will be willing to improve their qualifications in response to feedback on employer needs. Candidates differ widely on their ability and willingness to use digital tools to achieve this goal.

This use case is generic enough to serve the following personas in the role of the primary actor, for example:

- **Persona Example 1:** Employee in an operations management job at the energy and utility company has had their role automated and needs to upskill into operational management to stay employed.
- **Persona Example 2:** Employee from an underrepresented group at the manufacturing company seeks career advancement opportunities in operations management and industrial maintenance.
- **Persona Example 3:** Recent graduate for an industrial maintenance program at a community college who recently transitioned from the military where she received related maintenance training is exploring maintenance career opportunities in the manufacturing industry.
- **Actors:**
 - **Human:** Job candidates and career and job search guidance professionals, education, training and credentialing professionals.
 - **Systems:** Career and job search guidance and resume/profile development systems, education, training and credentialing enrollment and learning management systems, learning and employment records and wallets, AI systems that augment any of the above.

- **Preconditions:**

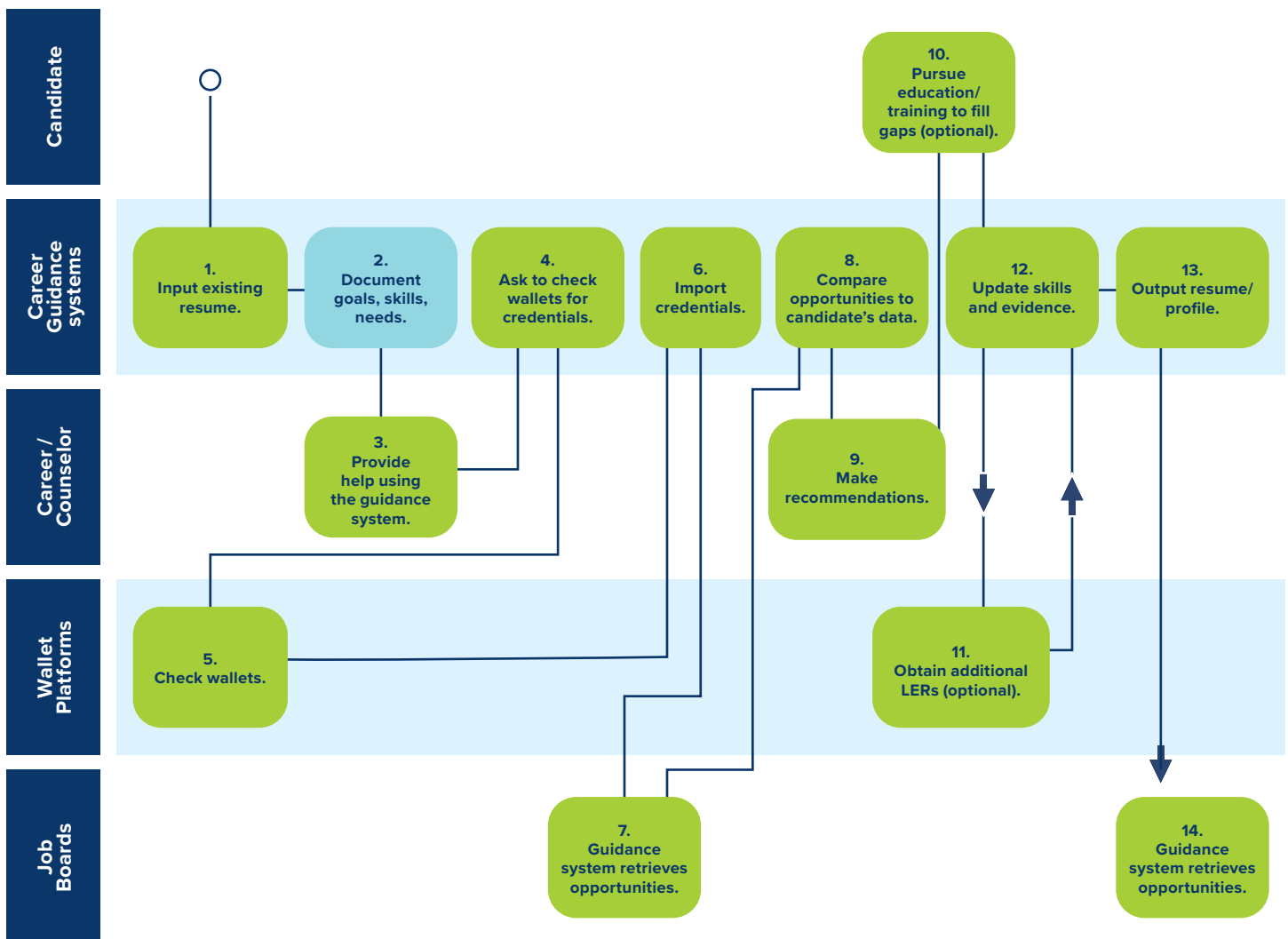
- Candidates have access to career and job search guidance and resume development assistance including systems that can search for and analyze changing job opportunity requirements and compare them to job candidate skills as documented in resumes/profiles and Learning and Employment Records (LERs).
- Candidates have the capacity and willingness to use this assistance to identify career objectives, catalog their existing skills and achievements, and target training and opportunities that are a fit for them.
- Candidates have access to resume/profile, digital credentialing and wallet systems that can make their resumes/profiles and LERs machine-readable for enabling search and discovery while protecting privacy through selective and progressive disclosure.
- Candidates have broadband and device access, device and adequate data literacy.

- **Flow of Events:** Candidate updating career goals and resume/profile for identifying job opportunities.

1. Candidate uploads or inputs their existing resume/profiles into a career guidance system.
2. Candidate documents their career goals, desired skills, and/or needs like salary or transportation to the best of their ability into system.
3. Receive help from a career coach or counselor throughout the career guidance experience.
4. When system sees an issuer who is issuing digital credentials, system asks permission to check existing wallet platforms to check if the candidate has any existing verifiable credentials that can be imported.
5. Guidance system checks wallet platforms.
6. Guidance system imports credentials.
7. Guidance system retrieves opportunities from job boards.
8. Candidate receives career and job search guidance in exploring related job opportunities and their job skill requirements in comparison to their own current skills.

9. Candidate considers recommendations for modifying or revising how their skills are described and to add other skills they have acquired through prior learning (e.g., work experience, education programs) to better match the most critical job skill requirements for relevant job opportunities (e.g., analysis of language used in job openings).
10. Candidate considers recommendations for closing skills gaps by pursuing adjacent or gateway jobs, short-term (paid or unpaid) project assignments, and/or additional education, training, and credentialing options, ideally resulting in additional issued and self-asserted LERs.
11. Candidate adds new experiences and LERs.
12. Candidate receives guidance on suggested skill language, and update their skills and evidence of those skills.
13. Candidate receives machine-readable resumes/profiles that can be effectively analyzed by employers and recruiters and job search advisors for making connections to relevant job opportunities. System enables candidate to decide on what information to present in their resume/profile to enable search and discovery while protecting privacy through selective and progressive disclosure which has been explained to the candidate in plain terms.
14. System identifies jobs and opportunities based on their career goals and revised resume/profile.

2.1 Candidate Develops and Documents Critical Skills



Appendix A: Detailed Use Cases

- **Post-Conditions/Success Criteria:**

- **Time and Cost**

- Number of days for job candidates to revise resume/profile language and apply for adjacent or gateway jobs and/or enroll in education, training and credentialing opportunities to fill gaps.
- Total cost for job candidates to use career guidance systems and job boards (ideally it's free or at least freemium for those in and outside of institutions).
- Cost to candidates is covered by institution membership or subsidy so that candidates have no out of pocket expense (at least for a free tier).

- **Quality**

- Percent of candidates who update their documents after receiving system/AI feedback.
- Percent of candidates who update their documents after receiving coach feedback.
- Percent of revised resumes/profiles that meet critical job skill requirements of a given job opportunity.
- Number of revised resumes/profiles that are machine-readable for easy access and analysis.
- Increased size of talent pool.
- Number of resumes/profiles that contain verifiable records (within a candidate pool or for a given opportunity).
- Number of resumes/profiles that contain or link to evidence (within a candidate pool or for a given opportunity).
- Candidate satisfaction with job search process with career guidance system.

- **Equity**

- All of the above metrics compared over groups.

- **Points of Failure (for detail see Appendix B):**

- **Skill Frameworks:** Limited Access to and Use of High Quality and Dynamic Open Competency and Skill Frameworks.
- **Structured Data:** Lack of Machine-Readable Structured Data Including Skills Data.
- **Skill Descriptions:** Skill Descriptions are Inadequate and Need Formats.
- **Algorithms:** Limited Development and Use of Translation and Analysis Algorithms.
- **Interoperability:** Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics.
- **Candidate Capacity:** Limited Capacity of Job Candidates and Guidance Services and Systems.

RECRUITMENT / IDENTIFYING OPPORTUNITIES

1.2 Employer Shares Job Opportunities and Recruits Candidates

Detailed Use Case 1.2

- **Goal of the Primary Actor: Employer:** Communicate opportunities and their requirements to job candidates and actively recruit candidates to get sufficient numbers and diversity of applicants to implement talent management strategies including upskilling/reskilling, advancement and hiring to address workforce needs. This use case is generic enough to serve the personas outlined in the first employer use case.
- **Actors:**
 - **Human:** Employers, HR professionals in recruiting, career guidance, training and development, and HR service providers, hereafter referred to as “Employers”.
 - **Systems:** Strategic workforce planning systems, HRIS/HCM systems, training and development (e.g., LMS, LXP), work management, ATS/recruiting systems, analytics software, skills frameworks, career websites and job posting and distribution systems, job sites.

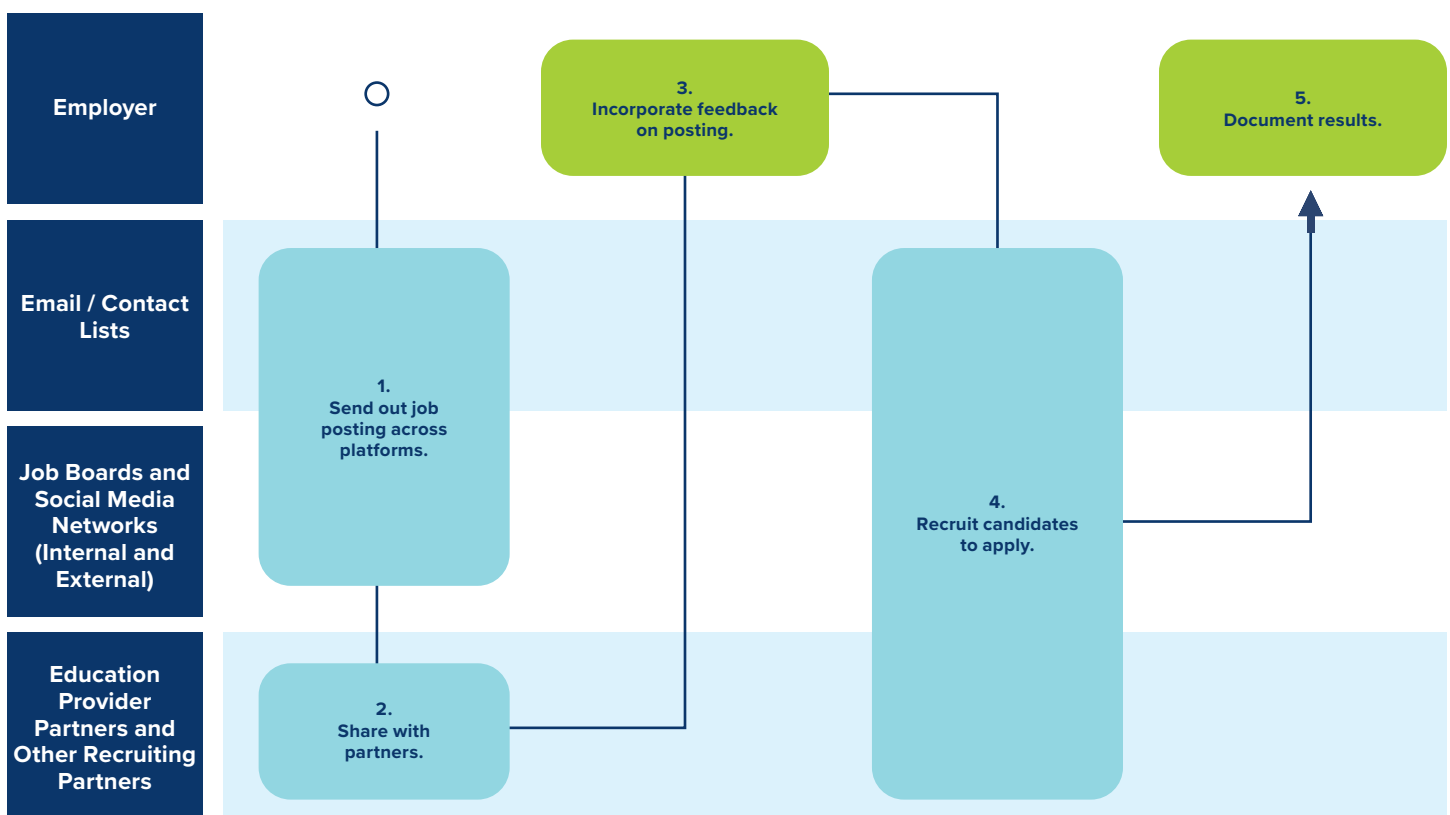
– **Preconditions:**

- Employers have access to and use strategic planning tools that are integrated with HRIS systems and tools for updating and validating job descriptions across career progressions and for transferring validated jobs data to talent management systems for upskilling, advancement and recruiting.
- Employers have access to job posting data, open competency and skill frameworks and other labor market information used in their industry for benchmarking and developing comparable job descriptions.
- Employers have access to integrated career websites and job posting distribution systems for communicating internal and external job opportunities.
- Employers use HCM systems.

– **Flow of Events: Job opportunity communication and recruitment of candidates:**

1. For internal recruiting, employer sends internal descriptions of jobs or career advancement opportunities to eligible job candidates, groups, or internal job boards. For external recruiting, employer posts job opportunities on career websites, company job boards.
2. Employer distributes descriptions of opportunities to recruiting partners, employee referral networks, social media sites, job sites, staffing organizations, and education and training provider partners.
3. Receive and consider any feedback about the posting or opportunity from partners, recipient systems, and candidates.
4. Employer identifies and recruits potentially qualified (passive) candidates based on recommendations from recruiting partners and preliminary analysis of candidate resumes.
5. Document any additional feedback and findings from the results of the search.

1.2 Employer Shares Job Opportunities and Recruits Candidates



Appendix A: Detailed Use Cases

- **Post-Conditions/Success Criteria:** Descriptions of job opportunities are created and distributed in a cost-effective manner resulting in the identification of the right number and diversity of identified job candidates and their conversion into applicants to meet projected workforce needs.
- **Time and Cost:** Reduced time and cost for identifying and recruiting potentially qualified candidates compared to previous performance and benchmarks.
 - > Number of days between posting of job opportunities to reaching the targeted number and diversity of potentially qualified applicants.
 - > Total cost of identifying and recruiting job candidates to reach the targeted number and diversity of potentially qualified applicants.
- **Quality:** Increased potential fit between identified candidates and applicants and job opportunity requirements compared to previous performance and benchmarks.
 - > Percent of identified candidates who meet job opportunity requirements including skill requirements.
 - > Percent of applicants who meet job opportunity requirements including skill requirements.
- **Equity:** Outreach and recruiting results in achieving DEI related goals for underrepresented groups in critical jobs compared to previous performance and benchmarks.
 - > Number and percent of identified job candidates from underrepresented groups.
 - > Number and percent of applicants from underrepresented groups.
 - > Number and percent of applicants from underrepresented groups that fill job roles.
- **Points of Failure (for detail see Appendix B):**
 - **Structured Data:** Lack of Machine-Readable Structured Data Including Skills Data.
 - **Skill Descriptions:** Skill Descriptions are Inadequate and Need Formats.
 - **Algorithms:** Limited Development and Use of Translation and Analysis Algorithms.
 - **Interoperability:** Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics.
 - **Employer Capacity:** Limited Employer Leadership Commitment and HR Process Design and Management.

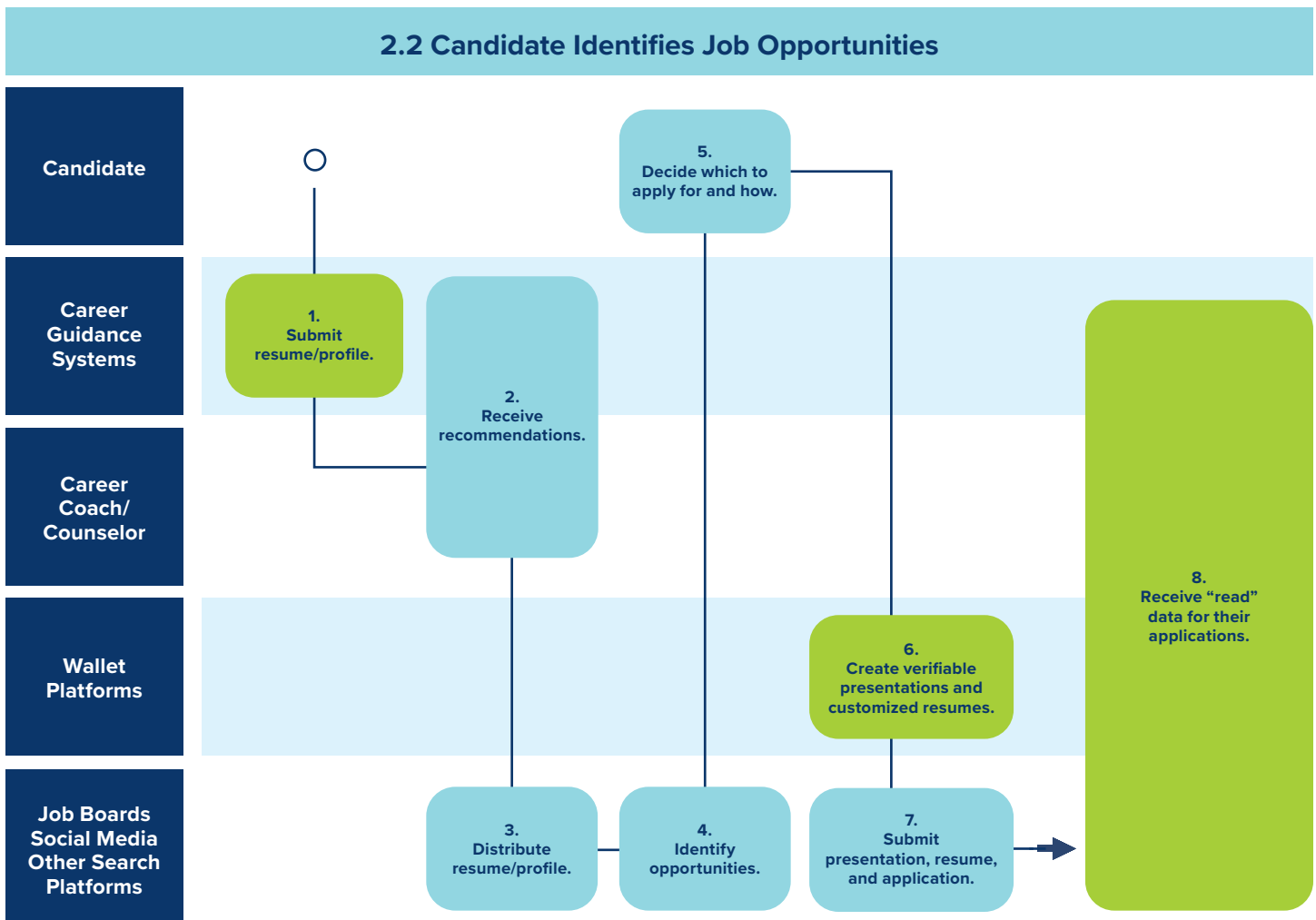
2.2 Candidate Identifies Job Opportunities

Detailed Use Case 2.2

- **Goal of the Primary Actor: Job Candidate.** Candidates are searching for employment opportunities including gig or seasonal work, career changes, internships, advancement, or different jobs at the same org. They want to find opportunities that match their preferences and qualifications quickly and easily. Many candidates will be eager to receive and implement feedback to get closer to getting hired. Some candidates may find in-person or online networking a worthy side goal to finding work. This use case is generic enough to serve the personas outlined in the first candidate use case.
- **Actors:**
 - **Human:** Job candidates and career and job search guidance professionals.
 - **Systems:** Career guidance, job boards, and resume/profile development systems, skill documentation systems, assessment systems, HRIS/HCM systems, training and development (e.g., LMS, LXP), work management, ATS/recruiting systems, analytics software.
- **Preconditions:**
 - Job candidates have access to career guidance, job search and resume development assistance including systems that can search for and analyze job opportunities and their requirements and compare them to job candidate skills as documented in resumes, documents, and/or Learning and Employment Records (LERs).
 - Job candidate has access to guidance and tools to develop, distribute and maintain resume/profile on social media sites, gig platforms, and job board resume banks for discovery by employers and recruiters.
 - Job candidates have access to digital credentialing and wallet software.
 - Candidate has resume using resume development guidance, templates and tools.

– **Job Candidate: Proposed Flow of Events: Resume/Profile Distribution and Search to Identify Job Opportunities for Application**

1. Candidate submits updated and machine-readable resume/profile to career and job search guidance providers for recommendations on job opportunities to apply (or from the last step of 2.1, their info is already in this system).
2. Candidate receives recommendations from job search and guidance systems on job opportunities to apply for or else prompts for more information.
3. Candidate distributes this info to social media sites, job sites (e.g., resume banks), gig work platforms, professional network sites, and other sites that match candidates to opportunities for discovery by employers and recruiters.
4. Candidate identifies job opportunities through their own search, recommendations from career and job search guidance providers, and employer and recruiter outreach.
5. Candidate decides on which opportunities to apply for and how to apply for these opportunities.
6. Using a digital wallet platform, candidate creates versions (“presentations”) of their resumes/profiles for each application that conveys their relevant qualifications while protecting privacy through selective and progressive disclosure.
7. Candidate submits the presentation and completes any additional application materials.
8. Candidate receives information about who accesses their submitted information and when (how many times) their materials are reviewed by potential employers.



Appendix A: Detailed Use Cases

– Post-Conditions/Success Criteria:

- **Time and Cost:** Reduced time and cost for identifying job opportunities that match career goals and verifiable skills.
 - › Number of days between submitting resume/profile to a passive candidate pool and getting a match.
 - › Total cost of identifying job opportunities.
- **Quality:** Increased potential fit between identified job opportunities and job candidate career objectives and verifiable skills.
 - › Percent of recommended job opportunities that match candidate career goals and variable skills (according to candidate, eg giving a thumbs up on a recommendation).
 - › Candidate satisfaction with job search process, particularly emotional affect.
 - › Candidate's assessed understanding of the job search process.
 - › Number of job search recommendations provided to candidates.
- **Equity:** Job candidates from underrepresented groups have equal success in identifying job opportunities for which they are qualified based on skill requirements.
 - › All of the above metrics broken out by group.
 - › Percent of recommendations that are given to equally qualified candidates who are members of underrepresented groups and those who are not from these groups (i.e., do job candidates get the same treatment in recommendations).
 - › Overall job opportunity rating (e.g., levels of responsibility, compensation) of recommendations provided to candidates from underrepresented groups compared to all job candidates.

– Points of Failure (for detail see Appendix B):

- **Skill Frameworks:** Limited Access to and Use of High Quality and Dynamic Open Competency and Skill Frameworks.
- **Structured Data:** Lack of Machine-Readable Structured Data Including Skills Data.
- **Skill Descriptions:** Skill Descriptions are Inadequate and Need Formats.
- **Algorithms:** Limited Development and Use of Translation and Analysis Algorithms.
- **Interoperability:** Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics.
- **Candidate Capacity:** Limited Capacity of Job Candidates and Guidance Services and Systems.



APPLICATION, SCREENING, SELECTION, AND DEVELOPMENT

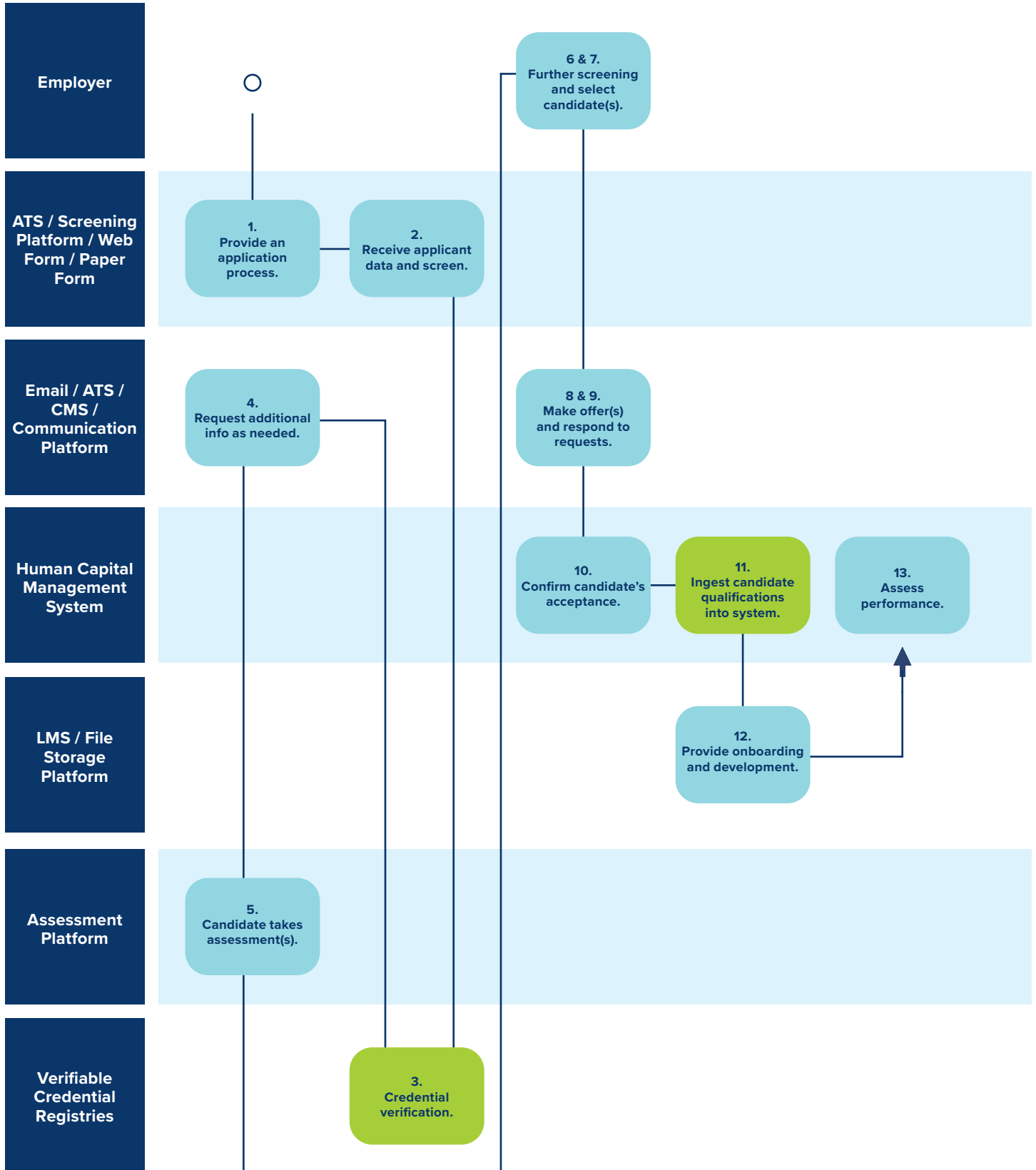
1.3 Employer Screens, Selects, and Develops Candidate

Detailed Use Case 1.3

- **Goal of the Primary Actor: Employer.** Successfully screen, onboard, and develop a sufficient number and diversity of job applicants to meet projected workforce needs and achieve organizational goals including DEI goals. This use case is generic enough to serve the personas outlined in the first employer use case.
 - **Actors:**
 - **Human:** Employers, HR professionals, and HR service providers, hereafter referred to as “Employers”.
 - **Systems:** Strategic workforce planning systems, HRIS/ HCM systems, training and development (e.g., LMS, LXP), work management, ATS/recruiting systems, analytics software, skills frameworks.
 - **Preconditions:**
 - Employers have access to applicant tracking systems that can effectively capture data on applicants including skills data and compare to job opportunity requirements.
 - Employers have access to valid and reliable assessment systems including structured interview systems to effectively screen applicants and assess those completing onboarding and development without bias.
 - **Flow of Events: Application Processing to Screening, Assessment, Selection and Onboarding and Development to Successful Job Performance**
 1. Employer provides an application process that may include application forms, the uploading of applicant resumes, and other application materials, including a space for any LERs, digital credentials, and/or presentations.
 2. Employer processes and organizes applicant data for comparing to job requirements, possibly including AI-based prescreening. The prescreening process uses intelligent skill matching which goes beyond string matching. It also is able to recognize alternative credentials. Rejected applicants are informed promptly.
 3. Employer verifies verifiable credentials.
 4. Employer requests additional information as needed to complete application process.
 5. Employer requests a skills and/or behavioral assessment of qualified applicants and interviews.
 6. Employer conducts additional screening such as interviews.
 7. Employer selects one or more candidates to proceed.
 8. Employer makes offer(s).
 9. Employer responds to request for further information from chosen applicants (e.g., salary ranges).
 10. Confirm candidate’s acceptance.
 11. Employer ingests this hire’s skills into internal skills/ qualifications database (may be part of human capital management system).
 12. Employer provides onboarding and development. Recommendation algorithms can use their skills data to recommend content.
 13. Employer assesses whether selected applicants are successfully performing their jobs.

Appendix A: Detailed Use Cases

1.3 Employer Screens, Selects, and Develops Candidate



- **Post-Conditions/Success Criteria:** Job applicants are successfully screened and selected within time frames needed by both employer and job applicant and selected applicants are successfully onboarded and developed for successful job performance within expected time frames.
- **Time and Cost:** Reduced time and cost for screening, selecting, on-boarding and developing selected candidates
 - › Number of days between application and successful job performance (time to full productivity).
 - › Total cost of applicant screening, selection, on-boarding and development to successful job performance.
- **Quality:** Increase in the percentage of selected applicants who successfully complete onboarding and development and successfully perform jobs.
 - › Percent of selected applicants who successfully complete onboarding and development based on assessment results.
 - › Percent of selected applicants who have achieved successful job performance based on performance management systems.
 - › Percent of identified job opportunities where a job candidate applies for and is determined to be a qualified candidate for further screening for acceptance.
- **Equity:** Outreach and recruiting results in achieving DEI related goals for underrepresented groups in critical jobs.
 - › Percent of selected applicants from underrepresented groups who successfully complete onboarding and development based on assessment results.
 - › Percent of selected applicants from underrepresented groups who have achieved successful job performance based on performance management systems.
- **Points of Failure (for detail see Appendix B):**
 - **Assessments:** Lack of Reliable, Valid, and Aligned Assessments for Evaluation and Feedback.
 - **Structured Data:** Lack of Machine-Readable Structured Data Including Skills Data.
 - **Skill Descriptions:** Skill Descriptions are Inadequate and Need Formats.
 - **Algorithms:** Limited Development and Use of Translation and Analysis Algorithms. **Interoperability:** Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics.
 - **Employer Capacity:** Limited Employer Leadership Commitment and HR Process Design and Management.



Appendix A: Detailed Use Cases

2.3 Candidate Participates in Employer Screening, Selection, and Development

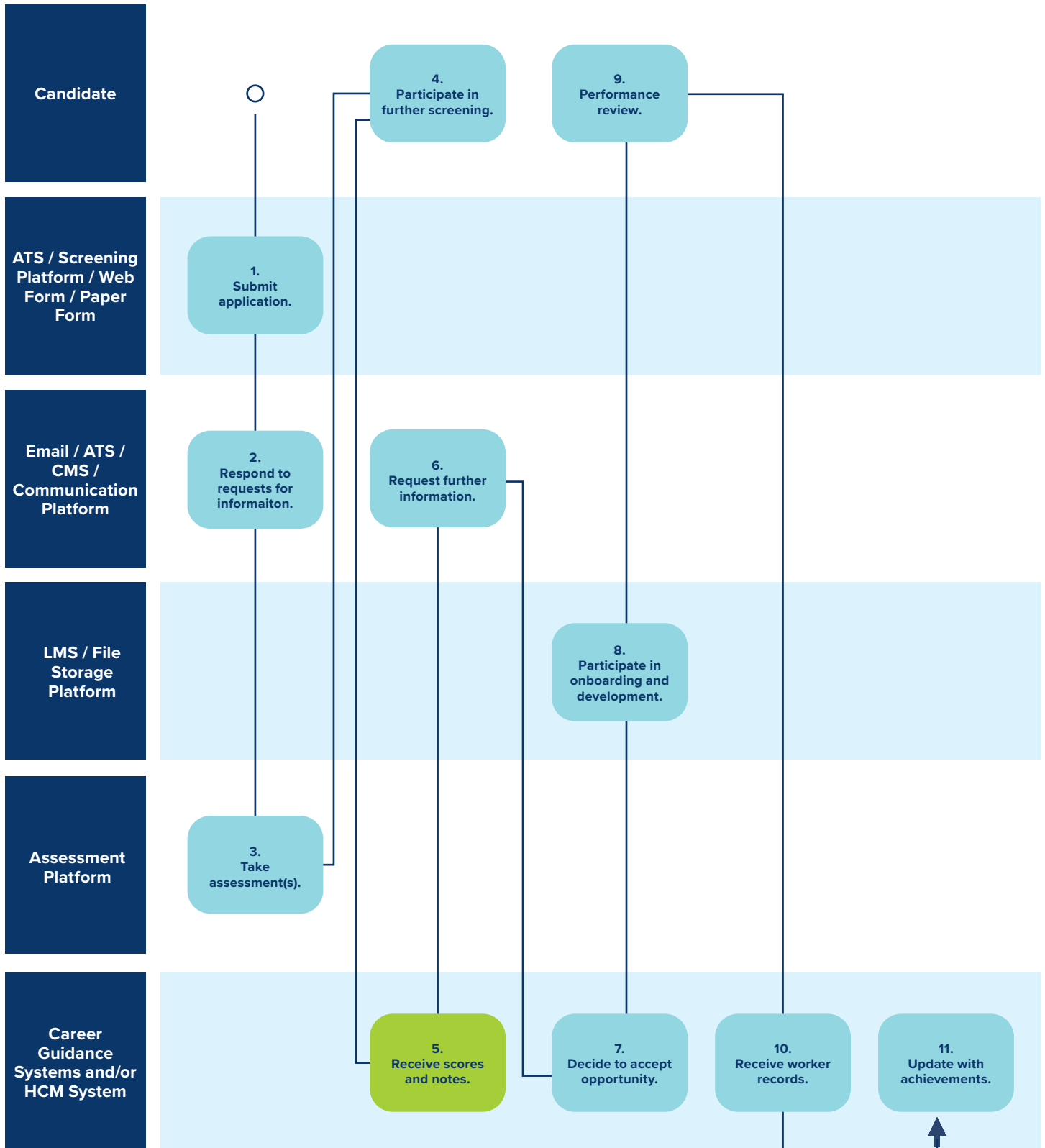
Detailed Use Case 2.3

- **Goal of the Primary Actor: Employer.** Successfully complete screening to be selected for a job opportunity and successfully complete onboarding and development for successful job performance. This use case is generic enough to serve the personas in the first candidate use case.
 - **Actors:**
 - **Human:** Job candidates and career and job search guidance professionals.
 - **Systems:** Career guidance and resume/profile development systems.
 - **Preconditions:**
 - Job candidates have access to access to career management and resume systems for planning and managing career and job transitions.
 - Candidates have chosen one or more opportunities to apply to.
 - **Flow of Events: Application Processing to Screening, Assessment, Selection and Onboarding and Development to Successful Job Performance**
 1. Candidate submits application for priority job opportunities including completing application forms and submitting resumes and other required materials using wallets.
 2. Candidate responds to requests for more information to complete application.
 3. Candidate participates in further screening including assessments and interviews.
 4. Participate in further screening.
 5. Candidate receives receipt of assessment scores and notes which they can add to their wallet if they so choose. Employer chooses a subset of these to share as feasible.
 6. Candidate requests further information if offered a job opportunity.
 7. Candidate makes decisions on which job opportunities to accept with the assistance of a coach or counselor.

8. Candidate, who is now a worker, participates in and completes onboarding and development and takes employer assessments of skills required for job performance.
9. Worker completes a performance review for determining successful job performance.
10. Worker receives a record or records about their employment which contains skill information that they can use and share with others, ideally as verifiable credentials.
11. Worker and employer update internal and external-facing records to reflect changing job roles and skills.



2.3 Candidate Participates in Employer Screening, Selection, and Development



Appendix A: Detailed Use Cases

– Post-Conditions/Success Criteria:

- **Time and Cost:** Reduced time and cost for applying for job opportunities and participating in screening and development.
 - › Amount of time needed to apply to a given job opportunity.
 - › Number and percent of applications in which basic application data on a resume (e.g. name, contact information) must be reentered in job application process.
 - › Amount of time in screening before job opportunity offer.
 - › Amount of time from job offer to completion of onboarding to start development and work.
 - › Amount of time in development to successful job performance.
- **Quality:**
 - › Percent of job applicants satisfied with application process and willing to recommend the application process to others.
 - › Percent of job applicants who are hired and are successful in their job performance.
 - › Percent of individuals that become proactive (as defined by taking actions in a system) in career management activities as a result of the process.
 - › Percent of individuals that seek advancement.
- **Equity:**
 - › All of the above metrics compared over groups.
- **Points of Failure (for detail see Appendix B):**
 - Same points of failure as 1.3.



EVALUATION AND IMPROVEMENT

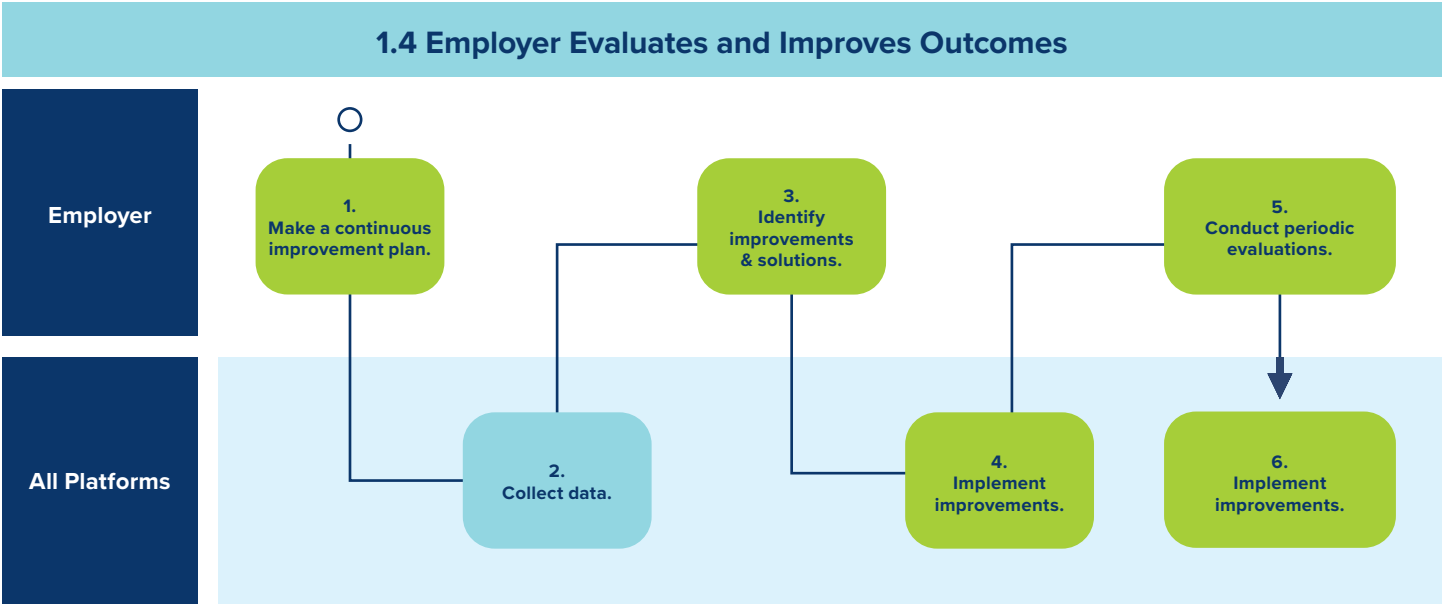
1.4 Employer Evaluates and Improves Outcomes

Detailed Use Case 1.4

- **Goal of the Primary Actor: Employer.** Determine if the implemented strategies were successful and make recommendations for improvement. This use case is generic enough to serve the personas in the first employer use case.
 - **Actors:**
 - **Human:** Employers, HR professionals, and HR service providers, including data analytics, continuous improvement and risk management providers hereafter referred to as “Employers”.
 - **Systems:** Strategic workforce planning systems and data analytics systems that collect and analyze data from multiple systems.
 - **Preconditions:**
 - Employers have strategic workforce planning systems and data analytics systems that collect and analyze data from multiple systems for managing the performance of the entire process.
 - Employers have the capacity to conduct continuous improvement and risk management based on proven frameworks and systems.

– Flow of Events:

1. Employer develops plans for evaluating and improving the process based on goals, objectives, and metrics for each stage of the process and a chosen continuous improvement and risk management framework.
2. Employer collects data at each stage of the process and provide performance data and analytics to those responsible for managing each stage.
3. Employer uses the data to identify improvement opportunities, identify potential causes of failures and develop solutions for testing and implementation.
4. Employer implements these improvements and solutions.
5. Employer conducts a periodic outcome evaluation of the end-to-end process to determine whether they were cost-effective in getting the right number and diversity of job applicants to successful job performance and implications for improving the process.
6. Employer tests and implements improvements resulting in better performance on key metrics including the outcome of successful job performance.



Appendix A: Detailed Use Cases

– Post-Conditions/Success Criteria:

- Time and Cost:

- › Number of days required to provide data and analytics to those responsible for managing each stage of the process.
- › Total costs to provide data and analytics to those responsible for managing each stage of the process.

- Quality:

- › Satisfaction of those responsible for managing each stage of the process in the quality and timeliness of data and analytics provided.
- › Percent of performance problems on key metrics that were successfully analyzed resulting in evidence-based solutions for testing and implementation that resulted in performance improvements.
- › Associations between individual skills and employee performance.
- › Degree of fit between high-performing skills and hiring requirements.
- › Frequency of evaluation cycles.

- Equity:

- › Percent of performance problems on key metrics related to DEI goals that were successfully analyzed resulting in evidence-based solutions for testing and implementation that resulted in performance improvements.

– Points of Failure (for detail see Appendix B):

- All of the above use case points of failure, especially Interoperability.

2.4 Candidate Evaluates and Improves Outcomes

Detailed Use Case 2.4

- **Goal of the Primary Actor: Job Candidate.** If unsuccessful in their search, to review any feedback and receive more guidance on what to change. If successful, to learn more about what worked and what didn't for the next possible opportunity search. This use case is generic enough to serve the personas in the first candidate use case.

– Actors:

- **Human:** Job candidates and career and job search guidance professionals, education, training and credentialing professionals. Wraparound services like
- **Systems:** Strategic workforce planning systems, HRIS/HCM systems, training and development (e.g., LMS, LXP), work management, ATS/recruiting systems, analytics software, skills frameworks.

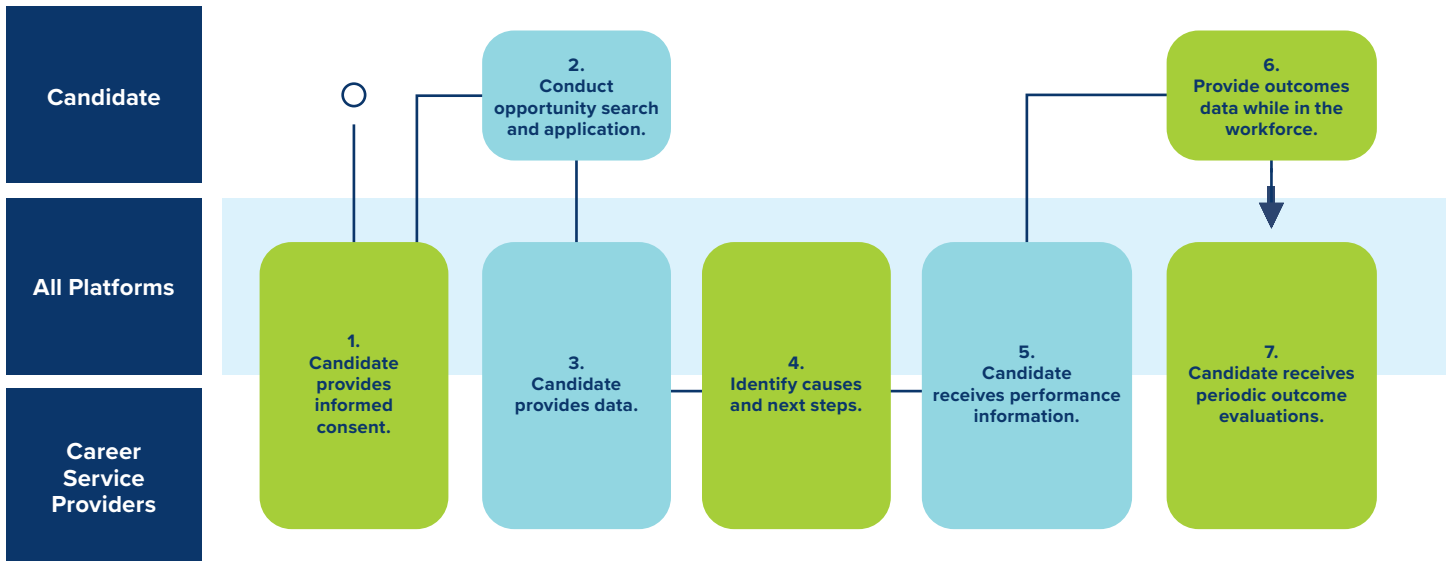
– Preconditions:

- Job candidates have access to career guidance and resume development assistance including systems that can share and analyze data for improving performance.

– Flow of Events:

1. Candidate provides informed consent to career and job search guidance to collect and analyze data for improving performance in reaching career goals.
2. Candidate conducts job/opportunity search and application processes.
3. Candidate provides data at each stage of the process including performance and outcomes data to the platforms and service providers for the approved uses.
4. Candidate receives information on the process and results of their job application or advancement opportunities to assess their success.
5. Candidate works with their platforms and service providers to use the information to identify potential causes of failures and success and identify actionable next steps.
6. If an opportunity is selected, candidate continues to share information about their outcomes in the workforce, and may be incentivized to do so.
7. Candidates who choose to continue to receive support can obtain more comprehensive outcome evaluations of the end-to-end process to determine whether their actions are effective in achieving their career goals and implications for improving the process.

2.4 Candidate Evaluates and Improves Outcomes



– **Post-Conditions/Success Criteria:**

- **Time and Cost:**

- › Frequency of insights provided to the job candidate and those responsible for managing each stage of the process.
- › Total costs to provide data and analytics to the candidate and those responsible for managing each stage of the process.

- **Quality:**

- › Satisfaction of job candidates and those responsible for managing each stage of the process in the quality and timeliness of data and analytics provided.
- › Percent of performance problems on key metrics that were successfully analyzed resulting in evidence-based solutions for testing and implementation.
- › Frequency of self-reported or coach-reported actions taken in response to analytics insights.
- › Frequency of self- or coach-reported performance improvements.
- › % of job candidates that demonstrate a proactive and quality engagement in career progression.
- › % of job candidates that have more meaningful work opportunities and additional earnings as measured by labor and wage data showing increases after the job seeking process.

- › A sample of candidates could be assessed on their understanding of and confidence in navigating the career marketplace to measure improvements.

- **Equity:**

- › Percent of performance problems on key metrics related to job candidate career goals those from underrepresented groups compared to all job candidates that were successfully analyzed resulting in evidence-based solutions for testing and implementation that resulted in performance improvements.
- › Disaggregated info based upon “underrepresented” communities of focus to determine gaps for specific groups regarding performance advancement and if there is bias introduced into the hiring/mobility process.
- › Improvements to aggregate candidate performance against key barriers like willingness to engage with digital tools, access to digital tools, obtaining childcare and transportation, etc.

– **Points of Failure**

- All of the above use case points of failure, especially Interoperability.

Appendix B: Points Of Failure Detail

POINT OF FAILURE	USE CASE EVENT	POTENTIAL SOLUTIONS	POTENTIAL SOLUTION PROVIDERS
A. Limited Access to and Use of High Quality Job Benchmark Data	1.1.1 1.1.2 1.2.1 2.1.9 2.2.2	<p>Promote open access to structured data on jobs and job openings as well as related industry data, including:</p> <ul style="list-style-type: none"> • Open job and job posting repositories • Guidance on using job benchmark data • Incentives to contribute structured data 	JWDN Technical Workgroup, DTSN, NASWA, NLx, JEDx/JDX, HROpen, Government Agencies
B. Limited Access to and Use of High Quality and Dynamic Open Competency and Skill Frameworks	1.1.5 1.1.6 1.1.7 2.1.2 2.1.8 2.2.2 Use cases 2.3 and 2.4 (the evaluation use cases)	<p>Create tools for search and discovery for relevant competency and skill frameworks available through open networks, which at least:</p> <ul style="list-style-type: none"> • Enable skills discovery • Enable skills publishing and licensing • Include guidance on using, and creating skill and competency frameworks • Provide incentives and guidance on publishing open frameworks • Encourage updating and validating the frameworks to match demand 	OCFC, OSN, professional and industry-based organizations, open licensing providers, management consulting, government agencies, system vendors
C. Lack of Machine-Readable Structured Data Including Skills Data	All use case events	<p>Promote the development and use of standards in creating machine-readable job descriptions/postings, resumes, LERs, and education/training program descriptions</p>	LERN, DTSN, JWDN, standards organizations, HR Open Standards Consortium

POINT OF FAILURE	USE CASE EVENT	POTENTIAL SOLUTIONS	POTENTIAL SOLUTION PROVIDERS
<p>D. Inadequate Skill Descriptions</p>	<p>Same events as Failure Point B</p>	<p>Steps to get there minimally include:</p> <ul style="list-style-type: none"> • Developing and promoting guidance and standards for the writing and validation of skill descriptions in frameworks, job descriptions, resumes, LERs, education/ training programs, including: • Link to hosted skills definitions • Develop metadata to signal employer verification of competencies • Standard levels of requirement (e.g. weighting/priority) • Performance criteria and rubrics • Create guidance/professional standards on developing and writing competency descriptions, ideally including levels of requirement and granularity • Promote an open marketplace for tools and systems that support the standards • Professional organizations, industry organizations, employers, and government agencies increase the quality of their skill descriptions in skills frameworks 	<p>OCFC, OSN, JWDM, DTSN, standards organizations, IEEE Defining Competencies</p>
<p>E. Limited Development and Use of Translation and Analysis Algorithms</p>	<p>1.1.2 1.1.3 1.1.4 1.1.5 1.1.7 1.1.8 1.1.11 1.1.14 2.1.2 2.1.8 1.2.3 1.2.4 2.2.2 2.2.6 1.3.2 1.3.4 1.3.6 1.3.11 1.3.12 2.3.10 1.4.3 1.4.5 2.4.4 2.4.7</p>	<p>Improve algorithm development and use for skills translation and analysis, particularly for the determination of matches between employer requirements and candidate skills, and related applications. Areas of focus include:</p> <ul style="list-style-type: none"> • AI ethics and transparency in this area • Facilitate and incentivize labeled data collection • Develop algorithmic translation and analysis • Provide guidance around features of skills analysis and translation solutions • Integrate skills tracking into performance management • Develop standards • Encourage the use of standards • Developing user-facing tools 	<p>OCFC and DTSN in cooperation with other T3 Networks, SHRM, ATD, standards bodies</p>

Appendix B: Points Of Failure Detail

POINT OF FAILURE	USE CASE EVENT	POTENTIAL SOLUTIONS	POTENTIAL SOLUTION PROVIDERS
<p>F. Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics</p>	<p>All events</p>	<p>Promote alignment and use of standards for job descriptions/postings, resumes, LERs, and education/training program descriptions.</p> <p>Promote data sharing for improving feedback cycles for employers and candidates and advanced data analytics while protecting privacy. Example topics include:</p> <ul style="list-style-type: none"> • API interoperability • Verify data integrity between systems, particularly LERs and employee records • Career guidance and resume development systems • Developing standards • Data collaboration/sharing agreements • Candidate incentives to provide feedback • Outcomes data feeds into algorithms • Mapping between standards 	<p>LER, JWD, and DTS Networks, Standards Organizations, tools for mapping/crosswalking like the DESM tool from the OCFC Network</p>
<p>G. Lack of Reliable, Valid, and Aligned Assessments for Evaluation and Feedback</p>	<p>1.3.5 2.3.3 2.3.5</p>	<p>Improve the validity, reliability and alignment of assessments and how they may be better used for evaluation and feedback for employers and job candidates. Some considerations include:</p> <ul style="list-style-type: none"> • Assessment alignment to skills and frameworks • Bias-controlled assessments • Assessment scalability • Assessments are available for soft and hard skills 	<p>Professional testing associations, HR Open Assessment Workgroup</p>

POINT OF FAILURE	USE CASE EVENT	POTENTIAL SOLUTIONS	POTENTIAL SOLUTION PROVIDERS
H. Limited Employer Leadership Commitment and HR Process Design and Management	All events in employer use cases	<p>Provide guidance and promote leading employer practices in skills-based hiring and advancement, including as possible topics:</p> <ul style="list-style-type: none"> • Marketing/branding relationship to hiring requirements • Requirements traceability • Top leadership commitment • Change management support 	Business associations, SHRM, ATD, design firms
I. Limited Capacity of Job Candidates and Guidance Services and Systems	All events in candidate use cases	<p>Promote leading practices in career guidance services and systems and build the capacity of job candidates to utilize them.</p> <ul style="list-style-type: none"> • Scaling informed consent • Application spam prevention • Teach records digital literacy • High levels of accessibility • Career navigation guidance systems 	Digital and data literacy training providers, design firms, equity consultants, Education Design Lab, Digital Promise, career guidance systems

LEGEND	
<p>JWDN: T3 Jobs and Workforce Data Network</p> <p>DTSN: T3 Data and Technology Standards Network</p> <p>OCFC: T3 Open Competency Framework Collaborative</p> <p>LERN: T3 Learning and Employment Record Network</p> <p>JEDx/JDX: T3 Jobs Data Exchange</p> <p>OSN: Open Skills Network</p>	<p>NASWA: National Association State Workforce Agencies</p> <p>NLx: National Labor Exchange</p> <p>SHRM: Society for Human Resource Management</p> <p>USCCF: U.S. Chamber of Commerce Foundation</p> <p>HRIS: Human Resources Information System</p> <p>ATS: Applicant Tracking System</p>

Appendix C: Points of Failure Descriptions

These descriptions augment the names given for the points of failure by providing examples of ways the point of failure can appear. Many of the following points of failure represent challenges both to creating infrastructure on the employers' side through content for job descriptions and also on the side of career guidance and resume/profile builder software which needs infrastructure to make suggestions and matches.

A. Limited Access to and Use of High Quality Job Benchmark Data

- **Access:** Many employers make hiring decisions without the aid of high quality and current benchmark data on jobs and job postings. Job benchmark data is limited to the accuracy of its source material. Traditional ways of creating this data are static, rigid, and often unvalidated. Preference should be given to dynamic, responsive data sources that cluster related roles.
- **Use:** Employers must effectively utilize jobs and industry data by applying it strategically to elucidate their hiring requirements. For example, identifying common and comparable skills for their most critical jobs.

B. Limited Access to and Use of High Quality and Dynamic Open Skill and Competency Frameworks

- **Access:** Employers and professional organizations rarely maintain skill requirements as machine-readable, structured data that can be easily transferred and processed across systems, which makes a dearth of this data for reuse. The data that does exist may be poorly validated or not well representative of real skill needs.
- **Employer use:** There is risk of choosing the wrong framework for a job or misinterpreting the information in a framework - such as by including all the skills from a framework when only some apply. Employers should also understand the metadata available to avoid underuse of the resources.
- **Candidate use:** Competency and skill frameworks can be used by candidates to tag their profiles with skills but this will require online hosted skills and software that helps suggest them to users to optimize fit with that candidate's actual skills.

C. Lack of Machine-Readable Structured Data Including Skills Data

- **Most workforce data is unstructured:** In addition to skill and competency frameworks and job descriptions, the more that is structured in the workforce space, the better the analyses can be. Employers do not store job and related skill requirements as structured data that can be easily transferred and analyzed across systems, including skills data. Even internal data sharing is inhibited, preventing use for learning and development needs, resourcing, capacity, etc.
- **Inadequate data entry:** We are extremely likely to see data get stuck as unstructured descriptions within structured files. Even when structured data fields are available, there is a temptation to dump a whole document into a "description" field and leave the other fields blank. This saves time but produces data that is technically structured but most of the value is still locked in text and inaccessible.

D. Inadequate Skill Descriptions

- **Skill proficiency levels:** How to deal with advanced vs beginner levels of the same skill has not yet been standardized or organized into best practices, yet it is a crucial distinction. While proficiency level and criteria could be stored as part of a particular skill's defining metadata, it would also be possible to store proficiency levels and/or criteria separately and combine them when they are needed (e.g., take a list of skills and a list of levels and produce "Advanced Sales".) This may be faster to implement but ultimately less robust than storing leveled skills with criteria (Advanced Sales and Beginning Sales are stored as individual skills).
- **Levels of requirement:** Making a clear distinction between pre-hire, post-hire, required, or preferred requirements is critical in determining fit, and yet lacks usage guidance. This causes interpretation differences that confounds many candidates' ability to determine their own fit. Likely deriving from a "must have analysis" and should distinguish what is trainable vs not trainable after hire.
- **Skill description statements are not useful:** The description of a skill lacks standardization. Many different standards could be used to write these descriptions. Being able to use a standard enhances interpretability and reusability. This can help prevent skills which are over specific to a single role or actor or too vague.

E. Limited Development and Use of Translation and Analysis Algorithms

- **Hard to compare skills data in candidate information with opportunities with education:** Often represented as a broken triangle of communication between employers, job candidates, and education providers, this key problem is an inability to accurately compare and translate skills data from job requirements and resumes of job candidates to determine potential match.
- **Skill analysis options are not well socialized or understood:** Most employers are not aware that there are vendors with algorithmic solutions to analyze and compare skills (e.g., determine two differently-worded skills as equivalent, similar, narrower, or prerequisite) or that their HRIS or ATS has features for this.
- **Not enough labeled data for skills analysis algorithms:** Humans will need to produce enough labeled data for algorithms to make accurate classifications for each purpose.
- **Ethical concerns with AI and personally identifiable information (PII):** “Garbage in, garbage out” applies to all algorithms. If the data used to train the algorithms contains bias, the results will contain bias. We have a responsibility to ensure the representation of minorities in training data. The current state of data privacy is not sufficiently empowering and protective of users. Employers need better guidance on how to develop better policies and practices for more transparent analytics including AI applications and the management and use of PII.
- **Inadequate career guidance and resume development systems:** While these exist at the state, national, education provider, and tech vendors levels, few are truly end to end in connecting career goals to education to jobs using more robust data than linkage by occupation and education program codes.
- **Algorithms are underdeveloped:** Existing matching and recommendation algorithms based on skills, employer, and candidate data are still young and untested. They are not yet relying enough on context. The basic application of string matching widely used in ATS to screen resumes is an example of an extremely primitive algorithm that is so blunt and context-free that it has a high rate of error in picking the right candidates and enforces biases that create unnecessary and harmful barriers to work.

- **Algorithms are proprietary and opaque:** Given the cost and complexity of development, currently private operators are creating algorithms as parts of larger software packages. They often run on proprietary data and are not transparent. They need to become more open and trustworthy.
- **Career guidance systems are too simplistic:** Systems in the future should allow the combination of areas of focus (e.g., technology and visual design), and provide more useful recommendations.

F. Lack of Data Interoperability and Sharing for More Effective Feedback and Advanced Data Analytics

- **Data sharing is complicated and intimidating:** Sharing data between organizations is costly and slow because agreements are required to specify the limitations on use of the data by the parties. These documents are not agile and often require legal review, hampering dynamic exploration. The fear of data leak prevents collaboration necessary to unlock valuable information for users.
- **Interoperability disincentives:** The use of systems that prevent easy portability of an employee’s own skills data hinders employee mobility and decreases the function of the entire ecosystem. Many systems create a closed, proprietary network that inhibits portability and customer system choice (vendor lock). This includes HRIS systems and wallet and LER record systems.
- **Data or context loss between systems:** Even for interoperable data, sharing a job posting from an internal system to a social media marketing platform is likely to reformat, omit, reorganize, and otherwise alter the data. This can also happen to a career profile as it is shared to an employer-candidate marketplace or to an employer.
- **Attribution and reuse of skills data is underdeveloped:** Work is needed to determine how skills definitions which are licensed as open for commercial use can be reused verbatim without duplication or in derivative forms while maintaining attribution. Licensing standards and intellectual property law are a starting point.
- **LER Systems, ATS/recruiting, HRIS/HCM, work management, job boards, LMS/CMS, and SIS systems are not open or interoperable:** Lacking standardization, cross-walking/mapping, APIs, and protocols, moving information between these systems is often prohibitively difficult.

Appendix C: Points of Failure Descriptions

- **Data sharing progresses while leaving out candidates:** Candidate needs and interests are not sufficiently considered in data sharing between organizations and systems. Perceived liability issues with sharing data to candidates will also be a concern. As organizations and systems improve intra- and inter organizational data sharing, getting information to the candidates who need it to take a more active and informed role is lagging.
- **Career guidance systems don't contain enough opportunities:** These systems need to have enough content in training and opportunities to make them useful for jobseekers.
- **Lack of feedback for users:** Employer, search, and guidance systems do not have the timely and useful feedback cycles for those managing and improving at each stage of the process, including candidates.
- **Algorithms do not get feedback on recommendation success:** Longer-term outcomes, like whether an opportunity recommendation was ultimately a good match for a candidate, are distanced from the recommendation and therefore less likely to be fed back into the algorithm to improve results.
- **Cold start problems:** A recommendation engine improves with feedback, so if due to a lack of users, initial recommendations are not adequately accurate, a system may be underused or abandoned before it can get into the swing of things.

G. Lack of Reliable, Valid, and Aligned Assessments for Evaluation and Feedback

- **Lack of assessments:** Employers do not have sufficient access to valid and reliable skills-based assessment systems that are predictive of future job performance.
- **Alignment of pre-hire screening and LER assessments:** Employer assessments and assessments used in issuing LERs may not be sufficiently aligned.

H. Limited Employer Leadership Commitment and HR Process Design and Management

- **Management and employee engagement and buy-in:** Staff across HR, IT, and management will be challenged to fundamentally rethink hiring, talent, and performance processes, and change behaviors to implement and improve hiring and advancement processes based on leading practices.
- **Applicant selection process is not updated:** Even if the recruiting and screening processes are updated, a selection process that does not change to skills-based methods will not achieve desired outcomes by effectively using the same constraints on a more diverse pool. For example, structured, skills-based interview questions are needed that focus less on credentials and more on skills. Valid and reliable assessments must be implemented.
- **Cross-departmental collaboration:** Many organizations will find this process pushes them into challenging but rewarding cross-departmental collaboration that was not necessary before.
- **Commitment to validating critical skill requirements:** Determining critical skills with reliable validation processes takes time and resources and is difficult to maintain because the payoff comes later in the hiring process and in later cohorts of hiring. Validation can include setting up analyses to see which skills high-performing employees have and funneling those into the hiring requirements on an ongoing basis. Tools for this process are currently available.
- **Company branding concerns and accurate representation of requirements:** Job postings are double duty instruments - they advertise a post and represent the company's brand as well as provide the necessary information on hiring requirements including skills requirements. This dual function may impede employers from focusing sufficient attention on listing right-sized list of requirements including detailed skill requirements.
- **Integrating processes:** Many employers do not manage skills-based hiring and advancement as an integrated process with strong connections between each stage and a clear focus on a balanced set of bottom-line outcomes.
- **Limited data use capacity:** Stakeholders do not have the capacity to collect and manage performance data and share data across systems to conduct evaluation and continuous improvement and risk management.

- **Time and resource commitment is overwhelming:** The full implementation of these use cases is demanding. Stakeholders may be struck by the costs even if they are persuaded by the benefits and choose to not fully implement or opt out.
- **Job descriptions become overloaded with skills:** The parallel to resume keyword stuffing, this is employer job description stuffing. Over time, requirements get added like rings on a tree. If employers add skills into their job descriptions without careful job analysis and validation, it may effectively increase the requirements for positions, impede candidates from applying, and confuse later analytics. The process of determining critical requirements is arduous but sets up the rest of the hiring and advancement process for success.

I. Limited Capacity of Job Candidates and Guidance Services and Systems

- **Volume increase without quality of fit increase:** Automated application systems have the potential to vastly increase the number of jobs an applicant can apply for AND the number of applicants an employer can process. It is likely some stopgap will be desired to reduce the resources needed by employers to screen applicants.
- **Inequitable candidate adoption of digital record technology:** To prevent only the most savvy users from owning and successfully using new technologies, strong adoption strategies are needed. This can result from lack of access to broadband, digital tools, or devices to lack of digital and data literacy. Social networks play a role in adoption behavior and perceptions of technology. Lack of access to an institution providing the tech will be a major barrier.
- **Candidate under-education and/or poor design leads to data exposure:** There is a need to prevent candidates' personal information from being inappropriately shared or leaked at the same time without the use of unwieldy authorization processes to beleaguer the user.
- **Undermarketing and/or poor design leads to underuse:** Possibly in conjunction with inequitable adoption, product or marketing issues may cause lower than desired uptake of digital record technology. User needs must be met to increase adoption. For example, a study found users are concerned that managing their own records exposes them to liability for mistakes in handling that was previously the liability of administrators.

- **Candidates reject digital record technology over privacy concerns:** Trust is lacking in several layers: the technologies are new, their implementation by institutions is new, and there is an underlying crack in trust with institutions and technology providers around ethical data use, without the new standards and technologies discussed in this report. Some users may be concerned that they will have less privacy and be exposed to more inappropriate uses of their data.
- **Candidate resume keyword stuffing:** Candidates already are encouraged to pull keywords from the job posting into their resumes to get through ATS systems. If employers use skills-based hiring to increase the list of screener words without better descriptions of skill requirements and skills analysis of resumes then they may contribute to the resume stuffing issue even more, which may decrease the accuracy of candidate resumes and profiles.
- **Candidates' experiences may count against them:** Candidates include work experience and education in order to include relevant skills learned, but employers may rate the candidate more negatively than they would have if the candidate had left out those experiences, due to the employer's negative perception of the work experience or education provider.
- **Perpetuating existing or adding new unintended biases:** Some technologies end up baking in existing stereotypes or biases from the data they have been given. Technology needs to be tested for its results and effects on users.
- **Additional job search and application complexity:** Adding layers and hoops to searching for and applying for work, while intended to make it easier, can just as easily make it overwhelming, intimidating, and inaccessible. In fact, it probably will to start with for many candidates, because the barriers to making it work for the user are extremely high. We need robust mitigation strategies from the start.
- **Guidance and job search systems for candidates need to be easy to use:** Guidance and job search systems, whether consisting of multiple systems connected by APIs or single end-to-end systems, must have Turbo-Tax or Apple-device levels of ease of use to not create more barriers than they tear down.

