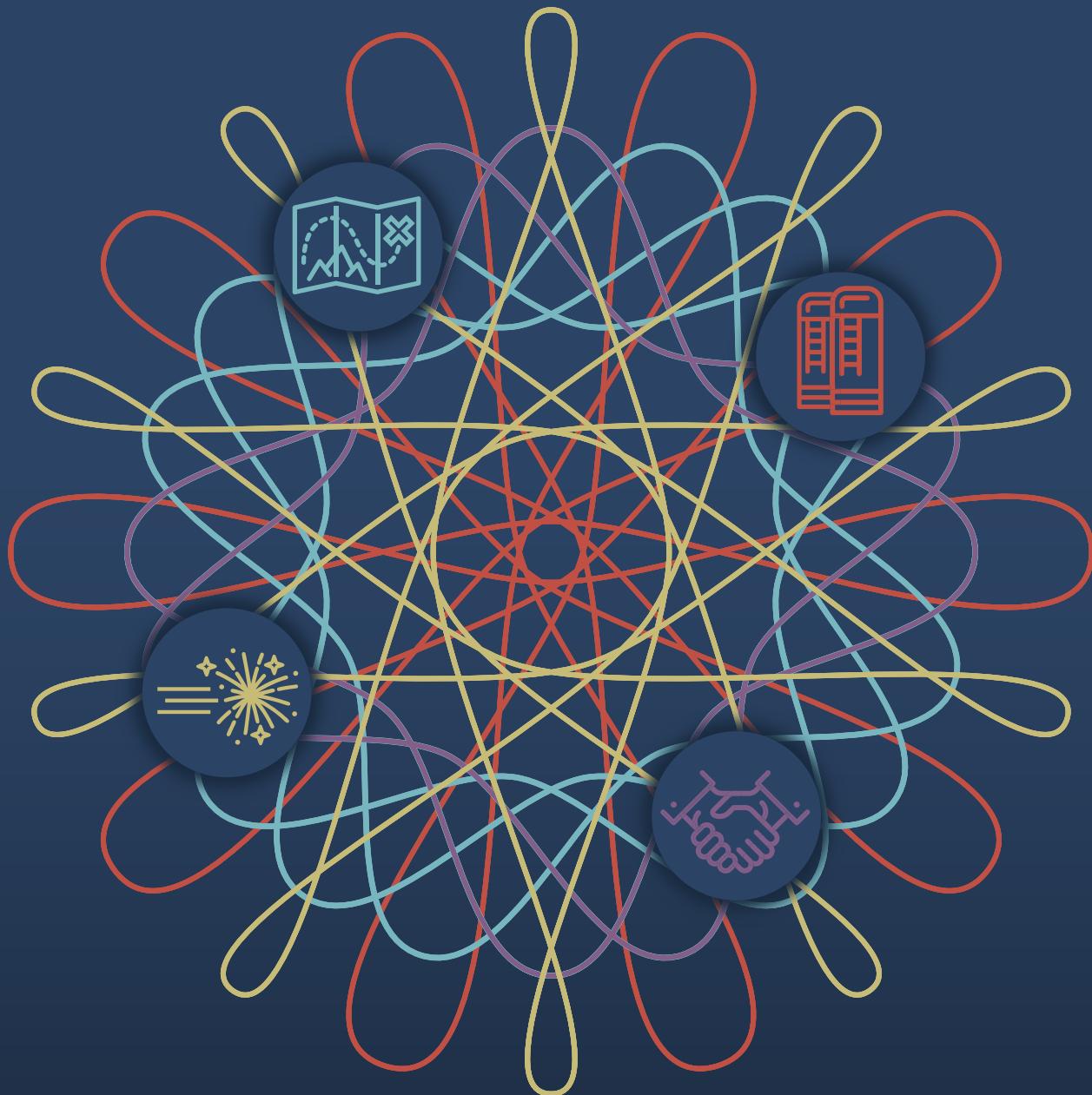


The Essential Guide to Digital Credential Interoperability

FROM PAPER TRAILS TO OPPORTUNITY PATHWAYS



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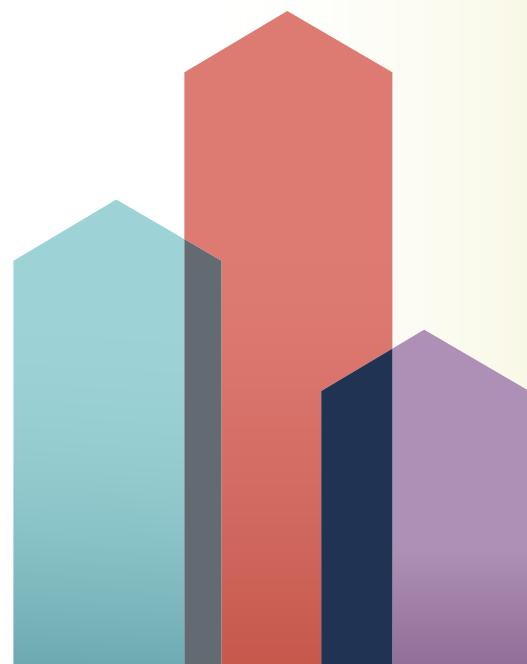


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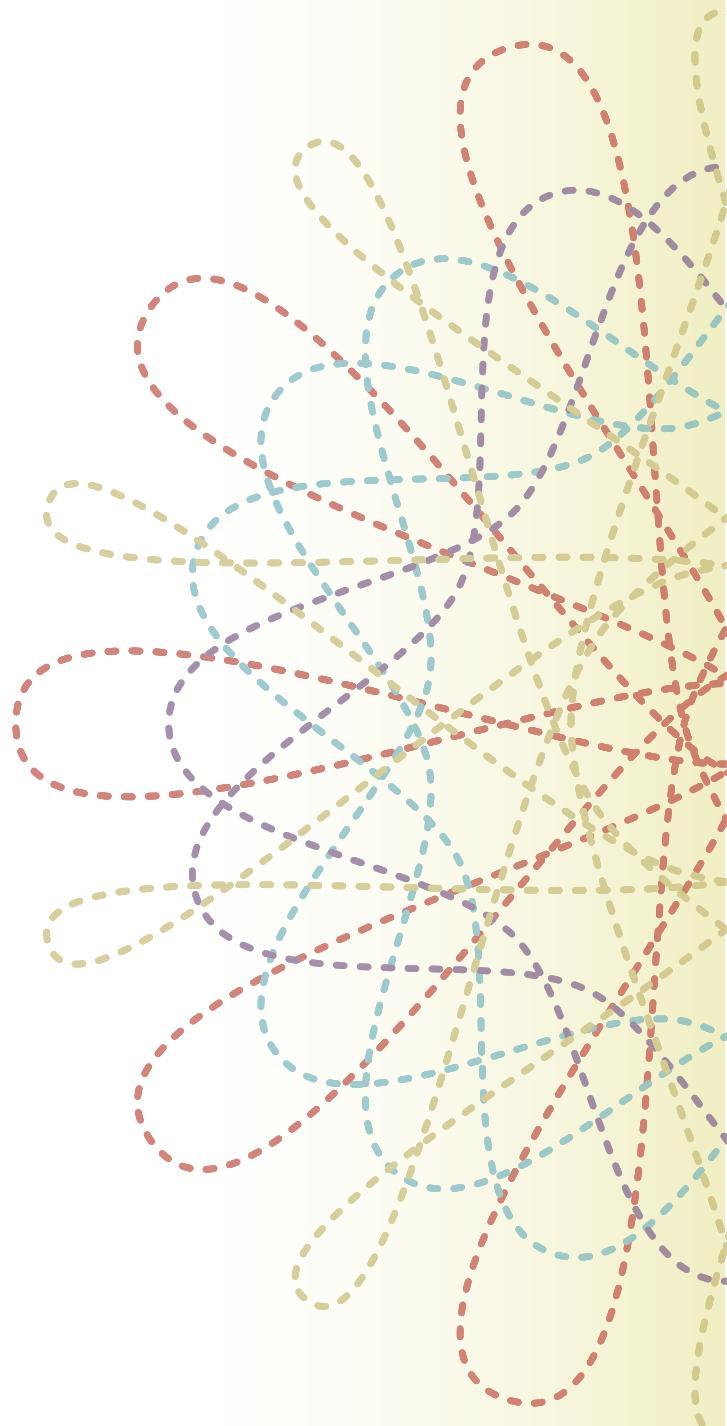
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The Essential Guide to Credential Interoperability

From Paper Trails to Opportunity Pathways

INTRODUCTION: SPOTLIGHT ON THE CREDENTIALING CRISIS

Across the education and training landscape, siloed data is not the exception—it is the widespread and unfortunate norm. Learning and training data and credentials are managed by different stakeholders and stored across data systems and platforms, including registrars and student data warehouses, Human Resources Information Systems, and state workforce databases, to name a few. This decentralization limits

data access and use. Furthermore, this type of technology fragmentation makes it difficult for learners to access and prove their own achievements to other organizations, institutions, or employers. And, it makes it difficult for anyone to obtain a comprehensive view of the skills learners have gained across their employment and learning experiences. This is especially true of records that are older and housed in legacy data systems. The sharing of credentials, learning, and employment records is a clunky and imperfect process that often results in frustration for learners, job seekers, employers, and workforce advocates.

Data fragmentation does not just affect traditional learners or college students. It affects the entire workforce ecosystem. Employers struggle to find suitable talent, and sometimes, to parse what their varied credentials mean. Education and training institutions cannot track student outcomes. Workforce agencies cannot connect job seekers to meaningful opportunities. And, policymakers lack the data they

Learning and employment data is stored across a number of different systems with different rules governing access and control.

	HIGH SCHOOL	FIRST JOB: RETAIL	STATE COLLEGE	SECOND JOB: NURSE'S ASST.	UNEMPLOYED: WORKFORCE	BOOTCAMP	THIRD JOB: MANAGER
DATA COLLECTED	Grades, Attendance, Assessments, Diploma	Employment & Wage Record, Resume	Student Transcript	Employment & Wage Record Skills & Competencies	State UI Case Management System	Student Record	Employment & Wage Record Skills and Competencies
WHERE IS IT STORED	Student Information System (SIS)	HRIS System Payroll System Online Profile	Student Information System (SIS)	HRIS System Payroll System Online Profile	State UI Database & Workforce Case Management System	SIS System Online Profile	HRIS System Payroll System Online Profile
WHO HAS CONTROL	School District	Employer	Institution of Higher Education	Employer	State Agency & Local Workforce Agency	Training Program	Employer
WHO HAS ACCESS	Parents, Foundations, Programs, Researchers	Future Employers Creditors	Student, Foundations, Programs, Researchers	Employee, Future Employers Creditors	State Programs, Training Programs, Researchers	(Parents) State Agencies, Foundations, Researchers	Employee, Future Employers Creditors

need to develop solutions to societal challenges.

Today's education, training, and employment credentials landscape—and therefore the academic and career success of millions of people—is built on a number of assumptions. When verifying a candidate's qualifications and skills, employers, institutions, and other stakeholders must assume that they can rely on the credentials the person provides to ensure:

- 1) The person is who they say they are**
- 2) The credential contains information agreed upon between the learner and the issuing organization**
- 3) The credential is authentic and the organization issuing the credential is who they claim to be**
- 4) The credential truly signifies competency or an acceptable level of knowledge**
- 5) The issuer awarding the credential is accredited and reputable**

In most cases, digital credentials are still PDFs, scanned images, or web-hosted badges that are not interoperable, restricting how a learner can trust, access, and share their own data. Many do not contain a digital signature, meaning individuals largely still rely on physical markers of authenticity, including handwritten signatures, printed watermarks, seals, and stamps—all easily forged or altered. This is problematic not only for education and training institutions and employers, but also for individuals, governmental organizations, and workforce agencies concerned with data and reporting.

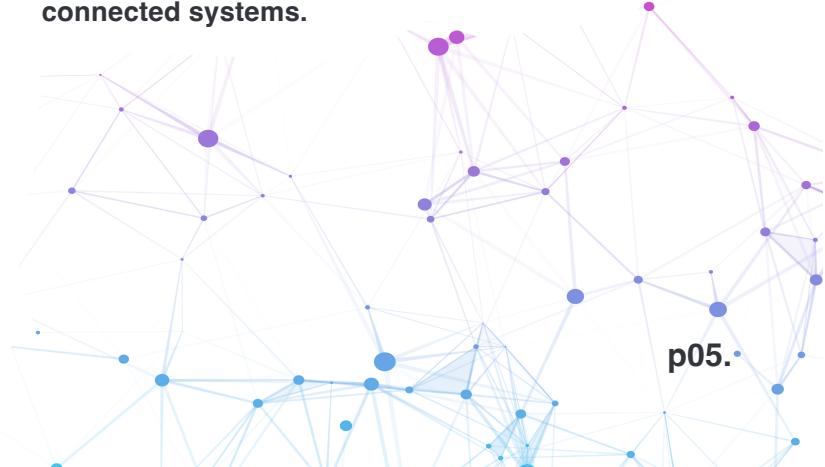
In short, today's education and employment credentials landscape is not interoperable.

With the exchange of data built upon the assumptions above, the unfortunate reality is that education and workforce credentials are readily manipulable, time-consuming to verify, and limit the ways in which people can prove their skills and use their achievements to unlock opportunities.

We propose that:

To meet modern expectations for personal and institutional data security, organizations should replace assumptions with robust, privacy-preserving data practices. At the same time, these practices must empower individuals to securely control and share their data. With the increasingly complex and demanding workloads facing education and human resources professionals, we recommend replacing manual credential verification with secure, technology-enabled processes. Additionally, we recommend that education and training providers offer credentials as interoperable Learning and Employment Records (LERs), recognizing degrees, diplomas, certificates, and even single courses or granular competencies in a structured, portable format that learners and job seekers can manage and share across the learning journey.

Interoperable digital credentialing systems shift institutions away from reliance on physical proof and implicit assumptions, to secure digital processes, enabling trust to be established through immediate, verifiable exchanges across interconnected systems.



LOCKED OUT: THE HUMAN COST OF NONINTEROPERABILITY

Olivia has worked as a retail associate at a clothing store in Las Vegas for six years. She displays her credentials on her LinkedIn profile. These include an associate of arts degree, a certificate she received following her onboarding and training, and four skill-specific badges she earned on the job in the areas of customer service, point-of-sale (POS) system operation, inventory management, and merchandising.

Motivated by rising cost of living and a desire to move to a new state, Olivia decides to apply for a job as a retail manager at a major brand's flagship store in Seattle. She submits her application, attaching PDFs of her skill-specific badges, and filling in the requisite form on the employer's website to indicate her degree type and awarding institution.

However, Olivia's badges only exist inside her employer's **learning management system (LMS)**. She can see them, but she can't export them. These credentials hold a key signal that her prospective employer needs, perhaps even more so than her degree, as the credentials signify that she has the specific skills needed to handle the daily workload of retail management and customer service. Lacking a way to share the badges themselves, Olivia simply mentions her badges in her resume and cover letter. She describes how her badges qualify her for the role, but she is unable to upload them as proof. She is left hoping that the hiring manager will trust her word. For backup, she includes her manager's contact information, although she knows that it could jeopardize her current job if her manager learns she is applying for a new job.

Lars is the flagship store's hiring manager in Seattle.

He sees through the **applicant tracking system (ATS)** that over 100 applications have been submitted for the role. Of those, half are automatically filtered out because they either don't have the desired experience, didn't upload the requested attachments, or didn't meet the keyword threshold. His recruiter sends him 15 that meet all the requisites of the job description. Olivia has the requirements, but because the technology used by the ATS is not interoperable with the types of digital credentials she has, her application is filtered out and never forwarded to Lars. She loses a chance to be considered for the position because she was unable to share her relevant skills.



Olivia's Problem.

Olivia is a highly skilled, experienced, and qualified candidate who is expanding her skills and abilities over time, yet she isn't able to show her progress. Therefore, her application does not paint a comprehensive picture of her ability. Because she cannot upload verifiable proof of her skills, the ATS has filtered her out before a human even had the chance to assess her qualifications. If Olivia chooses to rely on listing her manager as a reference to verify her skills, it could reveal her intention to seek a new job, jeopardizing her current one. Moreover, the manual verification of work

experience is a time-consuming process for Lars and his colleagues, which could delay the hiring process for weeks or longer.



Lars' Problem.

Lars sees a wide pool of applicants who have the keywords and file types requested by the recruiter. However, because of the lack of interoperability between Olivia's credentials and his system's capabilities, he misses out on meeting Olivia and likely dozens of other candidates who have similar experience, drive, staying power, and qualifications. Instead, he will only see the applications of those who present more traditional credentials that 'look good on paper.' Ultimately, he may hire a less qualified candidate.

The Shared Challenge.

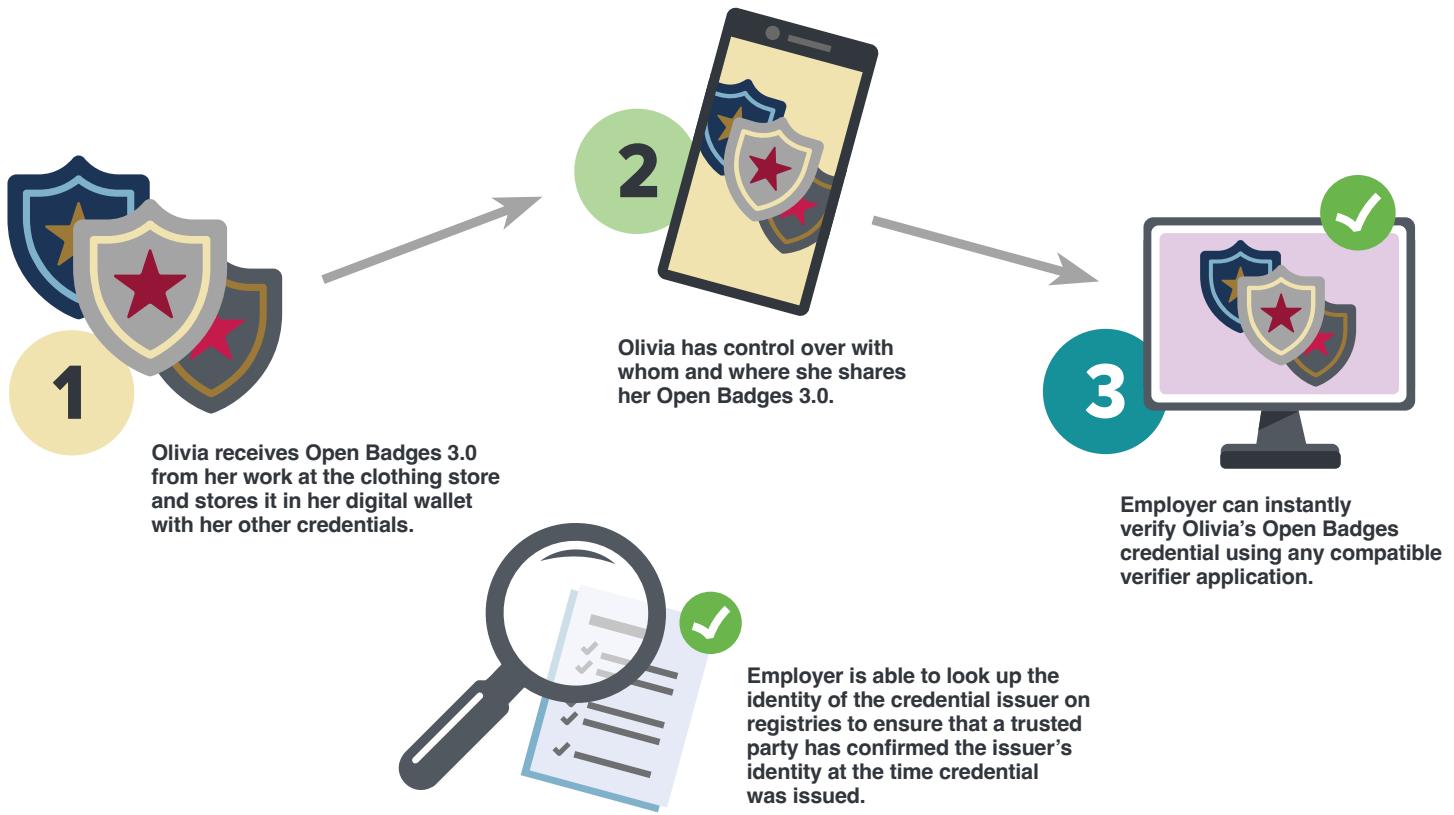
At a time when technologies like digital credentialing make it easy to obtain, award, and recognize skills, no person should have to depend on personal connections or the limited visibility of skills and abilities offered by an ATS to be considered for opportunities. No institution or employer should have to rely on assumptions and imperfect automated screening processes to find qualified candidates.

The Solution.

Interoperable, verifiable, and standards-based digital credentials like Open Badges 3.0 can bridge the gap between what people can do and what employers and institutions can see. They enable the near-instantaneous sharing of data in learner-controlled, privacy-preserving ways.



The flow of data from issuer to holder to verifier. Issuer identity registries provide an added layer of trust, enabling the verification of the issuer's identity.



These human and machine-readable credentials:

- Bring clarity to the recruitment processes, offering a clearer picture of a candidate's skills and knowledge than a list of achievements on paper can. This ensures that qualified candidates like Olivia are not excluded.
- Are immediately trustworthy for verifying a person's qualifications. This saves organizations time and introduces efficiency into hiring processes.
- Allow organizations to make more informed hiring decisions. This improves the likelihood of a strong match between a role and a candidate.
- Increase the value of credentials by ensuring they can be used and recognized more broadly. This can lead to better long-term student success and career outcomes.
- Ensure people are the owners of actionable data about their education and experience that can be used across the web. This gives them greater control over their learning and career journeys.

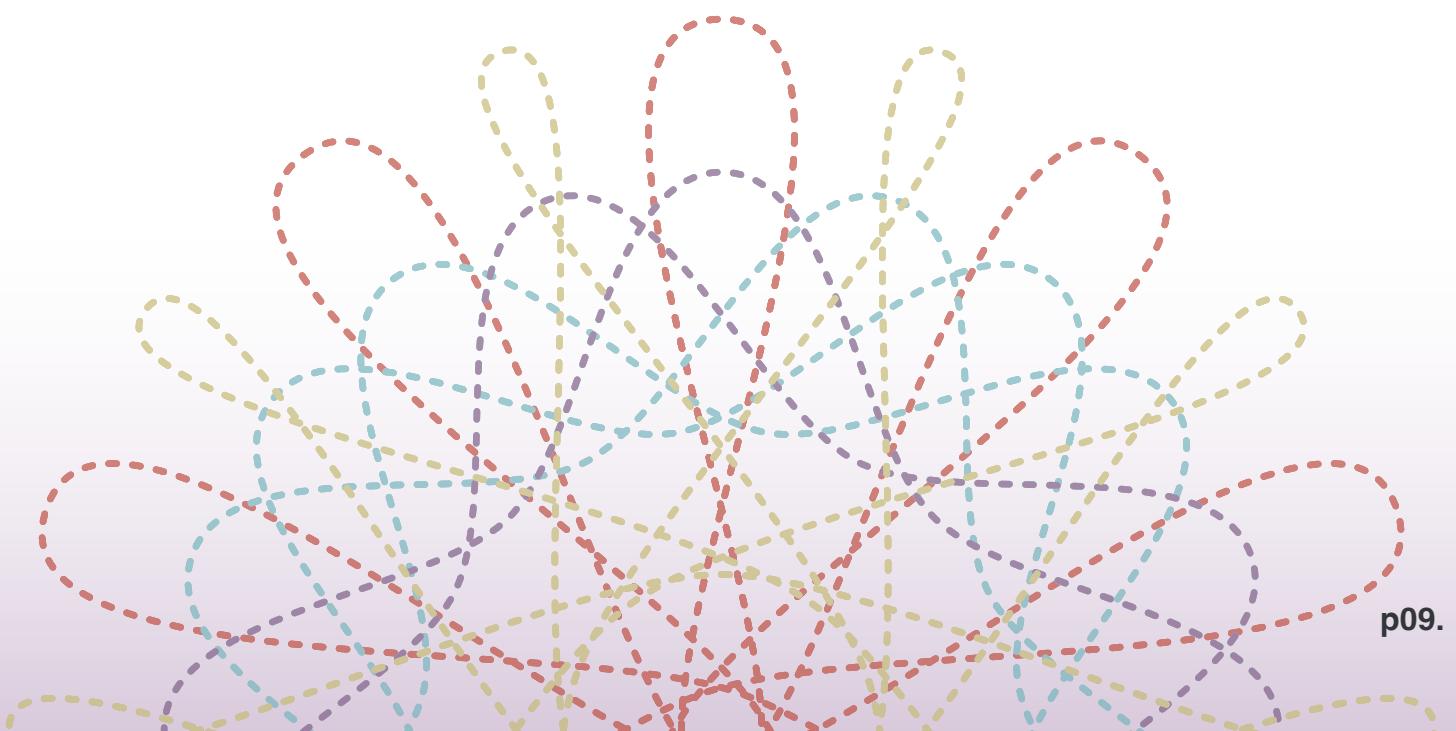
IN THE PAGES BELOW, YOU WILL:

- 1)** LEARN more about what *technical interoperability* is, how it works, and how it enables *semantic interoperability*
- 2)** UNDERSTAND how interoperability can help to address some of the most intractable challenges in education and the workforce
- 3)** GAIN an understanding of why this topic and these terms should be an integral part of the vernacular of every education, human resources, political, and workforce leader today

Semantic interoperability—outside the scope of this guidebook—Involves the mapping of skills, frameworks, and equivalencies, as well as the development and implementation of taxonomies that allow for shared definitions of credential metadata components. In short, while technical interoperability focuses on the 'how' of credential exchange, semantic interoperability pertains to the 'what' —the contents of each credential that is exchanged.

To learn more about semantic interoperability, read about the [World Economic Forum's Reskilling Revolution](#).

We'll help you grasp these concepts by going over some of the main value propositions that technical interoperability offers higher education institutions, employers, and governmental stakeholders. We'll also share some real-world scenarios to bring to life both the scale of the challenge and the opportunity at hand.



Interoperability Explainer

Toward a Connected Credential Ecosystem

Interoperability (noun):

The ability of digital credentials and their data to be exchanged, verified, and displayed seamlessly across physical, institutional, and technological boundaries, without loss of trust or accuracy. This exchange relies on open data standards, shared protocols, and machine-readable credential formats.

Interoperability of digital credentials and credentialing systems allows employers, education institutions, and governmental bodies to seamlessly exchange and verify LERs. It enables every credential to travel securely across platforms, maintaining its trust, meaning, and integrity in the process. In turn, people can rest assured that the full picture of their knowledge, skills, and abilities is relayed where it needs to go.

Technical interoperability of credentials is akin to the way in which an email can be securely and accurately sent from a Gmail account and opened in Microsoft Outlook without a loss of content or trust. This exchange is simple and seamless from the senders' and recipients' perspectives. However, what they don't see is the complex array of shared protocols and metadata behind the 'face' of the email. They don't see the behind-the-scenes data exchange that makes it universally interoperable. Email interoperability means that whether the message contains text, images, or a PDF, the receiving system is able to interpret and display it correctly without any action required by the receiver. Making digital credentials technically interoperable has the potential to make sending them as seamless as sending an email is today.

Interoperable **Learning and Employment Records (LERs)** give people control over their own achievement documentation across data silos. LERs capture not just degrees, diplomas, and certificates, but also proof of employment and granular learning achievements wherever they occur, including individual courses, skills, and competencies. This means people can collect and curate their records in a way that offers a comprehensive view of their experience and skills.

When all digital credentials, including LERs, are interoperable, they are portable, backed by structured data and information that makes them machine-readable, instantly verifiable, and transferable across all compliant systems. This inter-platform machine readability and transferability is called **technical interoperability**.



Today, institutions and employers use a variety of digital credentialing platforms and tools, including badging platforms and solutions provided by LMS and Student Information System (SIS) providers, some leveraging blockchain or proprietary web platforms that do not follow the key standards like Open Badges 3.0 or Comprehensive Learner Record 2.0 (explained below). When these standards are not followed, the credentials are not inherently interoperable. This leads to a number of limitations on privacy and portability, including the following:

- **The institution, not the learner, is in control of the data**
- **The credentials, including information about skills and abilities, are only shareable within their own ecosystem**
- **They don't allow people to control which information they want to share**

INTEROPERABILITY REQUIRES OPEN STANDARDS:

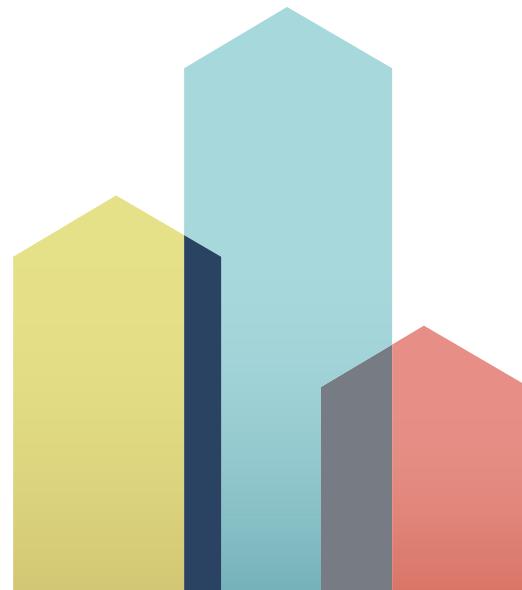
All of these standards are designed to contain valuable metadata, empowering learners to maintain and share their achievements in secure, privacy-preserving ways.

The W3C Verifiable Credentials Data Model (VCs) is a web standard for digital signatures that can be used to verify identity attributes and capabilities. This is a widely referenced specification for making claims on the web. VCs have emerged as a trustworthy way of creating digital versions of records and documents like IDs, driver's licenses, proving supply chain provenance and proof of purchase or ownership.”

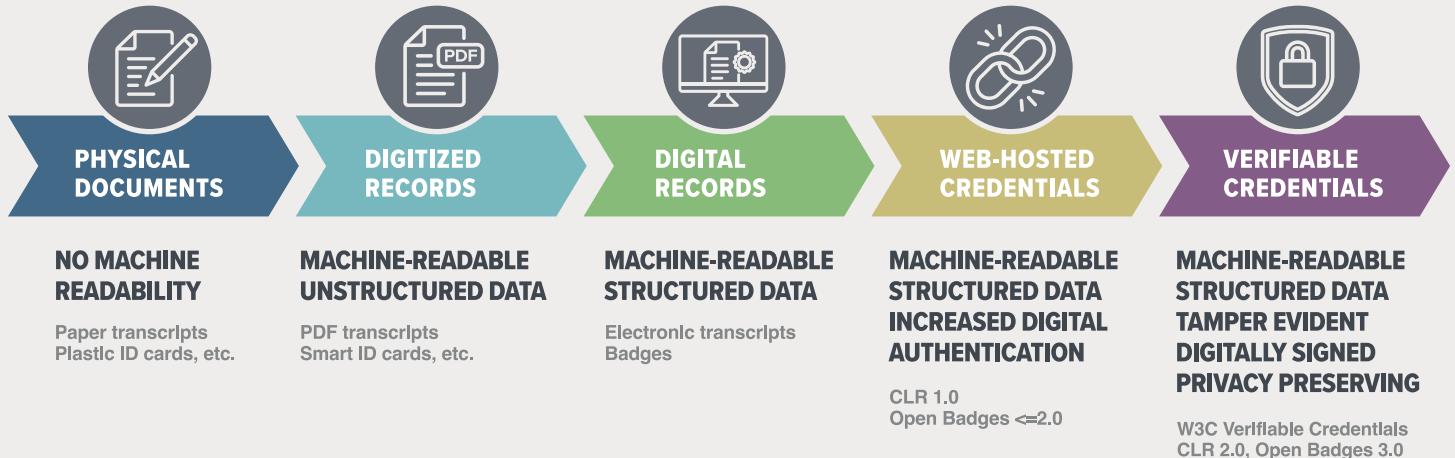
Open Badges v3 (OBv3) leverages much of the same technology as the Verifiable Credentials (VCs) standard to make claims specifically related to education and training. They are designed with the ability to be stored, shared, and verified alongside VCs, containing the same digital signatures and metadata capabilities. OBv3 can be used for achievements as complex as a degree or diploma or as granular as an individual course, skill, or competency. They contain **structured metadata** – data describing evidence of a learner’s accomplishment and the skills it represents. OBv3 uses **JSON-LD** – machine-readable data that links to shared descriptions of metadata elements. All OBv3 badges are VCs, but not all VCs are OBv3 badges.

Comprehensive Learner Record (CLR) 2.0 is another standard that has been used by education institutions, student record systems, and registrars. CLRs are ideal for describing multi-level achievements like entire academic transcripts, as they have the capacity to contain stacked or nested OBv3 credentials.

A comprehensive list of standards recommended by the DCC is available on our website's [standards resources page](#).



Digital credentials exist along a scale from least to most interoperable, with standards-based, digitally signed versions offering the most interoperability.



DIGITAL CREDENTIALS INTEROPERABILITY

Evolving data formats and open standards enable increased interoperability

Original Image created by The LER Accelerator CC BY-NC 4.0. Modifications made to language from the original image.

Digital Signatures that are implemented following standards like the W3C Verifiable Credentials Data Model and Open Badges 3.0 are used to en-crypt the content of digital credentials to prove that the content hasn't been tampered with since it was signed. These standards provide instructions for machines to verify the digital identity of the issuer and validate that it is a known trusted entity.

Interoperability in Action

Interoperability is an achievable goal. When adopted across the learning and employment ecosystem, it improves the learning journey for millions of people. Effectively, interoperability gives people the autonomy to curate the stories and experiences they feel are relevant to a particular audience. This ability to share and curate has the power to transform how we think about learning, evolving it from a series of linear, one-time accomplishments to a lifelong endeavor.

Below are a series of hypothetical vignettes that show what interoperability can achieve, and who it helps.



Interoperable Credentials Turn Data Silos into Actionable Information

SETTING THE SCENE

Sam is a state workforce director who is responsible for ensuring that the workforce system in his state is equipped to help residents obtain stable employment. His governor routinely asks for a clear picture of how many residents are being served, what services they are receiving, and how those services are tied to stronger employment. Each time, Sam's team must manually find and reconcile incomplete data from multiple state benefit and adult education systems. Sam's agency is only equipped to receive credentials in traditional, static formats, including PDF copies of identity documents, diplomas, transcripts, and web-hosted links to badges and certificates. Given the slow and manual nature of accepting non-machine-readable and non-standardized credentials, it is challenging for Sam's team to understand how the state's residents are moving through its benefits systems over time.

These paper-based processes create heavy case-management burdens for Sam's team, but they also lead to major barriers for clients or job seekers. Rosalynn is one such client. She, like millions of other residents, struggles to keep up with the paperwork and forms required to determine eligibility for state services. In a single week, she is referred to four different programs, each of which requests the same information from her: government-issued photo ID; SNAP award or denial letters; her high school diploma; recent pay stubs; and her hospitality training certificate. By the end of the week, Rosalynn has taken nearly a full workday of leave

to provide the same PDF and scanned documents to four different agencies, yet she is no clearer about which services she qualifies for or how they connect. The agencies cannot give her a definite answer, as real-time visibility into her situation is virtually impossible.

WHAT INTEROPERABILITY ENABLES

Sam's state would benefit from an interoperable framework that allows workforce agencies to issue and accept verifiable digital credentials instead of PDFs and paper documents. In doing so, the work of determining benefits eligibility, and verifying employment, education, and wages would become simpler and faster. Rosalynn could submit the digital credentials she has collected and stored over time, and she could rest assured that her documents are accessible and usable across all systems.

What Sam and Rosalynn Gain

- Assurance that verified credentials and information can be re-used and shared across systems with minimal effort
- Fewer duplicative requests and administrative burdens
- Shorter timelines and a clearer picture of program and benefits eligibility
- More dignified pathways to stable employment

RESOURCES FOR TAKING ACTION

- [Making Sense of Credentials: A State Roadmap and Action Guide for Transparency](#)
- [Going Digital: How Learning and Employment Records Shape Access to Quality Education and Jobs](#)
- [Project Unicorn & JFF LER Series](#)



Interoperability Builds Shared Trust Between Education and Employment

SETTING THE SCENE

Luisa is the Chief Human Resources Officer at Tidewater Logistics, a major Virginia employer with a steady need for skilled workers. In recent months, her team has seen a surge of applications containing falsified or exaggerated credentials. Manual checks reveal that some candidates have claimed degrees from institutions they never attended, listed certifications they never completed, or submitted forged documents that appeared legitimate at first glance. Each suspicious application requires hours of additional review, delaying critical hires, slowing down projects, and increasing the risk that an unqualified or fraudulent candidate might slip through. The costs are mounting—lost productivity from unfilled roles, staff time consumed by verification work, and the potential liabilities associated with onboarding someone whose qualifications cannot be trusted. Luisa worries that Tidewater is becoming a target for fraudulent applicants, and that the time her staff is spending detecting fakes is preventing them from identifying real talent.

Such challenges aren't just burdensome for the employer. They also negatively impact legitimate job applicants. While Luisa's HR team is able to manually verify traditional credentials like degrees, they give more scrutiny to non-traditional credentials obtained through online independent learning or bootcamps, as they are often shared in the form of static PDFs that are difficult to verify and trust. As a result, qualified applicants are unable to present a full picture of their skills.

When considered for a role, they must wait longer for a response while HR completes manual checks.

WHAT INTEROPERABILITY ENABLES

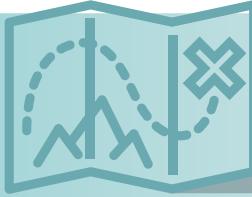
In an interoperable system that uses standards-based, digitally signed credentials like Open Badges 3.0 or VCs, Luisa and her team would be able to instantly verify credentials, including degrees, microcredentials, and licenses, without manual outreach or document review. In addition to significantly decreasing the financial and operational costs of fraud detection, interoperability replaces assumptions with authenticated evidence, turning credential verification into a faster, safer, and more trustworthy foundation for hiring qualified talent.

What Luisa Gains

- Faster, more efficient verification processes that free up HR staff time
- Trustworthy ways of authenticating degrees as well as microcredentials and skills-based learning
- Greater, proactive awareness of potential fraud

RESOURCES FOR TAKING ACTION

- [SHARED INFRASTRUCTURE For Skills-Based Hiring and Advancement](#)
- [Creating Real Value: Skills Data in Learning and Employment Records](#)
- [C-BEN Center for Skills: The Partnership for Skills Validation Resource Center](#)
- [Project Unicorn & JFF LER Series](#)



Interoperability Puts Learners in Control of Their Journeys

SETTING THE SCENE

Andrew, a twelve-year Army veteran living in New Hampshire, is ready to transition into civilian work after years of coordinating emergency response operations and managing complex projects during his time in the service. Andrew wants to apply for a job as an emergency operations specialist at a local hospital – a role that is a perfect match for his skills, experience, and career goals. However, Andrew's resume describes his achievements within the context of his military career. The roles he held are described in terms of military-specific job titles and codes. Andrew faces challenges summarizing in a civilian resume the skills he was recognized for in the Army. The result: he appears far less qualified than he is – a common challenge among veterans and other workforce demographics.

Timothy, the HR director at the hospital, notices that despite many veterans applying, most do not successfully pass application screening, in part due to differences in terminology. The skills that Andrew possesses are highly desirable for the position. Yet, Timothy is unsure how exactly Andrew's experience maps to the civilian competencies in his open role.

WHAT INTEROPERABILITY ENABLES

Interoperable, standards-based credentials are advantageous for veterans like Andrew and HR professionals like Timothy, not only because of their structure and security, but also

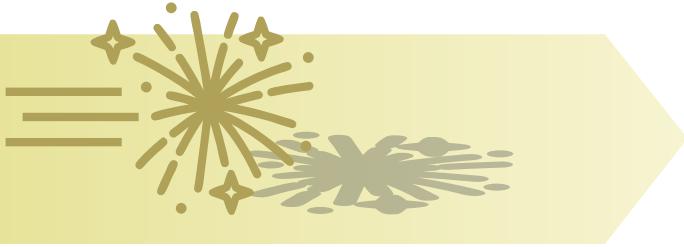
because they are capable of containing rich metadata about skills and competencies gained in the classroom, employment, or elsewhere. If Andrew were issued interoperable digital credentials by the Army, those credentials would contain granular, structured, and verifiable information about his emergency response skills. He could use those to apply for jobs, and the hospital could interpret that information without needing to manually translate military experience into civilian job requirements.

What Andrew and Timothy Gain

- **Credentials containing information about military-obtained skills that are understandable to civilian employers, which can improve rates of under- and un-employment among veterans and servicemembers**
- **Portable, verifiable evidence of achievements that Andrew can use anywhere**

RESOURCES FOR TAKING ACTION

- [Bridging Military Experience to Manufacturing Careers: Insights from the Manufacturing Readiness LER Pilot](#)
- [The ACE Military Guide](#)
- [Project Unicorn & JFF LER Series](#)



Interoperability Opens New Pathways for Flexible, Skills-Based, Lifelong Learning

SETTING THE SCENE

Wanda is the dean of Hawthorne College, a small private institution in Ohio facing declining enrollment and tightening budgets. To remain competitive, Hawthorne must offer more flexible, student-responsive learning experiences and cultivate new revenue streams. Wanda's team identifies a promising opportunity—a microcredential and continuing-education program that would attract current students, recent graduates, and non-traditional learners who balance school with work or pause and resume their studies over time. Stackable, skills-based credentials could help these learners visualize their progress, earn recognition for smaller units of learning, and pursue career opportunities without waiting for full degree completion. This program would also keep alumni and returning adults engaged with Hawthorne as their upskilling needs evolve.

As promising as the microcredential program sounds, Amir, the registrar at Hawthorne, is concerned about how credential verification would work in practice. His small team is already inundated with requests for transcripts and proof of completion from students. Many express frustration with the delay and hassle of needing to request access to their own academic data. To date, his office has completed all these requests manually, and now with the addition of micro-

credentials, he is worried his team will be unable to cope with an influx of new verification requests.

WHAT INTEROPERABILITY ENABLES

Interoperability allows Wanda to achieve Hawthorne's strategic vision for offering microcredentials while also addressing Amir's outdated and inefficient verification system. Interoperable, standards-based credentials can be issued securely, including valuable metadata for degrees, micro-credentials, and even granular skills and competencies. Once issued, Hawthorne students would be able to claim and store an independently and autonomously verifiable version of their credentials in a digital wallet, from which they can share their credentials whenever and with whomever they choose. This would effectively eliminate the need for manual requests from Amir's office.

What Wanda and Amir Gain

- The ability to offer students, prospects and alumni skills-based, flexible learning pathways, increasing the value proposition for attending Hawthorne
- A streamlined process for issuing and claiming instantly and independently verifiable credentials, reducing the workload for the registrar's office
- A more innovative solution for students that gives them access to their own academic data, leading to improved student satisfaction

RESOURCES FOR TAKING ACTION

- [LER Accelerator Initiative](#)
- [AACRAO Credential Chats with Noah Giesel](#)
- [T3 Innovation Network's LER Toolkit](#)
- [Project Unicorn & JFF LER Series](#)

Conclusion

Though the vignettes in this report are fictional, the challenges they describe—data silos, time-consuming manual verification processes, and limited portability—are real, and impact livelihoods and economic mobility for millions of job seekers. However, this does not need to be our reality. We invite readers to embrace a more hopeful vision for the future of education and work—one that is powered by interoperable digital credentialing.

In this evolved vision, job seekers like Rosalynn and Andrew could seamlessly provide their credentials to employers with the click of a button. They could do so without needing to take time off work or send repetitive emails. They would be safe in the knowledge that, despite their unique work experiences, their varied credentials could be easily understood by any organization. Employers like Luisa and Timothy could instantly verify and trust the credentials in the applications they receive, without a loss of time or efficiency, and with the assurance that they are seeing a realistic picture of the skills and abilities of not just some, but all, applicants.

Higher education professionals like Wanda and Amir could offer more attractive and skills-focused programs, confident that such innovation will improve the overall student experience. Government professionals like Sam could trust that they have a 360-degree view of their state or region’s workforce, and could be better positioned to give residents smooth and efficient pathways into and across the employment landscape.

Interoperability is a solution that is well within reach. The standards for using interoperable, verifiable credentials are free to use. The technology is available and, in many cases, open-source. Wherever you work and live within this ecosystem—as a job seeker, a hiring manager, or a stakeholder in higher education or employment—you have a role to play in making an equitable, interoperable system a reality. We invite you to use the stories and resources in this document to envision your role in the ecosystem and identify your first steps toward action.

