

EDU@2035

**BIG SHIFTS ARE COMING! LOOKING BACK
FROM 2035**

A DAY IN THE LIFE OF A STUDENT IN 2035

**BUILDING THE ROADMAP TO 2035 – LET’S
DO SOME IMAGINATIVE SCENARIO BUILDING**

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A DAY IN THE LIFE OF A STUDENT IN 2035

ANAYA

Anaya woke up early this morning at 0530. Already it was 24C degrees and humid outside in Singapore. Nothing new there. Anaya had set her MindClock (MC) the prior evening in eager anticipation of today's University Town Hall Orientation where she'd learn about the next step on her journey to becoming a chemist.

Though she looked forward to her specialized training, Anaya felt wistful thinking back on how she'd applied the first two post-secondary "brushstrokes." The blending of online and on-ground classes; group and solitary work; maker, doer and thinker classes provided just the right balance for her. And she'd met so many kinds of people. Her peers playfully called the two "brushstrokes" Learning to Learn and they were right. It would have all been overwhelming without Mr. Yip, her Holographic Advisor Bot (HAB). Mr. Yip helped her understand the Critical Thinking (Critical Thinking) and Design and Engineering Thinking (Year 2) learning goals and navigate the thousands of courses that would satisfy her plan. She now met the rubric and certification standards.

Thank goodness for the implants that made it possible for her to study and participate in many languages. Google's annual upgrades added new languages every year. Anaya was shocked and rather startled the first time she heard her voice clicking in Swahili in her Understanding Africa course. The tone of voice was hers even though she was sure she could not produce those sounds. Communication was, of course, a pillar of the first Brushstroke. In 2035, students could now take

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Looking Back from 2035

"We march backwards into the future."

— Marshall McLuhan

It's hard for us to imagine a future that is not like the present. When looking at familiar terrain in the rear-view mirror, we must remind ourselves that – less than 50 years ago – two of the world's biggest companies (Wal-Mart, Apple) had not yet incorporated or that 3 of the 5 largest companies in the world today are Chinese. Google is just preparing for its 20th anniversary, while global giants like Alibaba, Facebook and TenCent are not yet 15 years old! Worldwide, investors are pouring more than USD 3 Billion every year into educational technologies. How might innovations that flow from this investment change post-secondary education?

In 2035, will students choose among term-length and micro-courses from the Alibaba, Apple, Coursera, Sony, or YouTube catalogs? Will their instructors be at academies anywhere in the world, or might they be freelancers? Or chatbots? Will students wear prosthetic implants making it unnecessary to learn new languages? Will bionic devices give them augmented senses? Will we learn on campuses? In holodecks? At home? Using environmental scans, scenarios, probabilities and themes to fuel our imaginations, let's envision what "automizing and digitizing" analysis, optimization, prophecy and customization might mean in and for post-secondary education's mission!

From the rear-view mirror of 2035, our landscape might look as follows:

2011

Looking back, historians refer to 2011 as the inflection point. That year, the world mourns the loss of Steve Jobs, even as the number of iPhones sold passes 100 million. Google now boasts 12 million scanned books in its digital library and runs more than 300,000 applications on 190 million Android devices worldwide. Amazon now sells 105 electronic books for every 100 printed books and two Stanford University instructors offer an online course on artificial intelligence to all takers. 58,000 students from around the world enroll and the MOOC becomes front-page news. In 2011, Facebook is used by 1 in every 13 people on earth. Nearly half of the Facebook's core 18 to 34-year-old users check the social network when they woke up every day – 28% do so before even getting out of bed. While nearly two-thirds of all US internet users have Facebook accounts, 70% of the company's users live outside of the US. Collectively, earthlings in 2011 spend 4 million

courses in Nuance, or in Nonverbal, Diplomatic, Metaphorical or Cross-Cultural Communication. She loved her classes on Effective Disagreement and the one called Never Say This. After completing her 3-month Foundations immersion, Anaya took 6 microclasses, enough to satisfy a cohort requirement for the Chemistry concentration. Anaya really enjoyed the Nomenclature and Language of Chemistry courses. Communications courses prepared Anaya particularly well for her four international immersions.

Anaya's friends referred to the third and fourth Brushstrokes as the period of Learning to Earn. The coming year would blend courses in thinking and speaking like a chemist with technical courses in physical, organic and analytical chemistry. And labs. Lots of lab work. She'd also take a lot of micro-courses in lab safety, documenting experiments, chemical nomenclature, and ethical research. Anaya expected to spend about a third of her time in the coming year in the lab. In the last Brushstroke, she'd likely spend three-quarters of her time rotating between College, University, Government and Industry labs. She allowed herself a moment to daydream about a possible practicum with Roche in Switzerland. Maybe it was Singapore's tropical heat talking!

Today's orientation in the Yong Siew Toh Music Conservatory at the National University (NUS) would assemble several thousand people. There were few lecture theaters now since lectures were considered performance events – rare, special, very large and well attended. Didactic learning usually could be done at home or at the park via Immers-A-Casts from Apple, Google, Coursera or one of the other College and University Consortia (CUC) partners.

hours on Facebook in 2011.¹

2016-17

In 2016, Microsoft pays USD 26.2 billion for LinkedIn, the world's largest online social network for working professionals. LinkedIn is now the platform of choice for fostering professional relationships. It's where employers and job seekers discover one another. MOOC distributors and some mainstream colleges and universities now post digital badges to students' LinkedIn sites, making that site the global repository of data of everyone's knowledge and skills. Professor Ashok Goel, working with IBM, deploys "Jill Watson," as an online teaching assistant at Georgia Tech. Only two students in Dr. Goel's first class on artificial intelligence realize that Jill was a teaching chatbot built on IBM's Watson platform. By year's end, Sony sells more than one million virtual reality headsets for its PlayStation and Google releases its virtual translation headset. This was the year when the Mirai botnet of internet of things (IoT) devices crashes the French web host OVH, cripples Netflix, Reddit, and Twitter in large parts of the U.S. and takes 900,000 Deutsch Telekom routers offline! The University of Oklahoma launches the first VR class. Fifteen students and teachers in seven physical locations including four partner institutions and a home office, are connected in a virtual cave to study rare archaic cave art. The real cave is located on private land and is inaccessible to the public. By mid-2017, two-thirds of Facebook's 2 billion users check into the social network site daily!

2021

This year, post-secondary education's consortium movement really gets underway. U.S. Ivy League universities join forces with Stanford, MIT, Chicago, Toronto, Oxford, Melbourne and other "old tie" institutions. Their members "sprinkle" the new technologies around, but these institutions remain focused on tradition and on providing irreplaceable life experiences, unrivaled peer networks and job connections. These wealthy institutions understand that the experiences they provide are already highly personalized. Realizing that they could neither navigate the necessary changes, nor afford the next leap forward, less-advantaged colleges and universities band together. Leaping the chasm requires new strategies and policies and investments in technology, design thinking and change management. In some cases, for-profit universities join the consortia. They bring large-scale shared service models and solutions for testing, counseling and cross-boundary regulatory know-how to the table. The post-secondary consortia form alliances with schools and with Alibaba, Apple, Disney, Facebook, Microsoft, Sony and national governments. These partners have the capital, the

¹ Digital Buzz, "Facebook Statistics, Stats and Facts for 2011," at <http://www.digit-albuzzblog.com/facebook-statistics-stats-facts-2011/>

She smiled as she recalled the 3-hour micro-course on Laboratory Safety that began with a short introduction by the holographic Marie Curie. She looked so real.

Anaya's classes were small enough to allow discussion and big enough to accommodate global points of view. While your class might have only 25 students, three mega-pixel walls linked up to 36 linked classrooms. Student questions from nearly 1,000 students could be sorted, matched or even filtered – in real time – and either answered “live” or on the comprehensive class summaries (CCS) posted soon after the end of class. Anaya particularly liked the way that the software sorted the avatars of students attending class from home. These avatars populated virtual classrooms on the mega-pixel walls! The student sitting next to you might be in Brussels. Or they might be a SIM. Students were always trying to figure out who the SIMs were. And every class of 25 students had a top student from the same class last term who was earning credits for their Pay It Forward certificates. These students kept groups on an even keel throughout the world. Most classes were held from noon until 02:00 in the morning to sync with student biorhythms.

Anaya meditated for 20 minutes. She's practiced meditation since childhood and received academic credits for prior learning for her tested skills and experience. She also took micro-courses in the science and philosophy of mindfulness as part of the Design Thinking strand in Self-Management. Her Design and Engineering Thinking brushstroke was the best year of her life. She really felt now that she could bring her creativity to bear in a

technical know-how, the links to industry and government, the regulatory clout and the design thinking skills to make widespread reform possible. They also have great campuses, research facilities and libraries! Students now spend 3 hours per day on Facebook, YouTube or Coursera. Since these have become learning and testing platforms, educators now interpret student social network time as “time on task.” While lectures are now almost universally viewed in playback, post-secondary learning is more social than ever!

2026

The shake-out of post-secondary education begins this year. Some institutions lack the market, legacy assets or will to join a consortium and participate in widespread change. Lacking academic superstars or state-of-the-art facilities and, saddled with costly business models, a number of these institutions close or are absorbed by others. Faculty revolts occur at institutions. Holodecks – immersive simulation centers – begin springing up at consortium-member campuses and in big cities. These facilities are in demand year-round, 18 hours a day supporting vigorous teaching missions as well as public events. Holodecks tie campuses closer to their communities and local businesses. Maker labs also proliferate. Didactic teaching remains a bedrock feature of post-secondary education, but action- and experiential-learning now form a readiness bridge between the academic world and the world of work. One commentator notes that the Ivory Tower looks nice with a blue collar! By 2026, human teaching assistants are rare. Except at the elite institutions, nearly all students are supported by teaching chatbots. Like Star Wars' R2D2, these bots chatter away, answering questions, administering drills, marking papers and tests, playing games and displaying holographic images. These Robo-experiences engage students and enrich their learning. Academic societies now eagerly partner with publishers and AI companies to use assessment data from Bots to continually improve the Bots' instructional effectiveness. Human teaching assistants are responsible for monitoring classes and, of course, the Bots. These positions become particularly demanding after one software upgrade is hacked, corrupting facts and assessments in a Politics course used by thousands of students!

2031

While the shake-out period in post-secondary education brings about the demise of many longstanding providers, it is also a time of extraordinarily entrepreneurial experimentation. Two big breakthroughs open the floodgates of change. First, the widespread deployment of teaching and counseling bots eliminates considerable budgetary strain on colleges and universities. In many areas, teaching assistants, adjunct professors and others are no longer needed at the same level.

mindful and predictable way. Anaya also loved fostering others' creativity. Now she needed to apply those skills to chemistry!

Her friend Charles interrupted her thoughts (her Mind Filter – was not activated) with a proposal that Anaya, Thuy and he share a taxi to lunch on the way to the Orientation. The autonomous taxi would pick her up at 11:30, they'd go to their favorite Food Court, and take another taxi to campus. Few of their peers owned cars any more. Too costly and too much hassle. "Don't forget your gym clothes," Henry reminded her. "You can be sure they're planning a number of team building activities after the Orientation." Henry groaned at the thought of climbing another rock wall.

Anaya set her MF to suspend incoming calls and summoned her Teaching Bot (TB) for some test prep in her Real or Fake: Evaluating Evidence class. Her TB used adaptive learning to work her through a progressively more rigorous review of data, news reports, lab notebooks, historical documents, speeches, and video broadcasts. Anaya would have to identify which were real and which were fakes and summarize her reasoning. While she took the Evaluating Evidence prerequisite course, this course would focus on evaluating scientific evidence, giving her both a refresher and sharpening her focus toward Chemistry.

As well, many consortia are now organizing curricula under four educational imperatives: (1) critical thinking; (2) design and engineering thinking; (3) conceptual foundations of a field of study, and (4) the practice of a field of study. As institutions became comfortable with their new places in the consortia, they begin to really re-think their offerings and niches in the context of new curricula and new financial resources. Some focus on critical thinking or design thinking. Research-intensive institutions find they can operate more like research institutes with attractive flows of senior level undergraduates to learn by doing in their labs, studios or libraries. The departmental wrangling over who "has" to teach the 'Introduction to ...' courses is largely over. Lectures in massively personalized courses are typically taught by the best of the best. Gorgeous campuses in desirable locations became magnets for students seeking immersive, residential experiences throughout their educational journeys. Some institutions use the shifting student patterns of mobility and resource sharing models to shrink their physical campus footprints. They invest in developing online courses and programs, support services, microcredentials and other innovations. A new ecosystem is emerging. Students now see their home institution as an outfitter and their educational experience as expedition.

2035

The Nesting Movement reaches maturity in 2035. Borders in many developed nations are now tight and the trans-national flow of physical students is a challenge. Imbedded mixed reality contact lenses, holographic displays, computer-assisted visualization environments (CAVES), real-time language translation implants and teaching bots make it unnecessary for nesting students to learn on a campus. Nesting does not dampen the educational adventure. In 2035 many nesting students choose among term-length and micro-courses from the Alibaba, Apple, Coursera, Sony or YouTube catalogs. Their instructors might be at academies anywhere in the world, or they may be freelancers. The implants now make it unnecessary to learn new languages. Sitting at home on a holochair under the scanner along with implants makes it possible to sit in a virtual lecture theater in Bangalore, or even to study Ancient Rome sitting in the virtual amphitheater in Pompeii. Those not content to nest get to study at any institution in their GPN (Global Post-secondary Network), as travel costs are now incorporated into lower tuition fees. Post-secondary education is at last on the path toward delivering the sector's millennium-long dream of enabling widespread and affordable access to a rich, quality educational experience. In 2035, few post-secondary education can recall the time when only the wealthy could experience a highly-customized post-secondary education experience.

BUILDING THE ROADMAP TO 2035 LET'S DO SOME IMAGINATIVE SCENARIO BUILDING

**“Prediction is very difficult, especially if it is about the future.”
– Danish physicist Niels Bohr**

Danish physicist Niels Bohr observed that “prediction is very difficult, especially if it is about the future.” Despite the difficulty, prediction is an ancient and widespread practice. We predict because we know that we must to survive and prosper. As Jesse Jackson said, “we must be pulled by our dreams, rather than pushed by our memories.” We also need to predict because the timeline of human progress is lumpy. The ride is gradual and smooth until someone looks out to sea and imagines boats. Once invented, everything changes. And so we move through periods of disruption and integration. We believe that the capacity to dream about the future is uniquely human. Vision, survival and progress are inextricably tied.

Essential or not, our track record for accurate prediction is uneven. Because predicting the future is very difficult, Marshall McLuhan reminds us that – notwithstanding Jesse Jackson – we “march backwards into the future;”¹ that is, our forward steps are informed more by where we have been, than where we are heading. Unchecked, our cautious behavior can cloud our crystal ball, often leading us to underestimate either the rate of change or its magnitude. More important, looking at the future through the rear-view mirror leaves us exposed to the disruptive consequences of unanticipated changes. Even our most gifted forward thinkers have marched backwards. Remember when:

- In 1995, 3Com’s CEO Robert Metcalfe predicted in that “the internet will soon go spectacularly supernova and in 1996 catastrophically collapse,” or
- In 1997, Michael Dell said that if he was CEO of Apple he’d “shut it down and give money back to the shareholders,” or
- In 2004, Bill Gates told us that “two years from now, spam will be solved, “or
- In 2007, Steve Ballmer asserted that “there’s no chance that the iPhone is going to get any significant market share.” That same year he added: “I’d advise people to cover their eyes. You’re not going to like what you see.”

Even noted technology futurist Clifford Stoll claimed in 1995 that “no online database will take the place of your daily newspaper, no CD-ROM can take the place of a competent teacher, and no computer network will change the way government works.” Importantly, these dramatically incorrect predictions were made: (1) by very bright people who were immersed in technology; and (2) no more than 22 years ago! Who among us 20 years ago can recall or could have predicted that:

- Roger Federer, who debuted professionally that year with a world ranking of 803, would go on to dominate professional tennis for two decades.

¹ McLuhan, M. and Q. Fiore. (1967). *The Medium is the Message: An Inventory of Effects* Coordinated by J. Agel. New York, London, Toronto: Bantam Books, pp 74-75.

- McGill University student Justin Trudeau would become Canada's 23rd Prime Minister.
- Google would register the google.com domain name and go on to have annual revenues in excess of USD 90 Billion.
- The Tandy workstation with 2 MB of RAM would cost USD 8,499 (Monitor not included), whereas today's cell phones feature considerably great power and functionality, cost considerably less and fit into your pocket!



MAPPING THE FUTURE



Develop or
Adopt a
Framework

Determine
Assumptions

Assign
Probabilities

Construct
Scenarios
History

Imagine a
Future

Track the
Technologies

Craft Your
Future

As sailors know, we cannot predict the wind, but we can adjust our sails to reach our destination. Walt Disney added, "if you can dream it, you can do it." And dream we must. As technology's "third wave" forms, if we cannot imagine the future we can neither create it, nor prepare ourselves for it.

Develop or adopt a framework

The startling truth about the future is that few of us can predict it with great accuracy, particularly when asked to imagine 20 years out. Some of us struggle to remember the past! There are, however, a few people who have seemed to understand how the agents of change – who are managing our largest technology companies – are trying to fashion our future.

Among today's futurists, Mr. Thomas Friedman, author of *The World is Flat* and who has been described as "The Great Explainer," summed up the current trends eloquently:

"We're moving into a world where computers and algorithms can *analyze* (reveal previously hidden patterns); *optimize* (tell a plane which altitude to fly to get the best fuel efficiency); *prophesize* (tell you when your elevator may break or what your customer is likely to buy); *customize* (tailor any product for you alone); and *digitize* and *automize* more and more products and services."

Mr. Friedman warns that "any company that does not deploy all six elements will struggle, and this is changing every job and industry."²

Determine your planning assumptions

So, what are our shared assumptions about the future? Can we agree with reasonable comfort, that:

- Even assuming we only extend currently emerging technologies, the future will likely feature technologies that would be classified today as science fiction?
- The rate of technology adoption will vary widely across sectors of the economy and demographic characteristics?
- Varying adoption rates will likely exacerbate inequalities in wealth, access and distribution?
- Many of our companies, institutions, jobs and everyday habits and practices will be disrupted?
- Post-secondary education is likely to be disrupted?
- Post-secondary education's disruption is more likely to be of a 'slow boil' nature, rather than a 'big bang'?
- In 2035, many current post-secondary education institutions will no longer be operating or may have radically-changed business models, missions, markets and methods?

Extend and Apply the Framework

If we can agree that business people, consumers, policy makers, diplomats, teachers and even university administrators would like the more accurate, safer, more predictable and personalized world that Mr. Friedman describes, can we:

1. Extend, particularize and apply these themes in the post-secondary context?
2. Identify which key technologies to watch?
3. Identify some of the consequences (second-order effects) of these technologies?
4. Engage in blue sky thinking about crazy ideas like teleportation, digitization of the mind, extreme human longevity and other possibilities that are now in the realm of science fiction?

² Thomas Friedman, "Folks, We're Home Alone," in NY Times, September 27, 2017

5. Speculate about the broader political, social and economic forces (context) that may blunt, stop, retard or hasten the disruptions technology will bring?

Despite how difficult it is to predict the future, we must create scenarios that are compelling enough to motivate leaders – across countries, economic sectors, industries and elsewhere – to mobilize planning activities within their more specific context. We describe, as best we can, the shape, length and strength of the next vine we need to grab hold of.

Can we pick and choose (or modify) among an extended and context-specific set of themes and assumptions, including:

- Intensified pressure for educational accessibility, affordability and quality.
- Students growing up in the world Mr. Friedman describes will expect the products and services they consume to be highly personalized.
- Lower barriers to student mobility across learning venues and mechanisms via technologies, credit transfer and third-party assessments.
- Augmentation of human senses through computer visualization and simulation, wearable devices, smart objects, bionic enhancements.
- Continued focus on learning outcomes leading to the development of, coalescing around and application of learning rubrics.
- Continued spread of skill and knowledge certification via assessment of prior knowledge, independent study, “boot camps” and microcredentials.
- Widespread, but checkered adoption of chatbots to support student counseling and guidance, and teaching.
- Increased educational attention on hands-on, experiential and “maker-intensive” experiences.
- Continued movement of service provision to large Cloud providers, resulting in a rising interdependence between the education and technology sectors.
- Job losses, particularly among contingent staff and postgraduate teaching assistants leading to angst in the professoriate.
- Increased accents on lifelong learning, degree completion and just-in-time learning.

Assign Probabilities

It seems likely that 2035 will witness the widespread deployment of “intelligent” and “talkative” things and machines. Many cars will be self-driving and everyday objects – even postage stamps – will have enough imbedded intelligence and communications ability to generate the data to fuel our analysis, optimization, predictions, and personalization. Data will be everywhere and the science of slicing and dicing large datasets to extract meaning and fuel predictions and configure services will be practiced in every sector. Arriving at some agreement that takes account of each institution’s history, legacy, strengths, constraints and resources, we all need to assess the likelihood that any of our themes will take place. We also need to determine how important they may be to our institution.

This can only be accomplished through broad consultation and discussion. Policy makers, post-secondary education leaders and others will then need to temper our themes, probabilities and proposed weightings with their own forecasts of major external themes such as:

- What will the future of work look like in an AI-fueled world?
- How might the impacts and risks of climate change shape education investments and thoughts about campuses and student safety?
- How might heightened longevity affect workforce expectations and training needs?
- How will technology's benefits be divided and/or shared?

At least one other exogenous variable stands out:

- The state of global security.

As we all know, the events and consequences of September 11, 2001 in the U.S. are re-shaping the world order that was largely put in place by the victorious allies of World War II. The need for physical security has slowed the march of globalization. Subsequent malware attacks and the use of social networks to spoof elections throughout the world have added cybersecurity to our concerns. For post-secondary education's future, the key exogenous planning question might be: will nations encourage the movement of people, goods, jobs and ideas across borders, or will mobility be defined by fear and terror and truncated by walls, barriers and concerns over security?

Lay Out Some Possible Scenarios

Scenario building is fun and does not need to be precise. Great scenarios are controversial, but plausible. Their role is to stimulate discussion from which plans or actions might spring. Might we imagine:

1. Plus ça Change, Plus c'est la Même Chose

Post-secondary education continues to argue persuasively that campus-based, face-to-face interactions and connections between students, peers, and teachers are magical, formative and irreplaceable. Governments continue to fund existing institutions, which in turn invest cautiously in new technologies. These investments rarely show much return in either efficiencies or in improved student engagement and learning. Despite this, government subsidies continue to make the world of post-secondary education a somewhat dated but cost-effective expense for most students. Cynical commentators refer to colleges and universities as "those museums of learning."

2. The Eloi and Morlock (H.G. Wells, Time Machine)

The fabric of post-secondary education continues to tear leading to separate, but unequal systems and institutions. Elite institutions enjoy massive financial endowments, bucolic campuses, deep entanglements with global power elites, and a never-ending supply of the world's most accomplished students and professors. While in this post-secondary system, students enjoy access to state-of-the-art instructional facilities, research labs and instruments, and participate in symposia with world leaders. The student experience is sprinkled with luxury travel experiences and meaningful internships at top companies or with senior government officials. Around the world, parents go to extraordinary lengths to capture a

seat at the Eloi institutions for their children.

Most children go to Morlock institutions. These institutions focus on providing a good and employment-oriented education at a very low cost. In many countries taxpayers rebelled against the unstoppable tide of rising costs of post-secondary education. In the end, policy makers simply overruled their college and university administrators and imposed massive cuts to salary budgets while unlocking new funds earmarked for technology innovation in the classroom. Like all rational people, the rectors, vice-chancellors and presidents made sizeable cuts to their contingent academics and where possible reduced the size and expense of their campuses. The new technologies were successful in supporting these cost reduction measures without sacrificing either student satisfaction or measured learning outcomes. In some cases, measures of success rose.

3. Revenge of the Nerds, or Barbarians at the Gate

The fabric of post-secondary education continues to tear leading to separate, but unequal systems and institutions. While the elite institutions enjoyed competitive moats that others could not cross, the tectonic plates beneath the rest of post-secondary education began to shift.

A conspiracy of events, technology releases, and corporate overtures led educational innovators to seek one another out. If these pioneers could not build a moat the old-fashioned way, maybe they could band together. They revised their policies and business models and teamed with a technology giant. The giants were eager to demonstrate how their technology would end the millennium-long battle between cost and quality. Many experiments failed and some of the early consortia dissolved, but by 2025 some exciting results were coming in. Graduation rates were on the rise despite significant cost reduction. The rankings of Best Value institutions were dominated by some of these pioneers. And, of course, these new institutions had a “secret sauce.” Because each consortium had an ecosystem of technology providers at its core, education and business leaders were quick to realize that talent was the world’s new wealth. Curricula were dotted with meaningful internships with corporations, governments and NGOs and – guess what – graduates of these second-tier innovators began to leapfrog the graduates of the pricier elite institutions.

Parents began to notice and encouraged their children to consider the newcomers. Employers also noticed that the graduates of the “new schools” had better facility with technology, design thinking and teamwork. They didn’t always know which table utensil to use, but they were quite accomplished at conducting virtual meetings. Educators and investors noticed as well and the pace of innovation quickened. Colleges and universities were becoming different places to work, but for many, they were becoming better places to work.

4. The Job-Stealing Robot Apocalypse and the Siege of academe^{3, 4}



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We could also label this scenario: Rage Against the Machine. As the deployment of AI-enabled technologies advances, many academics without security of employment view the new teaching and advising bots as threats to their livelihoods. While some academics tinker with the evolving technologies, many hunker down. Science and engineering professors with research portfolios feel secure in this changing world and remain aloof, but humanists have seen and social scientists have written about the workforce disruptions in technology's wake. The release of each new technology is accompanied by demands in the scholarly literature for studies that demonstrate their learning effectiveness. The lead articles of many academic journals recall the story of William Lee, who invented a machine for knitting stockings in 1589. Lee's patent petition to Queen Elizabeth I was denied and her highness asked him to "consider thou what the invention could do to my poor subjects." Some academics seek the protection of unions while others form a *New Luddite Society*, a tongue-in-cheek gesture of solidarity with those who rioted between 1811 and 1816 out of fear of technological changes on the English wool finishing trade. Post-secondary education leaders who attempt wide technology adoption, in this scenario, are frequently subjected to votes of no confidence! In the end, the New Luddites and the more radical *Sabot Society* members are unable to enlist students as compatriots in the struggle. Students are immersed in technology, grew up with bots and cannot understand why their post-secondary institution is so slow to adopt these indispensable tools. Unchanging delivery models lead to rising costs. The lack of either industry partners or leading-edge technology contributes to widespread student *ennui*. Enrolments decline, particularly as employers begin to look favorably on microcredentials and boot camps in lieu of formal degrees. Political leaders facing angry students and parents re-charter

3 Maya Kosoff, "The Job-Stealing Robot Apocalypse May Be Worse Than Previously Thought," in Vanity Fair Hive, August 31, 2017, at <https://www.vanityfair.com/news/2017/08/the-job-stealing-robot-apocalypse-may-be-worse-than-previously-thought>

4 Kevin Carey, "The Siege of Academe," in The Washington Monthly, September/October 2012, at <http://washingtonmonthly.com/magazine/septoct-2012/the-siege-of-academe/> ©2013 Washington Monthly, LLC Reprinted with Permission of Washington Monthly

their top institutions as research institutes and discontinue support for the rest. Students find their ways to more forward looking and affordable institutions.

The DIY (Do It Yourself) Academy

Google, Microsoft and Facebook notice that considerable teaching and learning is taking place online. In particular, some of the MOOCs are enrolling millions of students and millions of others learn a wide range of skills on YouTube. Almost spontaneously the race is on. Google holds an amazing content marketplace, Facebook gathers billions of people, Microsoft's LinkedIn "owns" the interface between job seekers and job providers and Coursera not only has great links to the university sector, it has developed analytics and support structures (assessment, certification...). Missing a learning library – Microsoft gobbled up Coursera. IBM continued to focus on niches and to invest in Big Data University to support the voracious global demand for data science specialists. China's entertainment giant Dalian Wanda Group entered the fray and acquired XuetangX. The Group's film production capabilities and global network of movie theaters would blend strategically with Xuetang's solid academic pedigree and base of 10 million enrolled students.

More scenarios, of course, could and should be imagined. Scenario building is a way of engaging people in questions like: In 20 years,

- Can post-secondary education's current models of delivered and installed base of institutions meet the world's growing need for educated people whose careers can be 'robot proof'?
- Will post-secondary education and will my institution undergo gradual or radical changes (in mission, business model, delivery model ...)?
- Will undergraduate degrees continue to be a professional's admission ticket for entering the white-collar workforce?
- Will many of today's post-secondary institutions be able to afford the technology investments they will need to make to remain vibrant?
- Will online learning outcomes remain "as good as" face to face outcomes, or will new, immersive technologies combine with changing pedagogy to enrich learning outcomes significantly?
- When will technology giants (or publishers) decide that – as with video, books, and music – they could become important, if not dominant, distributors of education? When does that decision lead them to become important educational content producers?

Chart a Future History

Using your scans (of the environment ... trends ... science fiction ...), scenarios, probabilities as inputs, imagine what "automizing and digitizing analysis, optimization, prophecy and customization" might mean in and for post-secondary education's mission!

THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT

Embrace the framework and track the technologies.

- Thomas Friedman’s change framework should remind us that, while fun, predicting the emergence or maturation of specific technologies is less important than tracking the capacity of any technologies to change how we analyze, optimize, prophesize and customize. In a nutshell, the technologies likely to shape our foreseeable future are:
- Imbedded intelligence and communications; that is, smart and talkative things (Internet of Things);
- Artificial intelligence, including the related areas of natural language processing, machine learning, neural networks, intelligent agents, computer speech, vision, planning, and robotic control;
- Robotics;
- Visualization technologies such as holodecks; and
- Human-machine interfaces, including bionics.

Beyond the foreseeable future, gifted futurists like Ray Kurzweil remind us that in the broader context quite different technologies may alter the post-secondary landscape indirectly, but dramatically.

- “Personalized medicine” technologies and techniques that may change how long we live.
- Materials and energy-related technologies like solar desalination and Nano-materials that may change how and where we live.

Simply put: We need to track progress in all these areas.

Craft the Future

This said, the capacity of our institutions to analyze, optimize and prophesize well depends not only on new technologies, but on policies, processes, partnerships, and physical, financial and human resources. Our capacity to use new technologies to innovate in ways that break the iron triangle of costs, quality and access is what will make it possible for our institutions to shape their respective destinies.

Three years ago, John Seeley Brown said:

“We’ve got to ask ourselves what will the institutions of schooling, universities, research universities actually look like 5 or 10 years from now and if they look the same as they do now, then we’ve got problems.”⁵

In many countries, educators take pride in the fact that our great universities have operated continuously – in a recognizable form – for hundreds of years. Few institutions – even governments – can say that. However, new technologies and the children who are growing up with them have no allegiance to old institutions. More than ever, we need a post-secondary education to prosper amidst the job-stealing robot apocalypse. But we should not confuse the need for advanced education with the need for today’s institutional providers.

⁵ John Seeley Brown in, Richard N. Katz, “Edifice Rex,” at https://www.youtube.com/watch?v=zPgX-guuM_el&t=12s 11:09-11:42

This essay is not intended to persuade you of any single prediction. No one is that smart and no prediction is right for all. Rather, the messages are:

- Predicting the future is both a fool's errand and a necessity.
- Predictive accuracy demands inclusion and rigor.
- There are methodologies to adopt.
- Tracking key technologies is essential, but focusing on how to improve analysis, optimization and prediction across all elements of our institution's mission is more essential.
- The future will most certainly accommodate a wide range of missions, strategies, delivery styles and business models.
- The future will likely involve what economists refer to as an economic "adjustment." Old careers will disappear and new ones will appear. Change will always be painful and difficult to sustain. Failure to change may be more painful. Avoidance of the topic may be the most harmful strategy of all.
- Build scenarios that respect your institution's legacy and context, isolate the scenarios' key drivers, map the gap between the "as-is" state and future state of these drivers at your institution and identify strategies, investments, partners and timetables to make your future.
- Engage your institution and its stakeholders in your emerging vision of the future!

Marshall McLuhan also said, "I've always been careful never to predict anything that had not already happened."⁶ The future of technology and its impact on post-secondary education cannot be predicted. That future can and will be created by people of vision, conviction and talent. William Gibson was right, "the future is already here, it's just not very evenly distributed."⁷ It is surely ours to make.

⁶ Marshall McLuhan, "Television News is a New Mythic Form," an Interview with Tom Wolfe, at <http://www.marshallmcluhanspeaks.com/interview/1970-television-news-is-a-new-mythic-form/>

⁷ William Gibson on "The Science in Science Fiction, on *Talk of the Nation*, November 30, 1999.