

Computer Technology Changes the Business of Formal Education

How Increased Technology Will Force Innovation in Education

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Abstract: What is the future of education as computer technology exacerbates the divide between education as a business and education as a philosophy? Educational institutions, regardless of size, public/private charter or funding source, are faced with increasing business-like budgeting pressures. Technology has already removed many barriers to increased competition, such as geographic proximity, and allowed educational institutions to grow their potential markets. However, increased innovation in computer technology is also pressuring many of the more traditional aspects of higher education, including the fundamental business model. While there is no doubt that change is coming, it is not clear how future computer technology will impact the major aspects of education: Content Delivery, Student Assessment and Institutional Accreditation. What does seem clear is that educational institutions that cling to the *status quo* will decline while those that embrace change, in both academic policy and business practice, will improve not only their institutional standing but also the effectiveness of education in general. A new approach to the business of education is required if formal institutions are to keep pace with changing technology.

1 INTRODUCTION

The concept of education has been around for a very long time. “The idea and practice of universal, compulsory public education developed gradually in Europe, from the early 16th century on into the 19th.” (Gray 2008) Gray also explains that the early motivations for widespread education were mostly religious, with emphasis on learning to read the Scriptures, and that the methodology of repetition, memorization and testing of lessons, which is still used today, evolved from the “brute force methods long used to keep children on task on the farm or in the factory.” Today, formal post-secondary education is seen as a necessity, both for society in general and for an individual’s career improvement. Even though the long and varied history of the development of education fostered deep and rich traditions, it is still possible to take an objective view of education like any other industry that has been affected by the rise of computer technology. Just like improvements in other industries (banking, aerospace, communications, etc.), computer

technology has made many aspects of education easier. However, rather than focus on the evolutionary changes in areas such as admissions, classroom management, etc., the real question to be addressed is how computer technology is changing the very nature, and business, of education.

When trying to assess the impact of computer technology on an industry, it is tempting to look at activities that can be well defined and measured to gauge the effects of the implementation of the new technology. The premise here is not about incremental improvements but about change to the entire value proposition¹ of formal education. We have already seen evidence of this change in the growth of private, for-profit educational institutions that focus more on providing students with marketable skills than on an altruistic quest for knowledge. Understanding this level of change is complicated because measurement is extremely difficult when an activity evolves so much that it is no longer recognizable or even disappears altogether. This is what is fundamentally happening to formal education; computer technology is driving part of the product of formal education towards commodity¹ status, and most educational institutions

are not adjusting their business models to continue to provide value commensurate with the cost.

The future of formal education is dependent on how well educational institutions can meet the expectations of both society and individuals. All educational institutions, regardless of size, public/private charter or funding source, are faced with increasingly business-like budgeting pressures and can be viewed in the same way we would look at any other business. An educational institution has a number of product offerings, revenue sources, potential markets, etc., just like the corner restaurant or a Fortune 100¹ mega-corporation. An educational institution must understand what it is selling, to whom it is selling it and what price-point¹ the market will bear.

The exponential growth in computer technology has changed almost every aspect of our daily lives. We expect to be connected to a vast wealth of information 24/7 and to have it delivered to us on our computer, on our tablet and on our smartphone for free. Because of this market pressure, more and more vendors are looking at cloud computing as a ubiquitous solution (Iozzio 2013). We can already carry hundreds, or even thousands, of books on our e-readers or smartphones. The value of going to a formal educational institution to “get” an education seems to be a losing proposition. Educational institutions need to take a serious look at just where the value-add¹ is and refocus their product to deliver that value.

2 THE THREE ASPECTS

The Merriam-Webster on-line dictionary defines *education* as “the action or process of teaching someone especially in a school, college, or university” (Merriam-Webster <http://www.merriam-webster.com/dictionary/education>). Although this is an adequate definition for the *word*, it seems to fall short when thinking about the *concept*. Therefore, the author has developed a definition of education using three conceptual areas, or aspects, to try to capture how formal education (colleges and universities) differs from informal education (for-fee training classes) and self-education (independent study). The three aspects of education are:

Content Delivery: All of the activities related to imparting new knowledge to students. While traditionally thought of as classroom or lecture activities, computer technology has expanded the idea of Content Delivery to include many remote and distance learning activities. Content delivery is a

common aspect in formal, informal and self-education.

Student Assessment: All of the activities that are centered on measuring how well students have absorbed and retained the new knowledge. Traditionally, Student Assessment has been accomplished mostly by written and oral examinations, and computer technology has provided tools, such as automatic grading and test question databases, which allow more robust assessment without overly burdening instructors or institutions. Student Assessment is a common aspect of formal education. It is occasionally used, in less rigorous forms, in informal education and is seldom used in self-education.

Institutional Accreditation: A formal recognition that an institution has met official requirements of academic excellence, including curriculum development, the facilities provided to students, the quality of faculty, and institutional procedures for Content Delivery and Student Assessment. The impact of computer technology on Institutional Accreditation has been similar to the impact in other industries and is seen in improvements in communications, record keeping, information repositories, and documentation. Institutional Accreditation is an aspect unique to formal education.

Formal education, which may be provided as an educational institution’s dedicated function or as part of an institution’s larger product offering, includes all three of these aspects. A student is accepted at an educational institution and enrolls for classes with the expectation not only of getting knowledge, but also of receiving some certification of value showing that he or she has achieved a level of knowledge and/or specific skills. The Content Delivery aspect includes activities such as sitting for lectures, doing required readings, completing other course related activities, and sometimes doing lab work. The Student Assessment aspect is usually met by graded assignments and examinations. The professor or instructor makes the determination of how well the student has met the often poorly defined, and overly general, course objectives. The rigor of that determination process is very institution dependent. Some educational institutions require well-structured objectives and measurement processes, while other institutions allow a much more subjective determination. In the end, the student is paying tuition as much for the quality of the certification of completion, based on the educational institution’s reputation and level of accreditation, as for the delivery of the content. As

the Content Delivery aspect is driven towards a commodity, because it is freely available on the World Wide Web, then the rationale for the value of the education rests more and more only on the accreditation aspect.

3 TRADITION vs. BUSINESS

Formal education is usually seen from the point-of-view of tradition. An educational institution is very proud of characteristics such as when it was founded, who founded it, the philosophy of their approach, the institution's research subject areas, the credentials of the faculty, the size of the endowment fund, and, of course, their athletic programs. Formal education marketing tends to focus on the total experience of attending a given institution.

Formal education can also be viewed as a business with characteristics such as product line (degrees and certifications offered), return on investment (tuition, endowments, royalties, and grants realized for the development of courses, degrees, certifications, patents, research, etc.), market share (percentage of the potential student population attending), regulation compliance (accreditation), and, of course, non-product revenue (athletic ticket and merchandise sales). This business view can also be extended to the students' point-of-view where return on investment becomes the value received for the tuition paid. While it can be a very interesting exercise for a given educational institution to map their traditional administration concepts to business concepts, this discussion is focused on the effects of advancing computer technology on the future of the education industry.

3.1 The Tradition

How is the tradition of an educational institution related to computer technology? While many educational institutions are experimenting with alternate forms of Content Delivery, the traditional approach is still centered on the classroom or lecture hall. The term *lecture* was derived from the Latin *lĕctūra*, for a reading (Dictionary.com 2013). This approach goes back to the Middle Ages where the teacher would read aloud to a room of students (Britannica 2013). Books were extremely expensive when they had to be copied by hand, and students simply could not afford to own an individual copy. A school might only have a single copy of each book used in the curriculum. The lecturer, or reader,

would take the only copy of the text into a room at a given time and read it aloud. This, by its very nature, required advanced planning (i.e., enrollment) so that everyone knew where to be and when to be there. The technology advance of Gutenberg changed publishing but not the tradition of Content Delivery in education. Computer technology has not only changed publishing so that every student can own a textbook, but now students can also own a copy of every book on the subject and carry many of them around all the time in an e-reader. A public reader is no longer required, but most educational institutions still require students to attend class, physically or virtually. The credit given for a class is still based on the number of contact hours, and instructors are expected to do something productive during class time. An increasingly difficult challenge for instructors is developing classroom activities sufficiently interesting and valuable that students feel compelled to attend.

Educational institutions tie delivery to accreditation with the notion of taking a course for credit. The assumption is that a student can only get the real information on a subject from the school and only by advanced arrangement (acceptance at the school and enrollment in the course). Prior knowledge of the topic is irrelevant and the student is required to 'receive' the official version of the knowledge from the school and the instructor. Computer technology has made some changes to this traditional approach by allowing many instructors, the author included, to encourage students to go beyond the adopted text for a course and read other material. However, this is only a minor improvement. Many students are happy to acquire the knowledge on their own or through alternate channels (such as work, hobby clubs or on-line self-study), but they are still required to participate in the traditional delivery endorsed by the educational institution. As computer technology drives Content Delivery towards commodity, we will see increased student resentment over the high cost of receiving something they already have or can get for free. Educational institutions need to break with tradition and adjust their value proposition to focus more on accreditation than on delivery.

3.2 The Business

What is the business side of Content Delivery? The most obvious is how students are charged for their education; by credit hour, which is still based on the number of contact hours. Also, professors and

instructors are still mostly compensated based on the number of contact hours. Even tenured professors are expected to teach a minimum number of credits per semester or quarter, which is based on contact hours, or “buy” their time with research grant funding so a part-time instructor can be hired, who is paid by the number of contact hours. But the business relationship goes deeper. The lecture nature of university courses is usually tied to the adopted textbook model, which ties the interests (i.e., revenue stream) of the university to that of the publisher. De-coupling Content Delivery from Institutional Accreditation means that adequate alternative information sources would be acceptable. It also means breaking the relationship with publishers, resulting in additional resistance to change from bookstore managers, textbook publishers and instructors using publisher provided resources. This de-coupling is already underway. Computer technology is allowing students to avoid the “cartel-style” model that requires them to buy high-priced specific books (Fitzgerald 2013, p. 65). Fitzgerald discusses how Boundless Learning’s website allows students to enter a textbook name and the site responds with a matching table of contents, referred to as “Aligning your book” (Fitzgerald 2013). This idea could easily be modified to align to a well-defined syllabus instead of just an existing textbook (this is now an offering mentioned on the Boundless Learning website, <https://www.boundless.com/>). However, it is unclear just what the ultimate business model for on-line textbook equivalents will end up being. The textbooks offered by Boundless Learning are significantly less expensive than traditional publisher versions but Boundless only has a limited selection of high-demand texts. Publishers could address this issue in the short term by marketing electronic versions at price-points reflective of the cost of delivery. If anyone doubts how important this is to students, just ask a group of them how many are using used, old, borrowed or bootlegged versions of the required textbook, or how many have had an expensive textbook stolen.

But textbooks are just the beginning. The entire concept of Content Delivery is being disrupted by advances in computer technology in the form of MOOCs (massive open online courses). MOOCs, as implemented by a number of companies, such as Udacity, Coursera, and edX, address the technology of Content Delivery (Carr 2012). Carr makes an interesting comparison using the disruption to higher education caused by the postal service that allowed correspondence courses. “By the 1920s, postal

courses had become a full-blown mania. Four times as many people were taking them as were enrolled in all the nation’s colleges and universities combined.” (Carr 2012, p. 1) Yet educational institutions did not fundamentally change their business model; they just grafted a new format into the existing one. Then came distance learning, on-line classes, virtual classrooms, etc. All of these address the technology of Content Delivery but fail to address the business, which explains the initial popularity, but eventual decline, of new Content Delivery technologies. The correspondence study craze, begun in the 1920s, fizzled by the 1930s, and we see signs of a repetition of history. Carr provides an example where 155,000 people enrolled in a MOOC but only 5% passed the course (Carr 2012). Is this yet another case of start-up companies building really cool technology without enough thought into the underlying business model? Perhaps the 95% didn’t finish because they didn’t see enough value in return for the time, effort and cost of taking the course (just Content Delivery without any certification of attainment). In addition, every educator wrestles with how to meet the different learning styles of students (visual, auditory, kinesthetic, tactile, sit-and-get, interactive discussion, etc.) in the classroom. With limited time and budget, an instructor usually has to compromise and focus on the style appropriate for most of the students. It is just not practical to redesign the course material for a single student. However, in theory, a MOOC could be co-developed by several professors, each focused on a different learning style, to provide the best possible learning environment. With so many students enrolled, developing the course for all of the different learning styles can be easily justified and would still be cost-effective. Therefore, students should find taking the MOOC more enjoyable and rewarding, yet 95% gave up.

4 CHANGES FOR THE FUTURE

Given that computer technology is changing the world around us at an alarmingly increasing rate, what should educational institutions do? The key to the future of formal education is de-coupling Content Delivery from the other aspects of educational institutions. The hard part is that educational institutions still need to be responsible for the Student Assessment and Institutional Accreditation aspects. This is much more than just allowing students to test out of a small number of courses, either for full credit or to meet prerequisite or degree requirements. Most educational

institutions limit the number of transfer and test-out credits because they feel that they cannot certify the quality of the education unless the student has received a majority of the knowledge at that institution. What few educational institutions will admit is that there is also a threat to the business model. Since there is usually no revenue associated with transfer credits, and very little associated with the fees for testing out of a course, an educational institution that allowed significant classroom bypass would face serious revenue shortfall. Therefore, decoupling Content Delivery requires significant changes to the overall business model in addition to changes to the academic model.

Changes to the academic model are already taking place. Many educational institutions are using computer technology to increase the value-add for classes in the attempt to justify the continued requirement for in-house Content Delivery. If the content being delivered is not available anywhere else then students should see the value for sitting in the classroom. However, there are two major problems with this approach. First, students quickly resent it when course requirements are perverted to include in-classroom content that is not really applicable to the subject. Second, as soon as there is enough demand for the specialized content, someone will step up to provide it at a lower price-point, as shown by Boundless Learning's alternate textbooks.

Many educational institutions are trying to figure out how to deal with these changes. For example, the University of Colorado has contracted with Coursera for delivery of CU courses. However, these courses don't really fit into the current models, academic or business:

"While CU (like most universities aligned with Coursera) is not now offering courses for credit using the platform, we are excited about the possibilities of developing and delivering content with the potential to improve access, quality and completion for students. As Michael Lightner, professor and chair of the Department of Electrical, Computer, and Energy Engineering and co-chair of the CU Task Force on New Technologies, framed it, MOOCs can expand on the scholarship of learning and teaching. Lightner also says MOOCs not only provide the opportunity to share CU teaching excellence with the world, they also give our faculty the chance to incorporate MOOCs into blended courses, with the potential to enhance learning." (Benson 2013)

What is the real value to students for a course that does not offer credit (i.e., progress toward their degree) or that requires extra work without defined benefit? Benson, CU President, goes on to say, "We

don't know for sure where the technology will lead or what it will look like in a year or five or 10. The ground is quickly shifting for CU and for higher education as technology changes how we educate our students." (Benson 2013)

Another example of good, but poorly directed, intentions is from Brian Young, VP for Information Technology and Chief Technology Officer at The Colorado College. "We want to reshape the concept of massive open online courses (MOOCs) to provide open online access to vignettes of knowledge from our celebrated faculty. Our goal is to continually pique the interest of the entire Colorado College family whether in Colorado Springs or halfway around the globe." (Young 2013) Piquing everyone's interest may be a fun thing to do, but does it enhance the value of the education enough that students, and taxpayers, will pay for it? CC is well known as an innovative small private liberal arts school for things like changing from the traditional semester schedule to the Block Plan (one class at a time for three and a half weeks). Changes to the academic model may be easy, but changes to the business (i.e., revenue) model are still problematic.

Every educational institution believes their faculty to be excellent (otherwise they wouldn't have them) and that everyone should want to take classes from them. So it's understandable why an educational institution would want to offer courses through one of the for-profit e-institutions like Coursera. However, selling courses with no academic value (i.e. degree certification or accreditation) seems designed more for supplemental revenue than for fundamental changes to either the academic or business models.

Just look to recent history to see what computer technology can do to an entire industry in just a few years. In the early 1990s MCI was the innovator in long-distance telephony with a myriad of products to lower personal and business telephone bills. But now most people don't worry about their long-distance rates, using unlimited cell phone plans or Internet applications like Skype instead. MCI was more resistant to dealing with those inevitable changes than its competitors and, as a result, is no longer in existence (Norton 1994-2001). Large companies are very resistant to anything that undercuts their highly profitable product-lines, which gives start-up companies an opportunity to implement industry-wide innovations. Another example shows that the change may come from totally external forces. In 2009 Microsoft software was on 90% of the personal computing devices (PCs, laptops, tablets and smartphones), but by the end of 2012, it was on just 23% of those devices (Regalado 2013b). By the time the sleeping giants awake, it's a whole new world.

While MOOCs present some very interesting solutions, they are not without problems, such as official credit, uneven quality, automation for subjective topics, grading and, of course, technical problems (Leger 2013). On the other hand, they seem to be the current driving force:

“While MOOCs could be an opportunity to improve education in poor regions, they’re also profoundly threatening to bad professors and to weak institutions. Sebastian Thrun, the Google researcher who also runs educational start up Udacity, has predicted that within 50 years there might be only 10 universities still ‘delivering’ higher education.” (Regalado 2013a, p. 65)

Thrun “sees the traditional university degree as an outdated artifact and believes Udacity will provide a new form of lifelong education better suited to the modern labor market.” (Carr 2012)

Once Content Delivery has been decoupled from Student Assessment and Institutional Accreditation, professors can focus on providing more value to the educational process. Imagine taking an undergraduate philosophy course where the professor provides you a reading list of assignments and in-classroom discussion guidance. That level of Content Delivery could easily be moved to a web-based course or a MOOC. Think about the lack of feedback provided by the instructor at the end of the course with 25 students turning in large final papers that must be graded in the three or four days between the end of the class and when the institution requires grades to be turned in. Now imagine Content Delivery that is provided outside of the classroom environment. Students attend whatever discussion groups are available, using the format best suited to their learning style, at whatever time they are available rather than having to schedule a particular class only offered once every two years. The professor then receives material to be graded on an ongoing basis whenever a student signs up for a Student Assessment credit course. Institutions can then offer courses on an on-going basis and even offer different levels of assessment. For example, there could be one level of assessment course where the student just submits materials and gets a letter grade. Another level, for a higher enrollment fee, would involve feedback from the professor on an ongoing basis rather than a ‘one shot and you are done’ format, providing a significant market differentiation opportunity (and enhanced revenue) for the educational institution. This approach would significantly increase the potential population, or market, for an educational institution thus allowing for the potential to increase market share with the same product line. Not only could the institution leverage higher student enrollment because they're offering larger Content Delivery courses, but they

can also provide the assessment courses on an ongoing basis rather than having to schedule courses in the current semester or quarter methodology. Educational institutions could then focus their differentiation on the level of Student Assessment and the feedback provided to help students through the assessment process rather than on the commodity Content Delivery aspect.

Education is seeing a fundamental change because of alternative Content Delivery sources, such as MOOCs, TED talks, industrial training education (such as Learning Tree, ExecuTrain or Dashcourses’ Gogo), asynchronous Content Delivery providers (such as Great Courses; <http://www.thegreatcourses.com/> and Learn Out Loud; <http://www.learnoutloud.com>) and online self-study providers (such as Codecademy; <http://www.codecademy.com>). Alternative Content Delivery sources have a significant advantage because they are either free or very economical compared to most educational institutions. The drawback to the sources is that there is no assessment or accreditation, so the student taking these courses receives no accredited certification of the level of knowledge or skills attained.

5 THE RECOMMENDATIONS

If change because of computer technology is inevitable, then what should an educational institution do to capitalize on it rather than enter that long slow death spiral of protecting the *status quo*? The key is making coordinated adjustments to both the academic and business models. In other words, changing what they sell and what they charge for it at the same time and in a way that increases the overall value-add. The steps to do this are:

1. Create comprehensive and well-defined measurable objectives for *every* product offered (degrees, certifications, etc.). This goes beyond the vague and subjective descriptions in most college catalogs by providing real details about what knowledge and skills are required so that Content Delivery and Student Assessment can be developed to meet the objectives.
2. Create comprehensive and well-defined measurable objectives for *every* course offered. These objectives should be very specifically related to the product objectives above and sufficiently detailed to allow Content Delivery to be developed to meet those specific learning objectives.
3. Create a Student Assessment process for *every* course that is sufficiently rigorous that everyone

involved at the educational institution is comfortable certifying students' mastery of the topic without the educational institution having provided the Content Delivery. At this point the business model needs to be changed to allow the educational institution to maintain the necessary revenue stream by offering course mastery assessment as a separate product (likely replacing the fee to test out of a course).

4. De-couple Content Delivery from the Institutional Accreditation aspect. At this point there is adequate structure to allow professors to develop courses in whatever format is appropriate; online, correspondence, self-paced, MOOCs, etc. Again, the business model must be changed so that the cost to students for the Content Delivery is reasonable for just that, Content Delivery, while maintaining the educational institution's revenue stream. Professors and instructors can focus on pure pedagogy using the well-defined course objectives. In addition, educational institutions can further differentiate themselves by providing unique or learning style specific Content Delivery for courses at other educational institutions, leveraging their internal strengths.

In this environment, someone taking a MOOC course would know the value based on how well the course learning objectives meet their needs for the cost incurred. That value might be confidence in enrolling in the Student Assessment process to get credit for the course or attaining a non-accredited certificate to meet an employer's requirement for continuing education or for general knowledge in preparation for a new career. Other organizations might develop MOOC courses, or something else that we have no concept of today, to give students the knowledge and skills defined in the course objectives.

This list of recommended steps is meant to be more conceptual than literally prescriptive. Every educational institution needs to continue product differentiation (what's special about attending that institution) with focuses on their uniqueness. There are still opportunities for quality institution specific Content Delivery, maybe in conjunction with other forms, such as MOOCs. These changes really mean the end of the lecture course offering that is just a PowerPoint rehash of the textbook (i.e., "death by PowerPoint"). In fact, de-coupling the content allows Content Delivery to be focused on narrow specific topics rather than on an entire course. In addition, these narrow topics could be applied (i.e., reused or repurposed) across multiple courses, giving the educational institution better return on investment. Imagine offering a course (the Student Assessment part for credit) that relied on multiple

Content Delivery components, such as a MOOC or two, a programming component, a writing component, and a problem-solving component. A student could take the Content Delivery components he or she needed for the Student Assessment but not take the ones in which they were already proficient:

"The traditional model of instruction, where students go to class to listen to lectures and then head off on their own to complete assignments, will be inverted. Students will listen to lectures and review other explanatory material alone on their computers (as some middle-school and high-school students already do with Khan Academy videos), and then they'll gather in classrooms to explore the subject matter more deeply—through discussions with professors, say, or through lab exercises." (Carr 2012)

How an educational institution deals with partial failure of the Student Assessment is another area for marketing differentiation. The result could be better educational efficiency, lower cost to the student, reduced faculty load, increased student retention and higher enrollment capability for the educational institution (i.e., more revenue for the same investment). This provides a huge opportunity for the educational institution to leverage computer technology changes to the academic model with equally profound changes to the business model but still have products that meet expectations of industry and research organizations. This magnitude of required change to the business model will not be easy. Auditing a course is usually about the same cost as taking it for credit, which is an implicit business model where Student Assessment and Institutional Accreditation have no value. Restructuring the business model so that Content Delivery is less costly and more value (i.e., revenue) is shifted the other aspects will be a major paradigm shift for traditional educational institution administrators.

6 CONCLUSIONS

Many readers will undoubtedly dismiss this position on the future of formal education as impractical, unimplementable, radical, or even absurd. That's not surprising because educational institutions have embraced tradition for hundreds of years. Computer technology has been a major force of change for a fraction of that time, yet the impact has already been profound. Change is inevitable. How will formal educational institutions deal with the changes in light of the increasing cost of education, the general public's growing skepticism of the effectiveness of

formal education and mounting reluctance of taxpayers to provide additional funding? “Close to 60 percent of Americans believe that the country’s colleges and universities are failing to provide students with ‘good value for the money they and their families spend,’ according to a 2011 survey by the Pew Research Center.” (Carr 2012) The answer isn’t what’s comfortable for those of us who have been teaching for decades or what’s been the institution’s tradition for decades, or even centuries. Here is a quick test for the skeptics. Ask your students if they have a landline phone, or own a TV set, or rent movies at the corner video rental store, or when was the last time that they wrote and mailed a paper letter? The companies that were giants-of-industry providing these services a decade ago are but shadows of their former selves, if they even still exist. Should education change? Ask your students. Their answers to those questions are our future.

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REFERENCES

- Benson, Bruce, 2013, ‘A Message for the President’, communication from Bruce Benson, President of the University of Colorado,
<https://www.cusys.edu/presnews/2013/06/>
- Britannica, 2013, lecture discussed in ‘Medieval Universities’ article Title: ‘Western philosophy’,
Encyclopædia Britannica,
<http://www.britannica.com/EBchecked/topic/334428/lecture>.
- Carr, Nicholas, 2012, ‘The Crisis in Higher Education’, MIT Technology Review, September 27, 2012,
<http://www.technologyreview.com/featuredstory/429376/the-crisis-in-higher-education/>.
- Dictionary.com, 2013, "lecture," in Dictionary.com Unabridged. Source location: Random House, Inc.
<http://dictionary.reference.com/browse/lecture>. Accessed: December 02, 2013.
- Fitzgerald, Michael, 2013, ‘Free Textbooks Spell Disruption for College Publishers’, *MIT Technology Review*, vol 116, no 1, pp. 65-66.
- Gray, Peter, 2008, ‘A Brief History of Education’, Published August 20, 2008 in *Freedom to Learn*, excerpted by *Psychology Today* at

<http://www.psychologytoday.com/blog/freedom-learn/200808/brief-history-education>.

- Iozzio, Corinne, 2013, ‘The Final Upgrade’, *Popular Science*, October 2013 issue, p. 24.
- Leber, Jessica, 2013, ‘The Technology of Massive Open Online Courses’, MIT Technology Review, vol 116, no 1, pp 63-64.
- Norton, Tim R., 1994-2001, experiences as an employee at MCI.
- Regalado, Antonio, 2013a, ‘Online Courses Put Pressure on Universities in Poor Nations’, MIT Technology Review, vol 116, no 1, pp 64-65.
- Regalado, Antonio, 2013b, ‘Mobil Computing is Just Getting Started’, MIT Technology Review, vol 116, no 3, pp 69-70.
- Young, Brian, 2013, ‘Building on the Block with Technology’, in *Colorado College Bulletin*, November 2013, p. 21.

APPENDIX

¹This appendix provides simplified explanations of business terms to assist reader understanding in the context of this discussion.

Commodity: The characteristic that goods or services exhibit when they become both standardized and popular, causing multiple suppliers to compete aggressively driving the price to the lowest possible price-point.

Fortune 100: The Fortune magazine annual list of the 100 largest public and privately held companies in the United States based on gross revenue figures.

Price-Point: One of a series of possible competitive prices of a good or service. Each price-point is calculated to maximize profit based on the cost of materials and labor, the sales volume and desired margin (profit). Generally, the cost to produce a good or service decreases as volume increases (economy of scale) which allows the supplier to reduce the price (use the next lower price-point) while still making the same, or higher, profit.

Value-add: What a supplier does when transforming raw materials or services into the product to be sold that justifies a product price greater than the cost of production. For example, a restaurant adds value by preparing and serving the raw food.

Value Proposition: A statement that summarizes the added value for a product or service and thus compels a consumer to buy it from that supplier instead of a competitor. A Value Proposition is valuable to the supplier organization because it helps focus efforts on providing whatever is appropriate to deliver the stated value to the customer without providing anything unrelated that would add cost without adding value.