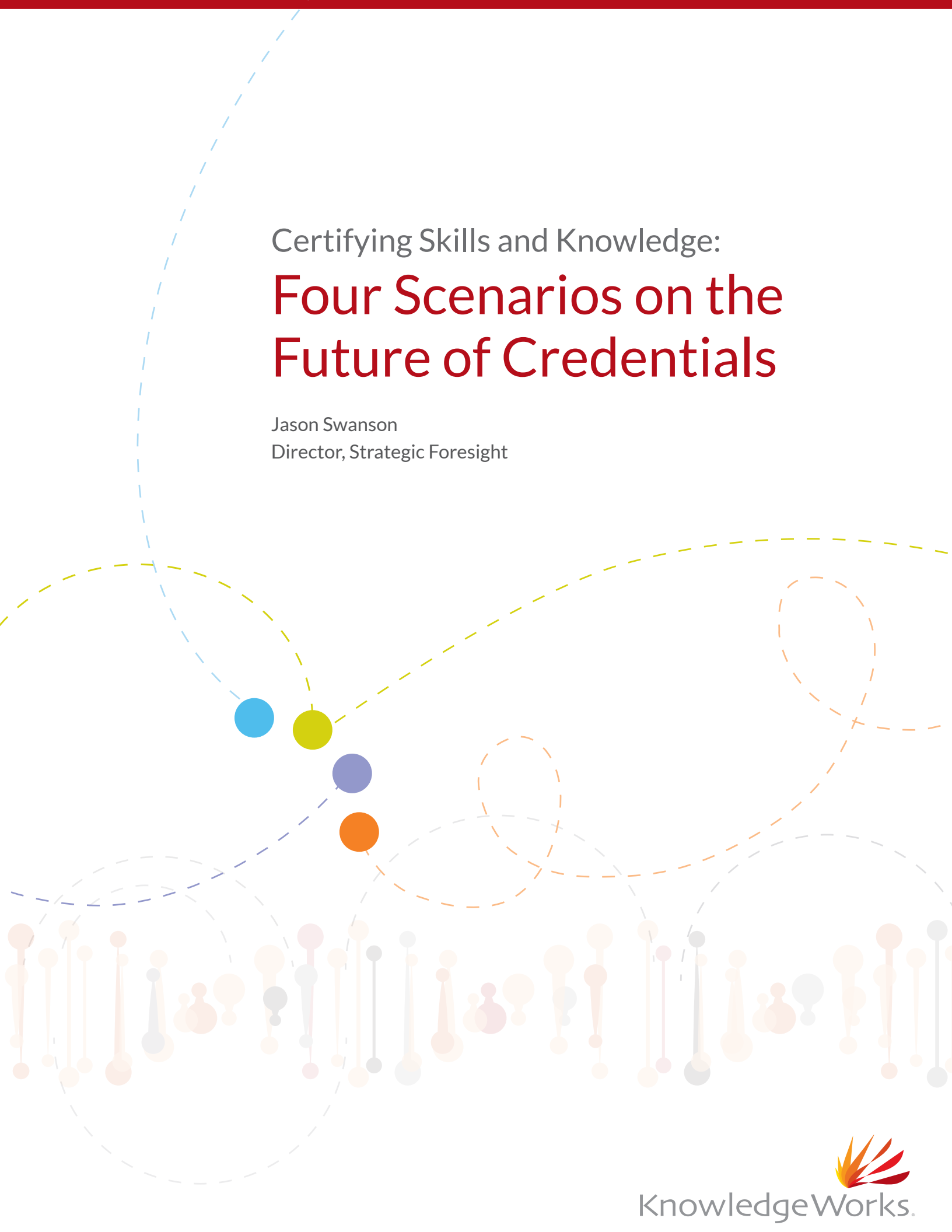Certifying Skills and Knowledge:

Four Scenarios on the Future of Credentials

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Certifying Skills and Knowledge:

Four Scenarios on the Future of Credentials

Disruptions to the education system and employment sector are changing what it means to acquire knowledge and skills and also how we might credential those accomplishments. Fundamental changes in how we educate people promise to change how we credential learning. At the same time, changes to how we work could alter the value that we place on current credentials, affect how we assess and award credentials, and give rise to new forms, which could in turn have the potential to disrupt the education sector even further.

As forecast in KnowledgeWorks' *Recombinant Education: Regenerating the Learning Ecosystem* and the related infographic, "A Glimpse into the Future of Learning," education in the United States is facing a decade of deep disruption as the digital revolution and the accompanying cultural and social changes reshape its structure. These disruptions point towards a future in which education will be increasingly personalized to each learner, school will take many forms, and a variety of learning agents will guide students in their learning journeys. With education becoming increasingly learner-centered, assessment is likely to become increasingly focused on mastery instead of time, with new uses of both formative and summative assessments to inform learning.

The employment sector is also experiencing change, affecting how, when, and where people might work. Current trends are pointing towards a future of work in which people are likely to think less in terms of climbing a career ladder and more in terms of navigating a career lattice. Employment is increasingly becoming ad hoc and networked, with full-time employment for a single organization declining as employers increasingly seek talent on demand. At the same time, drivers of change such as new forms of automation, an aging workforce, mobile technologies' blurring the line between work and home life, and economic globalization are pushing employees to hold multiple careers across their lifetimes and sometimes even at the same time. Such shifts could push many people to be in a mode of constant learning and continuous career readiness and could increase the need for specialized training similar to that required for professionals such as doctors, lawyers, engineers, and scientists.

With future trends pointing toward profound shifts in the structures of both education and work, credentials could evolve considerably over the next ten years. Given the roles that credentials play as symbols of knowledge, motivators for pursuing training and education, and the primary means of gaining access to as well as navigating today's job market, it is important to consider what credentials might look like in ten years, how they might be earned, and how they might be evaluated.

Credentials
are a specific qualification issued by an authoritative third party to signify that a person has achieved a particular transferable skill set or accomplishment.

Formative assessments
monitor student learning by providing ongoing feedback. They are typically low stakes but can be a powerful tool that educators, students, and other stakeholders can use to make real-time adjustments to the learning process.

Summative assessments
evaluate student learning against a standard or benchmark. They are high stakes, meaning they have a high point value and are issued at the end of a defined educational period.

Exploring the Future of Credentials

In order to explore what credentials might look like in ten years, this paper considers four scenarios for the future of credentials:

A baseline future, "All Roads Lead to Rome," imagines a future in which degrees awarded by the K-12 and post-secondary sectors still serve as the dominant form of credentials, but there are many roads toward gaining those credentials, such as diverse forms of school and educational assessments.

An alternative future, "The Dam Breaks," explores a future in which the employment sector accepts new forms of credentials, such as micro-credentials, on a standalone basis, leading to major shifts in both the K-12 and post-secondary sectors and new relationships between the academic and working worlds.

A second alternative future, "Every Experience a Credential," considers what credentials might look like if new technologies enabled every experience to be tracked and catalogued as a form of credential for both students and employees.

A wild card scenario, "My Mind Mapped," imagines a future in which breakthroughs in both the mapping and tracking of brain functions have created a new type of credential reflecting students' cognitive abilities and social and emotional skills.

The four scenarios presented in this paper represent future images of credentials based on the trajectory of current trends. The first three represent plausible futures, while the fourth scenario, "My Mind Mapped," represents a wild card scenario that is low in probability but high in impact. Each scenario in this paper reflects different drivers of change and a different set of fundamental assumptions about how changes affecting credentials might play out across the K-12, post-secondary, and employment sectors. Each of these sectors has a causal relationship to each of the others, meaning that changes in one sector can be expected to affect the other two.

It is important to note that the trajectory of drivers of change seldom stays the same over time. Trends often slow down, speed up, or even stop. Depending on the pace at which the key drivers of change unfold, each of the scenarios in this paper could become more or less plausible. Indeed, some of the scenarios might already seem more or less plausible in different settings and across the three sectors that they address.

Due to the inherent uncertainty of the future, it is unlikely that any of the four scenarios presented in this paper will turn out exactly as written. The scenarios are intended to bring to light key issues driving change in and around credentials in order to help stakeholders develop forward-looking visions for how people might attain and evaluate the quality of credentials, consider how best to leverage or otherwise respond to new and emerging forms of credentials, and develop strategies for creating credentials consistent with their visions for the future of learning.
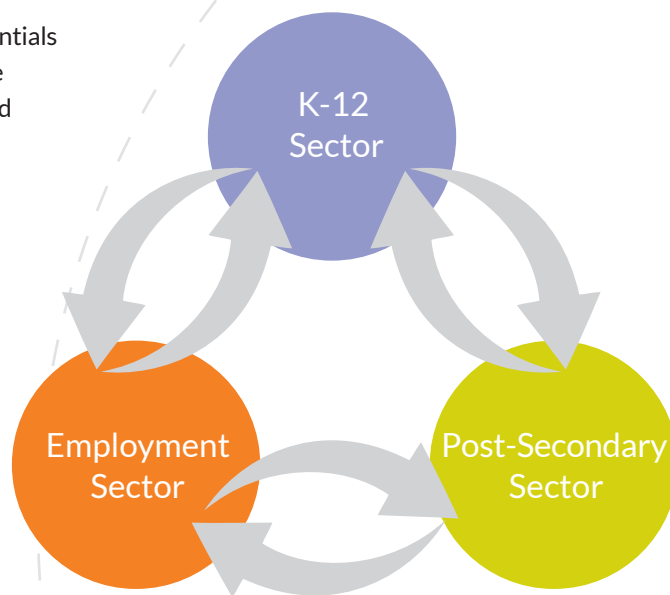
All Roads Lead to Rome

"All Roads Lead to Rome" imagines a future in which degrees awarded by the K-12 and post-secondary sectors still serve as the dominant form of credentials, but there are many roads toward gaining those credentials, such as diverse forms of school and educational assessments.

K-12 Sector

The dominant form of credentials in the K-12 sector is still the high school diploma; however, how and when students earn their diplomas has changed. Due to the increasingly personalized nature of school, some students might find themselves on a path resembling traditional high school, while other students might never enter the walls of a school, choosing to attend online schools, charter schools, homeschooling, or whatever option best suits each individual. Reflecting these multiple forms of school, multiple forms of assessment have become the norm, with a balanced system of assessments being used to improve student learning and evaluate mastery through formative, interim, and summative assessments.

While not dominant, alternative forms of credentials are increasingly joining the high school diploma on the transcripts of many high school graduates. Students use skill-tracking technologies such as the Learning Record Store (LRS) and micro-credentials such as badges to capture their learning outside of class as a way of proving that they have gone above and beyond what is being asked of them at school. While LRS systems and micro-credentials have not replaced the high school diploma, they have become important parts of a high school student's academic portfolio, helping students to stand out as they take their next steps after leaving high school. Thus, LRS systems, badges, and other micro-credentials serve to document how students have gone the "extra mile," giving additional meaning to extra-curricular activities such as volunteering.

Micro-credentials represent a specific skill or piece of knowledge that a learner has acquired at a granular level. Typically, the learner has to demonstrate the skill or knowledge to be awarded the micro-credential. Micro-credentials are often represented as digital badges.

Learning Record Store (LRS) is a system for storing and reporting learning data and experiences across all platforms. The LRS is used in conjunction with the experience application interface (xAPI), software used to capture both formal and informal instances of learning, which are then stored in the LRS. For the purpose of brevity, the term LRS will include the use of the xAPI going forward.

Post-Secondary Sector

Despite rising costs for higher education, more and more people are seeking four-year degrees because an increasing number of employers require them at a minimum. As the percentage of adults with a college degree has risen, so too has pressure to stand out from other graduates. Students have responded to that pressure by seeking degrees that are highly specialized or from name-brand institutions, or by pursuing advanced degrees. Attempts at controlling higher education costs, such as credit for experience, competency-based credentials, and even state-subsidized free college classes, have front loaded the market for the four-year degree, ensuring that the bachelor's degree has kept its place as the dominant form of credential in the post-secondary sector. Such front loading has resulted in lowering the perceived value of the four-year degree, as well as giving a compulsory feel to it. When in the past a bachelor's degree increased most access into the job market, it is now all but assumed that an applicant will possess such credentials.

As in the K-12 sector, post-secondary credentials are increasingly being augmented by micro-credentials as well as by other forms of credentials such as certificates from direct training programs. These types of credentials have proven useful for graduates and job seekers to augment their existing degrees, helping graduates to stand out from the pack or maintain a mode of continuous career readiness; however, they have not replaced traditional college degrees. For those who do not possess a traditional college degree, such alternative credential paths still remain somewhat niche due to hesitancy on the side of the employment sector to accept such credentials on a standalone basis.

Employment Sector

Despite highlighting a skills gap for new college graduates, the vast majority of employers remain reluctant to accept an applicant with just alternative credentials that address the gap. As a result, traditional higher education credentials still dominate the employment sector, serving as the major avenue for gaining access to the job market. Nonetheless, the employment sector utilizes alternative forms of credentials, such as micro-credentials, more widely than the K-12 and post-secondary sectors do. Alternative credentials increasingly serve to capture workplace learning, allowing employers to document training for their employees and to measure its return on investment.

LRS systems are also being used in the employment sector to record instances of both formal and informal learning. Coupled with human resources analytics, employee performance and training data that has been captured by an employee's LRS can be reviewed, analyzed, and certified as formal knowledge, creating a new type of credential out of once untrackable informal learning instances.

> **When in the past a bachelor's degree increased most access into the job market, it is now all but assumed that an applicant will possess such credentials.**

Conclusion

The employment sector's hesitance to embrace credentials besides traditional K-12 and higher education degrees has ensured that those credentials continue to dominate the credentialing landscape. However, as education has become more learner-centered and as the cost for higher education has continued to increase dramatically, diverse paths to attaining credentials have emerged. Alternative credentials have gained acceptance as tools that students can use to distinguish themselves, employees can use as they continue to re-skill and upskill, and employers can use to track the return on investment of training. These developments, along with the use of skill-tracking systems and other new tools, have allowed for the creation of a new type of credential that brings informal learning into formal learning environments.

Key Drivers

- Rise of personalized learning models, such as competency education
- Increase in the use of competency-based assessments
- Increase in employer emphasis on four-year degrees
- Ongoing employer hesitancy to embrace micro-credentials
- Increase in the number of people seeking advanced degrees
- Rising cost of higher education
- Growing number of direct-skill programs
- Increase in programs such as early college high schools that bridge high school and college

Signals of Change

- According to projections by the **Bureau of Labor Statistics**, "nineteen of the thirty occupations projected to grow fastest from 2012 to 2022 typically require some form of post-secondary degree," and "occupations typically requiring postsecondary education for entry generally had higher median wages ($57,770) in 2012 and are projected to grow faster (14.0 percent) between 2012 and 2022 than occupations that typically require a high school diploma or less ($27,670 and 9.1 percent)."

- According to Gallup's **"What America Needs to Know About Higher Education Redesign,"** only one in ten business leaders believes that schools are graduating students with the skills that their businesses needed, yet a report by Burning Glass entitled **"Moving the Goalposts: How Demand for a Bachelor's Degree is Reshaping the Workforce"** finds that employers are increasingly requiring bachelor's degrees for jobs that would not have needed them in the past.

- The Obama administration has announced plans to combat the rising costs of higher education through measures such as offering **college credit for prior experiences**, raising **Pell Grants** from $5,550 per person to an estimated $5,975 by 2017, and issuing an additional 820,000 grants by 2021. In addition, some states are creating measures to help students access college more easily: in **Oregon**, every high school student can access at least three college-level courses at no cost to the student.

- The **American Museum of Natural History** now offers a PhD in comparative biology and a Masters of the Art of Teaching, highlighting how learners can pursue traditional degrees in new settings.

- The **Department of Education** has announced plans to use its regulatory waiver authority to test the impact of making Pell grants available to high school students who are taking college courses.

The Dam Breaks

"The Dam Breaks" explores a future in which the employment sector accepts new forms of credentials, such as micro-credentials, on a standalone basis, leading to major shifts in both the K-12 and post-secondary sectors and new relationships between the academic and working worlds.

K-12 Sector

High school diplomas have diversified such that students can now work towards differing types of diplomas according to their goals. Students can choose a generalist diploma, which resembles the typical diploma of the past; an academic concentration diploma reflecting a focus similar to a college major; a career-ready diploma for students who might make the transition into the working world directly after high school; or a do-it-yourself style diploma reflecting a mix of academic and career concentrations. All of these diploma options combine traditional academics, micro-credentials, and real-world experience in ways that are appropriate to the students' goals and diploma choice.

Increased use of competency-based assessments has enabled the creation of these different types of diplomas, especially in the case of the career-ready diploma, which enables students to stack credentials to ensure that they are truly career ready. Workplace learning experiences are made particularly relevant through the help of a new kind of learning agent, an employment sector guide who is often referred to as a "career connector" or, as students put it, a "job jockey." Depending on a student's academic path, these new learning agents work for organizations in either the employment or post-secondary sector. They collaborate with schools to select promising students and steer them through their academic journeys to ensure that students meet the needs of their potential future employers. For students who choose the career diploma path, the input from the career connector often takes the form of helping to select which credentials to stack and which job experiences to seek. For students seeking further credentials from the higher education sector, the career connector also provides guidance towards certain academic concentrations.

Nanodegrees are compact, stackable credentials aimed at giving learners a specific skill set quickly and affordably, often in a year or less.

Learning agents are the many adults who might support learning in an expanded learning ecosystem.

Post-Secondary Sector

The college degree is no longer the dominant credential for those looking to enter the job market. Once employers broadened acceptance of different forms of credentials on their own merit, the market for low- to no-cost micro- and nano-credentials began to boom, breaking higher education's near-monopoly on credentialing for professional careers. High rates of tuition and a perceived lack of return on investment for traditional four-year college degrees led to a loss of students, causing the college market to contract so much that many universities and colleges closed. Only those with strong reputations, solid name recognition, or a known reputation for placement of graduates in competitive positions in the job market remained open. Likewise, the competency-based approach inherent to micro-credentials disrupted the certification process for those looking to enter the trades, causing a contraction in the number of credentialing bodies associated with them. The traditonal credentialing bodies that remain now act as certfying intermediaries, assessing an applicant's micro-credentials, such as those earned during a career path diploma, when certifying that a candidate has enough knowledge to enter a trade.

In an attempt to stay relevant and curtail falling enrollments, remaining colleges and universities now engage with employers in designing courses to address what the employment sector has labeled a "skills gap" for recent graduates. While enrollment numbers may be declining, there are still students who seek out higher education degrees. Students who follow the academic concentration diploma at the K-12 level may, with the advice of their career connectors, find themselves in the university system. In addition, the need for highly specialized training, such as that required of doctors, still draws students who are seeking entrance into highly specialized fields.

Employment Sector

Motivated by the skills gap among new graduates trying to enter the workforce, as well as by an acute awareness of the rising college costs faced by would-be employees, the employment sector has become actively involved in all levels of the formal and informal education systems. The employment sector now helps schools map competencies for the K-12 career path diploma, helping micro-credential issuers develop courses, sending representatives into the K-12 school system as guides and talent scouts in the form of career connectors, and even creating their own forms of micro credentials. Through this involvement, the employment sector has become a trusted partner in advising the K-12 and post-secondary sectors on credentials and the standards by which to issue them. Having come to play a direct hand in shaping most credentials in some fashion, the employment sector has gained some measure of assurance about applicants' qualifications.

With the quality of any given credential more clearly established and with the increasingly networked and ad hoc nature of work, it has become more and more important for applicants to distinguish themselves through the "brand of me" credential, through which they combine formal credentials and informal experiences such as internships, along with social networking, to market themselves as thought leaders. This new form of credential is largely informal in that it bears no official third-party verification. Lacking official third-party verification, the "brand of me" credential is typically backed by social reputation markers, helping to prove the statements being made by applicants about skills or experiences that might not be possible to track or for which there are no credentials and acting as a form of quality assurance. While on the surface this credential might seem similar to the professional networks of the past, such as LinkedIn, the use of reputation markers that validate the claims of the applicant has helped to formalize what in the past were informal credentials and has helped the employment industry begin to see the whole person beyond attainment of a traditional degree.

> **High rates of tuition and a perceived lack of return on investment for traditional four-year college degrees led to a loss of students, causing the college market to contract so much that many universities and colleges closed.**

The Dam Breaks

Conclusion

In sum, the employment sector's acceptance of a wide variety of credentials on a standalone basis has led to changes in both the K-12 and post-secondary sectors. The diverse array of credentials in the academic sectors has served to bring what were once considered fringe credentials into the mainstream, reflecting diverse learning environments, individual educational goals, and strong input from the employment sector.

Key Drivers

- Increase in the involvement by the employment sector in both the high school and higher education sectors

- Trend toward education becoming increasingly learner-centered

- Beginning diversification of educator roles

- Rise in ad hoc, network-based employment

- Increase in the awareness of a skills gap among recent college graduates

- Rising cost of higher education

- Emergence of reputation currencies and other forms of reputation markers

- Increase in the emphasis on personal branding and social media savvy as a necessity for gaining entrance into certain job fields

Signals of Change

- Louisiana's **Jump Start** program offers high school students a Career Diploma, whose purpose is to indicate student preparedness for careers in Louisiana's high-growth job sectors.

- **Coursera** has launched eighteen specializations designed to help learners master specific skills; students must apply those skills to a real-world project in order to receive certification.

- **Udacity's** nanodegrees offer courses on technology with direct input from companies such as AT&T, SalesForce, and Google.

- Contract-employment sites such as **Taskrabbit,** as well as ride-sharing services such as **Uber** and **Lyft**, rely upon reputation currency as a key component of the hiring process.

- This **report** from the National Governors Association highlights how thirty-six states have put into place polices that break the connection between awarding credit and seat time.

- A study conducted by Biz Library titled, **"Informal Learning: The 80/20 Rule,"** found that at least 80% of workplace learning is informal in nature.

Every Experience a Credential

"Every Experience a Credential" considers what credentials might look like if new technologies enabled every experience to be tracked and catalogued as a form of credential for both students and employees.

K-12 Sector

As learning became more and more personalized over the last decade, educators began to look for tools to capture student learning across formal and informal education spaces. Finding promise in the skill-tracking software that had been developed in the context of workplace learning, many schools adopted it in order to capture both formal and informal learning regardless of when, where, and how it happened. Now, Learning Record Stores (LRS) are as common as books and pencils were in the past.

The wide-scale adoption of LRS systems has not only helped to make learning more personal but has also made education extremely disintermediated. The roles of both the educator and the school have greatly changed. No longer the only purveyors of information, educators have become learning guides, awash in real-time data about their students' experiences. They help to steer each student using feedback captured in the LRS system, checking the level of mastery demonstrated in the student's experiences and determining where the student is on his or her educational journey. Throughout this journey, the school helps to certify the student's experiences based on competency markers laid out by its state's department of education. Schools now have a certain amount of defined autonomy in how they certify each student's experience, in effect letting each school create assessments that are appropriate for each learner.

The move towards experience-based mastery has made credit hours and grade levels artifacts of the past. While students still work towards diplomas, those diplomas are radically different than the ones earned by their parents and grandparents. Now that mastery has replaced seat time, some students pass through the K-12 system quickly, while others find that their journey takes longer. Due to this learner-centered approach to education, some students experience learning in the classroom, while others never step through the doors of their local schools. Regardless of where, when, and how they learn, all students have the experiences along their journeys toward mastery recorded.

> The move towards experience-based mastery has made credit hours and grade levels artifacts of the past.

Post-Secondary Sector

The use of LRS systems has also had a dramatic effect on the post-secondary sector. With the return on investment for the majority of post-secondary degrees declining, the sector has become a certifier of experiences much in the same way as the K-12 sector has. In partnership with the employment sector, colleges and universities have rolled out competency ladders for nanodegrees. These competency ladders allow students to demonstrate mastery step-by-step, sometimes through tests but increasingly through real-world application and experiences recorded via the LRS. These demonstrations of competency can then be clustered into what is

now commonly called the "nano," short for nanodegree. If a student wishes to go further in his or her academic career, he or she can stack nanodegrees to form the equivalent of bachelor's degrees and beyond. It is not uncommon to find motivated students who hold high forms of degree attainment yet have never taken an exam or written a paper. Rather, these students have clustered a set of learning experiences and paid a college or university to credential them.

Similarly, students who wish to pursue a trade find their LRS records being assessed against competency ladders reflecting the trade's basic set of competencies. If the student meets the basic set of required competencies, he or she will be granted entrance into the trade. If a student does not meet the required level for entrance, he or she can enroll in a workplace training program where the student's LRS captures their progress toward the required level of competencies. Regardless of how a student enters a trade, the LRS is used to document workplace experiences throughout his or her career, helping to highlight areas of skill as well as areas that may need to be developed further.

As the once lucrative market for post-secondary education experienced a shock due to revenue contraction, the only institutions that survived were those that created a strong brand for themselves and adapted their structures accordingly. Now, certain institutions are viewed as being more competitive than others in terms of the experiences that they certify, having more stringent criteria for what experiences reflect mastery and having competency ladders that are considered more rigorous, in effect giving the certifications they offer a higher value than those from other institutions.

Even as LRS systems have reshaped the post-secondary sector and the credentials that it awards, high-stakes summative assessments still serve as gates to entering highly specialized fields such as medicine and law. These fields and their associated exams have a long history of trust behind them, in effect forming trust webs around the granting of their credentials. While students must still pass these exams to gain access to practice, the ability to monitor and track learning experiences has led to many of these exams being customized to the student. In instances where a student has displayed deep mastery of certain areas through his or her learning experiences, the summative tests concentrate on areas in which the student has not yet demonstrated mastery.

Employment Sector

The implementation of LRS systems has also affected workplace learning and professional development. Given the ability to track every experience, workplace learning is now largely informal, with the majority of employees turning to search engines and company intranets in search of answers instead of pursuing expensive and time-consuming training. Similarly, LRS systems guide professional development by providing real-time performance data that enables employers to recommend just-in-time training in whatever form is appropriate for the employee to meet his or her professional goals.

Having led the development of skill-tracking systems, the employment sector has turned its attention to using the resulting performance data in its hiring processes via sophisticated human resources analytics. These human resources analytics, or "cyber scouts" as some job seekers have taken to calling them, actively search the web for candidates with the right combinations of certified experiences and competencies for open positions. Once it finds the right combination, the cyber scout contacts the job seeker and begins the interview or vetting process.

> **If a student wishes to go further in his or her academic career, he or she can stack nanodegrees to form the equivalent of bachelor's degrees and beyond.**

Every Experience a Credential

Conclusion

The ability to track anytime, anywhere, learning has changed the very notion of what it means to earn a credential. With every experience correlating to a credential, both the K-12 and post-secondary sectors have been forced to reinvent themselves as certifiers of experience. Earning credentials in either of these sectors is no longer about spending time in a chair or getting the base amount of work done; it is about demonstrating mastery. Similarly, the adoption of LRS systems has greatly changed the ways in which the employment sector develops and recruits human capital. With sophisticated human resource analytics constantly searching for job seekers with the right combinations of certified learning, experiences themselves have become the dominant credential.

Key Drivers

- Diversification of school structures
- Slow but persistent move away from seat time as a measure of learning
- Increasing emphasis on personalized learning within the formal education system
- Emergence of learning playlists in both formal and informal learning contexts
- Increasing use of stackable certificates in higher education
- Emergence of micro-credentials and nanodegrees
- Increasing adoption of Learning Record Store and other skill-tracking systems
- Increase in the use of big data in hiring

Signals of Change

Recruiting companies such as **GILD** use algorithms to comb through open source code in order to find and recruit the best software engineers.

Organizations such as Pandora, the National Health Service, and HealthStream have begun using **Learning Records Store** systems in order to identify correlations between learning activities and employees' job performance.

The United States Department of Defense's **Advanced Distributed Learning project** is using Learning Record Store and xAPI as key components in its learning architecture. The project aims to provide high-quality learning and performance enhancement that is tailored to an individual's needs and is delivered at the right place and time.

The **HIVE** Learning Networks bring together schools, libraries, museums, and other cultural institutions in Chicago, New York, Pittsburgh, and Toronto to give students opportunities to learn beyond the walls of the classroom.

Institutions such as **Western Governor's University**, **Arizona State University**, and the **University of Wisconsin** offer competency-based higher education with credit for prior experience.

My Mind Mapped

"My Mind Mapped" imagines a future in which breakthroughs in both the mapping and tracking of brain functions have created a new type of credential reflecting students' cognitive abilities and social and emotional skills.

K-12 Sector

As schools and other places of learning began to capture and analyze larger and more complex sets of data about their students, they began to use those insights to make data-driven decisions about how best to structure learning. The data uncovered individual learners' strengths and weaknesses, along with their preferred learning formats, helping to usher in personalized approaches to learning. As time progressed, advances in the understanding of the brain, coupled with ever-expanding data streams generated by students, helped to deepen educators' understanding not just of how to personalize learning, but also of how each student actually learns. Educators now have the ability to monitor a student's cognitive, social, and emotional skills, which are now referred to as their neuro-finger prints, in real time.

This newfound ability to understand a student's neuro-fingerprint changed a lot in education. In addition to designing and testing for "crystallized intelligence," or the knowledge and skills learned in school, educators now design curricula to help students develop their cognitive, social, and emotional skills. The credentials that students seek have changed as well. Rather than working towards a diploma, students now work to attain a standardized level of mastery for a core set of cognitive abilities, along with essential social and emotional skills such as determination, grit, self-control, and growth mindset. These levels are monitored in real time, with students receiving constant feedback as they move through their coursework. Once a student reaches the base level of mastery in all areas, he or she is considered a graduate of the K-12 sector. This rolling monitoring means that some students might finish their K-12 careers quickly, while others might take more time. Regardless of how long it takes, a well-developed neuro-fingerprint has become the credential.

Educator roles have diversified to reflect schools' new emphasis on monitoring the development of students' neuro-fingerprints. Neuro-fitness coaches now work hand-in-hand with students, parents, and other learning agents. Part medical professional, part educator, these neuro-fitness coaches help teachers create lessons and monitor feedback in order to stretch students' cognitive abilities. When students have extreme difficulty making progress, neuro-fitness coaches may recommend nootropics, changes in diet, mindfulness training, or mediation, to name a few options. In the case of nootropics, coaches watch for signs of "smart drug" abuse in students who may not need the boost but seek to gain an unfair advantage. Coaches also help to monitor whole-student health, being mindful of how issues such as trauma can impact a student's cognitive development and recommending ways both the school and the learner can take action to begin the healing process.

Students also engage with another new learning agent, the mind scout. Mind scouts resemble the guidance or career counselors of the past. They look at each learner's neuro-fingerprint, helping students identify an academic or career path that aligns to their goals and interests. Mind scouts use the insights provided by the learner's neuro-fingerprint to help find a path where the learner can further develop and flourish, whether that path is higher education, career training, or immediate employment.

Cognitive abilities
include such brain-based skills as perception, language, visual and spatial processing, memory, attention, motor skills, and executive functions.

Nootropics,
or "smart drugs," are cognitive-enhancing supplements that claim to have an effect on memory, cognition, and clarity of thought.

Post-Secondary Sector

While the K-12 sector has changed dramatically, higher education institutions and other post-secondary credentialing bodies look more similar on the surface. There are still university degrees, skill-training programs, and a proliferation of alternative credentials, such as micro-credentials and nano-credentials; however, each of those credentials now reflects an ideal neuro-fingerprint profile for students who wish to pursue them. Thus, this profile augments existing credentials by layering an additional set of competencies onto existing credential structures. The neuro-fingerprint profile helps to create highly personalized pathways for attaining credentials, not only by matching a student to an ideal area of study, but also by personalizing the path to credential attainment based on how the student's mind works. This hyper-personalization has led to a better fit between students and the credential paths that they seek, helping students master skills and concepts at a deeper level.

When applying to pursue a credential, a student or his or her mind scout will make sure that the credential itself, along with the various ways in which a student might attain that credential, match the student's neuro-fingerprint. In cases where there is not a perfect fit but there is a near match, non-cognitive levels are taken more deeply into consideration to see if factors such as determination or passion might fill in the gaps in cognitive ability. A student who has an interest in a particular area of study but who lacks the proper neuro-fingerprint will often find the doors to that pursuit shut by admissions departments. This sort of predetermination has shrunk the higher education and post-secondary certification markets. While there are a wide array of credentials available, many organizations have had to close their doors or limit their offerings due to the lack of qualified applicants.

The more stringent post-secondary credential market has also led to a high degree of nootropic abuse, as students try to gain an edge or alter their brain patterns in an attempt to gain acceptance into programs that their neuro-fingerprint may not permit. In an attempt to curtail such abuse, many credentialing organizations have a neuro-regulator on staff, trained at accessing years of neuro-fingerprint data in order to uncover possible abuse. When abuse is found, the student is removed from the program, and his or her neuro-fingerprint is flagged. Students with previous offenses are often subject to a thorough smart drug evaluation when they apply for another credentialing program.

Employment Sector

The employment sector had to retool its hiring and training practices as the ability to monitor the neuro-fingerprint became commonplace. The skills gap that employers once observed has virtually disappeared because graduates applying for jobs now display deep mastery of skills as a result of matching credential paths with neuro-fingerprints. Now, a smaller pool of applicants with higher education degrees or other forms of post-secondary credentials is highly desirable.

However, the biggest change in the employment sector has been the rise of entry-level positions and workplace training programs. In being able to see the neuro-fingerprint of applicants, the employment sector often works with mind scouts to find potential applicants who have the right neuro-fingerprint profile for the job or career path that needs filling, thereby attracting applicants who in the past might not have been able or have wanted to pursue higher education or other post-secondary credentials. These entry-level jobs have a strong workplace training element, where the employer trains and develops the employee to grow and move through the organization. In the case of temporary or ad-hoc employment, the employer has insight into an applicant's capabilities due to the neuro-fingerprint.

> A student who has an interest in a particular area of study but who lacks the proper neuro-fingerprint will often find the doors to that pursuit shut by admissions departments.

My Mind Mapped

Conclusion

The ability to monitor a student's cognitive abilities and social and emotional skills in real time has created a new form of credential in the K-12 sector, the neuro-fingerprint. This development has caused educators' roles to diversify, with new roles such as neuro-fitness coaches and mind scouts emerging. It has also altered post-secondary credentials by pairing established credentialing paths with ideal neuro-fingerprint profiles. The notion of matching a neuro-fingerprint to a job has also been embraced by the employment sector, which now offers more entry-level career paths and workplace training programs due to greater insights into how applicants think.

Key Drivers

- Increase in the use of academic performance and skill development data to support instructional decision making

- Increase in the amount of user-created data

- Increase in the sophistication and ease of use of data analysis tools

- Growing market for nootropics and other "smart drugs"

- Increase in awareness that whole-student health is an important component of academic success

- Trend in schools using curriculum to develop and measure social and emotional skills such as determination and grit

- Increase in consumer interest in the emerging neuro-fitness industry

- Increase in research and debate about whether cognitive skills can be intentionally developed

Signals of Change

- Neuro fitness programs such as **Quantified Mind**, **Lumosity**, and **Cognifit** seek to measure and improve users' cognitive abilities.

- A recent report from the **Economic Policy Institute** highlighted the need to address noncognitive (social and emotional) skills in education, stating that "noncognitive skills represent valuable assets with respect to both traditional school outcomes and the broader development of individuals" and calling for strategies to classify noncongitive skills in order to develop metrics for measuring them and strategies for nurturing them.

- The **Knights Academy** in Lewisham, UK, is using the cognitive abilities test (CAT) to help set students' academic goals and prove students' capabilities. The data from the CAT helps motivate students and parents to realize that students can achieve more than perhaps their academic records are showing.

- In a **recent study**, researchers at the University of Oregon were able to track short-term memory in near real time and predict which individuals could store memories with the highest quality or precision.

- A recent paper published in **Frontiers in Human Neuroscience** found that cognitive training improved the brain performance of students living in poverty.

Creating the Future of Credentials

Each of these scenarios for the future of credentials reflects different ways in which the sectors involved in credentialing might assess learning and grant credentials. Each of the scenarios also shows the effects that changes in one sector might have on the others. Together, the scenarios highlight the unlikelihood for credentialing to face significant disruptions over the next decade unless employers dramatically shift their acceptance of new forms.

As you read each of these scenarios, how did you find yourself responding? Which elements made you feel hopeful? Which elements made you feel worried or fearful? Was there a scenario whose future seemed more likely? One whose future you preferred?

Being mindful of your responses, what does your ideal future look like? As you develop your vision for the future, what strategies could you use to create your ideal approach to credentialing? Where might you be able to leverage some of the key drivers included in this paper to move credentialing toward your ideal approach?

It is impossible to know how the future of credentials will unfold; however, there is little doubt that credentials will change in some way. We can see the links between the education sectors, employment, and credentials, and any shifts in one of these sectors is sure to have an effect on the others. While the acceptance of credentials by the employment sector plays a major factor in the future of credentials, there are significant changes underway in the K-12, post-secondary, and employment sectors that give occasion to think about new ways to assess for credentials, to create new forms of credentials, and to begin examining the linkages among education, work, and credentials.

Strategic Possibilities

To help you think through the strategic possibilities presented by each of the four scenarios and begin developing your own vision and strategies for bringing it to life, here are some questions for reflection:

- How might stakeholders foster meaningful linkages among the education and employment sectors?
- How might employers change their hiring practices to include relevant credentials other than those currently in the mainstream?
- How might we begin to explore new ways of assessing learning in order to ensure that current and future forms of credentials have appropriate meaning and value?
- How might credentials diversify to reflect changes in employer needs?
- How might education stakeholders track and credential informal learning?
- What emerging forms of technology might help create new forms of credentials?
- How might stakeholders extend the use of alternative credentials such as certificates and micro-credentials?

As you develop your vision for the future, what strategies could you use to create your ideal approach to credentialing?

About KnowledgeWorks

KnowledgeWorks is an Ohio-based non-profit social enterprise that works to foster meaningful personalized learning that enables every student to thrive in college, career, and civic life. KnowledgeWorks works on the ground with schools and communities through a portfolio of innovative education approaches, helps state and federal leaders establish the policy conditions necessary to prepare all students for success, and provides national thought leadership around the future of learning. To learn more about our strategic foresight work, see **knowledgeworks.org/strategic-foresight**.

About the Author

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