New Technologies, Innovation, and Quality Assurance:

How to Consider QA and its Key Principles in a World of Disruptive Technology and Change in the Academy

Troy Williams
Managing Director, University Ventures
March 2019
Technology and Quality Assurance in Higher Education

1. Market pressure for faster degree programs
2. Rise of alternative credentials
3. Growth of online and competency-based education
4. New quality assurance = learning verification
Roadmap

1. Market pressure for faster degree programs
2. Rise of alternative credentials
3. Growth of online and competency-based education
4. New quality assurance = learning verification
Over 10,000+ colleges and universities worldwide founded in the past 50 years

<table>
<thead>
<tr>
<th>Year</th>
<th>1500s</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of institutions</td>
<td>66 universities, primarily in Europe</td>
<td>26,000+ colleges and universities worldwide</td>
</tr>
</tbody>
</table>

SOURCE: World Bank; Our World in Data
“Peak University” - US university count declining

US Colleges and Universities Over Time

SOURCE: US National Center for Education Statistics (NCES)
A research-oriented, faculty-centered, isomorphic university model

**Typical University Model**

» Advance knowledge and research

» Prepare students with research and critical thinking skills

» Serve society through basic research and innovative thought

» Academic departments organized around same set of canonical disciplines (humanities, social sciences, natural sciences, engineering)

» “Guild-like” tenure system rewards faculty conducting research in core disciplines for traditionally recognized journals
Employee tenures are decreasing

Average US Employee Tenure

<table>
<thead>
<tr>
<th>Number of Years</th>
<th>2010</th>
<th>2012</th>
<th>2014</th>
<th>2016</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 24 years</td>
<td>1.5</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>25 to 34 years</td>
<td>3.1</td>
<td>3.2</td>
<td>3</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>35 to 44 years</td>
<td>5.1</td>
<td>5.3</td>
<td>5.2</td>
<td>4.9</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Percent Decrease (2012-2018)
-8% -9% -13% -8%


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Technology is remaking the workplace rapidly

1980s
Personal computer

1990s
Email, Internet

2000
Social media

2000s
Cloud-based enterprise software

2007
Smartphone adoption

2018+
Artificial intelligence/automation
US student count declining

US Higher Education Enrollment Over Time

US student count declining

SOURCE: US National Center for Education Statistics (NCES)

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Global participation in higher education

Gross enrollment ratio in tertiary education
Total enrollment in tertiary education, regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.

SOURCE: World Bank; Our World in Data

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Increasingly, students go to college to get a better job

Percent of Students who Consider Getting a Better Job a Very Important Reason to Go to College

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>70%</td>
</tr>
<tr>
<td>1980</td>
<td>75%</td>
</tr>
<tr>
<td>1990</td>
<td>76%</td>
</tr>
<tr>
<td>2000</td>
<td>72%</td>
</tr>
<tr>
<td>2010</td>
<td>85%</td>
</tr>
<tr>
<td>2016</td>
<td>85%</td>
</tr>
</tbody>
</table>

SOURCE: National Freshmen Survey (UCLA)
Two models of education

Front-loading

Just-in-time

Age

20s

30s

40s

50s

60s

Education

Employment
Coding “boot camps” address student employment goals

<table>
<thead>
<tr>
<th></th>
<th>Traditional University</th>
<th>Coding Boot Camp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of study</strong></td>
<td>4 years</td>
<td>2-3 months</td>
</tr>
<tr>
<td><strong>Total tuition</strong></td>
<td>$200K+</td>
<td>$15-20K</td>
</tr>
<tr>
<td><strong>Job placement rate</strong></td>
<td>81%</td>
<td>85%+</td>
</tr>
<tr>
<td><strong>Expected salary</strong></td>
<td>$50K</td>
<td>$85K</td>
</tr>
</tbody>
</table>
Boot camps will proliferate across many industries

<table>
<thead>
<tr>
<th>Selected Industries</th>
<th>Illustrative Boot Camps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Engineering</td>
<td>GA, Hack Reactor, Lambda</td>
</tr>
<tr>
<td>Medical Training</td>
<td>Medical Sales College, PrepMI+</td>
</tr>
<tr>
<td>Design</td>
<td>AGI, Career Foundry, Designation</td>
</tr>
<tr>
<td>Sales</td>
<td>AH, Always Hired, Sales Bootcamp, memoryBlue</td>
</tr>
</tbody>
</table>
New technical skills are necessary
The skills gap has widened

US Job Openings and Unemployment Rate

Is the Skills Gap a broad phenomenon?

SOURCE: Trading Economics
The mechanics and technology of hiring have changed

- Hiring managers that use Applicant Tracking Systems:
  - 2000: <1%
  - Today: 75%

- Companies that use social media to recruit:
  - 2000: <1%
  - Today: 73%

- Most popular application mediums:
  - 2000: ...
  - Today: ...
Why are employment outcomes worse?  
Proliferation of technical skills

<table>
<thead>
<tr>
<th>Career Area</th>
<th>Technical Skills Specified</th>
<th>Cognitive and Soft Skills Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Healthcare</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>Engineering</td>
<td>71%</td>
<td>29%</td>
</tr>
<tr>
<td>Life/Physical Science and Math</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Manufacturing and Production</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Design, Media, and Writing</td>
<td>66%</td>
<td>34%</td>
</tr>
<tr>
<td>Research, Planning, and Analysis</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>Personal Care and Services</td>
<td>63%</td>
<td>37%</td>
</tr>
<tr>
<td>Finance</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Marketing and Public Relations</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>Management and Operations</td>
<td>61%</td>
<td>39%</td>
</tr>
<tr>
<td>Education and Human Services</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Hospitality, Food, and Tourism</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Sales</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Human Resources</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Clerical and Administrative</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Customer and Client Support</td>
<td>49%</td>
<td>51%</td>
</tr>
</tbody>
</table>
In response, universities are launching boot camps

In the US, more than 40-50 universities have launched coding boot camps

SOURCE: Course Report

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How the Skills Gap will impact higher education

» Boot camp and shorter degree programs will proliferate
  – Second and third tier universities must adapt
  – Regulation needs to support these programs
  – The traditional 3-4 year degree will decline in popularity
  – Boot camps will be integrated into higher education
Roadmap

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Micro-credentials address the communications gap between educators and employers

- **LEARNING PROVIDERS**
  - Certificate

- **EMPLOYEES**
  - Resume

- **EMPLOYERS**
  - Job Description
Digital credentials are at the nexus of key market trends

**89%**
Engagement a Priority

89% HR pros: a recognition system at work improves the employee experience. Lifts productivity & the bottom line.

**#1**
Millennials

Almost 75% of workforce, they rank learning & growth as top priority in job selection.

**70%**
Skill-Based Hiring

Reduces cost-to-hire by 70%, time-to-train by 50%; Companies organize around skills, not job titles.

**51%**
Skill-based Learning

51% employers already moving to competency-based microlearning.

**$1.6T**
Debt

$1.56T in US student debt and degree half life is short; other credentials are on the rise.

**81%**
Certifications Growing

81% of adults with a non-degree credential say it’s very useful for getting a job.

**85%**
Lack of Trust

85% of employers found a lie or misrepresentation on a resume or job application.

**43%**
Gigs & Freelancing

43% of workforce by 2020 will be free agents, driving demand for trusted skill indicators.

Demand for machine-readable, actionable data about employees & learners

**Portable, digital, verified achievements**

SOURCE: Credly
Micro-credentials will require a marketplace, verification, and collaboration among issuers

- Individual Candidates
- Academic Institutions
- Verification Intermediaries
- Credential Marketplace
- Credential Issuers
- Employers
- Recruiting Intermediaries
- Training Providers
Less selective universities will be impacted more by micro-credentials

Impact of Micro-Credentials

- Least impacted
- Most impacted

- Least selective institutions
- Moderately selective institutions
- Most selective institutions
University degrees will have value based on graduate performance

- Uber: ★★★★★
  - Driver rating

- eBay: ★★★★☆
  - Seller rating

- Google Maps: ★★★★☆
  - Restaurant rating

- The Ohio State University: ★★★★★
  - University rating
Regulations are tied to time-based measures

Minimum Program Lengths at US Higher Ed Institutions
- Associate’s, Bachelor’s, Graduate or Professional Degree
- At Least a Two-Year Program that Is Acceptable for Full Credit toward a Bachelor’s Degree
- At Least a One-Year (Federal Definition) Program that Leads to a Credential and Prepares Students for Gainful Employment in a Recognized Occupation

Minimum Program Lengths at US Proprietary Institutions
- At Least 15-Week Undergraduate Program with 600 Clock Hours or 16 Semester or 24 Quarter Credits, for Students without an Associate’s Degree
- At Least 10-Week Program with 300 Clock Hours or 8 Semester or 12 Quarter Credits at Graduate Level, only for Students with at Least an Associate’s Degree
- At Least 10-Week Undergraduate Program with 300-599 Clock Hours that Admits Students without an Associate’s Degree and that Has Verified Completion and Placement Rates of at Least 70%

The US Department of Education launched an innovative model with EQUIP

» EQUIP provides federal financial aid to eligible students enrolled in non-traditional training programs (e.g., boot camps)

» The program will improve access to innovative training opportunities that lead to good jobs and strengthen outcomes-based quality assurance processes

<table>
<thead>
<tr>
<th>Non-Traditional Provider</th>
<th>Institution</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUILD</td>
<td>Colorado State University GLOBAL CAMPUS</td>
<td>» 1-year certificate in Management and Leadership Fundamentals</td>
</tr>
</tbody>
</table>
| straighterline           | Dallas County Community College District | » Associate of Science in Business Concentration  
                               » Associate of Arts in Criminal Justice Concentration |
| General Electric         | Northeastern University | » B.S. in Advanced Manufacturing |

SOURCE: US Department of Education
Income Share Agreements (ISAs): the Next Generation of Student Financing

An ISA is a contractual agreement in which a student receives education funding in exchange for a percentage of post-graduation income over a defined number of years.

$5K tuition value
2-7 year obligation while working
2-5% of income
$5-10K value returned

SOURCE: Vemo Education
Universities worldwide are adopting income-linked financing programs

Income-share agreements

- **Purdue University**: Income-Share Agreements Could Solve Debt Crisis (2017)
- **University of Utah**: U of U launches financing program to help students finish their degrees (2019)
- **Clarkson University** and others have started ISA programmes...this could revolutionize higher ed (2019)

Income-based loan repayment

**SOURCE**: The Atlantic; Fox News; Financial Times
Credly is a marketplace that houses and verifies credentials.

Portable, digital, verified achievements

20M+ credentials documented
10M+ people; 195 countries
400+ providers and schools

Partners include corporations, training providers, and certification associations

SOURCE: Credly
What is blockchain?

**Blockchain** – a continuously growing list of records, called blocks, which are linked and secured using cryptography.

- **Distributed Ledger**: System of record with new transactions propagated to entire network.
- **No single point of failure**: Centralized data bases prone to tampering or physical damage.
- **Transparent**: Immutable record of all transactions.
- **Secure**: Economically impractical and physically challenging to hack.
Many universities are exploring digital credentialing
Credentials will stack to advance an employee’s career

Sally speaks at professional development conference

She gets invited to speak at a seminar in London on international trade but...

She earns another badge

And gets promoted at her firm

Sally earns a badge for her speaking capability

She signs up for an online course to brush up on skills

Joe is a Project Manager at logistics company that transports produce internationally

He attends a seminar about better tracking items through blockchain

Joe is promoted as lead on big project employing Blockchain Strategy

He has recently earned the Project Management - Agile Explorer badge

He earns badge for IBM’s Blockchain Fundamentals

Joe reshapes the future of his company, helping them become an industry leader

SOURCE: Credly
StraightenerLine lowers the cost and risk of pursuing a degree

- Offers 60+ online, competency-based, general education courses directly to students for a $99/month subscription, plus one-time course fee of ~$59.
- Enrolled 30,000 unique students over the past twelve months
- Credit transfer agreements with 130+ regionally accredited colleges and universities.
- Results: 30% yield of students who enroll in the program, with higher retention and faster progress

SOURCE: StraighterLine
How the rise of alternative credentials will impact higher education

<table>
<thead>
<tr>
<th>From...</th>
<th>...To</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 or 4 year degrees</td>
<td>Certificates and degrees varying from 3 months to 3 years</td>
</tr>
<tr>
<td>Universities as the only credential provider</td>
<td>Universities among many providers in a credential marketplace</td>
</tr>
<tr>
<td>Front-loaded education</td>
<td>Just-in-time delivery as part of lifelong journey</td>
</tr>
</tbody>
</table>
Roadmap

1. Market pressure for faster degree programs
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4. New quality assurance = learning verification
Students are moving online

US Post-Secondary Online and Ground Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>Millions of Students</th>
<th>Students Enrolled in at Least One Distance Course</th>
<th>Percent Students Enrolled in at Least One Distance Course</th>
<th>Percent Students Enrolled Exclusively in Distance Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>20.5</td>
<td>5.1</td>
<td>25.9%</td>
<td>11.9%</td>
</tr>
<tr>
<td>2013</td>
<td>20.5</td>
<td>5.3</td>
<td>27.9%</td>
<td>13.6%</td>
</tr>
<tr>
<td>2014</td>
<td>20.6</td>
<td>5.8</td>
<td>29.2%</td>
<td>14.0%</td>
</tr>
<tr>
<td>2015</td>
<td>20.5</td>
<td>6.0</td>
<td>31.2%</td>
<td>14.7%</td>
</tr>
<tr>
<td>2016</td>
<td>20.2</td>
<td>6.3</td>
<td>33.1%</td>
<td>15.4%</td>
</tr>
<tr>
<td>2017</td>
<td>20.1</td>
<td>6.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SOURCE: US National Center for Education Statistics (NCES)
Over half of on-ground students take online courses in Oregon Public Universities

SOURCE: Oregon Higher Education Coordinating Commission; Office of Research and Data

U V C O N F I D E N T I A L // T R A D E S E C R E T
Competency-Based Education (CBE) is emerging

Characteristics of CBE

» A mastery-based measure of study, not a time-based measure

» Theory is integrated with skill practice; knowledge supports performance

» Learning is self-paced, flexible, skill-based, personalized, and affordable
The Carnegie credit hour is a time-based model of mastery.

1 degree = 40 courses = 120 credit-hours
Western Governor’s University has made competency-based education its cornerstone

**Western Governor’s University**

» Online university launched in 1997 to expand access through online, competency-based programs

» Currently has over 100,000 students, or 0.5%+ of all US college students

» Uses over 1,800 attributes to flag at-risk students and deliver interventions

» Delivers a highly personalized education experience, allowing each student to move at their own pace

» Aligns students’ financial incentives with course completion and graduation

SOURCE: WGU Press Releases
Students are moving to online and competency-based education

Enrollment of Largest Online Universities

- Western Governors U (Competency-Based)
- Southern New Hampshire U (Partially Competency Based)
- Grand Canyon U
- Liberty U
- Walden U

SOURCE: US National Center for Education Statistics (NCES)
Roadmap

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Western Governors University’s competency-based model questioned

**POLITICO**

**Education Department's Inspector General probes Western Governors University (2015)**

The Education Department's Office of Inspector General is auditing whether a leading institution in competency-based education complied with federal financial aid and other regulations...

The biggest theme, he said, seems to be "regular and substantive interaction," a federal rule that says students in competency-based programs must have a certain amount of contact with instructors.

**U.S. Department of Education**

**U.S. Department of Education Issues Final Audit Determination for WGU (2019)**

Today, the U.S. Department of Education's Federal Student Aid (FSA) office determined Western Governors University (WGU) is indeed eligible to participate in federal student aid programs.

FSA determined that, particularly in light of a lack of clear guidance from the Department at the time of the audit period, WGU’s efforts to comply with the governing law and regulations were reasonable and undertaken in good faith.

SOURCE: Politico; US Department of Education
How the rise of online, competency-based programs will impact higher education

» Regulatory framework must be updated
» Universities must focus on the quality of outcome rather than quality of inputs
» Universities must adopt new learning verification models
» Online, faster, competency-based programs require modern quality assurance standards
Degrees are often signals for hiring managers

What is Signaling?

» Signaling occurs when the actions of a person with privileged information, an “insider,” triggers selling or buying behavior by those who do not have information

» The insider’s behavior is taken as a ‘market signal’ to others about a company’s value – hence, ‘signaling’

[Many economists] believe that college…is mostly signaling. Don’t most people go to college because they think it will get them a job?

SOURCE: Market Business News; The Library of Economics and Liberty
Generic college degrees don’t increase performance

“Knowledge may be power, but “knowledge from college” is neither predictor nor guarantor of success.”

“More and more, employers are going to want to see some proof that a potential employee has actually gained particular skills.”

“Students…going to less selective schools, maybe getting two-year degrees instead of four-year degrees…might have less specialized skills.”

SOURCE: HBR, Quartz, Marketplace.org
No degree, no problem: PwC, Deloitte, and EY hiding college degree information from hiring managers

» De-emphasizing formal education in recruitment process, beginning 2015

– Deloitte hiding the name of the candidate’s university from recruiters in its search for entry-level talent

– EY eliminating the requirement of a college degree

– PwC hiding from hiring manager whether applicants have a college degree

» Goal is to diversify their talent pool and focus on candidate attributes that more positively correlate with strong job performance

SOURCE: SHRM.org
15 large multinational companies recently announced that no college degree is required to apply

“Companies will hire the candidates whose experience and skills best suit them for the job. Many of those successful applicants will have university degrees. Some of them will not.”

SOURCE: Quartz; Glassdoor
Authenticating learning in the online space

Key questions for online learning verification

» How does the online program ensure the student of record has done the work?
» How are they authenticated? How frequently?
» How effective are authentication technologies?
There is a wide variety of authentication technologies commercially available

**Selected Authentication Methods**

- **Live ID**
  - Test-taker presents identification to proctor with video recording

- **Mobile ID**
  - Mobile biometrics authenticate test-taker
  - Dual log-in technologies (mobile and PC)

- **Auto ID**
  - Biometrics including keystroke matching, facial recognition, knuckle recognition, and voice recognition
The challenge with authentication in online learning

**Most Authentication Systems**

» User cooperates with institution to prevent fraud

» Example: bank wants person to be able to access account but deny fraudsters

**Authentication in Online Learning**

» User (student) often attempts to commit fraud against institution (cheating)

» Example: student tries to fool system into thinking that another student is them
Online proctoring / remote invigilation is growing rapidly

Estimated US Online Proctoring Market Size

- **Growth of online learning will drive rapid growth in online proctoring / remote invigilation**

<table>
<thead>
<tr>
<th>Year</th>
<th>Market Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>$136M</td>
</tr>
<tr>
<td>2023</td>
<td>$510M</td>
</tr>
</tbody>
</table>

**Annual Growth Rate:** 28-30%

**SOURCE:** 2015 Survey of Online Learning; NACE Career Services Survey; Non-profit Form 990s; NCES; IPEDS; Association of Governing Boards of Universities and Colleges; Council of Graduate Schools; Tyton Partners
Online proctoring generally comes in three forms

<table>
<thead>
<tr>
<th>Proctoring Offering</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Proctoring</td>
<td>» Most secure offering – test-taker accesses platform and is monitored by remote proctor via audio, video, and screen sharing</td>
</tr>
<tr>
<td>Record &amp; Review</td>
<td>» Audio, video, and screen share feeds are recorded for duration of exam and are subsequently reviewed</td>
</tr>
<tr>
<td>Automated Proctoring</td>
<td>» Captures audio, motion, and systematic changes to identify inappropriate behaviors with reviewable video recording</td>
</tr>
<tr>
<td></td>
<td>» Monitors test-taker and alerts instructor of inappropriate behaviors with photo evidence</td>
</tr>
</tbody>
</table>
Challenge for quality assurance: Institutional conflicts with enforcement

Online proctoring platform generates flags, with reviewable evidence
- Anomalies in behavior
- Rule violations
- Outright cheating

However, what does the institution, department, or professor actually do with these flags?
New technologies and trends driving the need for learning verification

How are institutions reviewing instances of cheating, and how will they hold students accountable?

» In today’s market environment, it may not be in the near-term interest of an institution to penalize the student

» However, it is in the long-term interest of higher education to make sure that these degrees stand for actual learning
With these trends in mind, quality assurance entities must prepare for the future of higher education:

- Shorter, faster, degrees
- Online learning
- Competency-based learning
- Credentials marketplace
- Learning verification