

*edu*Trends

ALTERNATIVE CREDENTIALS

ALTERNATIVE CREDENTIALS





ALTER- NATIVE CREDEN- TIALS

05/19

4 /	PROLOGUE
5 /	INTRODUCTION
6 /	THE COLLEGE DEGREE CRISIS: CONTRIBUTING FACTORS
14 /	CHANGING TIMES FOR HIGHER EDUCATION
15 /	THE PROMISE OF MOOCs
16 /	THE SECOND WAVE OF MOOCs
23 /	A CLOSER LOOK AT ALTERNATIVE CREDENTIALS
24 /	WHAT ARE ALTERNATIVE CREDENTIALS?
25 /	TYPES OF ALTERNATIVE CREDENTIALS
30 /	THE EVOLUTION OF THE COLLEGE DEGREE: ALTERNATIVE CREDENTIALS WORLDWIDE
31 /	UNIVERSITIES INNOVATING WITH ALTERNATIVE CREDENTIALS
35 /	COMPANIES INNOVATING TO CLOSE THE SKILLS GAP
37 /	ALTERNATIVE CREDENTIALS OFFERED BY TECNOLÓGICO DE MONTERREY
39 /	A CRITICAL LOOK
40 /	CHALLENGES
41 /	BLOCKCHAIN AND THE FUTURE OF ALTERNATIVE CREDENTIALS
43 /	THE FUTURE OF ALTERNATIVE CREDENTIALS ACCORDING TO EMPLOYERS

Prologue

For generations, the traditional college degree has been the currency of higher education and the golden ticket to the labor market. In the past, a university degree was sufficient to find a stable job that allowed people to become self-sufficient. Today, however, the game has changed. Political, social, and economic changes in the past decade, particularly the increase in tuition costs and global unemployment rates, have changed the perspective of both students and employers on the value of college education. Today, anyone who invests in higher education expects a significant return on the investment.

Moreover, we are at the threshold of the Fourth Industrial Revolution, which will change the way we live, learn, work, and relate to others. This rapidly evolving revolution has created new industries and eliminated others on its way. According to data from the World Economic Forum, more than half of the current job tasks will be performed by machines by 2025 (WEF, 2018). In this context, companies' demand for talent and profiles sought by employers are changing in tandem with technological progress. Students, recent graduates and workers, on their behalf, have the need not only for continuous training, but also for demonstrating the skills and competencies they have acquired. The development of these skills and competencies, which are not necessarily supported by a degree, are being obtained more frequently through MOOCs, bootcamps, and online courses that promise employability at a reasonable cost and in less time

In this context, lifelong learning will be-



come imperative. If a college degree is presently not enough to remain relevant at work, the trend will be to become permanent learners. While this scenario may seem bleak, especially for those of us who work in higher education, the reality is that it will be the opposite. Universities will not disappear and degrees will not lose their validity. We will see, though, a significant transformation in the pathways and the pieces of evidence. The paths that we use to walk to earn a bachelor's degree, master's degree, or certificate are diversifying. Now, evidence of acquired knowledge goes beyond a letter printed on a piece of paper. In the face of the changes that the Fourth Industrial Revolution will bring, we will need more than ever skills that make us more human. Traits like creativity, empathy, resilience, critical thinking, communication and collaboration will gain more importance and, therefore, will have to be reflected in academic transcripts.

Academic transcripts cannot remain as closed immutable records; we need to revamp the college transcript into a new open, transferable, and verifiable digital record that reflects not only academic achievements and knowledge but also social-emotional skills that will be key for future jobs. This report seeks to provide readers with a context on the transformation universities are currently undergoing, a closer look at the growing market of alternative credentials, and a glance at the initiatives that are presently modeling the future of alternative credentials. I can tell you that the upcoming years will be exciting and challenging for higher education.

KARINA FUERTE

Editor

Observatory of Educational Innovation

INTRO

More than a decade ago, American investment bank Lehman Brothers declared bankruptcy on September 15, 2008—which eventually affected global financial markets and triggered the Great Recession in the United States and set the stage for an international economic crisis. This collapse impacted not only banks, companies, and insurers, but also the jobs, personal savings, and mortgages of millions of people. Between 2008 and 2009, the U.S. labor market lost 8.4 million jobs (Economic Policy Institute, n.d.); this was one of the worst financial crises since the Great Depression.

These events would change the course of history over the next decade. Several economic sectors were affected, and education took a big blow. The Great Recession had a significant short-term impact on American colleges and universities that, following the crisis, were forced to reduce tuition to attract new students (Selingo, 2018). But one of the effects with the greatest impact on higher education in the long term was the change of perspective of new generations regarding a college education. For this generation of students, securing a better job is the main reason for investing their time and money in higher education (Selingo, 2018). Students have become customers and consumers of a product and a service: universities.

This commodification of education and the pressure to engage in “practical studies” for job purposes only, has led to the decline of the humanities (Vigo, 2018). The times when people attended university to increase their knowledge seems to be in the past now. This is how post-Great Recession generations have focused on better-paid careers with more demand in the labor market. The fields that suffered the most collateral damage were the humanities and social sciences—“useless” degrees in the opinion of some education leaders like Hakuban Shimomura, Minister of Education of Japan, who urged national universities to “take active steps to abolish [social science and humanities departments] or to transform them to

serve areas that better meet society’s needs” (Blakemore, 2015). Thus, more than fifty percent of Japanese universities reduced or eliminated entire humanities and social sciences departments.

More than a decade later, the panorama is even more complex. We are currently at the threshold of a technological revolution that will change the way we live, learn, work, and relate to others: the Fourth Industrial Revolution. If the First Industrial Revolution brought the steam engine; the Second Industrial Revolution the telephone, light bulb, and internal combustion; the Third Industrial Revolution or Digital Revolution, created the personal computer, Internet, and ICTs; the Fourth Industrial Revolution is characterized by a fusion of technologies that are blurring the lines between the physical, digital, and biological spheres (Schwab, 2016). This rapidly evolving technological revolution is creating new industries and eliminating others on its way, generating demand for professionals with new skills and competencies in fields like robotics, artificial intelligence, biotechnology, nanotechnology, statistics, and coding, among

The Fourth Industrial Revolution is characterized by a fusion of technologies that is blurring the lines between the physical, digital and biological environment.

SCHWAB, 2016

others. According to data from the World Economic Forum, more than half of all current job tasks in various economic sectors will be performed by machines by 2025 (WEF, 2018). This transformation, however, will create 133 million new jobs by 2022, compared to 75 million jobs that will be displaced according to this projection (WEF, 2018). As the Fourth Industrial Revolution advances, humans and machines will be increasingly working together. In this context, companies’ demand for

talent and profiles sought by employers are changing in tandem with technological progress. The education sector, however, especially higher education institutions, has had difficulties keeping up with these transformations and the lag has been evident. This is one of the reasons why initiatives and Think Tanks such as the Information Technology and Innovation Foundation (ITIF), sponsored by big companies like JP Morgan Chase and Microsoft, are promoting the separation of learning from credentialing (Kennedy, Castro, & Atkinson, 2016). From their perspective, graduates do not have the competencies they look for and traditional college degrees contain very little information on the skills, competencies, and knowledge of those who are just entering the workforce.

Hence, these big corporations are willing to open the credentials market to any company or institution that can make rapid changes to their courses and do a better job reflecting the acquisition of skills, competencies, and knowledge in a clear and quantifiable way. Companies such as IBM have made alliances with credentialing providers to train their employees directly in the areas and competencies they need. Other companies are turning into alternative credentials providers like Google (Grow with Google), Apple (App Development with Swift curriculum), and Amazon (AWS Educate). This process at a large scale (Big Data) combined with next-generation predictive algorithms (machine learning), is transforming the future of higher education credentials globally.

This scenario—although bleak—presents new opportunities for growth, particularly for higher education institutions that, even though have had difficulty keeping up with these transformations up to now, have and will continue to play a vital role in educating new generations.

DUCTION



The College Degree Crisis: Contributing Factors

Although a lot has changed since September 15, 2008, college degrees are still mostly considered the official culmination of student life —the end of an episode that gives way to adulthood and professional life. Most employers still require a degree as a signal of the ability to work, even for jobs that do not require higher education studies. The so-called “sheepskin” effect, a term coined by economists Thomas Hungerford and Gary Solon, determines that “the intrinsic value of higher education is not in the number of hours of effort that students dedicated to their studies, but rather in the paper obtained at the end of such studies.” (Fredin, 2017). Having a college degree has value in and of itself, regardless of how it was earned. Given the lack of other employability signals, a degree is the best signal that the employer has to determine if a candidate is the most suitable for a job.

While it is true that the reasons for going to university go beyond securing a job, nowadays, this is still one of the main reasons why students and their families are willing to invest significant amounts of money and time in college education. With the increase in tuition and severe global unemployment rates, anyone who pays for college expects a substantial return of investment. Consequently, the value of the degree is increasingly being questioned.

A recent study conducted by Gallup (2018) found that only 48% of U.S. adults expressed “a great deal” or “quite a lot” of confidence in higher education that year, down from 57% in 2015. The situation is similar in Latin America. According to the 2018 Economic Outlook report: Rethinking Institutions for Development (OECD/CAF/ECLAC, 2018), only 41% of Latin America and the Caribbean is satisfied with the quality of public education. While in the European Union, although inflation, unemployment, pensions, and social security are the issues that most concern Europeans, in a recent survey on the quality of life in Europe, the Eurobarometer found that the education system is one of the main concerns for 11% of Europeans (European Commission, 2017). A low but significant percentage if you consider that in eleven European countries college education is free (Arcas, Peñas, & Sacristán 2016).

While high tuition costs and return of investment are two of the main factors for questioning the value of higher education, other elements are also affecting the university reputation. The following section describes the factors that are affecting universities: the student debt crisis, college desertion (or dropouts) rates, the skills gap, certification as a goal, and the Fourth Industrial Revolution.

THE STUDENT DEBT CRISIS

In the past thirty years, tuition costs of public universities in the United States have grown 19 times faster than family income (Carnevale, Garcia, & Gulish, 2017). Tuition is a particularly serious problem in the United States. According to data from the Georgetown University Center on Education and the Workforce, currently “going to university is one of the biggest investments people will make in their lives” (Carnevale, Garcia, & Gulish, 2017). To illustrate this, here is the average cost of going to university in the United States for the 2017-2018 cycle: for full-time students in public universities the cost is US\$36,420 (the price includes tuition, fees, room and board) and US\$49,950 (the price includes tuition, fees, room and board) in private universities (College Board, 2017).

In the European Union, eleven countries offer their citizens free university education; in the rest of the countries, the maximum price for a course ranges from €7 in the Czech Republic, €41 in Poland, €183 in France, to €1,066 in Portugal. Spain is near the top of the list, with tuition that varies from €700 to €2,372, depending on the autonomous community (Arcas, Peñas, & Sacristán, 2016). There are also State-backed student loans in 71% of European Union countries, although the percentage of students who use these loans is less than 11% (Arcas, Peñas, & Sacristán, 2014). We must not forget, however, that for most, the cost of higher education goes beyond tuition. We have to add the cost of books, additional fees, room and board for those who study in a city far away from their hometown. The most recent record on Spanish student mobility indicates that 6.7% of young adults between 18 and 34 abandoned the country for part of their secondary or higher education (INE, 2014).

In Mexico, the cost for undergraduate degrees varies according to the institution. The country has 340 public universities and 90 private universities, according to data from Universia (n.d.). Although there is no tuition in public universities, students have the option to pay a voluntary or symbolic contribution, and they have to pay the cost of the admission test, which varies from one institution to another. As for private universities, OECD data (2018) indicates that the average price for a private Mexican university is 91,950 pesos annually. All this without considering any extra cost that each student has to incur, such as textbooks, food, transportation, and housing.

COLLEGE DROPOUTS

According to data from the World Bank, in Latin America, only half of students between the ages of 25 and 29 complete their university studies, and 50% of the total dropouts leave college during the first year (Ferreira, Avitabile, Botero Alvarez, Haimovich Paz, & Urzua, 2017). In Mexico, the dropout rate in higher education in the 2016-2017 period was 6.8% (Biblioteca de Publicaciones Oficiales del Gobierno de la República, 2017). What discourages the students? A survey conducted by technology firm Civitas Learning revealed some of the reasons why students drop out. From 1,500 university students surveyed, 36% mentioned that the main reason was lack of time, while 35% blamed anxiety and fear of failure, and 31% cited stress relating to the responsibilities demanded by the university (Guijosa, 2018a).

Billionaires such as Bill Gates, Steve Jobs and Mark Zuckerberg have become role-models for new generations. Considering the high costs of attending university, many young people ask, why go to college if I can create an app or platform worth millions of dollars? ¹ This is the message transmitted by countless articles that promote the cases of these “ultra-successful” college dropouts². Even though many studies have demonstrated that a higher level of studies leads to higher salaries and better job prospects in the future ³, the college dropout profile continues to be idealized. This fallacy, which economist Gary Smith calls the “survivorship bias” (Shermer, 2014), indicates that this is the logical error of concentrating on the people or things that made it past some selection process and overlooking those that did not, which may lead to false conclusions.



SKILLS GAP AND LABOR MARKET

Companies’ demand for talent and profiles sought by employers are changing in tandem with technological and economic progress. The education sector, however, especially higher education institutions, has not progressed in tandem with change. The lag is clear.

A study conducted by the McKinsey Center for Government found that 72% of universities surveyed think that their graduates are adequately prepared for the workforce, compared to 45% of new graduates and 42% of employers that also

thought they were adequately prepared. Another study conducted by McGraw-Hill Education found that only 4 in 10 university students feel “well-prepared” for their future careers (McGraw-Hill Education, 2018). A survey of 1,000 university students conducted by the publisher found that 41% of students surveyed feel “very prepared” for their future careers, a significant increase compared to data from 2017 when only 29% of students reported feeling confident with their university training. The perception of employers is not more positive. A recent study conducted by the National Association of Colleges and Employers (NACE) revealed that only 43% of employers surveyed believe that new graduates have the competencies and skills required to perform their jobs. (NACE, 2018).

This phenomenon, known as the skills gap, is transforming universities. According to Anthony P. Carnevale (2017), of Georgetown University, colleges and universities must align to the needs of the job market to better equip students with the skills they need to be successful in the 21st-century. According to the figures previously discussed, however, it is clear that the skills gap is not entirely up to universities or of one of the elements at stake. What is clearly evident is that universities, students, and employers do not agree on what they believe are the skills required for a successful professional life. According to Carnevale (2017), students and universities need a modern guidance system with clear information of skills acquired both in and out of university. To build a modern skills guide system will be one of the biggest challenges to overcome in the coming years.

¹ Recently, Silicon Valley investor Peter Thiel started offering venture capital for two years to gifted teenagers to found their own startup on the condition that they do not waste their time going to college <http://www.newsweek.com/2017/03/03/peter-thiel-fellowship-college-higher-education-559261.html>

² Some examples: *10 ultra-successful millionaire and billionaire college dropouts*, by Abigail Hess for CNBC; *These 19 Insanely Successful College Dropouts Prove You Don't Need a Degree*, by eEconomista.es; *15 Inspiring College Dropouts Who Prove Hard Work is the Way to Success*, by Alicia Prince for Lifehack.

³ In 2016, the unemployment rate in the European Union for people aged 25 to 64 who had completed a tertiary education was 84.8%, much higher than the 54.3% for those who only completed primary or lower secondary school. Data obtained from the website https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Employment_statistics/es#undefined



CERTIFICATION AS A GOAL

Certification is another factor that is affecting the students' outlook on what university represents to them. "When secondary education students only want time to pass as quickly as possible to obtain their degree, we find ourselves at the zenith of certification: the desire to learn is substituted by the wish for time to pass so as not to suffer academic torture." (Acaso, 2018). We have reached the time where education certification has passed from being a means of being a goal, taking away the desire to learn out of love for knowledge.

This obsession with getting a certificate or degree has resulted in numerous university graduates being "overqualified" for available jobs.

In the context discussed above, the current role of universities as primary providers of professionals is unsustainable. Not all young adults must attend university and not all universities have to carry the burden of training the entire workforce on their own. The requirement to obtain a university diploma to have a well-paid job or to move up within companies has had a negative impact on both employees and employers.

Beyond being responsible for training future professionals, universities must educate citizens and assist in creating solutions to global problems to serve as

society's transformation pillars. As Pedro Miguel Echenique, Condensed Matter Physics professor at Universidad del País Vasco, said during the 2018 IV Universia Deans Meeting: "a university whose mission is employability, while profitable, is not focused on the essence of the university" (2018). Going back to this essence will be key to face the challenges that the Fourth Industrial Revolution will bring.

4 See Acaso, M. (2018). *De la certificación como medio a la certificación como objetivo: Cifuentes, su TFM y la universidad como fraude*. <http://www.mariaacaso.es/la-certificacion-medio-la-certificacion-objetivo-cifuentes-tfm-la-universidad-fraude/> y Lindo, E. (2018). *Brotos de titulismo*. El País. https://elpais.com/elpais/2018/09/14/opinion/1536948635_139383.html

THE FOURTH INDUSTRIAL REVOLUTION

The Fourth Industrial Revolution, a term coined by Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, is used to describe the current time when new technologies are blurring the physical, digital, and biological boundaries of our lives (Schwab, 2016). According to a study conducted by the Organization for Economic Cooperation and Development (OECD), 48% of jobs in the 32 countries studied have a high probability (over 70%) of being automated, while 32% of jobs, if not replaced, would face significant change as a result of automation, changing the skills required to carry out these tasks (Nedelkoska & Quintini, 2018). According to Bessen (2015), however, this technological progress will create new job opportunities: “innovative technology is displacing workers to new jobs rather than replacing them entirely,” and the possibility of being affected by automation decreases as the level of education of people increases.

The activities that will be most impacted by automation will be those that require a lower level of education. While teaching, for example, is one of the economic activ-

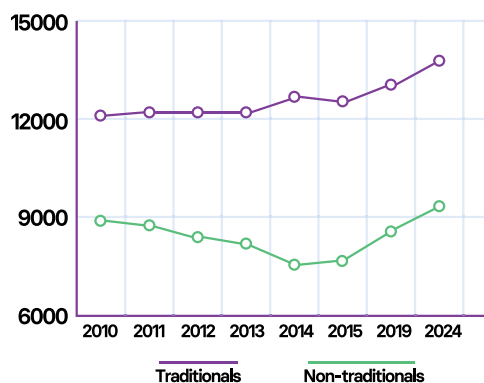
ities that will be least affected by automation, according to the OECD study. Teaching professionals have a probability of only 28% of being replaced by an algorithm or machine, compared to 64% of food preparation assistants (Nedelkoska, & Quintini, 2018). As technology changes the character and direction of professions and work tasks, how do people adapt to the new jobs of the future? In this regard, universities will play a vital role in the supply of continuing education, not only for typical university students but also for the new wave of students that are entering universities.



“NON-TRADITIONAL” STUDENTS, THE NEW NORM IN HIGHER EDUCATION

Just like technological advances are changing the way we live and work, the profile of university students is also changing. They are no longer the typical students between 18 and 23 years of age who, upon graduating from high school, immediately go to college to dedicate all their time to their studies. Although many students still fit such profile, “non-traditional students” continue to grow in numbers. According to the US National Center for Education Statistics (NCES), enrollment among students younger than 25 years of age in the US increased by 22% from 2003 to 2013, while enrollment of students older than 25 rose by 19%. Although the percentage of students older than 25 is low, the expectation is that for 2024, the increase in enrollment of students older than 25 will be 14%, compared to only 13% of students younger than 25 (NCES, 2014). According to NCES, students that have at least one of the following characteristics fit the profile of non-traditional students.

FALL ENROLLMENT IN DEGREE-GRANTING INSTITUTIONS OF TRADITIONAL AND NON-TRADITIONAL STUDENTS BETWEEN 2010 AND 2024.



Demographic data of the United States of America/
Source: National Center for Education Statistics (NCES).

PROFILE OF A NON-TRADITIONAL UNIVERSITY STUDENT

✓ Age 24 or older.

✓ Self-supporting.

✓ Works full-time (35 hours or more per week) attends university part-time or occasionally.

✓ Usually, does not live on campus or in university housing.



✓ Some are single parents or responsible for a minor; hence student's time is divided between work, family, and school.

✓ Is usually a first-generation student

✓ Does not take the usual path to college. Could have had difficulties finishing middle school and high school

*Demographic data of the United States of America. Source: National Center for Education Statistics (NCES).

Non-traditional university students are increasingly becoming more the norm than the exception, not only in the US but in the rest of the world. In Mexico, according to data from the National Statistics and Geography Institute (Instituto Nacional de Estadística y Geografía) (INEGI, 2015), only 31.5% of young people ages 18 to 25 attend school and 27.77% of Mexico's population aged 25 to 29, have at least a degree in technical or higher studies (INEGI, 2015). However, higher education programs and pedagogical methodologies have not changed at the same pace as the other sectors of the economy while this new student demography is entering universities. Some of them will be first-generation students looking for flexible programs that fit their work and life responsibilities. Some of them will need programs for single mothers and fathers, requiring special assistance and guidance from institutions.

Unlike their parents, new generations do not aspire to remain 20 or 30 years in the same company. A study conducted by LinkedIn showed that 20% of Generation Z has had, on average, four or more jobs, while Baby Boomers, in comparison, have had only two jobs in the past ten years (Delgado, 2018). Therefore, a high percentage of this emerging student demographic needs to continually go back to university to train and reenter a changing workforce.



LIFELONG LEARNING: FROM A FOUR-YEAR DEGREE TO A LIFELONG EDUCATION

In the past, a college degree was sufficient to find a stable job that allowed people to become self-supporting. The formula: go to university, get educated, graduate and get a job, worked for many generations, but today reality is more complex. Presently, a large number of university graduates are facing difficulties to become financially independent of their parents. Just last year, the global unemployment rate was 5.6%, and the number of unemployed amounted to 192 million (WLO, 2018). According to research by the National Bureau of Economic Research, only 50% in the 1984 birth cohort earned more than their parents, compared to 90% of Americans born in 1940 (Chetty et al., 2016). This global problem, combined with the skills gap triggered by the rapid pace of technological progress, has led people who already have a university degree to go back to school to receive training, whether through post-graduate studies or specialization courses, in specific skills required by the labor market.

If we add the fact that life expectancy has increased in most countries, not only is our lifespan increasing but so are our working-life years. According to OECD data, life expectancy at birth in countries like Japan, the United States, and South Korea is currently more than 75 years (OECD, 2017). UK's Centre for Ageing Better projects that in 2024, 18 million people will be over 60 in the United Kingdom. A girl born today has a 50% chance of living to 100 years (Centre for Ageing Better, n.d.). Living for a century will imply more years of work-related active life.

The increase in life expectancy and the restructuring of the labor market have resulted in a large segment of senior citizens that continue to hold a job. A situation that is driving governments and universities to focus on offering academic programs to help them stay socially and mentally active. In Spain, where 18.7% of the population is 65 years and older, "Universities for Older Adults" are common. In Madrid, Complutense University offers initial and specialized academic programs for 55-year old adults through the University for Older Adults (Universidad para los Mayores). The University of Barcelona, on its behalf, has the University of Experience (Universidad de la Experiencia), which offers comprehensive university programs for people over 55 whose objective is lifelong training.



Another example is the Senior Citizens' University (University per a Majors), of Universitat Jaume I, which targets people over 55 who wish to continue studying and expanding their general knowledge. Universities will play a key role in the future, in particular in the continuous education area. Programs aimed at adults that need to go back to school to strengthen their knowledge and skills continually will have a high demand.

The Singapore government is currently making one of the most significant efforts to promote lifelong learning through the [SkillsFuture](#) initiative, which seeks to encourage continuous learning in its citizens. In a recent interview for Times Higher Education, Tan Thiam Soon, President of the Singapore Institute of Technology, stated

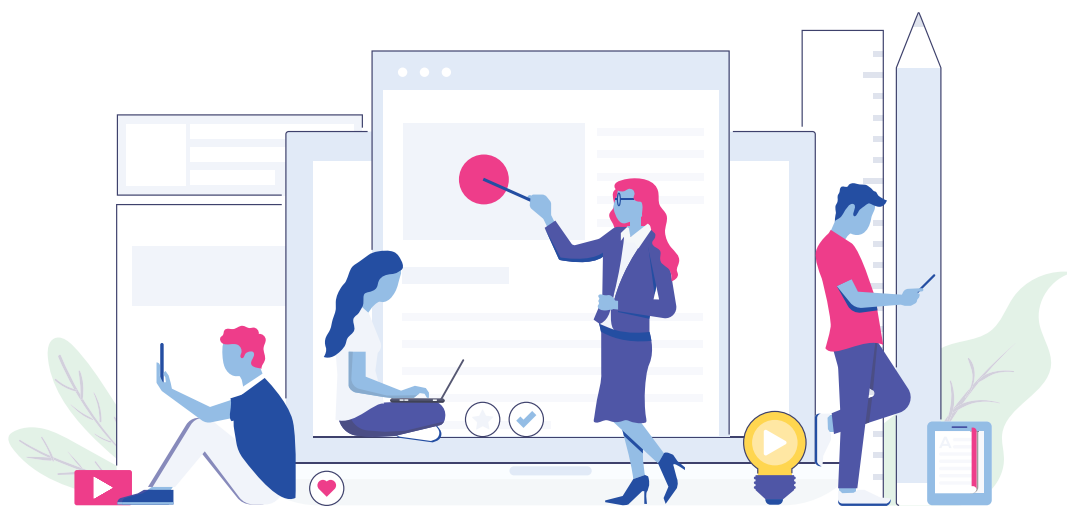
that the initiative seeks to “provide Singaporeans with the opportunities to develop their fullest potential throughout life.”¹ Quoting futurist Alvin Toffler, Tan Thiam Soon said that the capacity to “learn, unlearn and relearn”² will be vital for the future, especially to fight the skills gap problem. If we foster in students the ability to learn, when they join the job market and need to keep up to date, the “relearning” process will not be difficult if they have been doing so from an early age. If we also promote the pleasure of learning out of love for knowledge, the process will come as a natural part of professional life. So far, we have discussed how economic and social changes in the past decade have profoundly affected the reality of university students who have to be prepared, not only for a volatile, complex,

and uncertain world but also for unprecedented radical changes that we will see in the next years. Are universities prepared for these changes?

¹ See Ross, J. (2018). Lifelong learning vital for Singapore to avert ‘bleak’ future. Times Higher Education. Retrieved from <https://www.timeshighereducation.com/news/lifelong-learning-vital-singapore-avert-bleak-future>

² “The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn” (Toffler, 1970).

Changing Times for Higher Education



SO FAR, WE HAVE DISCUSSED how economic and social changes in the past decade have profoundly affected the reality of university students who have to be prepared to face a volatile, complex, and uncertain world. These changes have made continuous updating one of the distinctive elements of the 21st-century. Given this outlook, the ability to reinvent oneself constantly will be crucial to face the challenges of the Fourth Industrial Revolution, and alternative credentials will play a key role in reinvention.

However, at the core of this problem is the need to communicate learning in a clear and concise way. A traditional diploma only implies that a student passed a certain number of credits that entitle him to a professional degree. The number of hours spent in the classroom and studying to pass a test does not necessarily guarantee that a student acquired the competencies required to perform a job or profession. Moreover, the process of acquiring skills, abilities and knowledge is different from certificates or diplomas that attest this to a potential employer or client. To solve this problem, a transformation in high-

er education is necessary; disassociate learning from the traditional concept behind the professional degree will be imperative. We need to rethink the university curriculum, not as a list of subjects that represent studies in specific fields of knowledge, but rather as periods of learning, inside and outside the classroom, that provide evidence of incremental advances in well-defined skills, knowledge and abilities acquired throughout one's lifetime.

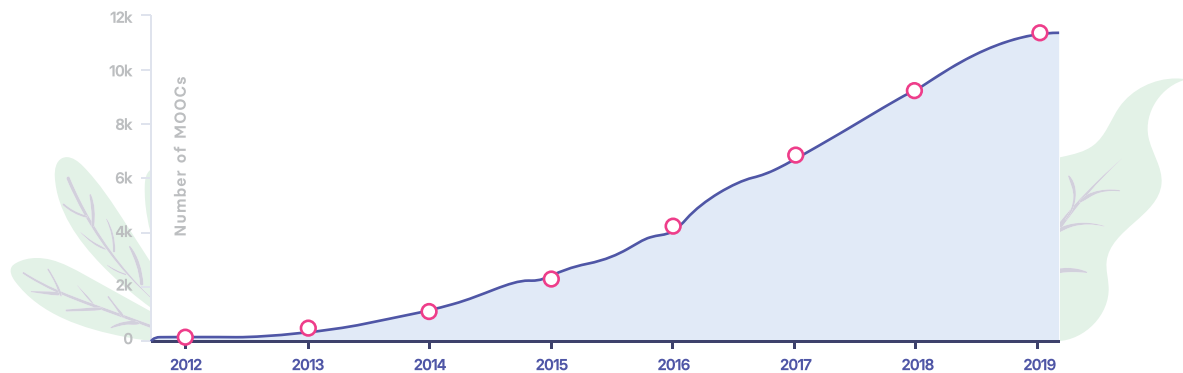
The skills to stay afloat in any profession change at such a fast pace today that it is not enough for higher education to occur just once in a lifetime. Additionally, many experiences of university life do not contribute to obtaining a certificate with official validity, but they are still valuable for both, students and their future employers. The replacements for the standard diploma must be capable of communicating these learning experiences in a granular and standardized way to both, the students and their possible employers.



The Promise of MOOCs

The most emphatic response from the education community to the economic, political and social changes of the past decade has been the generalized adoption of Massive Open Online Courses (MOOC). The rise of MOOCs is due to two phenomena: the emergence of Open Educational Resources and Open Social Learning (ITESM, 2014). These trends paved the way for George Siemens, Stephen Downes and David Cormier to launch Connectivism and Connectivist Knowledge in 2008, the first MOOC in history. Four years later, the success was such, that the New York Times called 2012 “the year of the MOOC” (Pappano, 2012) due to the launching of edX – a platform that emerged from an alliance between Harvard University and the Massachusetts Institute of Technology (MIT) – and to the rapid growth of other MOOC providers such as Coursera and Udacity. Back then, the belief was that these platforms would democratize access to higher education, threatening the very existence of universities. However, more than a threat, these platforms offered new growth opportunities, since it was evident that MOOCs had quickly become a trend that stirred higher interest for some of the best universities. Thus, through MOOCs, these elite group of universities started to offer quality education to the world, allowing participants to interact with renowned professors, experts, and with others interested in the same subjects, thus contributing to collaborative learning.

However, MOOCs did not revolutionize higher education as expected. Although courses, MOOC providers and enrolled students have continued to grow ever since, approximately three out of every four students enrolled in a MOOC already have a bachelor’s degree, and only 6% of students finish a course (Brown, & Kurzweil, 2017). In spite of these results, the flexibility offered by the MOOC model allowed universities to reach more people through their online presence in platforms such as Coursera, edX and Udacity.



The Second Wave of MOOCs

Although the market that the MOOC originally intended to transform (higher education) was not noticeably affected, MOOC providers found a niche with the potential to change the way universities create and distribute online programs: OPM or Online Program Management (Shah, 2018a). Many of the courses that are part of these MOOC-based online programs are offered to users for free with the option to pay if they want a certificate or diploma. According to Shah (2018a), this represents an advantage over traditional online programs, which do not have as much reach.

We are witnessing the second wave of MOOCs, this time through MOOC-based degrees, which range from professional certificates to full online master's

programs. The modular nature of these programs enables them to be divided into a series of courses or units, allowing users to study at their own pace, both based on their time and economic capacity. Despite the promising future that these degrees offer, we do not know whether these programs may be sustained at much lower prices than traditional online or on-campus degrees.

Just over seven years after the first MOOC launched, a total of 101 million students have enrolled in at least one MOOC course from the offering of 11,400 courses offered by more than 900 universities worldwide. Only in 2018, 20 million new users enrolled in at least one MOOC (compared to 23 million that enrolled in 2017) (Shah, 2019). According to data from Class

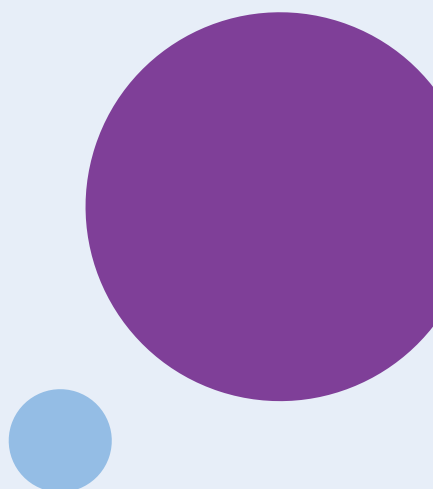
Central (Shah, 2019), these are the five main MOOC providers by the number of registered users:

- 1 **Coursera**
37 million users
- 2 **edX**
18 million users
- 3 **XuetangX**
14 million users
- 4 **Udacity**
10 million users
- 5 **FutureLearn**
8.7 million users

Main MOOC Platforms

COURSERA

IT WAS FOUNDED IN 2012 BY TWO STANFORD PROFESSORS, Daphne Koller and Andrew Ng, who wanted their courses to be available to anyone, not only to Stanford students. Both envisioned a platform where anyone, anywhere could learn and earn credentials from the world's top universities and education providers. According to information published in Coursera's platform, its course offering is divided into the following education programs:



- **MOOC Courses** In these courses, students have access to video lectures, discussions forums, and auto-graded and peer-reviewed assignments. Upon completing a MOOC, the participant can receive a certificate by paying a fee that varies according to the course.

- **Specialization:** Specializations are designed for those who want to master a specific career skill. Upon completing a series of courses and hands-on projects, students will earn a Specialization Certificate to share with their professional network and potential employers.

- **Professional Certificates:** Are training programs offered by universities and companies that seek to equip participants in certain professional skills. The purpose of some Professional Certificate programs is to prepare students to pass an industry certification exam, while others help them get the experience and skills needed to launch a career in a specific field.

- **MasterTrack™ Certifications:** With these certificates, Coursera has split Master's programs into online modules so that students can earn credits to obtain a university degree at an affordable cost.

- **Degrees:** At a lower cost than a traditional on-campus program, students can earn an official degree from recognized universities. Through modular learning programs, participants can study online anytime and anywhere and earn credits as they complete their course assignments. At the end, students receive the same degree as the ones who attend class on campus.

In 2016, Coursera launched Coursera for Business, where companies pay a fee so that their employees can access curated learning programs based on over 2,500 university courses (Levin, 2016). This initiative has two subscription plans:

1. Team: recommended for teams and companies with less than 500 employees. This subscription is US\$400 per user, per year.

2. Enterprise: recommended for large companies with more than 500 employees. Companies in this second plan receive advanced analytics, support in developing learning pathways, and information on how their employees are learning on Coursera (Shah, 2017).

Coursera in numbers*

37	Million students
+150	participating universities, companies, and institutions
+2,700	Courses
+250	Specializations
+4	Complete degrees

*Data obtained from the Coursera platform, 2018.

edX

FOUNDED BY HARVARD UNIVERSITY AND MIT IN 2012 this platform offers high-quality courses from the world's best universities and institutions. EdX's mission is to "democratize and reimagine education by increasing worldwide educational access and creating a culture of continuous, lifelong learning" (edX, 2018). Open edX is an open-source platform that powers courses and is available for free. With Open edX, educators and technologists can build learning tools and contribute with new features for the platform.

While students can sign up for MOOCs for free, they also have the option to earn a Verified Certificate in most edX courses. Verified certificates can be added to a curriculum and digitally displayed in LinkedIn profiles.

EdX's education offering is divided into the following types of programs:

- **MOOC Courses:** These free courses are created by affiliate institutions and cover a wide range of subject areas in all disciplines: from economics, finance, marketing, and entrepreneurship to languages, history, philosophy, and writing.

- **MicroMaster[®]:** Originally developed by MIT as a pilot program, the accelerated and flexible MicroMasters program is considered the first credential of its kind offering a pathway to a valuable credential for academic institutions and employers. This initiative seeks to bridge the skills gap by providing students with knowledge in demand to move forward in their career or to follow an alternative path to university. MicroMasters certificates promise to serve as

an "academic currency" in a world where continuous lifelong learning is becoming more important than ever.

- **Professional Certificate Programs:** These programs are a series of in-demand courses designed to build or advance critical skills for a specific career. Created by industry leaders and top universities, Professional Certificate Programs help develop skills in demand in the job market and actionable knowledge needed for today's jobs through a flexible and affordable online learning experience.

- **edX Professional Education:** These courses are designed to provide working professionals with the ability to advance their

skill-sets, careers and enhance their curriculum without disrupting their busy schedules. These courses run for a few weeks and are geared for specific skills demanded by the private sector, with an emphasis on learning and hands-on scenarios in the field. Professional Education offerings are fee-based, with costs varying according to the course. Many courses offer students Continuing Education Units (CEUs) or professional education credit. All courses provide students a personalized Professional Certificate of Achievement.

- **Online Master's Degree:** Are flexible and fully online master's degree accredited programs from the world's top universities. These programs are designed for



busy people who want a flexible and affordable master's degree, but with the same value and rigor as a traditional. The following are the universities that currently offer these online master's degrees through edX: Georgia Tech, Texas University at Austin, University of California - San Diego, University of Queensland, University of Indiana, and Curtin University.

- **Global Freshman Academy:** Offers individuals from around the world the opportunity to take the same courses as Arizona State University (ASU) on-campus students. Through this program, students can earn transferable credits (valid for ASU or any other university) from anywhere in the world, and pay tuition only if they pass the subject. Courses are

available for the following topics: English composition, algebra, and pre-calculus.

- **XSeries™:** These programs provide students a more comprehensive understanding of fields through a series of courses grouped into a single subject. These subjects include all disciplines such as videogame design, data analysis, and religion. An XSeries program certificate demonstrates competency in a specific subject area and indicates a level of achievement that helps students excel in career-oriented fields.

edX in numbers*

18	Million students worldwide
+130	participating universities, companies, and institutions
+2200	Courses
+64	million course enrollments
+29	million students in flexible courses

*Data obtained from the edX platform, 2018.

XUETANGX

XUETANGX IS THE FIRST Chinese MOOC platform. Founded in 2013 by the University of Tsinghua and the MOE Research Center for Online Education platform, the platform is authorized to operate edX courses in China.

With over fourteen million registered students, XuetangX is one of the world's top five MOOC providers, but it is very different from other platforms. It has a self-paced mode and a "visualization and editing course" that makes it easier for professors to edit courses (Shah, 2016). It also has an app for Android, iOS, and smart TVs.

XuetangX in numbers*

+14	Million users
+32	Million course enrollments
1700	Courses
+500	Partners

*Data obtained from the XuetangX platform, 2018.

UDACITY

THIS PLATFORM BEGAN as an experiment in online learning when Stanford instructors Sebastian Thrun and Peter Norvig decided to offer their "Introduction to Artificial Intelligence" course online for free (Udacity, n.d.). Over 160,000 students in 190 countries enrolled. Seeing the potential to educate at a global scale, Udacity was founded to democratize education by offering affordable, flexible, and economic world-class higher education opportunities.

Udacity's education offering is divided into two types of programs:

- **MOOC Courses:** Udacity offers free MOOC courses that are divided by level (basic, intermediate, and advanced) in areas and subjects such as: computer science, math, programming languages, artificial intelligence, physics, robotics, psychology, statistics, and even self-driving car fundamentals.
- **Nanogrades:** Udacity's Nanodegree® Programs are designed to bridge the skills gap between learning and career goals through partnerships with industry leaders and experts who understand the skills that are in demand in the job market. In addition to the online course subjects, students that enroll in a nanodegree must complete a series of projects and supporting courses designed to help them develop relevant skills for the workplace and build a portfolio to show to prospective employers. Besides the course material, nanodegrees include other services like classroom mentorship, moderated forums, and project reviews to ensure a personalized experience.

In 2016, Udacity announced the launch of a new program called Nanodegree Plus, which guaranteed a job within six months of graduation or they reimbursed tuition in full. According to Class Central (Shah, 2018c), however, this option disappeared without any official announcement by the platform.

Udacity, Georgia Tech, and AT&T recently teamed up to offer a master's degree entirely online and accredited in computer science, the first of its kind offered through a MOOC platform. The cost of the master's degree is US\$6,600, a low price compared to an average of US\$45,000 for an equivalent campus-based program (Donovan & Benko, 2016).

Udacity in numbers*

+10	Million users
+187	MOOC courses
+34	Nanodegrees
+8	Million students worldwide
+53,000	students enrolled in nanodegrees
+18,000	nanodegree graduates

The self-driving car nanodegree had **10 000** students enrolled and received **43 000** applications.

*Source: Udacity's 2017: Year In Review / MOOC Report by Class Central (Shah, 2018c).



FUTURELEARN

FOUNDED IN 2012, FutureLearn is a private online education platform owned by The Open University (FutureLearn, n.d.). The first courses were launched in September 2013, and since then its education offering has grown to its current offer of over 700 courses.

It has more than 150 partners around the world, including many of the best universities in the United Kingdom and institutions with a vast archive of cultural and educational material, such as the British Council, the British Library, the British Museum, and the National Film and Television School.

In 2017, FutureLearn introduced a new payment method called “Upgrading” for users to “enhance” their experience in the platform (Walton, 2017). By paying a fee, ranging from £24- £69 (depending on the course), users can upgrade their benefits, which include:

- Unlimited access to the course for as long as it exists on FutureLearn.
- Access to tests and exams (if applicable for the course).
- A certificate upon completing the course or scoring at least 70% on any test.

FutureLearn’s education offering divides into three types of programs:

- **MOOC Courses:** The platform offers more than 344 courses in areas such as business, health, psychology, art and design, law, education, science, and engineering.

- **FutureLearn Programs (certificates):** These flexible online programs allow students to deepen their understanding of a subject and develop relevant career skills for their professional career. Courses are free, with the chance to earn an academic or professional credential by paying a fee.

- **Degrees:** Flexible pay-as-you-go learning program in which students can choose from a range of subjects and levels (from post-graduate certificates to full master’s degrees). Degrees include cybersecurity, digital learning leadership, and even an MBA with artificial intelligence or sustainability specialization.

FutureLearn in numbers*

+8.7	Million users
+700	Courses
+150	Partners
49	FutureLearn Programs (certificates)
24	Degrees

*Data obtained from the FutureLearn platform, 2018.

MOOC COURSES WITH A DEGREE OR CERTIFICATE

There are more than 500 MOOC-based credentials available online. Coursera is at the top of the list with over 250 MOOC-based credentials; followed by edX with around 220 credentials, Udacity with 22 nanodegrees, FutureLearn with 22 certificate programs, and XuetangX with eight micro degrees.

MOOC-BASED CREDENTIALS

Provider	Type of Credential	Number	Average Cost	Average Time
Coursera	Specializations	464	n/d	n/d
	Professional Certificates	2	USD 2 980 to USD 5 600	4 to 10 months
	MasterTrack™ Certificate	3	USD 2 000 to USD 3 474	4 to 7 months
	Online Degrees	13	USD 15 000 to USD 30 000	10 months to 4 years
edX	MicroMaster®	51	USD 540 to USD 1 500	40 weeks to 1 year
	edX Professional Certificate Program (Professional Certificates)	98	USD 75 to USD 2 340	3 to 16 weeks
	edX Professional Education	66	USD 60 USD to 585	2 to 6 weeks
	XSeries™	29	USD 132 USD to 316	12 to 40 weeks
	Online Master's Degree	8	USD 10 000 to USD 25 000	2 to 3 years
	Global Freshman Academy	3	All courses are free, but a verified certificate has a cost of US\$49	Self-paced
Udacity	Nanodegree® Program	33	USD 499 to USD2 400	3 to 8 months
FutureLearn	FutureLearn Programs	26	USD 130 to USD 1 700	n/d
	Degrees	26	USD5 000 to USD 20 285	6 months to 5 years
XuetangX	Microdegrees	8	n/d	n/d

A CLOSER LOOK

AT

ALTER

—

INATIVE
CREDEN—

TIALS

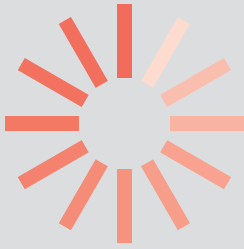


What are alternative credentials?

Alternative credentials refer to the competencies, skills, and learning outcomes derived from assessment-based, non-degree activities and align to specific and timely needs in the workplace (Fong, Janzow, & Peck, 2016). The use of alternative credentials has increased in recent times, partly in response to the current economic, political, and social context described in the introduction. These new forms of alternative education are becoming more common because they provide individuals with new ways

— more accessible, affordable, and efficient — to demonstrate their knowledge and skills to potential employers.

The universe of alternative credentials is complex and varied. Although there is much research on the topic, so far there is no consensus on a single universal classification of the types and forms of these credentials. Nevertheless, we propose a modified version of the classification by Jessie Brown and Martin Kurzweil (2017).



01 LABOR MARKET TRAINING AND CREDENTIALING

CERTIFICATE PROGRAMS

These programs typically last for less than two years and are offered by technical/career colleges, vocational and trade schools, for-profit schools, and community colleges. Most people who participate in these programs do not hold a graduate degree and look for certification in fields like electronics, auto mechanics, health sciences, and cosmetology (Brown, & Kurzweil, 2017).

For example, edX created its professional certificate programs to offer online courses in high-demand fields; these programs were designed to build or advance critical skills for a specific career. Created by industry leaders and top universities, professional certificate programs help develop skills in demand in the job market. Coursera also has a wide variety of professional certificates offered by universities and companies that seek to train participants in vocational skills.

WORK-BASED TRAINING

This type of training refers to corporate training programs and hands-on learning offered by companies for employee development. Entry-level corporate training and workforce development programs usually lead to an industry-recognized certification, either associated with a specific employer or awarded by an industry association (Brown, & Kurzweil, 2017). In 2016, Coursera launched Coursera for Business, where companies pay a fee for their employees to access curated learning programs that draw on over 2,500 university courses (Coursera, 2016).

Companies like AT&T, Walmart, and IBM have invested in the training and education of their employees through comprehensive training programs. In the case of AT&T, the company launched the Workforce 2020 initiative (or WF2020) in 2013 to train around 280,000 employees. With Workforce 2020, AT&T has spent US\$250 million on employee education and professional development programs and more than US\$30 million in tuition assistance annually (Donovan, & Benko, 2016). Through May 2016, employees had taken more than 1.8 million emerging-technology courses, most of which were taken online on platforms like Udacity; employees could receive training for US\$200 a month, reimbursable if the course is satisfactorily completed (Donovan, & Benko, 2016). Walmart Academy is another corporate effort to train and retain employees. In February 2015, Walmart announced an investment of US\$2.7 billion in education, training, and higher wages (Schmid, 2017). The company initially opened 70 academies across the United States. In addition to Walmart Academies, the company also launched another training course called Pathways for all new entry-level

Types of Alternative Credentials

01. Labor Market Training and Credentialing
 - Certificate Programs
 - Work-Based Training
 - Skills-Based Short Courses
 - › *Bootcamps*
02. MOOCs and Other Online Micro-credentials
 - MOOC
 - Micro-credentials
 - Micro/Nanodegrees
 - Digital Badges
 - Online Professional Certificates
03. Competency-Based Education Programs

employees. In 2017, at the inauguration of the Academy number 100 the company announced that it expected to open 100 more by the end of that year (Ward, 2017). Aware of the importance of continuous learning in an uncertain changing future, IBM is one of the pioneer companies in work-based training. According to Forbes, IBM employees consume an average of 60 hours of professional education annually; to achieve this, the company spends half a billion dollars in employee education every year (Yohn, 2018).

SKILLS-BASED SHORT COURSES

These courses can be part of short-term certificate programs or stand-alone as opportunities for gaining specific skills for employment (Brown, & Kurzweil, 2017). Skills-based short courses have gained popularity in the past few years due, to a great extent, to the boom of bootcamps.

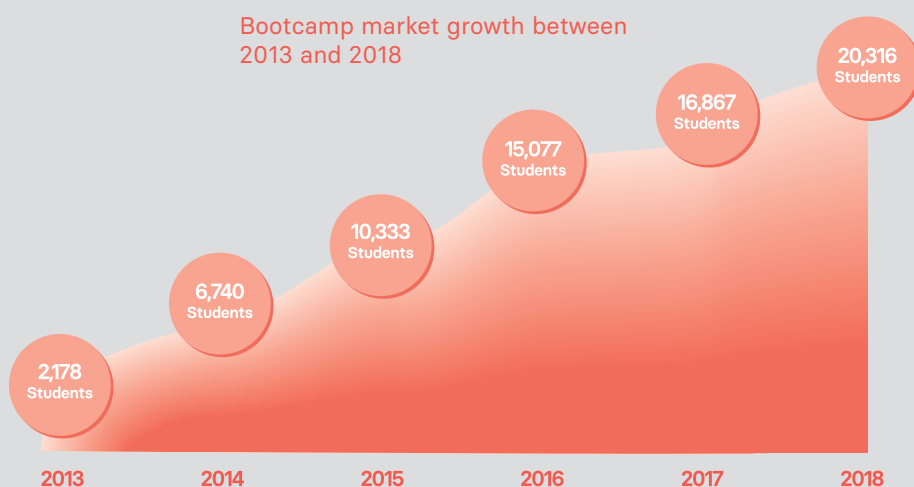
Bootcamps

The highly popular bootcamps are intensive short courses that teach skills in high demand like web development, coding, data science and data analysis, among others. Through an immersive experience, students learn a wide range of skills in a short time (between ten weeks and six months).

The typical bootcamp program is skills-based, providing students with real experience in building projects and applications. They can obtain, in a short time, the skills needed to advance in their careers and satisfy the labor market demand immediate-

ly following graduation. Moreover, these courses are characterized for having robust job placement programs, usually through direct partnerships with companies and employers, to help students build a portfolio to show on the job market. While bootcamps include areas of study like leadership and entrepreneurship, the programs with most supply and demand are intensive web development, programming, and data science.

In 2012, the first programming bootcamp was launched. Six years have passed ever since and in that time the industry has grown considerably. According to data obtained by Course Report (2018), coding bootcamps are presently a US\$240 million industry and is expected to graduate around 20,316 developers in 2018 (20% growth compared to 16,867 graduates in 2017). The bootcamp market grew 9x between 2013 and 2018.

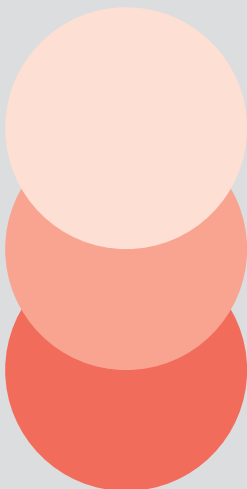


Source: Course Report "2018 Coding Bootcamp Market Size Study" (2018).

A recent bootcamp market study conducted by Course Report indicates that the average cost of a bootcamp is US\$11,900 with an average length of 14.4 weeks.

In 2018, there was a total of 95 in-person bootcamp providers registered and 13 more online, only in the United States. There are around 542 schools worldwide that offer both types of coding bootcamps (Course Report, 2018). The report also identifies a trend of collaboration between bootcamp providers and companies. According to this study, 24 bootcamps currently work with partners on corporate training, which are expected to teach 16,593 students through 634 corporate training partners (a 111% growth since 2017).

The average bootcamper is 29 years old, has six years of work experience, at least a bachelor's degree, and has never worked as a programmer. Approximately 36% of bootcampers are women (Course Report, 2017). Their average salary increased by 50.5%, with a median salary of US\$46,974 before starting the bootcamp and US\$70,698 upon completion (Course Report, 2017).



02 MOOCs AND OTHER ONLINE MICRO-CREDENTIALS

MOOCs

Massive open online courses (MOOCs) are classes taught through technological platforms that enable the teaching-learning process to thousands of students. These courses are a response to the challenges faced by education institutions and organizations in a time of information overload: there is a need for training individuals who are looking for high-quality, low-cost education and who also expect short-term results without going through the traditional pathway to a course (Cormier, & Gillis, 2010). In a MOOC, the student can have free access to high-quality content, most of it from elite schools, through explanatory videos, lectures, exercises, and evaluations. Participants can also contact expert professors and an extensive network of colleagues enrolled throughout the world.

MICRO-CREDENTIALS

Micro-credentials are digital certificates used to demonstrate that an individual masters a specific skill or field knowledge. Once the particular requirements for the micro-credential are met, the user receives a digital certificate as proof of having completed the course. Currently, MOOC providers like Coursera, edX, and FutureLearn offer these types of micro-credentials.

MICRO/NANODEGREES

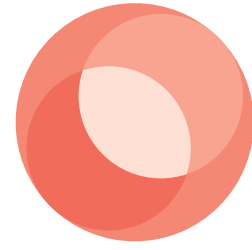
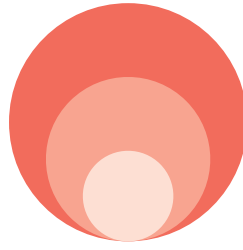
In this type of alternative credential, the education institution determines the length, approach, and academic rigor associated with these credentials. Sometimes, these can serve to earn a higher degree or certificate under any specific field of knowledge, skill, or competency.

Coursera Specializations offer Specialization Certificates in several career skills; the platform also provides Professional Certificates from universities and companies that seek to train participants in professional skills.

Through its MasterTrack™ Certificates, Coursera has split master's degrees programs into online modules so that students can earn credits to obtain a university degree at an affordable cost.

On its part, edX has created MicroMaster®, these accelerated and flexible programs are considered the first credential of its kind with value for academic institutions and employers. Micro-Masters seek to bridge the skills gap through courses in demand in the job market.

Another pioneer in this type of micro-credentials is Udacity. Through partnerships with industry leaders and experts of the labor market, the platform created the Udacity Nanodegree® Program to bridge the skills gap between learning and career goals.



DIGITAL BADGES

The term “badge” applies to specific or punctual learning activities, defined as “granular” due to their short and concrete structure. However, the use of this term has recently increased as a digital representation for any credential. Badging was the response to the skills gap, and by 2010 there was such a proliferation of digital badges that a virtual “Wild West” was created (Jirgensons, & Kapenieks, 2018). In 2011 Mozilla brought some order to the digital badges environment with the help of a grant from the MacArthur Foundation, the idea was to design and create free open digital badges (Jirgensons & Kapenieks, 2018). Mozilla aspired to develop a transparent, open digital framework to store, arrange, and stack digital badges (2018).

With the termination of the MacArthur grant, Mozilla stopped issuing free open badges but in 2014 launched the IMS Global Learning Consortium, a non-profit educational technology organization (2018). The most common digital badge is the one presented by IMS Open Badge Web Standard, with a visual format and embedded metadata associated with such badges, to ensure control and operation of this alternative in the digital world.

IBM is a pioneer in alternative credentials and digital badges. More than 370,000 of its employees have earned about 720,000 digital badges through Acclaim, a Credly platform that of-

fers credentials and digital badges (Yohn, 2018). In 2015 a pilot program launched offered four types of digital badges with three main objectives: to increase employee recognition, to motivate them to acquire new skills and to make its workforce more inclusive.

ONLINE PROFESSIONAL CERTIFICATES

We can define these certificates as credentials generally issued by education institutions, online platforms, or companies where upon completion, students receive a certificate without a degree. The purpose of some professional certificate programs is to prepare students to pass an industry certification exam, while others are used as training to earn the necessary experience to start a career in a specific field.

03 COMPETENCY-BASED EDUCATION PROGRAMS

According to Brown and Kurzweil (2017), competency-based programs are considered alternative credentials that offer another possible pathway to a credential or degree by granting academic credits when students demonstrate competency in learning outcomes, rather than considering only the completion of a particular course. Generally, one of two approaches to competency-based education is followed:

1. A credentialing approach that awards students academic credit based on the assessment of their prior learning, independent of the program.
2. An institutional approach, in which students learn on a more flexible schedule (than in traditional academic programs) in order to achieve the competency-based learning outcomes. Programs that take this approach culminate in certificates, associate's degrees, or bachelor's degrees, and the most common areas of study are business, education, health care, and engineering (Brown, & Kurzweil, 2017).

Competency-based education programs have grown significantly. In 1990, no more than 50,000 students enrolled in this type of programs, but by 2013 the number of students enrolled had increased to nearly 200,000, mostly concentrated among pioneer universities in competency-based programs, such as Capella University, Excelsior College, and Western Governors University (Fleming, 2015). Some institutions, such as Western Governors University, offer only competency-based programs, while others, such as Southern New Hampshire University's College for America, Capella University, and University of Wisconsin's UW Flexible Option, offer these along with their traditional programs (Brown, & Kurzweil, 2017).

It is estimated that by 2020, as many as 750 universities and higher education institutions will offer competency-based programs, with enrollments exceeding 500,000 students, mostly adults, learning through flexible online programs that allow them to progress at their own pace (Fleming, 2015). These programs are also expected to be designed explicitly around employer demand, which will be a key driver for market growth.

ALTER

THE EVOLUTION OF
THE COLLEGE DEGREE:



NATIVE
CREDEN-
TIALS
WORLD-
WIDE

Universities Innovating with Alternative Credentials

[FLEXIBLE COMPETENCY-BASED PROGRAMS]

→ SOUTHERN NEW HAMPSHIRE UNIVERSITY: FLEXIBLE AND AFFORDABLE PROGRAMS FOR THE NEW COLLEGE STUDENT

Southern New Hampshire University (SNHU) is a US, private, nonprofit university with an innovative offer that combines in-person programs with online learning. It has more than 3,000 on-campus students in Manchester, NH, and 90,000 students enrolled in over 200 online programs.

SNHU is internationally recognized for reinventing higher education to fit the needs of students and workforce through more than 300 programs aligned to workforce needs, from certificates to doctoral level degrees in areas such as health, business, education, arts and humanities, social sciences, and STEM (science, technology, engineering, and math). Students can enroll online, and no admission tests such as SAT, GMAT, or GRE scores are required.

ONLINE PROGRAMS FOR REFUGEES

In June 2017, seventeen students in Rwanda (Africa) became the first generation of refugee students who graduated with an accredited associate's degree in the United States. The graduates were part of an SNHU pilot program that partnered with Kepler, a nonprofit university program in Africa (Russell, & Weaver, 2017).

COMPETENCY-BASED ONLINE LEARNING

In October 2017, SNHU announced the launch of a Master's of Education in Online Teaching based on competencies. The university created this customized, competency-based postgraduate degree program in alliance with K12 Inc., a company specialized in blended and online learning. The program consists of training modules and a series of three to six postgraduate-level micro-credentials that can stack into a full Master's Degree in Education focused on a blended and online approach for elementary and secondary education. Teachers may progress at their own pace as they complete competencies and projects set in real-world contexts (Fuerte, 2017a).

ITS PROGRAMS ARE:

- **Flexible.** Students have 24/7 access to courses and can progress at their own pace.
- **Affordable.** The university has one of the lowest tuition rates in the United States. The price is frozen since 2012.
- **Accredited.** Its more than 200 programs meet the highest academic standards.

REIMAGINING LEARNING TO ADDRESS WORKFORCE NEEDS

In October 2018, LRNG, an organization that seeks to bridge the equity gap by transforming how young adults' access and experience learning, announced its merger with SNHU. With this merger, SNHU and LRNG are looking to address workforce needs and increase access to learning pathways for low-income students using an urban ecosystem approach. In order to accomplish its objective, SNHU and LRNG will work with local governments, employers, and community-based partners to identify workforce and educational needs and build digital badges, learning playlists, and even entire degree programs depending on what skills are on demand in each city (Keane, 2018).

For more information visit:
<https://www.snhu.edu/>

[COMPETENCY-BASED PROGRAMS]



→ WESTERN GOVERNORS UNIVERSITY: REIMAGINING THE PATH TO A DEGREE

Western Governors University (WGU) is an online pioneer university in competency-based education. It is the only institution that offers competency-based degrees at scale. The program measures learning rather than time; hence each course culminates with an evaluation, project, or presentation that allows students to show what they have learned. In this program, students advance as soon as they have mastered the material, rather than advancing when the semester or term ends. If students can learn faster, they can accelerate through university. With 24/7 access to online learning courses, students have a learning experience tailored to their knowledge and pace.

WGU offers bachelor's and master's degrees in the fields of education, nursing, computer science, and business. Its programs are designed for working professionals that want the opportunity to earn a graduate or postgraduate degree.

CHARACTERISTICS:

- **Efficient:** Students focus on learning new material, reviewing previously learned subjects, and analyzing topics they know well. On average, a bachelor's or master's degree lasts 9 to 48 months, depending on the program.
- **Flexible:** Study anytime, anywhere. The learning resources of this program are available in any place that has access to Internet connection.
- **Individualized:** Every student is different. WGU looks for a completely personalized learning experience.
- **Supports Success:** Faculty, staff and even fellow students provide support and guide to students on their path. Students can contact faculty members by email or phone.
- **Affordable:** The price of this competency-based program is lower than one of a traditional university career. A semester costs on average US\$3,420 (depending on the program).
- **Flat Rate:** Unlike universities where you pay per credit, WGU's flat-rate tuition links time and cost. Here is where a competency-based education program can be a real money saver: speeding up the pace of the program means saving money.
- **Students control when they take their exams:** They can take a test whenever they feel ready.

For more information visit:
<https://www.wgu.edu/about/competency-based-education.html>



[DIGITAL BADGES]

→ PURDUE PASSPORT: A DIGITAL PASSPORT TO DEMONSTRATE STUDENTS COMPETENCIES AND ACHIEVEMENTS

Purdue University was a pioneer in designing and applying digital Mozilla badges (Jirgensons, & Kapenieks, 2018). In 2012 the university developed the Purdue Passport, a combination of e-portfolio and learning system that uses digital badges to demonstrate student's competencies and achievements. Users can show the badges earned through this passport and in social networks such as LinkedIn and Facebook.

HOW DOES IT WORK?

Students earn badges when they complete challenges. Each challenge consists of several assignments and activities that the student must complete. Once students successfully complete all the assignments, Purdue Passport automatically grants them a digital badge that can be shared online. This passport allows users to visually display their work as concrete evidence of their knowledge.

The university recently launched the Passport app in iTunes and Google Play. This app is available for Purdue students and faculty, and also for users of other institutions.

For more information visit:

<https://www.purdue.edu/cie/globallearning/badges.html>

<https://www.openpassport.org/Account/Login>

<https://www.itap.purdue.edu/learning/tools/passport.html>

[MOOC-BASED DEGREES]

→ GEORGIA TECH: FIRST ONLINE MOOC-BASED MASTER'S DEGREE

In collaboration with AT&T and Udacity, the first MOOC-based degree launched to the market was a Master's degree in Computer Science. It began in 2014 for a total cost of only US\$6,630 (approximately a sixth of the price of a traditional on-campus degree). With 6,365 students enrolled, from 109 countries, this Master's degree is the largest and most affordable program in computer science in the United States (McKenzie, 2018).

For more information visit:

<http://www.omscs.gatech.edu/>

<https://www.udacity.com/georgia-tech>



[MOOC-BASED DEGREES]

→ **UNIVERSITY OF ILLINOIS: THE MBA OF THE FUTURE**

Following the example of Georgia Tech, the University of Illinois at Urbana-Champaign announced a fully online master's degree in 2015. The online Master's in Business Administration (iMBA) at the University of Illinois is affordable, heavily interactive, and fully online. The iMBA program features live global classrooms, team projects, and personal contact with professors. So far, over 1,000 students from more than 65 countries have enrolled in the program.

In collaboration with Coursera, the iMBA organizes its curriculum into modules called Specializations, which contain courses in leadership, strategy, economics, accounting, and finance. Additionally, the program offers other specializations designed to develop students' future-forward vision in areas like digital marketing, innovation, and globalization.

To earn the iMBA degree, students must complete six specializations, three Capstone projects, and participate in live global classrooms. At around US\$22,000 the iMBA can be completed in 24 to 36 months. Besides the iMBA, the University of Illinois at Urbana-Champaign has launched other online master's degrees with Coursera, one in computer science and another in accounting, at US\$20,000 to US\$30,000 each.

For more information visit:

<https://www.coursera.org/degrees/imba>
<https://onlinemba.illinois.edu/>

[MOOC]

→ **ASU GLOBAL FRESHMAN ACADEMY: "SAME COURSES, SAME FACULTY, SAME CREDIT"**

At Arizona State University (ASU), the Global Freshman Academy offers people of all origins the opportunity to take the same courses that ASU students take on-campus. Through this program, in partnership with edX, participants can earn valid ASU credits that are also transferable to other institutions. Over 230,000 students in more than 180 countries have enrolled in the Global Freshman Academy.

CHARACTERISTICS:

- No application or admission essays required.
- Students can take the course at no cost (a fee of US\$600 per credit must be paid to get academic credits, only after passing the course).
- If the student is not satisfied with the grade obtained, he may take the course several times until he gets the desired grade.
- Students can course the entire first year without going to the campus in person, at their own pace, and at a more affordable price than in-person classes.
- Credits received are valid at Arizona State University and other universities.

For more information visit:

<https://gfa.asu.edu/>
<https://www.edx.org/gfa>

[LABOR MARKET TRAINING AND CREDENTIALING]

→ **NORTHEASTERN UNIVERSITY - GOOGLE: A NEW PATHWAY TOWARD A COLLEGE DEGREE**

In September 2018, Northeastern University and Google announced the creation of Grow with Google, an initiative aimed at people who complete Google's IT Support Professional Certificate, offered through Coursera. With this collaboration, students can receive credits toward a Northeastern Bachelor's Degree in Information Technology. This new pathway to college is designed to help professionals gain the skills to satisfy the increasing demand for qualified workers in the fields of information technology and computer science.

Northeastern is the first university to give students an opportunity to convert the Google-backed information technology certificate into credit toward a Bachelor of Science in Information Technology (Callahan, 2018). Google courses are open to anyone, and those who complete the certificate program and are accepted to Northeastern's College of Professional Studies, can be awarded up to 12 credits toward a Bachelor of Science in Information Technology, saving time and money (more than US\$6,000 in tuition) (Callahan, 2018).

For more information visit:

<https://www.coursera.org/specializations/google-it-support>
<https://news.northeastern.edu/2018/09/18/googles-it-support-professional-certificate-can-now-count-toward-a-degree-at-northeastern-university/>



Companies Innovating to Close the Skills Gap

[DIGITAL BADGES]

→ IBM-CREDLY DIGITAL BADGES

The rapid pace at which technology is advancing requires not only new skills but also “liquid skills” to keep pace with rapidly-evolving technology development (Credly, 2018). In 2014, technology evolved every 18 months on average. In 2016, growth was so fast that it changed within just 12 weeks or less (Credly, 2018). Many jobs in the technology sector require specialized skills but not necessarily a degree. These challenges led IBM to look for alternatives in training and re-training its workforce. IBM executives found the solution: digital badges.

WHY DIGITAL BADGES?

- Because they are timely, verified, and portable credentials
- Because HR and employers can verify and track candidate's skills through the badges.
- Because these badges allow differentiating employees by skills while providing a complete vision of the individual's competencies and abilities.
- Because they allow real-time verification of employee achievements
- Because they provide data that enables maps of the company's human talent.

To create a digital badge program with the characteristics listed above, IBM needed a platform that would allow to manage, offer, and verify these credentials. Therefore, the company decided to launch its digital badge program through Pearson's Acclaim platform that was acquired by Credly in 2018. Credly and Acclaim offer a complete global solution suited for Credly's global digital credentials market.

“With our digital credentials program, we want to shift mindsets in our industry and make tech more diverse and inclusive. We want to bring in people with non-traditional backgrounds, attract people re-entering the workforce or relaunching their careers.

We want to create more jobs for people where tech jobs are scarce to create a more diverse and inclusive workforce,” says David Leaser, Senior Program Executive, Innovation and Growth Initiatives at IBM (Credly, 2018). Since the pilot launch in 2015, the program has had more than 370,000 badge earners, and around one million badges have been issued (Credly, 2018).

For more information visit:

<https://credly.com/blog/post/case-study-ibm>

[WORK-BASED TRAINING]

→ MARKLE FOUNDATION - MICROSOFT SKILLFUL INITIATIVE: AN ECOSYSTEM TO CLOSE THE SKILLS GAP

Automation and technological advances are having a profound impact on the workforce. While the digital economy has resulted in substantial growth and prosperity for some, it is leaving many others behind. Today's jobs require more and more new skills, and these skills are rapidly changing.

In June 2017, the Markle Foundation and Microsoft Corp. announced a US\$25.8 million three-year partnership to expand Markle's Skillful initiative, a data-driven approach to connect US workers and businesses in a rapidly evolving labor market. Skillful was launched in 2016 to bring together key players across the labor market —employers, state and federal governments, LinkedIn, educators, and workforce centers — to help US workers adapt to the changing workplace (Microsoft, 2017). The online services offered by this initiative enable job seekers to learn what skills are in demand and to access professional training at any stage of their career. At the same time, Skillful aligns employers and educators so that their training programs teach the skills required to succeed in today's digital economy (Microsoft, 2017).

"Millions of Americans don't have the information, tools or skills needed to succeed in the digital economy. We urgently need to transform the labor market so everyone can compete with equal dignity for today's jobs," said Zoë Baird, CEO and president of the Markle Foundation, in a press release. "We are living in a time of economic change as sweeping as the Industrial Revolution, and this innovative partnership with Microsoft will help job seekers and employers rise to this profound challenge."

Two years after launching this initiative in Colorado, USA, Skillful announced in October 2018 its expansion to a second state: Indiana. The expansion will bring investment, training, tools, and innovative methods to increase and train Indiana's workforce. The launch of Skillful Indiana brings together the Markle Foundation, Microsoft Philanthropies, Walmart Foundation, Lumina Foundation, and Indiana Governor Eric J. Holcomb's Workforce Cabinet to create better pathways to good jobs.

For more information visit:

<http://www.skillful.com/indiana>

<https://www.markle.org/rework-america/skillful>

Tecnológico de Monterrey's Alternative Credentials



MOOCS AND ALTERNATIVE CREDENTIALS OFFERED BY TECNOLÓGICO DE MONTERREY

On February 21, 2013, Tecnológico de Monterrey joined Coursera with an offering of Spanish and English courses, becoming the first private university in Latin America to participate in this platform.

The Tecnológico de Monterrey-Coursera alliance was born with the following objectives:

- To offer the world the Tecnológico de Monterrey's learning
- To reach new audiences and boost student attraction
- To strengthen its leading position in academic innovation and excellence
- To try out an on-campus hybrid model

The initial course offering consisted of seven courses with more than 137,000 students from 142 countries enrolled. Currently, the educational offering in MOOC platforms divides into MOOCs, specialized programs, MicroMasters, flexible postgraduate studies, and remedial alternatives.

MOOCS

Tecnológico de Monterrey MOOCs offers in the following platforms: Coursera (13

courses and four specializations), edX (24 courses, one Micromaster, and two professional certificate programs), and MéxicoX (one course). In subjects like calculus, physics, project management, professional skills, effective communication, critical thinking, family business leadership, data analysis for decision making, among others.

SPECIALIZED PROGRAMS

Tecnológico de Monterrey offers specialized programs in: data analysis for decision making, project management, iOS app development, social media marketing, and a professional certificate program in family business and entrepreneurship.

MICROMASTERS

University-level courses designed for professional advancement that provide deep learning in a specific field and are recognized by companies for their relevance. Enrolled students learn an accelerated and affordable master's degree.

The EGADE Business School of Tecnológico de Monterrey has launched the program MicroMaster Program in Professional Skills: Negotiation and Leadership on edX platform. This MicroMaster program consists of six online courses focused on professional

skills that allow developing a set of soft skills for career advancement (Zambraño, 2018).

FLEXIBLE GRADUATE STUDIES

Tecnológico de Monterrey will offer through Coursera three specialization courses that will combine in-person and online learning, including subjects such as: instructional design, education technology and innovation, and learning assessment.

REMEDIAL ALTERNATIVES

Although these courses are available to anyone, Tecnológico de Monterrey's MOOC strategy also offers these courses as an option to earn credits for the basic requirements so that first-time students can adequately progress in subjects of greater specialization. The following are the remedial courses offered in this modality:

- **Remedial Alternative: Introduction to Physics.** The courses Physics: Dimension, and Movement and Physics: Vectors, work, and energy, give first-time Tecnológico de Monterrey students the opportunity to earn credits for the "Introduction to Physics" remedial course in less time.

- **Remedial Alternative: Introduction to Math.** The courses Calculus: Linear Model, Calculus: Quadratic Model, Calculus: Cubic Model, and Calculus: Other Models, give first-time students the opportunity to earn credits for the remedial course "Introduction to Math" in less time.
- **Remedial Alternative Algorithmic Thinking.** Currently under development, this remedial alternative will consist of two courses.
- **Remedial Alternative Health Sciences.** Currently under development, this remedial alternative will be available through MOOC courses and a bootcamp.

THE TRIAD: AN ALLIANCE TO SHARE KNOWLEDGE FROM LATIN AMERICA TO THE WORLD

In collaboration with Coursera, the three top private universities in Latin America: Universidad de los Andes (Colombia), Tecnológico de Monterrey (Mexico) and Pontificia Universidad Católica de Chile (Chile) have launched a Specialized Program to offer free MOOCs to students of the participant universities, enabling access to different content and improving the existing educational offer.

This alliance started its Specialized Program with a total of 100 MOOC courses: 45 from Tec de Monterrey, 39 from Universidad de los Andes and 16 from Pontificia Universidad Católica de Chile, plus seven specializations. For students enrolled in these universities, the courses and certificates will be free. For the general public, they will be likewise free, and they will only pay the cost of the certificate if they wish so.

For more information visit: <https://coursera.org/programs/la-triada-fegw7>

TEC MOOCS BY THE NUMBERS

→ TECNOLÓGICO DE MONTERREY MOOC STUDENTS

	2013	2014	2015	2016	2017	2018
Coursera Students	60 074	91 441	33 420	111 508	45 449	356 244
edX Students				5089	45 277	6066
MéxicoX Students					3323	92 056

TOTAL: 454 366

BOOTCAMPS OFFERED BY TECNOLÓGICO DE MONTERREY

The bootcamps offered by Tecnológico de Monterrey are designed considering the most demanded market needs. Through these immersive courses, the institution trains qualified teachers and teaching assistants to provide a dynamic learning experience. Currently, Tecnológico de Monterrey offers two bootcamps.


CODING AND WEB DEVELOPMENT: In 24 weeks, students learn HTML5, CSS3, JavaScript, jQuery, Node.js, PHP, Laravel, Express.js, React.js, Database Theory, Bookshelf.js, MongoDB, MySQL, Command Line, Git and more. This program is available in person and online.

DATA ANALYSIS: With this course, students learn the skills required to get a job or advance in their careers through data analysis tools, such as Python, JavaScript, Advanced Excel, SQL Databases and more.

Both programs are designed to provide the flexibility that students need, whether they have a full-time job or are attending university. In the span of 24 weeks, students immerse into an intensive program. Participants not only cover the fundamental aspects, but they also apply the knowledge to solve real-world problems, while reinforcing their portfolios.

In September 2018, the first cohort of 28 graduated from Tec's Coding Boot Camp. Most students (95%) started the program without knowing how to code or any computer languages. Six months later, they presented their applications and digital platforms to burst into the digital economy and improve their communities (Vázquez, 2018). The students that participated in this first edition included engineers, industrial designers, marketing and finance specialists. Through a Demo Day, graduates presented their final projects, which ranged from applications focused on generating savings in the freight transport industry, to programs focused on personal finance and even a project seeking to promote rescue and animal adoption.

For more information visit: <https://bootcamp.tec.mx/>



A CRITICAL LOOK

Thanks to the growing alternative credentials market (digital, boot-camps, MOOCs, and competency-based credentials, among others) students and employees have more options than ever to get the training they require. However, there is no practical method to obtain relevant and comparable information on the broad range of alternative credentials. One of the few initiatives that is trying solve this problem is Credential Engine, a non-profit organization that seeks to improve transparency in the credentials market by creating a credential registry and search system. Since December 2017, Credential Registry and Credential Finder™ are open to the public to publish and search for credentials. However, this ongoing initiative barely suffices to cover the credential offering in the US. We need a global credential registry, search, homologation and verification system

that, using a common language, provides people a universal alternative credential window. The alternative credential market is a complex universe and can be confusing, but it has many areas for improvement and great potential. The alternative credential registry and verification system can be broadly improved with the use of blockchain technology. The blockchain is a shared, decentralized and immutable database to record a transaction history. Even though it is still in an experimentation phase, this technology, applied to education, promises permanent authentication and storage for the growing alternative credentials market, while giving users direct control and management over their credentials (Jirgensons, & Kapenieks, 2018). Additionally, its applications can go beyond transforming traditional transcripts. Most universities continue to use paper as the preferred medium

to record and provide evidence of the education of a student. Others have evolved into the PDF format transcripts appended with electronic signatures, but the method is vulnerable to forgery (Jirgensons, & Kapenieks, 2018). Through its infrastructure, blockchain may contribute transparency in student records and files, in such a way that all person's education can be recorded in the same place. With blockchain technology, a student can accumulate credentials (blocks) from different providers in chronological order (chains) with a secure and decentralized learning approach that is student-centered and recognizes flexible pathways (Jirgensons & Kapenieks, 2018). With the implementation of lifelong education, it will become increasingly necessary to have access to a decentralized, personal, reliable and inalterable transcript. If we are going to be lifelong students, a single diploma will

not suffice; new transcripts and degrees must evolve into a big open file that can be adapt to the needs of a continuous learning process. With blockchain technology, educational institutions will save time, money and human resources in recording transcripts. Companies and employers will have direct and immediate access to the credentials and competencies of each candidate as he or she is learning and updating his or her skills. On the other hand, even though collaboration with the industry will be essential for the future of work, universities must not become employee factories. In the words of Dr. Pedro Miguel Echenique: “A university whose whole mission is employability, while it may be profitable, is not focused on the essence of the university” (2018). This essence must be research and transfer of knowledge. However, if the Fourth Industrial Revolution will cause lifelong education to be the new norm, higher education institutions may not lose the opportunity to provide, through continuous education programs, the knowledge demanded by employees and employers. Lastly, even though an increasing number of universities, institutions and companies have joined the alternative credential movement, we must support and incentivize academic research on the efficiency of such programs, their return on investment and the value of such types of credentials. Additionally, new intelligent technologies and systems may provide professors and researchers with a large amount of data on how students learn, data that can be analyzed for academic and teaching purposes. Universities must be at the forefront of alternative credentials by promoting scientific research on the field. As we have learned up to now, the alternative credential ecosystem has transformed not only higher education, but also continuous education programs, professional training, and formal and informal learning. There is still a long road ahead, and the broad array of alternative credentials that are currently available lead to a need for a homologated, reliable, verifiable and transferrable system. There are many challenges ahead, but even more opportunities.

Employers' recommended priorities for colleges and universities.



According to a 2018 analysis by Gartner (Lowendahl, Thayer, Morgan, & Yanckello, 2018) on the technologies that will impact higher education, the alternative credential market must address three fundamental challenges:

1.TRUST: Who can give out credits? How are the quality standards of courses and certifications assured?

2.TRANSPARENCY What is the granularity needed to represent a skill adequately? Can we create a universal alternative credential search, verification and certification system?

3. DOCUMENTATION: How can we adequately represent student learning and results? How can we achieve a common language in skills, competencies and credentials documentation? How can we improve our registry systems to make learning certification more efficient?

Higher education institutions, on their part, will also face challenges regarding the future of credentialing and online education. In this respect, the Northeastern University Center for the Future of Higher Education and Talent Strategy surveyed US employers to know their opinion on the future of alternative credentials and their value in the labor market. The survey asked talent and HR leaders to mention the priorities and actions that they would recommend to universities to guarantee the quality and usefulness of online credentials. The results show that job training and a curriculum validated by the private sector are the highest priorities that universities must have, according to employers.



Blockchain and the Future of Alternative Credentials

A large part of the challenges reviewed in the previous section can be resolved by adopting blockchain technology in the creation and delivery of alternative credentials. Some universities are already experimenting with this technology. Below we present the most relevant cases in the innovative use of blockchain for credentialing.

→ MIT BLOCKCERTS: DIGITAL DIPLOMAS WITH BLOCKCHAIN TECHNOLOGY

On October 2017, the Massachusetts Institute of Technology (MIT) introduced Digital Diploma, a pilot program that offers students the possibility of receiving certifications in their smartphones through an application that uses Bitcoin blockchain technology. The Blockcerts Wallet application developed by MIT in collaboration with Learning Machine was built to create a verifiable and secure version of diplomas (Murillo, 2017). Blockcerts is an open source application to create, issue, and review blockchain-based results. These digital records are recorded in a blockchain, cryptographically signed, manipulation-proof, and they may be shared with employers and other universities (Blockcerts, s.f.). MIT informed that, in 2017, 111 graduates became the first to receive their digital diplomas with blockchain technology.

For more information visit:

<https://www.blockcerts.org/about.html>

→ WOOLF UNIVERSITY: THE FIRST BLOCKCHAIN UNIVERSITY

A group of academics from Oxford University announced in March 2018 the creation of Woolf University, the first fully accredited, borderless higher education institution, which will operate with blockchain technology (Woolf University, s.f.). Given the problem of unemployment and temporary work contracts of professors and the crushing debt faced by many university students, Woolf creators sought an initiative to empower academics and connect them to students from around the world.

The credits obtained are recorded through smart contracts and accredited by traditional institutions (Fredin, 2018). The creators of the project expect this new higher education model to eliminate bureaucracy and the cost of university degrees (the annual tuition fee will be US\$5,000). Additionally, it seeks for academics to have greater control over their jobs, by allowing an autonomous and decentralized organization among professors and students. (Woolf University, s.f.).

For more information visit:

<https://woolf.university>

→ DISCIPLINA: A BLOCKCHAIN PLATFORM FOR ACADEMIC CREDENTIALS

The current system for sharing official academic records and transcripts is slow, complicated and expensive. Recruiters have no way of corroborating all courses immediately, while candidates cannot guarantee credentials obtained in their curriculums (Guijosa, 2018b). DISCIPLINA, the first blockchain platform dedicated to keeping a safe, verifiable and efficient academic credential record was created to optimize this process.

This unified platform will allow users to store their academic and professional achievements digitally. Likewise, recruiters can use DISCIPLINA to search for candidates according to their accomplishments and specialization fields. DISCIPLINA is an open source blockchain. Therefore, any educational or talent search institution can use this platform (Guijosa, 2018b).

For more information visit:

<https://disciplina.io/>

→ RMIT CREDS: DIGITAL BADGES WITH BLOCKCHAIN TECHNOLOGY

As of August 2018, RMIT University students will be able to certify their credentials, competencies, and skills with blockchain technology. In collaboration with Credly, the university will give students the opportunity to publish in their curriculum information on educational credentials and badges that are sharable through social media such as LinkedIn or Facebook (Guijosa, 2018c). RMIT will initially offer these credentials to students who complete the Developing Blockchain Strategy course, in addition to digital credentials of its new “RMIT Creds” portfolio, which includes skills such as leadership, writing, collaboration, creativity, academic integrity, among others (Guijosa, 2018c).

For more information visit:

<https://www.rmit.edu.au/news/all-news/2018/jul/blockchain-badges>

<https://www.rmit.edu.au/creds>

→ SONY GLOBAL EDUCATION: A BLOCKCHAIN PLATFORM TO TRACK AND MANAGE STUDENTS' EDUCATION RECORDS

In August 2017, Sony Global Education announced a partnership between IBM and Sony Corporation to develop a new blockchain-based student education records platform. The new platform, developed using IBM Blockchain, uses this technology to track and manage students' learning progress and to establish transparency of scholarly achievements between students, schools, and employers (Fuerte, 2017b). IBM Blockchain will allow students to manage a variety of services offered by different institutions and consolidate them in a single verified repository, which will also enable them to share their transcripts and scholarly achievements with potential employers.

For more information visit:

<https://www.ibm.com/blockchain>

<https://www.sonyged.com/2017/08/10/news/press-blockchain/>

The Future of Alternative Credentials According to Employers

To understand the importance of alternative credentials, we must know the perceived value of these credentials in the job market. Unfortunately, recognizing the value of educational credentials in hiring has historically been an understudied area (Gallagher S., 2018). Northeastern University's Center for the Future of Higher Education and Talent Strategy surveyed 750 human resources leaders at US employers to understand how the value of alternative credentials is evolving in the job market and how employers perceive online degrees, micro-credentials, and emerging credentials.

The general perspective of the employer community on this matter is critical, as it provides a window into the future of jobs and alternative credentials. Some of the study's key findings include:

VALUE OF EDUCATIONAL CREDENTIALS

The relative value of educational credentials in hiring has held steady (29%) or increased (48%) for most employers over the past five years.

CONTINUOUS LIFELONG LEARNING

A majority of Human Resources leaders (64%) believe that, in the future, the need for continuous lifelong learning will demand higher levels of education and more credentials.

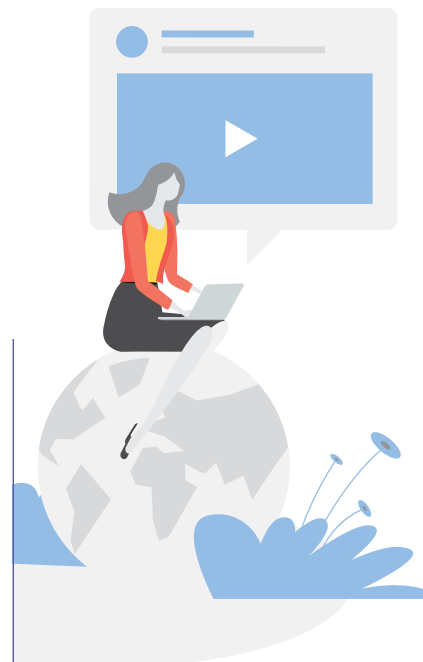
SKILLS VERSUS DEGREES

Skills-based or competency-based hiring is gaining significant interest and momentum. In this respect, 23% of Human Resources leaders report that they are formally prioritizing skills over degrees, and 39% said that they are exploring and considering this possibility.

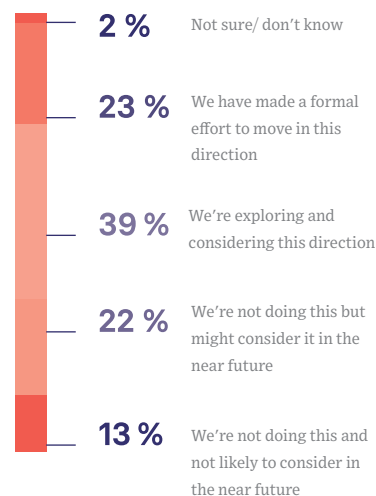
55% of employers agreed that micro-credentials are "likely to diminish the emphasis on degrees in hiring over the next 5-10 years."

ONLINE CREDENTIALS AND DEGREES

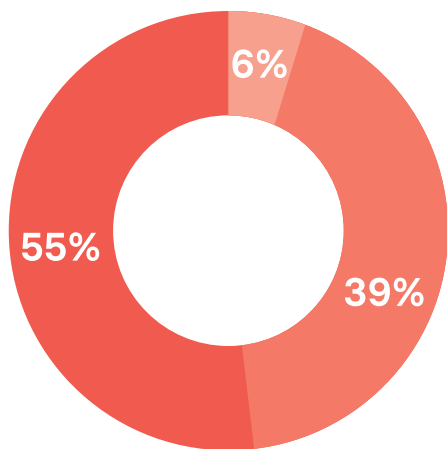
Online credentials are now mainstream. A majority (61%) of Human Resources leaders believe that credentials earned online are generally equal to those completed in-person. While 71% stated that they have personally hired someone with a degree or credential completed online.



Extent to which organizations have formal skills-based hiring initiatives underway or are considering a strategy that de-emphasizes degrees and prioritizes skills.



SOURCE: Educational Credentials Come of Age. A Survey on the Use and Value of Educational Credentials in Hiring. Northeastern University's Center for the Future of Higher Education and Talent Strategy, 2018.



PERCEPTION OF QUALITY FOR CREDENTIALS EARNED ONLINE

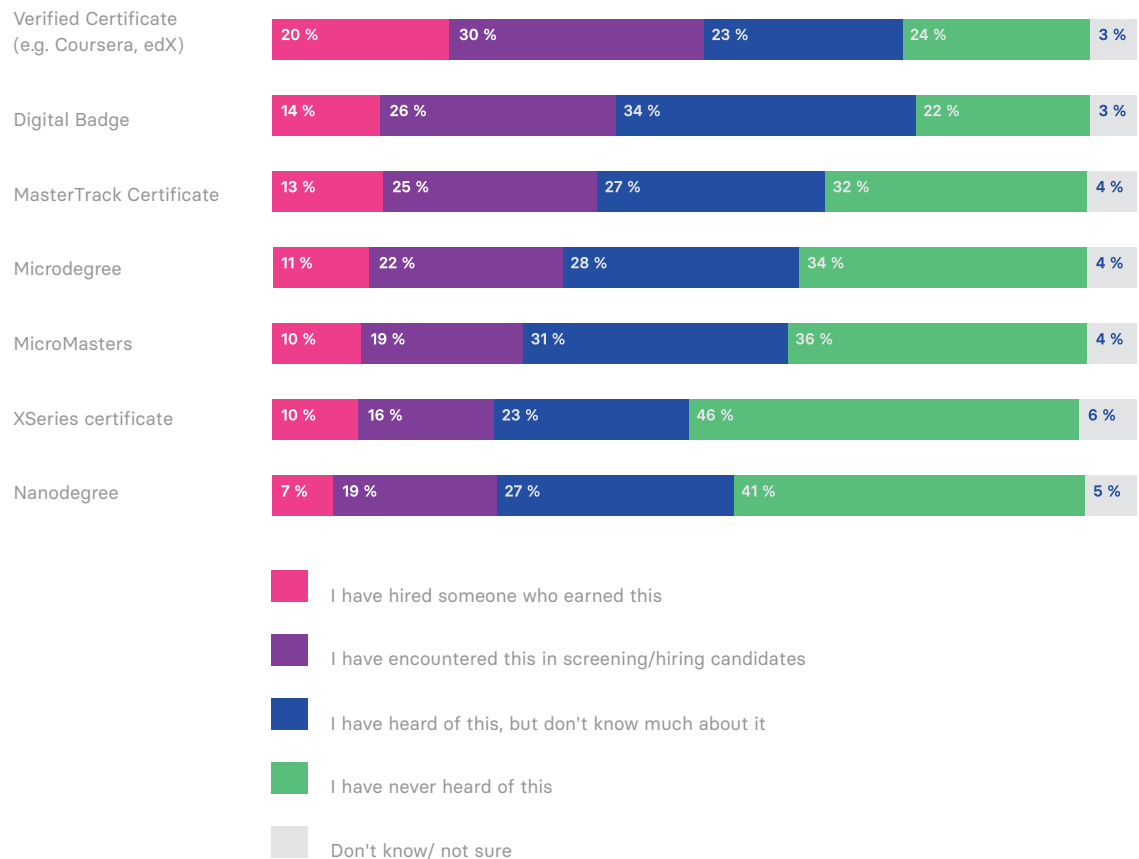
55 % No difference
Credentials earned online are generally equivalent to those completed in-person

39 % Credentials earned online generally lower quality than those completed in-person

6 % Credentials earned online are generally higher quality than those completed in-person

SOURCE: Educational Credentials Come of Age. A Survey on the Use and Value of Educational Credentials in Hiring / Northeastern University's Center for the Future of Higher Education and Talent Strategy, 2018.

LEVEL OF AWARENESS OR EXPERIENCE WITH THE VARIOUS TYPES OF "MICROCREDENTIALS" THAT MAY APPEAR ON A CANDIDATES' RESUME



SOURCE: Educational Credentials Come of Age. A Survey on the Use and Value of Educational Credentials in Hiring / Northeastern University's Center for the Future of Higher Education and Talent Strategy, 2018.



CONCLUSIONS

Learning does not end at university. People continue learning throughout their personal and professional experiences, within and outside the educational context, both formally and informally. While this is not new, the economic, political, and societal changes of the last decade have clearly and fundamentally shown the need for continuous training that adapts to changing times. Thus, the supply of new paths and alternatives to traditional learning programs has increased considerably in the past few years, and it is expected to continue growing. Its proliferation will contribute to building a continuous lifelong learning culture that gives people access to more agile, diverse, inclusive, and flexible alternatives.

Education institutions with the ability to adapt to this new reality will stand out when faced with the imminent transformation of the world of training. The growing supply of alternative credentials must not be seen as a threat to traditional degrees; on the contrary, we hope that this transformation contributes to the evolution of degree programs and to remove access barriers. Traditional degrees and alternative credentials may and will have to coexist and learn from each other, strengthening learning opportunities for society. In the coming years, it will be essential that universities -primary

sources of knowledge, creation, and transfer- encourage and promote formal research that demonstrates the efficiency and value of these alternative credentials. Since this is an emerging field, lack of data and scientific evidence of alternative credentials represent a large area for improvement for education research groups, which will give universities the opportunity to play a vital role in the evolution and consolidation of alternative credentials. Lastly, new technologies like blockchain have the potential to contribute to the progress of the alternative credentials market and the imminent transformation of the college degree.

Academic transcripts can no longer remain as closed and immutable records. The modern world demands the creation of a new system for academic records based on education periods rather than on academic degrees, providing citizens with an open, transferable, and verifiable record that reflects not only academic knowledge but also, social-emotional skills that will be crucial for an uncertain and volatile future with unprecedented changes. In the future, the role of universities as primary sources of knowledge and engines of social transformation is and will continue to be essential.

→ CREDITS AND ACKNOWLEDGMENTS

OBSERVATORY TEAM

Esteban Venegas

Karina Fuerte

Rubí Román

Alejandro Murillo

Christian Guijosa

Paulette Delgado

Sofía García-Bullé

Mariana Limón

THE OBSERVATORY WISHES TO THANK

Julien Depauw

Esteban Fredin

Cover by: Alberto Viloria



References

Acaso, M. (April 9, 2018). *De la certificación como medio a la certificación como objetivo: Cifuentes, su TEM y la universidad como fraude*. Retrieved on October 2018 from María Acaso: <https://mariaacaso.es/educacion-disruptiva/la-certificacion-medio-la-certificacion-objetivo-cifuentes-tfm-la-universidad-fraude/>

Arcas, O., Peñas, C., & Sacristán, V. (June 19, 2014). *El coste de estudiar en Europa*. Obtained from Observatorio del Sistema Universitario: <http://www.observatoriuniversitari.org/es/2014/06/19/el-coste-de-estudiar-en-europa/>

Arcas, O., Peñas, C., & Sacristán, V. (December 2016). *¿Por qué precios tan distintos?* Retrieved on October 2018 from Observatorio del Sistema Universitario: <http://www.observatoriuniversitari.org/es/2017/01/25/por-que-precios-tan-distintos/>

Bessen, J. (2015). *Learning by doing: the real connection between innovation, wages, and wealth*. New Haven: Yale University Press.

Library of Official Publications of the Government of the Republic. (May 15, 2017). *Principales Cifras del Sistema Educativo Nacional 2015-2016*. Retrieved from the Government of the Republic gob.mx: <https://www.gob.mx/publicaciones/articulos/principales-cifras-del-sistema-educativo-nacional-2015-2016>

Blakemore, E. (October 5, 2015). *Japanese Universities Are Shuttering Social Sciences and Humanities Departments*. Retrieved on October 2018 from Smithsonian.com: <https://www.smithsonianmag.com/smart-news/japans-government-asks-all-universities-shutter-humanities-and-social-sciences-departments-180956803/#VL6FsE>

Blockcerts. (n.d.). *About Blockcerts*. Obtained from Blockcerts The Open Standard for Blockchain Certificates: <https://www.blockcerts.org/about.html>

Brown, J., & Kurzweil, M. (2017). *The Complex Universe of Alternative Postsecondary Credentials and Pathways*. Cambridge, Mass: American Academy of Arts & Sciences.

Callahan, M. (September 18, 2018). *Google's IT Support Professional Certificate Can Now Count Toward a Degree at Northeastern University*. Obtained from News @ Northeastern: <https://news.northeastern.edu/2018/09/18/googles-it-support-professional-certificate-can-now-count-toward-a-degree-at-northeastern-university/>

Carnevale, A. P., Garcia, T. I., & Gulish, A. (July 2011 [sic], 2017). *Career Pathways: Five Ways to Connect College and Careers*. Retrieved on October 2018 from George-

town University. Center on Education and the Workforce: <https://cew.georgetown.edu/cew-reports/careerpathways/>

Centre for Ageing Better. (n.d.). *People are living longer*. Obtained from Centre for Ageing Better: <https://www.ageing-better.org.uk/living-longer>

Chetty, R., Grusky, D., Hell, M., Hendren, N., Manduca, R., & Narang, J. (2016). *The Fading American Dream: Trends in Absolute Income Mobility Since 1940*. National Bureau of Economic Research.

College Board. (2017). *Trends in College Pricing 2017*. Recuperado el Octubre de 2018, de College Board: <https://trends.collegeboard.org/college-pricing>

Cormier, D., & Gillis, N. (2010). *What is a MOOC?* Obtained from Wikimedia Commons: http://commons.wikimedia.org/w/index.php?title=File:3AWhat_is_a_MOOC.ogg

Course Report. (December 19, 2017). *2017 Coding Bootcamp Outcomes & Demographics Report*. Obtained from Course Report: <https://www.coursereport.com/reports/coding-bootcamp-job-placement-2017>

Course Report. (August 21, 2018). *2018 Coding Bootcamp Market Size Study*. Obtained from Course Report: <https://www.coursereport.com/reports/2018-coding-bootcamp-market-size-research>

Credly. (2018, June 25). *SHIFTING THE UP-SKILLING PARADIGM: Digital badges help IBM create a diverse, inclusive workforce*. Obtained from Credly: <https://resources.credly.com/resources/case-study-ibm>

Delgado, P. (October 15, 2018). *Profesionistas en movimiento: dos de cada tres profesionistas ven positivo cambiar de empleo con frecuencia*. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/profesionistas-en-movimiento-2-de-cada-3-profesionistas-ven-positivo-cambiar-de-empleo-con-frecuencia>

Donovan, J., & Benko, C. (October 2016). *AT&T's Talent Overhaul*. Obtained from Harvard Business Review: <https://hbr.org/2016/10/atts-talent-overhaul>

Economic Policy Institute. (n.d.). *The Great Recession*. Retrieved on October 2018 from The State of Working America: <http://stateofworkingamerica.org/great-recession/>

edX. (October 2018). *edX Media Kit*. Obtained from edX: <https://www.edx.org/es/media-kit>

Europa Press. (12 de Septiembre de 2017). *Radiografía de los universitarios españoles, en 9 gráficos*. Obtenido de Europa Press: <https://www.europapress.es/sociedad/noticia-radiografia-universitarios-espanoles-graficos-20170912191902.html>

Europa Press. (September 12, 2017). Radiografía de los universitarios españoles, en 9 gráficos. Obtained from Europa Press:

European Commission. (2017). Standard Eurobarometer 88 "Public opinion in the European Union." European Union: European Commission. Obtained from Eurostat Statistics Explained.

Ferreira, M., Avitabile, C., Botero Alvarez, J., Haimovich Paz, F., & Urzua, S. (2017). At a Crossroads: Higher Education in Latin America and the Caribbean. Obtained from Open Knowledge Repository: <https://openknowledge.worldbank.org/handle/10986/26489>

Fleming, B. (February 17, 2015). Mapping the Competency-Based Education Universe. Obtained from Eduventures: <http://publicservicesalliance.org/wp-content/uploads/2015/02/Mapping-the-Competency-Based-Education-Universe-Eduventures.pdf>

<http://publicservicesalliance.org/wp-content/uploads/2015/02/Mapping-the-Competency-Based-Education-Universe-Eduventures.pdf>

Fong, J., Janzow, P., & Peck, K. (2016). Demographic shifts in educational demand and the rise of alternative credentials. Washington, DC: UPCEA.

Fredin, E. (October 30, 2017). La crisis del título universitario. Observatorio de Innovación Educativa. Retrieved on October 2018 from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/2017/10/30/la-crisis-del-titulo-universitario>

Fredin, E. (April 2, 2018). La primera universidad blockchain promete ser Uber para estudiantes y Airbnb para los profesores. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/la-primera-universidad-blockchain-promete-ser-uber-para-estudiantes-y-airbnb-para-profesores>

Fuerte, K. (October 31, 2017a). SNHU lanza un Máster en Enseñanza en línea basado en competencias. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/2017/10/31/snhu-lanza-un-mster-en-enseanza-en-linea-basado-en-competencias>

Fuerte, K. (August 14, 2017b). Una nueva plataforma basada en tecnología blockchain ayudará a rastrear y administrar el historial académico de los estudiantes. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/2017/8/14/una-nueva-plataforma-basada-en-tecnologia-blockchain-ayudar-a-rastrear-y-administrar-el-historial-academico-de-los-estudiantes>

Fuerte, K. (May 24, 2018). "La Universidad, digan lo que digan, tiene un prometedor futuro". Retrieved on October 2018 from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/encuentro-reciores-universia-2018-salamanca>

Fuerte, K., & Guijosa, C. (July 9, 2018). Glosario de

Innovación Educativa. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/glosario-de-innovacion-educativa>

FutureLearn. (n.d.). About FutureLearn Our story. Obtained from FutureLearn <https://www.futurelearn.com/about-futurelearn>

Gallagher, S. (October 30, 2018). The Beginning of a New Era in the Online Degree Market. Obtained from Ed-Surge: <https://www.edsurge.com/news/2018-10-30-the-beginning-of-a-new-era-in-the-online-degree-market>

Gallagher, S. (2018). Educational Credentials Come of Age. A Survey on the Use and Value of Educational Credentials in Hiring. Boston: Northeastern University Center for the Future of Higher Education and Talent Strategy.

Guijosa, C. (July 16, 2018a). El reto de la deserción universitaria. Retrieved on October 2018 from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/el-reto-de-la-desercion-universitaria>

Guijosa, C. (July 13, 2018b). Nace DISCIPLINA, tecnología blockchain para corroborar credenciales académicas. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/disciplina-tecnologia-blockchain-de-credenciales-academicas>

Guijosa, C. (July 24, 2018c). RMIT emitirá insignias digitales con tecnología blockchain. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/rmit-emitira-insignias-digitales-con-tecnologia-blockchain>

INE. (October 2014). Encuesta sobre Movilidad Internacional de los Estudiantes - 2014. Obtained from the National Institute of Statistics (Instituto Nacional de Estadística, INE): <http://www.ine.es/dynt3/inebase/es/index.htm?type=pcaxis&path=/t13/p472/2014/p01/&file=pcaxis>

INEGI. (December 8, 2015). Encuesta Intercensal 2015. Obtained from the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, INEGI): <http://www.beta.inegi.org.mx/proyectos/enchogares/especiales/intercensal/>

ITESM. (2014). Edu Trends MOOC. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edutrendsmooc>

Jirgensons, M., & Kapenieks, J. (2018). Blockchain and the Future of Digital Learning Credential Assessment and Management. Journal of Teacher Education for Sustainability, 145-156.

Jones, J. M. (October 9, 2018). Confidence in Higher Education. Retrieved on October 2018, from Gallup: <https://news.gallup.com/opinion/gallup/242441/confidence-higher-education-down-2015.aspx>

Keane, L. (October 19, 2018). Southern New Hampshire University and LRNG Merge to Deploy Innova-

tive Community-Based Education Strategy in Cities Across the US Obtained from Southern New Hampshire University: <https://www.snhu.edu/about-us/news-room/2018/10/snhu-lrng-merger>

Kennedy, J., Castro, D., & Atkinson, R. D. (2016). Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing. Washington, DC: Information Technology & Innovation Foundation.

Levin, R. (August 31, 2016). Announcing Coursera for Business. Obtained from Coursera Blog: <https://blog.coursera.org/announcing-coursera-for-business/>

Lowendahl, J.-M., Thayer, T.-L. B., Morgan, G., & Yancello, R. A. (2018). Top 10 Business Trends Impacting Higher Education in 2018. Stamford, CT: Gartner.

McKenzie, L. (March 20, 2018). Online, Cheap -- and Elite. Obtained from Inside Higher Ed: <https://www.insidehighered.com/digital-learning/article/2018/03/20/analysis-shows-georgia-techs-online-masters-computer-science>

Microsoft. (June 27, 2017). The Markle Foundation and Microsoft partner to accelerate a skills-based labor market for the digital economy. Obtained from Microsoft [sic] News Center: <https://news.microsoft.com/2017/06/27/the-markle-foundation-and-microsoft-partner-to-accelerate-a-skills-based-labor-market-for-the-digital-economy/>

Mourshed, M., Farrell, D., & Barton, D. (January 2013). Education to employment: Designing a system that works. Obtained from McKinsey & Company: <https://www.mckinsey.com/industries/social-sector/our-insights/education-to-employment-designing-a-system-that-works>

Murillo, A. (October 20, 2017). MIT presenta un nuevo programa de certificación digital que utiliza blockchain. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/2017/10/20/mit-presenta-un-nuevo-programa-de-certificacin-digital-que-utiliza-blockchain>

NACE. (April 2018). Job Outlook 2018. Obtained from National Association of Colleges and Employers (NACE): <http://www.naceweb.org/store/2017/job-outlook-2018>

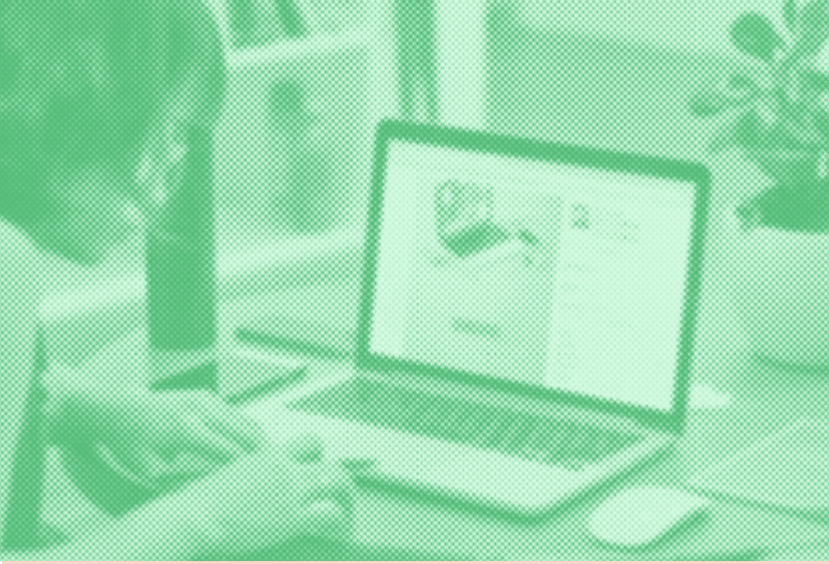
NCES. (2014). Digest of Education Statistics: 2014. Chapter 3: Postsecondary Education. Retrieved on October 2018 from National Center for Education Statistics (NCES): https://nces.ed.gov/programs/digest/d14/ch_3.asp

NCES. (n.d.). Nontraditional Undergraduates / Definitions and Data. Obtained from National Center for Education Statistics (NCES): <https://nces.ed.gov/pubs/web/97578e.asp>

Nedelkoska, L., & Quintini, G. (2018). Automation, skills use and training. Retrieved on October 2018 from OECD iLibrary: <https://doi.org/10.1787/2e2f4eea-en>

OECD/CAF/ECLAC. (2018). Perspectivas económi-

- cas de América Latina 2018: Repensando las instituciones para el desarrollo. Retrieved on October 2018 from OECD iLibrary: <http://dx.doi.org/10.1787/leo-2018-es>
- OECD. (November 10, 2017). What has driven life expectancy gains in recent decades? A cross-country analysis of OECD member states. Obtained from Health at a Glance 2017: OECD Indicators: https://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2017/what-has-driven-life-expectancy-gains-in-recent-decades-a-cross-country-analysis-of-oecd-member-states_health-glance-2017-5-en
- OECD. (2018). Education at a Glance 2018: OECD Indicators. Retrieved from OECD: <https://doi.org/10.1787/eag-2018-en>
- OIT. (January 22, 2018). Perspectivas Sociales y del Empleo en el Mundo: Tendencias 2018 [Resumen]. Obtained from the International Labour Organization: https://www.ilo.org/global/research/global-reports/weso/2018/WCMS_615674/lang-es/index.htm
- Pappano, L. (November 2, 2012). The Year of the MOOC. The New York Times.
- Ross, J. (October 10, 2018). Lifelong learning vital for Singapore to avert 'bleak' future. Obtained from Times Higher Education: <https://www.timeshighereducation.com/news/lifelong-learning-vital-singapore-avert-bleak-future>
- Russell, C., & Weaver, N. (June 20, 2017). Changing the Narrative on Refugee Education One Graduate at a Time. Obtained from Southern New Hampshire University: <https://www.snhu.edu/about-us/news-and-events/2017/06/refugee-education>
- Schmid, E. (February 23, 2017). Work That Matters: Looking Back on 2 Years of Investing in People. Obtained from Walmart Blog: <https://blog.walmart.com/opportunity/20170223/work-that-matters-looking-back-on-2-years-of-investing-in-people>
- Schwab, K. (January 14, 2016). The Fourth Industrial Revolution: what it means, how to respond. Retrieved on October 2018 from World Economic Forum: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>
- Selingo, J. (21 de Septiembre de 2018). How the Great Recession changed higher education forever. Recuperado el Octubre de 2018, de The Washington Post: <https://www.washingtonpost.com/education/2018/09/21/how-great-recession-changed-higher-education-forever/>
- Selingo, J. (September 21, 2018). How the Great Recession changed higher education forever. Retrieved on October 2018 from The Washington Post: <https://www.class-central.com/report/xuetangx/>
- Shah, D. (October 16, 2016). XuetangX: A Look at China's First and Biggest MOOC Platform. Obtained from Class Central: <https://www.class-central.com/report/coursera-2017-year-review/>
- Shah, D. (December 31, 2017). Coursera's 2017: Year in Review. Obtained from Class Central: <https://www.class-central.com/report/udacity-2017-review/>
- Shah, D. (3 de Junio de 2018a). *The Second Wave of MOOC Hype is Here and it's Online Degrees*. Obtained de Class Central: <https://www.class-central.com/report/second-wave-of-mooc-hype/>
- Shah, D. (June 3, 2018a). The Second Wave of MOOC Hype is Here and it's Online Degrees. Obtained from Class Central: <https://www.class-central.com/report/mooc-stats-2017/>
- Shah, D. (January 18, 2018b). By The Numbers: MOOCs in 2017. Obtained from Class Central: <https://www.class-central.com/report/moocs-stats-and-trends-2018/>
- Shah, D. (January 9, 2019). Year of the MOOC-based Degrees: A Review of MOOC Stats and Trends in 2018. Obtained from Class Central: <https://www.scientificamerican.com/article/how-the-survivor-bias-distorts-reality/>
- Toffler, A. (1970). *Future Shock*. New York: Random House. Udacity. (n.d.). About Us. Obtained from Udacity: <https://www.udacity.com/us>
- Universia. (n.d.). Universidades en México. Obtained from Universia México: <http://www.universia.net.mx/universidades>
- Vazquez, A. (September 28, 2018). Se gradúa la primera generación del Tec Coding Boot Camp lista para enfrentar los retos de la economía digital. Obtained from Observatorio de Innovación Educativa: <https://observatorio.itesm.mx/edu-news/se-gradua-primer-generacion-del-tec-coding-boot-camp>
- Vigo, J. (May 3, 2018). The Commodification of Learning and the Decline of the Humanities. Obtained from Quillette: <https://quillette.com/2018/05/03/commodification-learning-decline-humanities/>
- Walton, M. (February 27, 2017). Introducing upgrading on FutureLearn courses. Obtained from FutureLearn: <https://about.futurelearn.com/blog/upgrading-future-learn-courses>
- Wan, T. (October 6, 2018). The Most Important Skills for the 4th Industrial Revolution? Try Ethics and Philosophy. Obtained from EdSurge: <https://www.edsurge.com/news/2018-10-06-the-most-important-skills-for-the-4th-industrial-revolution-try-ethics-and-philosophy>
- Ward, T. (April 17, 2017). What is a Walmart Academy? How They're Building Confidence and Careers. Obtained from Walmart Blog: <https://blog.walmart.com/opportunity/20170417/what-is-a-walmart-academy-how-theyre-building-confidence-and-careers>
- WEF. (2018). The Future of Jobs 2018. Obtained from the World Economic Forum: <http://reports.weforum.org/future-of-jobs-2018/>
- Woolf University. (n.d.). *Woolf Building the first blockchain university*. Obtained from Woolf University: <https://woolfuniversity/#/>
- Yohn, D. L. (September 12, 2018). Advancing A Culture Of Education At IBM. Retrieved on October 2018 from Forbes: <https://www.forbes.com/sites/deniselyohn/2018/09/12/advancing-a-culture-of-education-at-ibm/#2674e62c5265>
- Zambrano, E. (2018, Octubre 17). *Programa Micro-Masters del Tecnológico de Monterrey en habilidades profesionales*. Obtained de edX: <https://blog.edx.org/programa-micromasters-del-tecnologico-de-monterrey-en-habilidades-profesionales>





Subscribe on our website: observatory.tec.mx



You are free to share, copy and redistribute this material in any medium or format, adapt, remix, transform and create from the material without charge or collection any of the authors, co-authors or representatives in accordance with the terms of the Creative Commons license: Attribution - Non-Commercial - Share Equal 4.0 International. Some of the images may have rights reserved.