MICRO-CREDENTIALS:

Do they hold promise for low-skilled workers?

October 2017

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Do they hold promise for low-skilled workers?

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GLOSSARY

Term (and source from which it is derived)	Definition
Badge (American Council on Education, or ACE)	A form of credential signifying a person's achievement at some level of competency. Badges are issued by organizations to individuals.
Certificate (Lumina)	A form of credential awarded upon the successful completion of a brief course of study, usually one year or less but sometimes longer. Certificates are sometimes issued for completing a course and sometimes for attaining competencies. They are used to recognize achievements at many levels of knowledge and skills, from foundational skills to postgraduate learning. They are typically awarded by institutions of higher education, university extension programs, or nondegree-granting, postsecondary institutions such as local career and technical schools.
Certification and professional certification (GEMEnA and Lumina)	A form of credential awarded by a certification body based on an individual demonstrating through an examination that he or she has acquired the designated knowledge, skills, and abilities to perform a specific job. The examination can be written, oral, or performance based. Certification is a time-limited credential that is renewed through a recertification process. Certifications are typically awarded through an assessment and validation of skills in cooperation with a business, trade association, or other industry group.
Competency (Career One Stop)	The capacity to draw upon and apply a set of related knowledge, skills, and abilities to successfully perform a work role, function, or task. Competencies often serve as the basis for skill standards that specify the level of knowledge, skills, and abilities required for success in the workplace.
Connected credentials (Lumina)	Credentials that can be linked meaningfully with other credentials. This is a broader term than stackable credentials and includes other forms of connectivity, such as lateral, latticed, nested, and other similar connections.
Credential (Lumina)	A documented award by a responsible and authorized body that attests to the achievement of specific learning outcomes or to a defined level of knowledge or skill relative to a given standard. An umbrella term that includes degrees, licenses, certificates, and professional or industry certifications.
Cross-cutting competency (Lumina)	Knowledge and skills that are not specific to a particular field or discipline and are generally considered to be valuable across most if not all credentials and employment environments.
Degree (Lumina)	A form of credential that indicates satisfactory completion of a course of study in which an individual can demonstrate the knowledge, skills, and abilities that are commensurate with the requirements in a specific field of study. Degrees vary in the level of knowledge and skills that the holders are presumed to have. They are awarded for accomplishments in academic, vocational, or religious studies. Although requirements in each field differ, degrees are presumed to be comparable in accomplishment. Often a diploma is used to provide evidence of a degree awarded by an institution (usually a college or university) that has been granted the authority by a state, a recognized Native American tribe, or the federal government.
Education certificate (GEMEnA)	A credential awarded by an educational institution based on completion of all requirements for a program of study, including coursework and test or other performance evaluations. Certificates are typically awarded for life (like a degree). Certificates of attendance or participation in a short-term training (for example, one day) are not in the definitional scope for educational certificates.

Glossary *(continued)*

Term (and source from which it is derived)	Definition
Knowledge (Lumina)	An individual's demonstrated understanding of a body of facts, principles, theories, and practices related to broad or specialized fields of study or work.
Lateral credentials (Lumina)	Credentials that enable earners to move laterally from one field of study to the next.
Latticed credentials (Lumina)	Credentials that are interwoven with each other in mutually supporting ways (for example, educational progress toward a license and a degree simultaneously).
License (GEMEnA)	A credential awarded by a government agency that constitutes legal authority to do a specific job. Licenses are based on some combination of degree or certificate attainment, certifications, assessments, or work experience. They are time limited and must be renewed periodically.
Micro-credential	Shows a mastery of one or more job competencies. Micro-credentials are more specialized and focused than a traditional academic degree.
Nested credentials (Lumina)	Credentials that are a subset of or embedded in other credentials, such as a badge or a certification as part of a degree.
Portability (Lumina)	Credentials that can be used in a variety of environments. They enable the credential holder to use the credential as a stepping stone to other credentials.
Proficiency (ACE)	A certain level of achievement, as determined by a provider. In competency-based education, "proficiency" is sometimes used in conjunction with "mastery," where proficiency is the level of achievement considered passing (for example, 60 percent) but in which a higher level of achievement (for example, 85 percent) is required for mastery and progression through a program.
Skill standards (Career One Stop)	Levels of skills (or competencies) required in a given job or role. They form the basis for measurement criteria to assess competency attainment. A competency model differs from a set of skill standards in that skill standards define what is required in a given job while competencies typically do not.
Skills (Lumina)	What a person can do in applying knowledge, completing tasks, and solving problems. Skills can be described in terms of complexity and type, including cognitive, technical, communication, interpersonal, and practical.
Stackable credentials (Lumina)	Credentials that are part of a sequence of credentials that can be accumulated over time to build qualifications and to help individuals move along a career pathway toward further education, different responsibilities, and potentially higher-paying jobs.
Transparency (Lumina)	Credentials that are easy to understand and compare. Competencies represented by transparent credentials are clearly defined. Information about the credentials and their value is readily available to earners, issuers, endorsers, and consumers.

A. INTRODUCTION

Micro-credentials are increasingly touted as alternatives and complements to traditional degrees. The term *micro-credential* has no standard definition. In general, however, many experts agree that a micro-credential *shows a mastery of one or more job competencies and is more focused and specialized than a traditional degree,* so we use that definition here. Despite this high level of agreement, the details of what micro-credentials are and their role in the credentialing system are highly debated.[1]

Micro-credential

A credential that shows a mastery of one or more job competencies and is more specialized and focused than a traditional academic degree

Because micro-credentials can be earned relatively quickly and focus on job competencies, they have the potential to provide job seekers, in a short time, with skills in demand in the labor market. This characteristic can make them valuable in labor markets in which the demand for specific skills is rapidly changing by providing an opportunity to job seekers who need to gain skills quickly to access low-cost, employer-driven training in an area of skill need.

To assess their potential for building employment opportunities for low-skilled, entry-level workers, the U.S. Department of Labor (DOL) contracted with Mathematica Policy Research to conduct an environmental scan of micro-credentials. Researchers collected information from a literature review, a web search review, and one-on-one interviews with 26 experts and practitioners in the credentialing field. To ensure candid discussions during the interviews, both experts and practitioners were assured confidentiality in reporting their comments. The scan is not exhaustive. Resource constraints, for example, prevented us from talking to two key groups of stakeholders: credential seekers and job seekers. Still, the scan helped define and describe micro-credentials, including what they are and how they are delivered, the opportunities they present and the challenges they generate; their promise for use by the workforce system; and the steps that could be taken to deepen our understanding of their potential to help low-skilled, entry-level workers gain a foothold in the labor market and advance along a career pathway.

1. DEGREES AS A CREDENTIAL IN HIRING

Employers have long used degrees as a primary credential to hire and promote workers (Gallagher 2016) and reward degree holders accordingly. In 2016, 55 percent of people with a high school diploma were employed, compared to 42 percent without a degree. The advantages continue for those with associate's degrees, with the 68 percent employed. Among employed associate's degree holders, men received a 13 percent wage premium and women a 21 percent premium over those with a high school diploma. Increases are even stronger for those with

[1] Although micro-credentials reflect a single (or few) competencies, not all competencies are job based. Because the focus of this study was employment, we restricted definition to credentials that reflect job competencies.

bachelor's degrees: 74 percent were employed, and they earn about $423,800 more during their lifetimes than those with high school diplomas.[2]

These advantages accrue despite the independence of institutions of higher education (IHEs) from the labor market, with general organizational practices and faculty incentives to maintain the independence making it hard to build connections to the labor market (Diamond 2006). Furthermore, the accreditation agencies that federal and state governments use to assure quality in awarding degrees include broad indicators of quality in such areas as financial stability, faculty qualifications, facilities, equipment, library resources, and the availability of student support services but do not include indicators that tie programs to the labor market (McCarthy 2014).

Despite the advantages that degrees offer, people can face significant challenges in pursuing them. Students from low-income or minority families are more likely than others to face these challenges, which lowers their access to degree programs and can lessen their achievement when enrolled. Challenges include (U.S. Department of Education 2016, unless noted):

- **Degrees are expensive.** In 2015, the average annual cost for undergraduate tuition, fees, room, and board was $25,402 for those at a four-year institution and $10,153 for those at a two-year institution.
- **It takes a long time to complete a degree, and completion rates are low.** Only about 40 percent of students starting at a four-year institution full-time in 2008 received a bachelor's degree in four years, and about 60 percent received a degree in six years. Students starting full-time in 2008 at two-year institutions fared worse: only about 28 percent received a degree or certificate within 150 percent of the normal time it took for completion (usually considered to be two years for an associate's degree).
- **Preparation often is poor.** Among the cohort starting an IHE in 2003–2004, 68 percent of those starting at two-year public institutions and 40 percent of those starting at four-year public institutions took at least one remedial course between 2003 and 2009 (Chen 2016). Only about half of those at a two-year institution completed the courses they started (59 percent at four-year institutions).

The continued growth in jobs requiring workers to have some postsecondary training (Carnevale et al. 2013), the challenges of linking degree programs to the labor market, and the difficulties some people face in pursuing degrees have led key stakeholders in the government, private, and nonprofit sectors—and both Presidents Trump and Obama—to call for new forms of credentials that explicitly link to the labor market.

> Micro-credentials are "a way for employers to be able to do recruitment a lot more surgically than simply saying 'I assume everyone should have a bachelor's degree,' which is a pretty blunt instrument [to use in hiring.]"
>
> *— Credential expert*

- The 2005 Commission on the Future of Higher Education, convened by the U.S. Department of Education (ED), recommended that postsecondary education degree programs

[2] See Bureau of Labor Statistics (2017) for employment statistics and Belfield and Baily (2017) for information on earnings and wages.

become more flexible and nimble in responding to innovations and workforce needs (U.S. Department of Education 2006).

- In 2015, the Workforce Innovation and Opportunity Act (WIOA) expanded education and training options for vulnerable workers, including those with limited skills (Bird et al. 2014; Workforce Innovation and Opportunity Act 2014). American Job Centers (AJCs) now have more flexibility to use training dollars on evidence-based approaches that can lead to industry-recognized credentials, and their performance measures now include credentials and skills. The performance measures in the Adult and Dislocated Worker Programs now include credential rate (percentage of participants who obtain a recognized postsecondary credential or diploma during program participation or within one year after program exit), and the Youth Program measures now include in-program skills gain (percentage of participants in education leading to a credential or employment during the program year and achieving measureable gains).
- The U.S. Chamber of Commerce Foundation is currently developing an employer-led approach to closing the skills gap. This effort is focusing on restructuring existing credentials so that they better meet the needs of employers, and is closely aligned with the employer-driven nature of many micro-credentials.
- Lumina Foundation commissioned a beta Credentials Framework in 2015 that provides a platform through which to understand and compare the competencies associated with any credential, whether a degree, certificate, industry certification, or a micro-credential. At that time, Lumina also launched the Connecting Credentials initiative, which calls for an interconnected system of competency-based credentialing that can connect employers and job seekers by coordinating credit-based and noncredit credentials in higher education.

2. CREDENTIALS THAT ARE SHORTER THAN DEGREES

Perhaps in response to these developments, the number and type of micro-credentials awarded have received increasing attention in recent years. Consider these three micro-credentials:

Micro-credentials include

- Certificates
- Certifications
- Badges

1. **Certificates,** like degrees, are awarded for life after course completion. Public community colleges awarded about half of the certificates issued in 2013 (Brown and Kurzweil 2017), with for-profit occupational colleges awarding about 40 percent (Rosenbaum and Rosenbaum [2013] discuss these colleges). Certificates are available through noncredit and for-credit education. *Credit-bearing certificates* can provide credits that count toward degree requirements and become the "first rung on the ladder to a college degree" (Carnevale et al. 2012). Students can apply for federal financial aid under Title IV of the Higher Education Act while they pursue either short-term (less than one year to complete) or long-term (between one and two years) for-credit certificates. Credit-bearing credentials increased from about 6 percent of IHE credentials awarded in 1980 to 22 percent in 2010 (Carnevale et al. 2012), with Integrated Postsecondary Education Data System (IPEDS) data suggesting the number awarded grew by 68 percent between 2001 and 2014, compared to the 54 percent growth in degrees. Examples include certificates awarded for child care education, food production, home health aides, and paralegal roles. *Noncredit workforce certificates* are awarded after

courses or activities that provide technical workplace skills. Students pursuing them are not eligible for federal financial aid and the coursework does not carry credit that can be applied toward a degree, diploma, or other formal award (Van Noy et al. 2008). Still, these workforce certificates can be structured to respond quickly to emerging industry needs or tailor their format to student and employer needs because they need not follow traditional academic guidelines (Haimson and Van Noy 2004; Voorhees and Milam 2005). Although they can provide a bridge to college for those without a degree (Grubb et al. 2003), pathways connecting noncredit students to credit programs generally do not exist (Morest 2006; Voorhees and Milam 2005).

Although an IHE's accreditation process includes credit-bearing certificates (McCarthy 2014), the variety in certificates and providers and lack of quality assurance of noncredit certificates leave their quality uneven. This variety also makes it difficult to estimate gains associated with them. Existing evidence shows earning gains of about $2,000 to $3,000 per year (Belfield and Baily 2017), with some people increasing employment rates by finding a job in a different sector (Xu and Trimble 2014).

2. **Certifications,** such as CompTIA Network+ certification in information technology (IT) and the three-tiered system of SCPro™ Certifications offered by the Council of Supply Chain Management, abound. Certification bodies, including industry and professional associations, award a certification after a person demonstrates the knowledge, skills, and abilities to perform a specific job (Crawford and Mogollón 2010). The certification body sets the standards for demonstrated competency and the process that ensures that the holder meets those standards. The process frequently includes passing a test, performing tasks in a controlled setting, or showing a portfolio of work, and it may require individuals to have already earned a degree (Brown and Kurzweil 2017). In general, certifications are time limited and require a reassessment of competency to ensure that skills and competencies remain current. The ARMY COOL database lists 1,566 types of certification awarded by industry associations. Only about 28 percent of those are validated by a third-party accrediting body.
3. **Badges** can be earned in a variety of learning environments and can indicate an accomplishment that is not a degree, certificate, or certification; an estimated 25,000 badge issuers existed in 2015 (Priest 2015). High schools and adult education programs use Open Badges to engage learners, motivate learning, and provide evidence of skills. Digital badges often indicate the award of a certificate or certification in the same way that a diploma can represent a degree. Digital badges are often obtained through online platforms such as Pearson VUE's Acclaim and Credly and may or may not represent credentials that have been accredited. Digital badges can convey information that helps individuals and employers understand what the actual credential represents. For example, Acclaim badges include information about who issued the badge, who the badge holder is, the badge holder's competencies and skills, and the steps taken to earn the credential. Job seekers can display digital badges on LinkedIn and other social media sites, allowing employers to identify people with needed skills. In a parallel process, some human resources departments have included digital badges in their internal databases, allowing them to search for employees who have the skills for a specific project or for an unfilled position.

As the type and number of micro-credentials have expanded, so have the methods by which they are obtained. Massive Open Online Courses (MOOCs) emerged in 2011 as (often) no-cost, noncredit online courses that were not connected to a credential program. They quickly expanded beyond those roots. By 2016, more than 700 universities offered over 6,850 credit and noncredit courses as MOOCs. Class Central data suggest that the top five MOOC platform companies and providers had about 50 million registered users in 2016, with Coursera and edX hosting two-thirds of those registrants (23 and 10 million, respectively). MOOC platform companies and providers are increasingly charging for courses or for a certificate, in part because the market is increasingly drawing in lifelong career learners who want to achieve professional and career growth (Shah 2017). Many of the newer MOOC platform companies and providers have launched their own certificate and degree programs. We found no evidence that MOOCs were accredited by a third party unless they were offered as part of an existing degree program.

In addition, privately owned and operated companies offer short-term courses to prepare students for jobs. Boot camps, for example, are short-term, intensive courses that prepare students for jobs primarily in high-demand fields such as software engineering and particularly in web and mobile development (for example, Ruby language, JavaScript, Object C, and Python). Although students create products during the course that can be used to showcase their skills to employers, they often do not receive a credential after successful completion. Course Report indicates that about 18,000 students completed one of the 91 boot camps operating in the United States and Canada in 2015, a substantial increase from the 41 programs that taught 5,987 students in 2013.

3. THE MICRO-CREDENTIAL ENVIRONMENTAL SCAN

To better understand micro-credentials and to begin to assess their promise for low-skill job seekers, we conducted a literature review, web search review, and interviews with six credential experts and 20 micro-credential practitioners. The literature and web search reviews guided selection of experts and practitioners. The interviews were guided by semistructured, individually tailored discussion guides. They occurred between October 2016 and May 2017, with broad credentialing field experts interviewed before practitioners. Interviews with experts and practitioners differed slightly:

Environmental scan

- Literature review
- Web search review
- Interviews with 26 individuals
  - Credential experts
  - Micro-credential practitioners

- **Expert interviews.** The experts interviewed included people with in-depth knowledge of credentials and thought leaders in the credentialing and workforce development fields. These interviews provided a broad overview of the credentialing field and how micro-credentials fit into it.
- **Practitioner interviews.** The research team selected a wide variety of practitioners to obtain a broad view of the different entities that offer and support micro-credentials. Individuals interviewed included people who worked in organizations that (1) offered credentials or provided a platform for offering them (referred to as *providers* throughout), (2) accredited certificates or certifications, (3) employed workers with micro-credentials, (4) were part of the workforce development system, or (5) issued certifications. These interviews provided a deeper understanding of the stakeholders interested in micro-credentials, models for developing and delivering content, and positive aspects and challenges of micro-credentials in general and for low-skilled workers specifically.

The scan also drew on the expertise of a technical working group (TWG) of three academics with knowledge of the training needs of low-skilled workers and credentials. The TWG provided input at several key points during the scan: (1) at the design stage, (2) in the interpretation of initial findings, and (3) in the review of the report.[3]

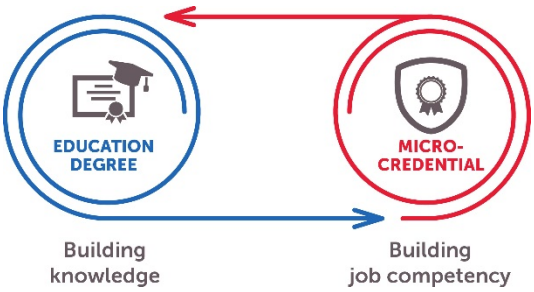
[3] See the Acknowledgments page for a list of the experts, practitioners, and TWG members consulted.

B. DESCRIBING MICRO-CREDENTIALS

One of the most difficult aspects of the study was placing parameters around micro-credentials. The literature and web reviews and the interviews suggested that micro-credentials might be viewed as an educational and training Wild West, with providers creating their own credential terms, definitions, and requirements and few common quality standards being applied. One implication of this discussion was the need to develop a glossary of terms to communicate our findings and support continued dialogue about their potential.

Still, those interviewed for this study agreed that a micro-credential demonstrated a mastery of one or more job competencies and that this focus made them more specialized than traditional academic degrees. This general agreement allowed us to cleanly separate micro-credentials from licenses, which show evidence of meeting minimum government requirements to perform a job rather than specific competencies and often require credentials for their acquisition.

Interviews with credentialing experts suggested that the boundary between micro-credentials and education degrees is not distinct, despite a relatively clean conceptual distinction. The specialization and separation from IHEs allow many micro-credentials to be clearly distinguished from degrees. Likewise, the academic focus and looser link between many degrees and the labor market allow them to be clearly distinguished from micro-credentials. The distinction is less clear in other cases, such as when micro-credentials are embedded in courses that lead to a degree or credit toward a degree. In such cases, the broad-based knowledge developed in degree programs can be structured to complement the job competencies developed by micro-credentials, as the symbiotic nature of the diagram to the left shows. For example, a degree program in accounting might include coursework to prepare a student for a job as a private accountant, a badge to indicate the holder meets the education requirements for the certified public accountant (CPA) exam, and credit for prior learning if the student holds the CPA certification.



1. CREDENTIAL STRUCTURE

Arguably, the impression of the Wild West that characterizes micro-credentials is best illustrated by their lack of a standardized structure, especially when compared to traditional degrees. ED defines the structure for degree programs, including associate's, bachelor's, and master's degrees, as well as research doctorates, in terms of credit hours, not competencies. For example, an associate's degree is defined as: "An award that requires completion of an organized program of study of at least 2 but less than 4 years of full-time academic study or more than 60, but less than 120 semester credit hours." The highly structured description of a degree has no equivalent for micro-credentials. Some micro-credentials are offered after a student completes courses that comprise a program. For example, all the online platform companies and private online education companies interviewed offer the ability to link together courses to earn a micro-credential, with Udacity's Nanodegree programs, Coursera's Specializations, and Alison's

Learning Paths all linking courses together to create a credential. Still other micro-credentials are offered after a student completes a single course. All but one provider interviewed offer micro-credentials after a student completes a single course, including optional preparatory courses. For example, students who successfully complete a single course in IBM's Big Data University earn a badge. Students who complete a single edX MOOC can purchase a Verified Certificate, such as Accounting for Decision-Making.

> "One of the problems with micro-credentials is everyone is making it up as they go along. . . . The risk here is you're introducing a lot of noise into an already inefficient system and making it more difficult for employers to decipher and cross-correlate [credentials]."
>
> *— Credential provider*

Neither do micro-credentials have a standardized mode of instruction. Most commonly, providers interviewed offered content in a single mode: only online or by having students choose either online or in person. A few offered materials only in person. For example, some online platform companies such as Coursera only offer material online, while Launch Academy offers boot camps either in person or online. In addition, some providers interviewed offer materials online that students can study on their own without guided instruction to earn a micro-credential. Such a structure would allow students with preexisting knowledge and skills to devote little time to studying the material before completing the required assessment for the micro-credential.

The interviews with experts and practitioners also showed a wide variation in the type of and depth of the assessments used to demonstrate competency and receive a micro-credential, even though the methods were fairly standard. Assessments include:

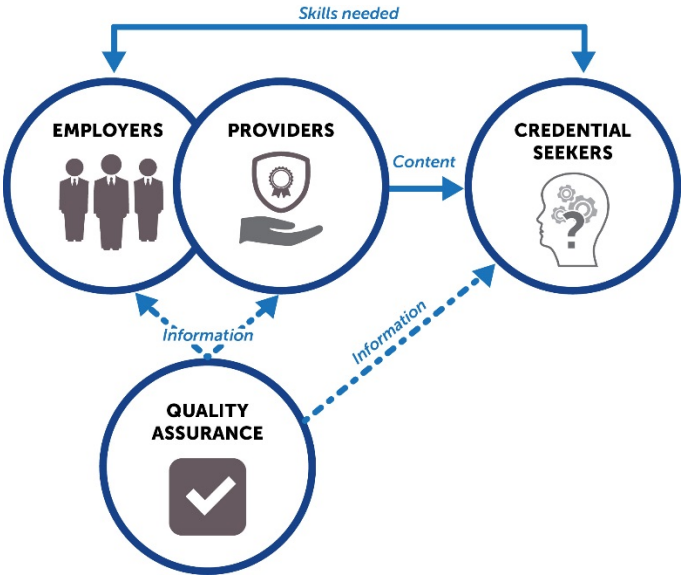
- **Completion of one or more examinations.** Most providers interviewed require students to pass at least one examination in some or all of their courses to earn a micro-credential. However, the frequency and depth of these examinations varies. Some micro-credentials are only granted after students pass multiple examinations throughout the course or program; others are conferred after only one examination at the end. Some providers require proctored exams; others require students to pass online quizzes without proctoring. Pearson's Basic Professionalism badge, for example, requires students to pass an online assessment at the end of each of five modules of its Basic Professionalism course, with a score of 80 percent or higher needed to earn the badge. Still others require students to pass examinations that include more hands-on, online simulations.
- **Completion of one or more projects.** Several providers interviewed require students to complete projects, instead of exams, for at least some of their courses. For example, Udacity's Android Basics Nanodegree requires students to complete several projects to earn the micro-credential, including building a single screen app and a quiz app.
- **Completion of an examination and a project.** A few providers required completion of both an examination and a project for a micro-credential. For example, Colorado Community College System's Healthcare Badge in Communication requires students to pass an assessment in prepared speaking and to complete and pass two final projects in health communication promotion.

2. THE MICRO-CREDENTIAL ECOSYSTEM

The scan identified a typical process for micro-credential development: (1) identifying the competencies needed to perform a specific job successfully, often in consultation with employers or subject matter experts who understand required competencies; (2) focusing content development on one (or only a few) of these competencies; and (3) developing a platform through which content is delivered.

This process involves many stakeholders, including employers, providers, credential stakeholders, and quality assurance providers. Figure 1 illustrates the ecosystem in which the stakeholders interact. Employers need skilled workers, and micro-credentials allow credential seekers to gain the competencies employers need or to demonstrate to employers that they have them. Because micro-credentials often signal highly specialized skills or are developed for a specific employer, they can facilitate a direct link between employers and job seekers (shown by the dual-headed arrow between these stakeholders). Although employers can also serve as providers of micro-credentials (the overlapping circles in the diagram), other entities, such as educational institutions, typically provide a venue or structure for offering the credential to credential seekers (shown by the line linking providers and seekers). Finally, where quality assurance is applied, accreditation organizations and others hold providers to a standard for their content and provide information to both employers and credential seekers about the quality of the credential, as the one-way arrows in the figure indicate. The activities that each of these stakeholders undertake are discussed in more detail below.

Figure 1. The micro-credential ecosystem



a. Employers

Interviews with experts and practitioners suggest that employers play a variety of roles in building and offering micro-credentials. Employers not only develop and offer credentials for their own products or processes, they also work with other micro-credential providers to develop curricula, validate content or credentials, provide instruction, or provide information about what skills workers need.

- **Offer credential (that is, are providers).** Some employers offer micro-credentials based on a demonstrated competency to use their products. Although a company, such as Microsoft or IBM, might hire individuals holding their credential, they typically tailor credentials to job competencies needed throughout the industry. Employers also create micro-credentials to build skills in their workforce. AT&T, for example, partnered with Udacity to help develop entry-level software skills in new hires and to help current employees reskill or hone their skills.

- **Develop curriculum.** Some employers work with providers to structure the courses, program, or materials leading up to an employer-driven micro-credential. The reverse arrangement also exists: some providers seek partnerships with employers to create micro-credentials, consulting with them to create the curriculum or design the projects used to assess competence.
- **Validate content or credential.** Providers sometimes ask employers to review and validate course content or a specific credential. Reviews might occur during the development process by an advisory council, an individual employer, or an industry association. Providers interviewed also had employer representatives review the criteria for awarding a micro-credential or the projects or tests students completed to demonstrate competency.
- **Provide instruction.** Some providers partner with employers to teach their courses. For example, Steve Huffman, Reddit's CEO, teaches Udacity's Intro to Programming course.
- **Provide knowledge of skill needs.** Some providers interviewed built ties with employers to keep abreast of what skills workers need. These providers involved employers in their micro-credentials formally through advisory boards or informally through periodic discussions to gain feedback on existing credentials and on skills currently in demand.

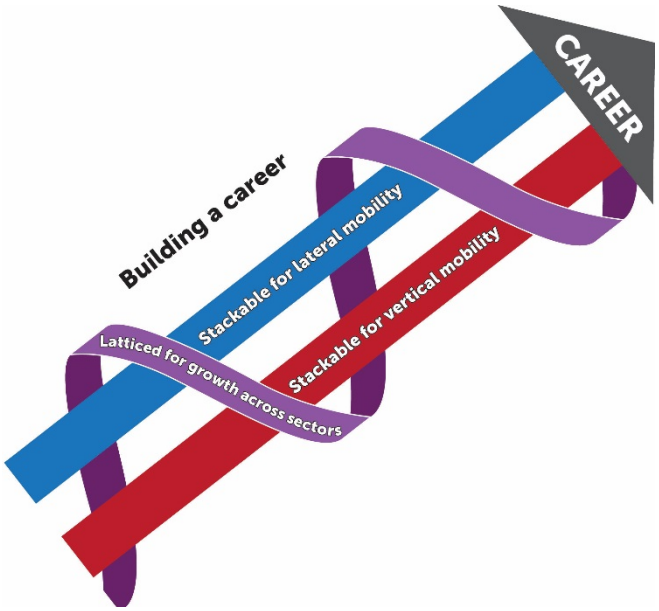
b. Providers

The interviews with experts and practitioners identified seven entities other than employers with a role in offering micro-credentials: (1) educational institutions, (2) online platform companies, (3) private online education companies, (4) community-based organizations, (5) industry associations, (6) privately owned and operated companies, and (7) local governments.

- **Educational institutions** such as IHEs, secondary schools, and adult education programs offer micro-credentials. For example, the Community College of Allegheny County in Pennsylvania offers micro-credentials to students in health and IT that meet local employer demand for skills in those sectors. As another example, a consortium of universities collaborated to form the University Learning Store, which offers online, skills-focused courses leading to credentials designed to meet the needs of employees and workers.
- **Online platform companies,** including MOOC providers, provide educational institutions and employers with web hosting for courses that can lead to digital badges. IHEs and employers create the content, with guidance from the platform companies on adapting it to an online platform. The companies may also provide advice to IHEs and employers on data-driven best practices, including on the strategy behind their portfolio of course offerings, the design of the MOOCs, and marketing. Examples include Coursera and edX.
- **Private online education companies** offer online curricula leading to micro-credentials. They differ from online platform companies because they create the course content and teach the courses, often in collaboration with employers. Udacity is a prime example.
- **Community-based organizations** also may offer micro-credentials as a way to train low-skilled, entry-level workers. For example, the nonprofit Climb Wyoming works with local employers to design industry-specific training courses for low-skilled, entry-level workers who are also mothers. Some of the programs offered, such as for certified nursing assistants, offer a micro-credential for successful completion.

- **Industry associations**, and professional associations like the Project Management Institute, mostly offer certifications for skill competencies in their specific sector. As an example, the National Institute for Metalworking Skills (NIMS) offered 56 different certifications in metalworking in 2017.
- **Privately owned and operated companies** offer targeted courses leading to micro-credentials. Students in Revature's 12-week software engineering boot camp, for example, complete job-specific projects and receive a Revature Certified Software Engineer credential upon completion.
- **Local governments** offer micro-credentials like badges for participation in a program or demonstration of a skill but are not likely to create the content for the credential. The Detroit Mayor's Office, for example, offers badges to youths in the city's summer jobs program for demonstrating skills, such as conflict resolution, that are built through the training program.

c. Credential seekers



In general, people pursue credentials to increase employment and earnings and pursue micro-credentials to gain skills that are in demand or show employers they possess them. By affording individuals with a chance to gain skills in "bite-sized" portions, micro-credentials can potentially move completers into the workforce relatively quickly. Micro-credentials might also afford an opportunity to build a broad set of competencies gradually, by "stacking" chunks of knowledge into a key set of skills. Credential stacking can help someone move vertically up a career ladder. For example, a construction worker might be able to move into a managerial position by pursuing project management certifications or move into self-employment by building foundation-level business knowledge with a Coursera Business Foundations Specialization. Stacking also can allow people to move horizontally across industries, occupations, labor markets, or departments within a company by adding depth to their skills. For example, a computer programmer might learn a new language to apply programming skills in a different environment or in a different programming job with expanded opportunities.

d. Quality assurance providers

Quality assurance providers, often accrediting agencies, evaluate a credentialing or educational program against defined standards set by a third party. By assuring compliance with these standards, they provide a credential with credibility and demonstrate to the profession, employers, and credential seekers that it has met the objective standards. The International Certification Accreditation Council (ICAC), the American National Standards Institute (ANSI), and the Institute for Credentialing Excellence (ICE) currently serve as the largest quality assurance providers for nondegree credentials.

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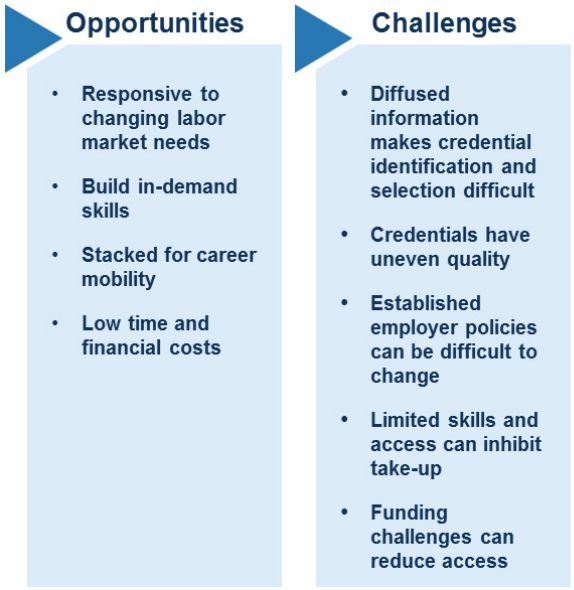
C. OPPORTUNITIES AND CHALLENGES

The scan revealed several tensions in the development of micro-credentials that suggest opportunities afforded by micro-credentials and challenges that must be overcome for their full potential to be harnessed. Key tensions include:

- Adapting programs to in-demand skills on an ongoing basis makes micro-credentials more responsive to labor market needs, but also makes them more difficult for employers and credential seekers to assess. This fluidity also hampers efforts by quality assurance providers to set standards for them.

- Providing job seekers with the opportunity to quickly build the skills employers need in the short term may open employment opportunities, but unaligned employer recruitment and hiring practices often make it difficult for people without degrees to meet requirements.

- Requiring a relatively short time for completion and offering a flexible format affords individuals opportunities to stack credentials and build broad sets of skills; however, many of the currently available micro-credentials require a core set of skills to pursue them, which might limit access and inhibit their take-up.



- Carrying relatively low financial and time costs makes micro-credentials more affordable than degrees, but the noncredit nature of many leaves credential seekers without eligibility for financial aid.

The following sections provide details of these tensions by presenting them as potential opportunities and challenges.

1. OPPORTUNITIES

a. Responsive to changing labor market needs

One key potential strength of micro-credentials is their adaptability to changes in the labor market. The scan identified two characteristics that could contribute to this strength. First, because micro-credentials are narrower than degrees, providers can quickly alter their credential requirements to focus on building skills for new in-demand areas. This flexibility might be especially valuable in industries in which skills are rapidly changing, such as IT. In addition,

existing micro-credentials can be discontinued when slowing product demand or an influx of skilled workers reduce the labor market demand for a skill. Second, the interviews with practitioners suggest that another source of responsiveness could lie in the fact that micro-credentials are not usually part of the accreditation process. Providers can easily build and rely on employment-driven indicators of success and quickly create new micro-credentials or update the content of existing micro-credentials when the demanded skills in the labor market change (if the credentials are not subject to the constraints set by accreditation agencies). One provider interviewed considered seeking accreditation for one of its programs so that students could apply for financial aid, but noted that it would always keep at least one unaccredited program that could remain responsive to labor market changes.

> "When we do come out with an [accredited] program, we anticipate it will be a lot less volatile and less responsive to the needs of the hiring market."
>
> *— Credential provider*

b. Build in-demand skills

As experts and providers noted in interviews, micro-credentials that reflect competency in skills that are in demand in the labor market would be valuable in hiring if employers were aware of the specific skills and competencies the credentials represent. Knowing the specific skills job applicants with a credential possess could help employers recruit applicants with the precise skills they need instead of using degrees that may signal a set of general skills. This more honed recruitment approach could reduce recruitment and training costs.

Such an approach is being used in the IT field. Still, employers and job seekers in a variety of sectors might be able to benefit from their use. Micro-credentials are available in many other sectors—including health, general education, workforce readiness, and data science and analysis. Alison, for example, offers credentials in care provision, touch typing, educational psychology, and Google Analytics. Edevate offers a Certified Nursing Assistance MicroDegree, a Conflict Resolution MicroDegree, and a Data Management MicroDegree.

c. Stackable for career mobility

Providers usually offer some credentials at the entry level and others at more advanced levels that require prior education or understanding of less advanced topics. This variation allows individuals to stack credentials for career mobility. For example, Coursera's Statistics with R Specialization is a beginner specialization in data visualization and analytics that does not require prior experience or education beyond basic math. However, Coursera's Strategic Business Analytics Specialization is an advanced specialization designed for professionals in the field or for graduate students who have a background in R and analytics. Some providers (for example, Cisco's Career Certifications in networking) make stacking easier by mapping their credentials into progressive steps for building depth of knowledge. Cisco's network certifications have five levels—(1) entry, (2) associate, (3) professional, (4) expert, and (5) architect—with several certifications at each level. Certifications at the lower levels can be used as prerequisites for earning the higher-level certifications. Students can start their networking professional career by earning the Cisco Certified Entry Networking Technician (CCENT) certification at the entry level and then move on to earn the Cisco Certified Network Associate (CCNA) certification at the associate level, which is a prerequisite for the Cisco Certified Network Professional (CCNP) certification at the professional level.

Other providers enhance mobility by latticing their for-credit micro-credentials with other credentials, such as degrees, in mutually supporting ways. For example, some online platform companies offer micro-credentials that are accepted for credit. EdX's MicroMasters® Programs provide people a meaningful way to indicate to the labor market their mastery of a certain subject, skillset, or specific job competencies and offer credit toward a master's degree. At the time of print, edX's partners have created 36 different MicroMasters® Programs—programs in high-demand areas like cyber security and project management show competencies in these high-demand areas and provide credit toward master's degree programs at many of the world's top IHEs. EdX's program on robotics provides job competencies in designing, building, and programming robotics and credit for these courses at the University of Pennsylvania.

d. Low time and financial costs

Both the time and financial costs of obtaining a micro-credential are almost universally lower than obtaining a degree. Because micro-credentials focus only on one or a few competencies, most can be earned within one year; some can be completed in three months or less. This time might be further reduced if the curriculum is self-paced or competency based, which can allow someone with background knowledge of the content to move at a quicker pace. Financial costs are extremely low when compared to degrees. A few providers (such as IBM's Big Data University) offer free courses and free credentials. Others (including Alison and edX) offer their courses free but charge for their credentials, which cost far less than the annual tuition for a bachelor's or master's degree. Many credentials cost less than $1,000, and some fees are as low as $20. Others range in price between $1,000 and $5,000. According to Course Report, tuition for a boot camp averages about $11,500 for ten and a half weeks. The College Board estimates that attending a public two-year college costs, on average, $3,400 per year (or $6,800 for a two-year degree), and a public four-year college costs, on average, $23,900 per year (or $95,600 for a four-year degree).

2. CHALLENGES

a. Diffused information makes credential identification and selection difficult

Without an understanding of what a credential represents, employers cannot reliably evaluate applicants and their skills. The proliferation of micro-credentials, the plethora of providers developing them, and a lack of standardization in structure and requirements make it hard for employers and job seekers to distinguish between different micro-credentials, much less use them as evidence of competencies. Although this may also be true to some extent for degrees in the same major offered by different IHEs, the issue is likely magnified for micro-credentials because many are not accredited and terminologies and approaches for the credential are not standardized.

> "Certification is a garbage can term right now. You don't know what that is until you peel the onion several layers. You can get a certification by paying $25 and people say 'I'm certified.' Or [the certification] can be ANSI accredited that meets international and national standards. . . . That word [certification] has become meaningless."
>
> *— Credential expert*

In addition, interviews with practitioners suggest that the terms used for specific micro-credentials are not clearly differentiated. Even long-standing terms such as *certificates* and *certifications* do not convey a common understanding.

Consider that a certificate can be awarded for partial program completion, course completion, successful completion of course requirements and associated assessments, or as an advanced intermediate "degree." Furthermore, the distinction between certificates and certifications has become blurred as some certifications—for example, the SCPro™ Fundamentals Certifications—are exam based and do not require renewal. The distinction between degrees and credentials has also blurred, with some of the newer micro-credentials using names that sound like degrees, such as Nanodegrees and MicroMasters® Programs, even though students earn certificates, not degrees, in these programs.

Several efforts are under way to develop and convey standard definitions of credentials. For example, GEMEnA, the federal interagency work group led by the National Center for Education Statistics at ED, ICE, and Lumina, in partnership with the national Connecting Credentials initiative, have developed, provided, and publicized definitions of terms associated with credentials, including micro-credentials. These definitions draw a distinction between, for example, an industry certification and a certificate. Many of these same efforts are also working toward clarifying definitions to inform future data collection initiatives and help researchers establish meaningful parameters for credentialing.

Another effort to help employers, school and career counselors, credential seekers, governments, and other stakeholders navigate the existing maze of micro-credentials is the Credential Engine's Credential Registry. This is an attempt to enter all credentials, including micro-credentials, into a registry that creates more transparency regarding the credentials and allows judgments to be made regarding the quality and market value of the credentials through stakeholder "apps" that have established criteria for their specific needs. When completed, the registry could serve as a tool to (1) help workers identify credentials that hold promise for gaining or advancing in employment and compare different types of credentials, including their earnings potential; and (2) help employers interpret whether particular credentials will meet their competency needs.

b. Credentials have uneven quality

> "I think it's confusing now because of a lack of standards. . . . There is such a proliferation of badges, it is hard if you are an employer to know what is worth something and what is not."
>
> *— Credential provider*

Several experts and providers interviewed discussed the lack of quality standards and control as characteristics of the burgeoning micro-credentials. The resulting uneven quality of micro-credentials limits the confidence of employers and workers in them. Even if employers understand the competencies that a credential is supposed to represent, they may lack confidence that the credentialed job seeker actually has the skills, without some assurance of quality or a trusted relationship with the provider.

c. Established employer policies can be difficult to change

Despite the potential for micro-credentials to help employers reduce hiring and training costs, the practice of hiring applicants with degrees is likely embedded in many employers' human resources policies, and changing those policies can be difficult. Indeed, several experts and providers interviewed said that employers still look for candidates with degrees instead of looking for individuals with particular skills.

IBM's New Collar Initiative

IBM is working to change the hiring climate to prioritize capabilities over credentials. IBM found that there are 500,000 open technology jobs in the United States, and universities are producing only one-tenth that number of computer science graduates. As a result, finding candidates with the right mix of skills means looking at candidates from all backgrounds, who have obtained skills in different ways, such as through vocational training, coding boot camps, certification programs, and more. IBM calls jobs that require less than a four-year degree "new collar" jobs. Recently, IBM's CEO Ginni Rometty encouraged then President-elect Donald Trump to focus attention on these jobs as a way to grow the economy.

IBM's New Collar Initiative is changing how the company hires workers by incorporating micro-credentials into the process. Because IT work evolves rapidly and many jobs are difficult to fill, IBM began to search for new approaches to education, training, and recruiting. After examining job requirements for hard-to-fill positions, IBM found that many do not require a traditional college degree. What mattered was relevant skills that were often obtained through vocational training and demonstrated through micro-credentials. As a result, IBM hiring managers have begun looking for candidates with relevant skills, regardless of how they were obtained. IBM has also committed to hiring U.S. veterans in "new collar" positions that require skills but not a degree. The company has created training programs specifically for veterans to train and certify them for new collar jobs. IBM is also investing in workforce training and development in the United States more broadly and advocating for policy changes that will help Americans build new collar skills.

d. Limited skills and access can inhibit take-up

Student enrollment and success in micro-credential programs largely depends on the level of their foundational and soft skills. Several experts and providers reported that students usually need English language fluency; high school–level, basic literacy and numeracy skills; and, if the credential is online, computer literacy. In addition, several reported that credential seekers need to be self-directed, organized, and able to create and follow their own timelines, characteristics that can be challenging for students who face competing priorities, such as work and family obligations. These findings suggest that programs could consider directing students who do not demonstrate sufficient foundational or soft skills to remediation modules to build those skills or integrate soft skills into their curriculum, as Per Scholas does.

Per Scholas' soft skills training

In addition to training participants in the technical IT skills needed for a job, Per Scholas teaches participants the soft skills they need to succeed. Per Scholas trains students in professional development skills, including customer service, time management, team building, professionalism, resourcefulness, anger management, and public speaking. In some courses, students spend four days each week learning technical skills and one day each week learning soft skills.

e. Funding challenges can reduce access

Although the time and financial costs of micro-credentials are, in general, far lower than for degrees, their costs might still be prohibitive for some. People who enroll in micro-credentials offered outside of IHEs frequently are not eligible for Title IV financial aid, although the Educational Quality through Innovation Partnerships (EQUIP) experiment is examining the

potential for financial aid to apply to nontraditional training providers, including coding boot camps, online courses, and employer organizations. In the past, training funds at AJCs could not be applied toward them either. This ineligibility might change under WIOA, such that providers could be included on eligible training provider lists at the state and local levels. Currently, however, training funds can only be spent in areas showing evidence of success (TEGL 41-14), so evidence supporting successful outcomes for micro-credential holders would need to be built. Until then, training funds cannot be used to support job seekers pursuing micro-credentials.

Students also must be able to access materials. Materials for some micro-credentials are readily available online to anyone with the skills and motivation to pursue the credential; however, people must have internet access to obtain them. Other micro-credential programs restrict access to their materials, and some providers require students to submit a program application before enrolling. Although some programs have application processes that are *pro forma* (for example, community colleges usually take all applicants), others require applicants to undergo a more intensive process that may include an interview.

D. PROMISING PRACTICES FOR WORKFORCE DEVELOPMENT

In 2014, the U.S. Departments of Labor, Commerce, Education, and Health and Human Services summarized the evidence on adult job training strategies and programs. As part of that effort, they identified six practices used by employment and training programs that had evidence of success:

1. Provide a postsecondary education, particularly a degree or industry-recognized credential related to jobs in demand
2. Use flexible and innovative education and training approaches, such as contextual learning and bridge programs that prepare individuals for the credential
3. Relate training closely to a real job or occupation
4. Engage employers and industries to improve the alignment of training with employers' needs
5. Provide access to accurate and up-to-date labor market data, as well as information and guidance about career and training opportunities to help individuals make better decisions about training and help policymakers and program administrators plan
6. Coordinate strategies across systems to integrate the education, training, and support services that lower-skilled individuals and those with multiple barriers to employment need to prepare for and succeed in the workplace

Effective workforce development practices

- » **Provide a degree or industry-recognized credential related to jobs in demand**
- » **Use flexible and innovative training**
- » **Relate training closely to a real job or occupation**
- » **Engage employer and industry**
- » **Provide access to accurate and up-to-date labor market information**
- » **Integrate education, training, and support services**

This section provides examples of promising practices currently used by micro-credential providers across these six workforce development strategies that could help them become valuable opportunities for job seekers and employers.

1. PROVIDE A DEGREE OR INDUSTRY-RECOGNIZED CREDENTIAL RELATED TO JOBS IN DEMAND

CompTIA's industry-recognized credentials

CompTIA A+ certification is an industry-recognized credential in demand in the IT field. With the A+ certification, workers can apply for help desk and PC technician jobs that have an average salary of $52,000. According to employment projections from the Bureau of Labor Statistics, these jobs could grow faster than average (13 percent) through 2024.

Some micro-credentials identified for this study are industry recognized. Credentials such as the CompTIA A+ certification have been developed with input from industry to ensure that the skills received in training are in demand by employers and require a rigorous assessment. In the case of the A+ certification, quality is assured with accreditation by ANSI.

Individuals interviewed suggested that industry recognition might be increased if credentials became validated through a trusted process, such as an

accrediting body. Other suggestions for validation included rigorous assessments and employer involvement in reviewing and validating curriculum, standards, assessments, and performance projects.

2. USE FLEXIBLE AND INNOVATIVE PEDAGOGIES

The interviews identified several ways in which the learning environment for a micro-credential was contextual or flexible and provided a bridge for success in subsequent training.

- **Contextual learning** means that material is taught in a way that is relevant to the student, with the student's future career being the context for micro-credentials. Contextual learning allows students to grasp the meaning of the material using their own unique experience and draws heavily on real-world problems, projects, and applications. Examples include pedagogies such as project based learning, applied learning, hands-on learning, and experiential learning (learning through reflection of learning). Several micro-credential providers interviewed used hands-on projects in which students learn by doing real-world tasks. Students use the products they create as part of these projects (for example, a web application) to showcase their skills to prospective employers. Udacity grounds its training in this approach, as do boot camps from Launch Academy and Revature.
- **Flexible formats.** Online platform companies, including MOOC providers such as edX, provide their courses in a flexible format. All courses are offered online and some, including Introduction to C++, are self-paced, so workers can complete the training on their own schedule, using a location and an online device of their choosing.
- **Bridge programs** help students who lack the necessary foundation, soft skills, or support services for higher levels of education or training (U.S. Department of Education 2012). They often combine basic skill instruction with occupational content, employment skills, and training success strategies so that students are prepared to meet the challenges of a rigorous training program. Programs such as Per Scholas' CodeBridge provide a bridge for individuals, including low-skilled workers, to prepare for more rigorous, advanced, or intensive programs like boot camps.

Per Scholas' CodeBridge: Preparing students to succeed in a short intensive program

Per Scholas, in collaboration with General Assembly, offers innovative training through the CodeBridge program. CodeBridge is a 17-week program that begins with 5 weeks of basic web development training at Per Scholas. The program is designed to prepare students for entry into General Assembly's 12-week immersive boot camp in web development.

3. RELATE TRAINING CLOSELY TO A REAL JOB OR OCCUPATION

Udacity's Nanodegree and Nanodegree Plus Programs

Udacity's Nanodegree programs are designed in collaboration with employers to ensure that the skills students learn are matched to those required by real jobs. For example, Udacity created the curriculum for the Data Analyst Nanodegree in collaboration with Facebook and Tableau to verify the skills needed in the labor market. Udacity is confident that students will obtain jobs after completing the Data Analyst Nanodegree. The company also offers students a Nanodegree Plus option, which guarantees that they will obtain a job within six months of earning the credential or they will get their tuition reimbursed.

Micro-credentials included in this study (mostly those offered by online platform companies, badges, and certifications, but typically not certificates offered by IHEs) were often created by analyzing a job and breaking it down into required competencies. Providers then created one or more micro-credentials to represent the required competencies.

Udacity uses this process to create its Nanodegree programs. Curriculum developers look at a job opening, determine what skills are required to do the job, and develop a curriculum with projects that students complete to show they have the required skills—all in collaboration with employers.

4. ENGAGE EMPLOYERS AND INDUSTRY IN DEVELOPING CREDENTIALS

One way to help ensure alignment between training and labor market needs is to engage employers or industry associations in developing the credential. One example of this engagement is the Colorado Community College System (CCCS), which engages employers and industry in developing and offering micro-credentials. CCCS staff thought digital badges could help fill the skills gap in the advanced manufacturing sector. They engaged representatives from the manufacturing industry to identify the competencies required, such as through summits to engage employers and industry representatives in a conversation that determined in-demand skills, competencies needed for jobs requiring those skills, and development of the badges. Colleges modified existing coursework in machining to integrate the digital badges, which also reflected manufacturing standards identified by NIMS. Local employers look for the NIMS badges when hiring and use the NIMS registry to find individuals who have that badge. Students can show their digital badges as part of their applications.

5. CONVEY LABOR MARKET INFORMATION

The research uncovered a few ways in which micro-credentials have helped convey information about employment to individuals that can help guide them as they navigate and make decisions about careers and training opportunities.

- **Embedded in digital badges.** Job seekers need access to labor market information to identify training programs and credentials that will lead to jobs with career advancement opportunities. Micro-credentials offered as digital badges embed this information in the badges that can help job seekers understand how the credential relates to potentially available jobs. In the Acclaim platform, each skill tag in the badge's metadata is linked to labor market information about, for example, available jobs that require the skills and employers who are demanding them. By accessing this information, job seekers can compare available badges in a provider's catalog to determine which will lead to the types of jobs they are seeking and that are available in their community.

Acclaim digital badges

Nearly all the badges offered through Pearson VUE's Acclaim platform provide workers with access to linked labor market information about how the skills gained through the badges translate to available jobs. For example, IBM's Cloud Java Developer badge, offered through Acclaim, lists cloud computing as one skill that will be gained by earning the badge. When interested workers click on the cloud computing skill, they are taken to a web page that lists the top related job titles with links to available job postings, the top locations where that skill is in demand, the top employers demanding that skill, a list of related skills, and salary range information.

- **Available through a mobile app.** The Greater Memphis Alliance for a Competitive Workforce created the digital MemphisWorks program, an innovative combination of labor market information and skills training. MemphisWorks is a website and mobile app that allows job seekers to search for available jobs in their community and access short online training courses to earn badges in entry-level skill areas related to the specific job.

6. INTEGRATE EDUCATION, TRAINING, AND SUPPORT SERVICES

Individuals with a relatively low level of skills often need support to help them complete an education or training program. Many face competing demands for their time (for example, children and work). Some need services to help stabilize their lives (for example, for substance abuse, mental or physical health, and financial counseling). Some need transportation assistance for in-person training. Others need to acquire digital competencies and internet access for online training. Nearly all struggle financially and need help with tuition and related expenses.

Support for people working toward a micro-credential can be provided in a number of ways. Community colleges, for example, typically offer a comprehensive set of support services for students and might be in a good position to offer short-term services for people working toward a micro-credential. Although other providers might not be able to provide such comprehensive services, some partner with nonprofits or the AJCs, as Coursera for Governments & Nonprofits has done.

Still other providers interviewed have developed services that target specific types of support within their programs. Examples include the following:

- **Academic support,** such as tutors, advisers, or online forums for students to ask questions. Some providers offer online mentors who answer students' questions and lead online forums. Others provide students with tutors or mentors in person. One provider that offers courses online has tutors hold tutorials in person in select cities; another provider has opportunities for students to meet with mentors and other students in physical locations.
- **Nonacademic support,** such as transportation supports, equipment, uniforms, and emergency loans. One provider offers students case management and access to emergency loans, transportation assistance, financial counselors, and partnerships with clothing resources. Another offers transportation stipends and financial support to purchase books and work-related uniforms and tools.
- **Career support and career coaching,** such as online guides for job searching, connections to employment opportunities, and career counseling from staff. One provider provides written guides on writing resumes and cover letters and conducting career research, among other topics. Others offer one-on-one resume support. A few providers offer guidance to students about what other credentials they may want to pursue. Some also connect students with companies that are hiring. Providers that do not provide career services could consider partnering with the AJCs, which offer many of these services, including career counseling, job listings and placement, labor market information, job interview preparation, and resume help. However, several experts and providers cited the decentralized nature of the workforce system as a barrier to this kind of partnership because students are located in many AJC service areas. The regional planning done under WIOA might lesson this barrier.

Coursera for Governments & Nonprofits

Coursera for Governments & Nonprofits is an arm of Coursera that partners with public and nonprofit organizations to provide customized training for workforce development. Coursera provides government entities and nonprofits access to online training programs and the option to add their own in-person support services. For example, through Onward to Opportunity, military service members prepare for civilian careers by taking in-person courses paired with Coursera online courses. They also receive one-on-one career supports, such as career coaching, resume writing, and mock interviews.

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E. NEXT STEPS

Information in this environmental scan suggests that, despite challenges, micro-credentials might have the potential to help job seekers, including low-skilled, entry-level workers, find a job and progress along a career path. It highlights how micro-credentials could be used to build in-demand skills in the labor market and open job opportunities for low-skilled job seekers. Still, the absence of rigorous research on micro-credentials and their recent proliferation by new providers and in different forms means that more work needs to be done to assess their potential for low-skilled workers and, ultimately, to determine their effectiveness. Although a long, rich history of research estimates the returns to education degrees and provides evidence of programs that support their completion (see research contained in the What Works Clearinghouse), research on micro-credentials is mostly descriptive. When research has attempted to estimate returns to micro-credentials, it has not been structured to isolate the impact of micro-credentials on labor market outcomes and, as a result, cannot offer evidence of effectiveness (see, for example, Quan et al. 2007).

Findings from this scan helped identify initial avenues of research on micro-credentials that would add to the body of knowledge about their potential to support workforce development for low-skilled, entry-level workers. We examine this research potential in four areas.

1. ESTIMATE THEIR IMPACT ON LABOR MARKET OUTCOMES AND TRAINING

Micro-credentialing offerings have proliferated in recent years, despite little robust evidence about their effectiveness in improving labor market outcomes. The small amount of research that has been conducted has frequently focused on for-credit certificates, without considering the broader array of micro-credentials offered, and has not specifically considered returns to credentials for low-skilled workers. In addition, research has not assessed whether low-skilled, entry-level individuals are more likely to complete training or credentialing programs if they are awarded badges along the way. Neither has research assessed the association between acquiring micro-credentials, including stacking complementary micro-credentials, and increasing employment and earnings. Future research could fill these voids by addressing such questions as: "*Do micro-credentials improve training, employment, and earnings outcomes of low-skilled, entry-level job seekers?"*

Because of the diversity in available micro-credentials, the most effective evidence in answering these questions would be through randomized controlled trials (RCTs). Smaller-scale trials on pilot programs could begin to build evidence of their potential. Examples include:

- **Embedding micro-credentials in existing training programs** to assess whether participants are more likely to complete the program. Community colleges (for example) that offer multiple sections of a course could randomly select some sections to embed badges into the course (or at the end of the course for multiple-course programs) to indicate mastery of a skill and progression toward a credential and other sections to award a single credential at the end of the program (that is, business as usual). Such a study would provide evidence about whether micro-credentials might improve retention in training or allow individuals to use badges to find employment while still continuing their training. A related follow-up survey or match to administrative data could evaluate longer-term outcomes.

- **Providing vouchers** to a treatment group of job seekers or incumbent workers so that they could pursue a micro-credential or a training in which micro-credentials are embedded. The control group would receive vouchers for training in a traditional program. WIOA training funds, provided to customers through individual training accounts, could support training for both groups. The research could then be structured to look at whether employment, earnings, or program retention was higher for job seekers pursuing micro-credentials than for those engaged in traditional training.
- **Embedding an RCT into an existing micro-credential program** that has excess demand for its program, and a willingness to randomly assign applicants, classes, or sites into treatment and control groups. Such a study could be structured with power to accurately estimate the effectiveness of a micro-credential training program that has sizable enrollment.

After micro-credentials have matured to a level in which strong programs can be built and identified and evidence of success of pilot programs exists, rigorous nationwide research on their impact can follow. Until that time, the emerging body of research on micro-credentials can be compiled on what is known about their effectiveness. A website devoted to these studies would include the range of evidence—both positive and negative—and would allow researchers, policymakers, and program directors to assess the effectiveness of micro-credentials for themselves. As the research expands, findings on micro-credentialing could be disseminated through existing clearinghouses, including the DOL Clearinghouse for Labor Evaluation and Research (CLEAR) or ED's WWC websites.

2. DEVELOP AN INVENTORY FOR LOW-SKILLED WORKERS

The proliferation of micro-credentials has produced a need to better understand how many are currently available that could be pursued by low-skilled, entry-level workers. Our scan suggests that some existing micro-credentials could be used to build skills and create career pathways for low-skilled, entry-level workers. However, the scan also suggested that many of the well-established credentials are developed for the IT sector or might require numeracy and computer skills that are beyond those typically held by low-skilled workers. An inventory of existing micro-credentials could help workforce development agencies (for example) understand their current potential and limitations for use in training. Research questions for such a study might include: *How many and what type of micro-credentials exist that low-skilled, entry-level workers could pursue? For what sectors and occupations would they develop skills?*

Several sources might be used to start such an inventory:

- The sources cited in this scan—IPEDS, Course Report, and Class Central data—might be used as a place to start a count and categorization of micro-credentials; however, each of these sources provides a snapshot of one specific type of credential (that is, certificates offered by Title IV institutions, boot camps, MOOCs).

- The Credential Engine's Credential Registry could provide an inventory, because it is currently building a voluntary registry of all credentials, including micro-credentials, and apps that would allow individuals to search the credential database. However, the extent to which the registry can be used to readily identify credentials that can be pursued by low-skilled workers is unclear.

- Secondary data could be used help build our knowledge about the different credentials held by low-skilled workers, with several data sources potentially available. The Participant Individual Record Layout (PIRL) system, the new performance reporting under WIOA, will include several fields on training that leads to certificates and certifications. The Interagency Working Group on Expanded Measures of Enrollment and Attainment (GEMnA) has helped integrate a standard set of survey questions into many ongoing surveys, including the Adult Training and Education Survey, the Current Population Survey, the Survey of Income and Program Participation, and the National Survey of College Graduates. Both the surveys and PIRL could help identify the types of micro-credentials attained by low-skilled individuals and, perhaps, show their correlations to labor market outcomes. (Ewert and Kominski [2014] provide an example of how these questions might build our knowledge of micro-credentials). Still, they cannot provide an exhaustive inventory of the specific types of micro-credentials for low-skilled workers (for example, IT certifications, health certificates).

Information from secondary data sources could provide a snapshot of the micro-credentials held by low-skilled workers. However, they might not capture the depth of credentials available because many of the newer credentials might not be held by a large proportion of the low-skilled individuals in these databases. Combining information from these sources with information obtained from a representative sample of micro-credentials or badges offered would provide a more complete picture of the breadth and depth of micro-credentials available across sectors and occupations. Such an augmentation would require primary data collection of information about micro-credentials offered from the larger providers, such as Pearson.

3. EXPLORE WAYS TO VALIDATE QUALITY

This scan and a scan of alternative postsecondary credentials (Brown and Kurzweil 2017), as well as the EQUIP goal to "strengthen approaches for outcomes-based quality assurance processes that focus on student learning and other outcomes" for nontraditional training providers, highlight the need to build quality assurance processes for micro-credentials. These processes would allow for the accurate and comparable evaluation of micro-credentials with quality and enforceable standards for all providers without limiting a provider's ability to change the training when the demand for skills changes. Research on this topic might address such questions as: "*What processes might be put into place that would assure employers that job applicants with a particular credential have relevant labor market skills?"* and *"How can flexibility be built into the micro-credentialing accreditation process?"*

Possible methods to answer these questions include surveys of, or scenario testing with, employers and accrediting bodies. Surveys of employers could include questions about credential validation processes that would give them confidence in the value of a micro-credential. Scenario tests would ask employers to review variations in accrediting information for different credentials and to select the credential that they would more likely use for hiring decisions. Because employers in different sectors might have different perspectives, studies could be powered for subgroup analyses by sector. Surveys of accrediting bodies might come after employer surveys and include questions about the changes that would be needed to accommodate employers' preferences.

4. UNDERSTAND WHAT INFORMATION MIGHT HELP JOB SEEKERS CONSIDER MICRO-CREDENTIALS

One key challenge facing micro-credentials is that information about them is diffuse: the plethora of micro-credentials and providers has made it difficult for job seekers to understand the meaning and relevance of a specific micro-credential. This difficulty might be exacerbated for low-skilled workers who might find it difficult to find suitable micro-credentials in light of the plethora of credentials offered in the IT field and developed for higher-skilled workers that was suggested by this scan. Building an understanding of how entry-level, low-skilled workers decide which training options to select might help counselors at AJCs (for example) target the types and sources of information that could help job seekers better understand the training options available to them. Research in this area might address the following question: "*What type of information would allow job seekers to consider alternative credentials in their decision making on training programs?"* This question might be answered through:

- **Surveys or qualitative research** that determine the types and sources of information that low-skilled, entry-level job seekers use when making decisions about employment, careers, and training or that provide insight into employers' reluctance to rely on micro-credentials when hiring. Questions related to job seekers might center on whether they place relatively more weight on word of mouth, more formal sources of information about the program or credential, or labor market information when deciding what training to pursue.
- **Pilot tests** that provide information about micro-credentials to low-skilled, entry-level job seekers in a particular job market can assess how job seekers use the information to decide which training to pursue. For example, the research might focus on a local market that is heavily IT focused and assess the barriers that might prevent low-skilled workers from obtaining micro-credentials in the IT field. The design of the pilot(s) could be informed by behavioral insights research; for example, the pilots could include "nudges" toward different types of information and be paired with a debriefing for job seekers about the helpfulness of the data for decision making.

F. RESOURCES

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2. REFERENCES

Belfield, Clive, and Thomas Bailey. "The Labor Market Returns to Sub-Baccalaureate College: A Review." New York: Columbia University, Community College Research Center, 2017. Available at: http://ccrc.tc.columbia.edu/publications/labor-market-returns-sub-baccalaureate-college-review.html. Accessed August 26, 2017.

Bird, Kisha, Marcie Foster, and Evelyn Ganzglass. "New Opportunities to Improve Economic and Career Success for Low-Income Youth and Adults: Key Provisions of the Workforce Innovation and Opportunity Act (WIOA)." Washington, DC: CLASP, September 2014. Available at: http://www.clasp.org/resources-and-publications/publication-1/KeyProvisionsofWIOA-Final.pdf. Accessed May 17, 2017.

Brown, Jessie, and Martin Kurzweil. *The Complex Universe of Alternative Postsecondary Credentials and Pathways*. Cambridge, MA: American Academy of Arts & Sciences, 2017. Available at: https://www.amacad.org/content/publications/publication.aspx?d=22786. Accessed July 23, 2017.

Bureau of Labor Statistics. "Labor Force Statistics from the Current Population Survey." Last modified February 8, 2017. Available at: https://data.bls.gov/cgi-bin/surveymost?ln. Accessed August 31, 2017.

Carnevale, Anthony P., Stephen J. Rose, and Andrew R. Hanson. "Certificates: Gateway to Gainful Employment and College Degrees." Washington, DC: Georgetown University, Center on Education and the Workforce, 2012. Available at: https://www.insidehighered.com/sites/default/server_files/files/06_01_12%20Certificates%20Full%20Report%20FINAL.pdf. Accessed February 13, 2017.

Carnevale, Anthony P., Nicole Smith, and Jeff Strohl. "Job Growth and Education Requirements Through 2020." Washington, DC: Georgetown University, Center on Education and the Workforce, 2013. Available at https://cew.georgetown.edu/wp-content/uploads/2014/11/Recovery2020.FR_.Web_.pdf. Accessed August 26, 2017.

Chen, Xianglei. *Remedial Coursetaking at U.S. Public 2- and 4-Year Institutions: Scope, Experiences, and Outcomes.* Washington DC: National Center for Education Statistics, September 2016. Available at: https://nces.ed.gov/pubs2016/2016405.pdf. Retrieved August 26, 2017.

Crawford, Michael, and Maria Paulina Mogollón. "Labor Competency Certifications in Commercial Operations: A Literature Review." Washington, DC: World Bank, December 2010. Available at: http://siteresources.worldbank.org/INTRANETTRADE/Resources/239054-1239120299171/5998577-1254498644362/6461208-1300395801193/Labor_Competency.pdf. Accessed February 12, 2017.

Diamond, Robert M. "Why Colleges Are so Hard to Change." *Inside Higher Ed*, September 8, 2006. Available at: https://www.insidehighered.com/views/2006/09/08/why-colleges-are-so-hard-change. Accessed August 25, 2017.

Ewert, Stephanie, and Robert Kominski. *Measuring Alternative Educational Credentials*: *2012*. Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, January 2014. Available at: https://www.census.gov/prod/2014pubs/p70-138.pdf. Accessed July 26, 2017.

Gallagher, Sean R. *The Future of University Credentials*. Cambridge, MA: Harvard University Press, 2016.

Grubb, Norton, Norena Badway, and Denise Bell. "Community Colleges and the Equity Agenda: The Potential of Noncredit Education." *ANNALS of the American Academy of Political and Social Science*, vol. 586, no. 1, March 1, 2003, pp. 218–240.

Haimson, Joshua, and Michelle Van Noy. "Developing the IT Workforce: Certification Programs, Participants, and Outcomes in High Schools and Two-year Colleges." Princeton, NJ: Mathematica Policy Research, 2004. Available at: https://www.mathematica-mpr.com/our-publications-and-findings/publications/developing-the-it-workforce-certification-programs-participants-and-outcomes-in-high-schools-and-twoyear-colleges. Accessed August 28, 2017.

McCarthy, Mary Alice. "Beyond the Skills Gap: Making Education Work for Students, Employers, and Communities." Washington, DC: New America Foundation, 2014. Available at: https://www.luminafoundation.org/files/resources/beyond-the-skills-gap.pdf. Accessed May 23, 2017.

Morest, Vanessa Smith. "Double Vision: How the Attempt to Balance Multiple Missions Is Shaping the Future of Community Colleges." In *Defending the Community College Equity Agenda*, edited by Thomas Bailey and Vanessa Smith Morest. Baltimore, MD: The Johns Hopkins University Press, 2006, pp. 28–50.

Priest, Nora. "Digital Badging and Micro-Credentialing." Quincy, MA: Nellie Mae Education Foundation, 2015. Available at: http://bostonbeyond.org/wp-content/uploads/2016/06/Digital_Badging_Paper_NMEF.pdf. Accessed May 25, 2017.

Quan, Jim J., Ronald Dattero, and Stuart D. Galup. "Information Technology Wages and the Value of Certifications: A Human Capital Perspective." *Communications of the Association of Information Systems*, vol. 19, article 6, 2007, pp. 81–114.

Rosenbaum, James E., and Janet Rosenbaum. "Beyond BA Blinders: Lessons from Occupational Colleges and Certificate Programs for Nontraditional Students." *Journal of Economic Perspectives*, vol. 27, no. 2, spring 2013, pp. 153–172.

Shah, Dhawl. "MOOCS Find Their Audience: Professional Learners and Universities." *EdSurge*, July 6, 2017. Available at: https://www.edsurge.com/news/2017-07-06-moocs-find-their-audience-professional-learners-and-universities. Accessed August 24, 2017.

U.S. Department of Education. *A Test of Leadership: Charting the Future of U.S. Higher Education*. Washington DC: ED, 2006. Available at: https://www2.ed.gov/about/bdscomm/list/hiedfuture/reports/final-report.pdf. Accessed August 26, 2017.

U.S. Department of Education, National Center for Education Statistics. "Digest of Education Statistics, 2015." NCES 2016-014. Washington, DC: ED, December 2016. Available at: https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2016014. Accessed May 3, 2017.

U.S. Department of Education, Office of Vocational and Adult Education. "Promoting College and Career Readiness: Bridge Programs for Low-Skill Adults." Washington, DC: U.S. Department of Education, January 2012. Available at: https://www2.ed.gov/about/offices/list/ovae/pi/cclo/brief-1-bridge-programs.pdf. Accessed May 26, 2017.

U.S. Department of Labor, U.S. Department of Commerce, U.S. Department of Education, and U.S. Department of Health and Human Services. "What Works in Job Training: A Synthesis of the Evidence." Washington, DC: U.S. Department of Labor, U.S. Department of Commerce, U.S. Department of Education, U.S. Department of Health and Human Services, July 22, 2014. Available at: https://www.dol.gov/asp/evaluation/jdt/jdt.pdf. Accessed May 17, 2017.

Van Noy, Michelle, James Jacobs, Suzanne Korey, Thomas Bailey, and Katherine L. Hughes. "Noncredit Enrollment in Workforce Education: State Policies and Community College Practices." Washington, DC: American Association of Community Colleges, 2008. Available at: http://www.aacc.nche.edu/Publications/Reports/Documents/noncredit.pdf. Accessed August 31, 2017.

Voorhees, Richard A., and John H. Milam. "The Hidden College: Noncredit Education in the United States." Winchester, VA: Voorhees Group, 2005. Available at: http://www.voorheesgroup.org/voorheesgroup-pubs/Hidden%20College.pdf. Accessed August 28, 2017.

Workforce Innovation and Opportunity Act. 29 USC 3101, 2014.

Xu, Di, and Madeline Joy Trimble. "What About Certificates? Evidence on the Labor Market Returns to Non-Degree Community College Awards in Two States." New York: Teachers College, Columbia University, Center for the Analysis of Postsecondary Education and Employment, November 2014. Available at: https://ccrc.tc.columbia.edu/media/k2/attachments/what-about-certificates-returns-to-non-degree-awards.pdf. Accessed May 22, 2017.

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