# Can MOOC's and Existing E-Learning Efficiency Paradigms Help Reduce College Costs?

Stephen Ruth
*George Mason University*

E-Learning enrollments in post-secondary education are growing significantly but the annual cost of tuition continues to increase more than inflation. Does this mean that E-Learning cannot reduce costs? After describing some salient details of the tuition cost problem, this article examines four paradigms that have the potential to reduce tuition significantly over the long term, perhaps by half. First, it reviews the potentially game-changing effects of free Massively Open On-line Courses (MOOC's) and the new MIT/Harvard Ed X project. Both are very new and eventually target as many as a billion on-line students. Second, it describes the underutilized but highly scalable National Center for Academic Transformation's (NCAT) course redesign paradigm, capable of reducing aggregate administrative and teaching costs by billions annually, and examines problems associated with its wider deployment. Third, Western Governors University's competency-based approach is presented as another way of drastically reducing labor costs while increasing availability of college courses to low income students. Finally, the export/import approach is introduced, in which MOOC's for credit become available (at a fee) beyond the offering institutions, thereby setting up a disruptive, but potentially highly economical reduction in faculty and administrative labor expense.

Keywords: MOOC, WGU, NCAT, Competency-Based Education, Ed X, Import/Export Model, Course Redesign

## INTRODUCTION: THE COST PROBLEM
## CAN E-LEARNING HELP?

Dr. Diana Oblinger, president of Educause, the leading organization of college IT

*Stephen Ruth is a professor of Public Policy and Technology Management, and Director of the International Center for Applied Studies in Information Technology at George Mason University, Virginia. Stephen Ruth can be reached at ruth@gmu.edu.*

managers and developers, commented recently that higher education must "reduce costs, improve perceived value, provide evidence and be accountable, know the data, and provide leverage and innovation" (Warger & Oblinger, 2011).  College tuition cost in the United States is soaring, growing at over twice the annual inflation rate for three decades, aggregating a rise of 369 percent after adjusting for inflation (The College Board, 2011, 13). The annual aggregate cost for postsecondary education, for-profit and non-profit, in the United States is approaching $500 billion and has increased 5 to 6 percent per year for the past decade (National Center for Education Statistics, 2010a, National Center for Education Statistics, 2010b, National Center for Education Statistics, 2011, 528, 539, 532). Here are a few additional statistics from the College Board's 2011 findings: the average annual cost of a non-profit public college bachelor's degree is up 8.3 percent over the past year to $8,244 (plus room and board of $8,887) and a non-profit associate's degree up 8.7 percent to $2,963.  For private non-profits it's a 4.5 percent rise to $28,500 (plus $10,089) and for for-profits, a 3.2 percent increase to $14,487. One third of all matriculating college students get no grants or scholarships (The College Board, 2011, 10). When the totals are disaggregated to show costs of for-profit vs. non-profit associate degrees (almost half the undergraduates in the United States are enrolled in 2-year colleges) the for-profits cost five times as much (Mullin, 2010). In terms of unpaid student loan debt, the aggregate total in the United States has passed $1 trillion, more than the total of U.S. credit card debt (Mak, 2011) and the average graduating  student has college loan burden in the range of $24,000, including an increase of 5 percent during the past year alone (Fairchild, 2011).

## BACKGROUND INFORMATION

Several inherent structural issues hinder the achievement of major cost savings through E-Learning (Archibald & Feldman, 2008). Some regard the problem as an example of Baumol's Cost Disease, where major productivity improvements are impossible, like a symphony orchestra playing a master work or a mechanic working on a car (Surowiecki, 2003).  A recent analysis indicated that it is possible to reduce the cost of undergraduate education by half, partly through ICT/E-Learning intervention. (Fried, 2011). Many of its proposed solutions to high tuition aim at the two most significant costs: administration and teaching. The teaching cost displacement opportunities are close to being exhausted because  barely 30 percent of US college instructors are tenured or on tenure track now, down from 75 percent three decades ago (AAUP). And a great number of these permanent faculty assets report low enthusiasm for E-Learning (Sammons & Ruth, 2007; Schell, 2004). In addition, while there are thousands of quality college courses available free on-line (with syllabi and free streaming lectures, etc.) from the world's greatest universities (Open Course Consortium, 2010; Open Culture course web site, 2011), there is no systemic approach to deploy them for credit across non-originating institutions, and there is relatively little electronic sharing of physical facilities for common activities like registration, lectures, libraries, and the like (Ruth, 2010). In a time when college costs are increasing dramatically, capitalizing on the potential cost-cutting potential of E-Learning would seem more significant than ever.

As E-Learning becomes more mainstream, can it make a dent in these numbers? At the level of postsecondary education policy, E-Learning was once considered a useful cluster of technological interventions but not part of core strategy—only a tactical asset, not strategic. That has changed. The latest Babson Survey Research Group report (previously called the "Sloan On-Line Survey" and still supported by Sloan Foundation), an annual study which polls senior executives in higher education—presidents, provosts, deans, administrators, etc.--found that E-Learning is increasingly considered a strategic

element in policy planning. It reported that 66 percent of the senior academic officers representing a sample of 2,500 American colleges and universities agreed that online learning was a critical element of their institution's strategy, up from barely 50 percent in 2003.

During the past decade E-learning use has been increasing significantly, to the point where now 31 percent of all college students take at least one course at distance. That's 6.1 million on-line college students, an increase of over 560,000, or 10.1 percent over one year, compared to increases in traditional enrollment of 0.6 percent. In the first Babson report eight years ago, 57 percent of the academic leaders responded that learning outcomes of on-line education are equal to or superior to face-to-face. In the most recent report it's 67 percent (Allen & Seaman, 2011). So if provosts, presidents and academic administrators favor e-learning and demand for its use is increasing, what new approaches might help solve the cost problem?

In this article, four possible solutions to this problem will be described. Each has its own advantages and disadvantages, but collectively they represent a possibility to achieve dramatic long term decreases in college costs, especially in teaching and administrative areas. The first, free Massively Open On-line Courses is completely new but, unlike the other three, already has significant funding and the support of top education officials at the offering institutions. The second, major increases in NCAT's successful course redesign approach could revolutionize the undergraduate cost landscape because its proven results are scalable and potentially able to save billions in annual teaching and admin costs. Third, the potential of competency-based programs, especially the Western Governors University, has barely been tapped. WGU's current enrollment of about 25 thousand could be increased significantly, since, like the NCAT and MOOC examples, it requires no major capital investment and scales easily. The fourth, gradual introduction of an export-import model of learning, where fee-based MOOC's are widely deployed in giving local course credit, could be disruptive, because of its challenge to traditional faculty roles, yet it also offers the largest potential cost savings in the long term.

*THE FIRST PARADIGM: MOOC'S AND ED X*

Within less than a year there has been an astonishing increase in investment, at least $100 million, in a completely new type of on-line college course. This section will describe the two most significant of these, Stanford's free Massively Open On-line Courses (MOOC's) introduced in the fall 2011 semester, and the May 2012 announcement of the Harvard-MIT partnership called Ed X, which its sponsors describe as the "greatest change in education since the printing press" (Ed X introduction, 2012). Both of these significant E-Learning projects are focused on three goals, which, if achieved, could truly be called disruptive. First, they aim to reach very wide audiences— the six Stanford courses (see below) achieved enrollments of over 300,000 and the Ed X aim is eventually to reach a billion students. Second, both use an open-source model dedicated exclusively to web-based delivery, not warmed-over class lectures. The third characteristic is the most interesting—the courses are all free to the user, at least for now.

First, a description of the pioneering Stanford University MOOC's will be presented first. In the fall of 2011 Stanford offered three new on-line Computer Science courses, available at no cost to the public. Unlike the thousands of free courses available from MIT, Yale, Carnegie Mellon, UC Berkley and many others, the Stanford offerings came with lesson outlines, quizzes, mid-term and final exams, grading, mentored office hours with the instructors and other features representing the best current E-Learning practice. The worldwide response was astonishing: 300,000 student applications (Koller, 2011). One of the courses, Introduction to Artificial Intelligence, was taught by two well-known

experts: Sebastian Thrun, a Research Professor of Computer Science at Stanford and Google Fellow, and Peter Norvig, Director of Research at Google Inc., and a Fellow of the American Association for Artificial Intelligence.  The course consisted of twenty on-line streaming lectures, such as Problem Solving, Probabilistic Inference, Probability in AI, and so on.  It was only open to matriculated Stanford students for credit, but the high participation rate offers a clear indication of the pent-up demand for high quality, content-rich, partly interactive E-Learning offerings. There were eight required homework exercises, four programming assignments, plus a mid-term and final examination. (CS 221 Web site, 2011)  One of the for-credit obstacles for the Stanford course was removed when Germany's University of Freiburg and several other European universities established a process to monitor exams for students registered in the Stanford course and award University of Freiburg credit for successful completion (University of Freiburg, 2011). Stanford plans has offered another half dozen courses of this type in the spring 2012 semester (Open Culture, 2011), And MIT, with about two thousand open courses available on line, has announced that some of them will be offered to non-MIT matriculates as part of a new certificate-granting program (Associated Press, 2011). What are the actual final numbers of participants in the Stanford AI course? There were 175 matriculated Stanford students who took the mid-term exam for credit plus about 23,000 non-Stanford students, many of whom were on a par grade-wise with the Stanford group, and 54 from Freiburg University (Kolowich, 2011).

Stanford's E-Learning approach is extraordinary in its student response--definitely not a fluke. So if a small number of  E-Learning courses are so popular and the same materials (lectures, worksheets, interactive contacts with the instructor, exams, etc.) are already available, it would seem that a significant returns-to scale opportunity is attainable, where each added student reduces the unit cost and the cost amortization or break-even point is reached quickly. The obvious cost savings:  faculty and administrative labor, since instead of several thousand versions of the course, each with its own overhead, salaries and other expenses, there could be only one, very carefully crafted version, prepared and presented by the most famous instructors in the world, using the most comprehensive and student-centered learning platforms  in the world.

After the Stanford success in the Fall 2011 semester several events occurred almost simultaneously. First, four startup companies were funded, all offering free college courses:  Udacity (http://www.udacity.com/)—with seven-week courses in fields like computer security, building search engines, etc.; Coursera (www.coursera.org )--hosts dozens of courses in technology, finance, sociology, logic, etc., through Princeton University, Stanford University, University of California, Berkeley, University of Michigan-Ann Arbor, and University of Pennsylvania; Goodsemester (www.goodsemester.com )—a course development site;  and Udemy (www.udemy.com )--offering courses in specialties like technology, business, health, life style, language , music sports and many more. And in December 2011, practically simultaneous with the Stanford courses and these four new startups, MIT, which owns two thousand free courses, began to offer a certificate for successful completion of some of them (Washington Post, 2011).

Next, the Ed X paradigm will be described. Ed X  has  most of the same goals as last year's Stanford rollout, but has significantly higher funding than other startups of this type, $60 million.  Here is an excerpt from Ed X's web site, on the day of Ed X's introduction, May 2, 2012:

"Features will include: self-paced learning, online discussion groups, wiki-based collaborative learning, assessment of learning as a student progresses through a course, and online laboratories. The platform will also serve as a laboratory from which data will

be gathered to better understand how students learn. Because it is open source, the platform will be continuously improved."

The first course offering, called Circuits and Electronics 6.002x, running as a prototype from March through June 2012, already has 120,000 students enrolled, despite its rigorous prerequisites—AP level course in electricity and magnetism, basic calculus, linear algebra and differential equations and more (Circuits and Electronics 6.002x web site, 2012).

In what ways is Ed X different from the profusion of courses already available as MOOC's? It is not clear yet, because it's so new, but it seems that there will be at least five differentiators. First, a significant theme of Ed X is getting data about how students learn. That goal will be imbedded in all courseware, eventually offering a major source of in situ information for analysis. Second, even though it is open source; that is, available to almost any user regardless of platform, Ed X does not seem to be aiming at offering for-credit courses through other universities. Third, Ed X has the capacity to offer thousands of courses, significantly more than the other recent entrants in this field, and they will be in all disciplines. As mentioned, MIT alone already has over 2000 MOOC's available. Fourth, as of now the intent is for only Harvard or MIT professors to offering the content, unlike some of the new startups which feature lecturers from other institutions. Fifth, Ed X seems to have enough backing to be able to be self–sustaining for a long time, more so than Coursera , which has $16 million in funding. But eventually there will need to be a bottom line way to sustain the enterprise, and that may possibly be some sort of Export/Import Model—see below).

*THE SECOND PARADIGM: MASSIVE IMPLEMENTATION OF COURSE REDESIGN*

Leaving the completely new world of MOOC's and Ed X, there are several significant cost-saving measures available for over a decade which are fully capable of achieving serious reductions in labor and administrative costs, thereby reducing tuition. One of these is course redesign, in which high volume college courses are optimized through teaching and technology interventions. The gold standard for redesign is the National Center for Academic Transformation (NCAT) (Miller, 2010). Since the late 1990's NCAT has proven again and again that high volume college courses, like Math 101, Econ 101, Soc 101, etc.--which constitute close to half the total hours of course delivery (FTE) at a college—can be reconstructed in such a way that they are considerably lower in unit cost and also deliver significantly better learning outcomes. That sounds too good to be true, better outcomes and less per-student cost, but it's exactly what NCAT has been achieving for over a decade. There are many types of NCAT course redesign but nearly all involve some kind of increased E-Learning intervention, from the blended learning approach where some course elements are taught at distance and the rest by traditional methods, to the Emporium at Virginia Tech where about 5,000 students per semester get credit for various quantitative courses through interactive courseware at a warehouse-sized facility with 500 work stations and on-duty graduate assistants and professors (Robinson & Moore, 2006; Twigg 2012). NCAT has been highly praised and is supported by the Sloan Foundation, The Bill and Melinda Gates Foundation and many other groups. Over the past decade hundreds of courses have been successfully redesigned. Two English Composition courses, one at Ohio State University and the other at Brigham Young, each reached 3,000-students at a cost of over $1.14 million. After the NCAT redesign the aggregate cost was reduced to less than $730 thousand, with improved outcomes for the students. That comes out to savings of about $60 dollars per student for 6 thousand students. A 3000-student Composition course at

Tallahassee Community College saved $107 per student after NCAT, and there are many more similar examples (National Center for Academic Transformation, 2010).

But why not thousands or tens of thousands of NCAT course interventions, instead of several hundred? Why might a university be reluctant to make massive, cost-effective use of a proven, respected, replicable approach that could make dramatic reductions in unit and total costs for over half the FTE available? NCAT, which always has to be invited to an institution, has only been able to work with a few hundred high volume courses, instead of the hundreds of thousands that are eligible. Vance Fried's American Enterprise Institute study *Opportunities for Efficiency and Innovation: A Primer on How to Cut College Costs* recently explored ways to provide a first class undergraduate education at a top public institution at   drastically reduced cost (Fried, 2011). His key point is that faculty salaries are by far the most significant cost element in tuition increases, closely followed closely by administrative salaries. His solution includes significant reductions in unit costs through several major activities: first, separate teaching funding from research funding; second, significantly *increase* the student-teacher ratio; third, cancel programs that have few students or instead share them across wide areas; fourth, make dramatic reduction in administrative costs, which rose 67 percent over inflation from 1993 to 2007. E-Learning has a significant role in all of these solutions. *Economist Magazine* suggested that Dr Fried should have added the three year college degree, common in many countries, to the list (Schumpeter, 2011). If he had, E-Learning's contribution would be even more significant. Fried sees the advantage of E-Learning usage as especially compelling in undergrad courses that use the lecture/exam format, the same ones that NCAT focuses on:

> …radical savings through online delivery can be achieved in courses taught in a lecture/exam format, the bread and butter of lower division instruction at public research universities. Some universities are beginning to pursue this approach. It spreads the cost of creating the online lecture over thousands of students, with variable costs per student limited to faculty (often graduate assistants) time spent in responding to e-mail questions and grading. (Fried, 2011, p. 15)

The strategic problem is that a relatively small number of high-volume college courses have employed the NCAT treatment, out of the hundreds of thousands that might be eligible. The savings are clearly scalable, and can be employed both in very high volume courses—representing a significant fraction of the institution's FTE—as well as relatively rare courses that need to be shared across campuses throughout the country or beyond. There are over 20 million students in the higher education system so if even a half of them could experience these proven benefits in a few courses every semester the savings would be significant—possibly $5 billion per year or more—and, as mentioned, the NCAT approach also improves learning outcomes, an obvious bonus.

*THE THIRD PARADIGM: USING E-LEARNING IN COMPETENCY-BASED ACADEMIC PROGRAMS-- CHALLENGING THE IDEA OF THE UNIVERSITY AS A PLACE*

Perhaps the greatest inhibitor of reducing unit costs through E-Learning is the concept of the university as a place.  For hundreds of years it has been the physical space of a university that has offered academic services to students, scholars and the community. But Information and Communication Technology (ICT) advances have made it possible to imagine a college where faculty, academic departments, libraries, meeting

rooms, etc., are not tethered exclusively to a physical location. The University of Indiana implemented such an option by taking the unusual step of canceling the plan for building a sorely-needed new physical campus and opting for an arrangement with Western Governors University (WGU) naming the new virtual campus WGU-Indiana.  It's an outsourcing alliance between Indiana's higher education system and the established Western Governors University, an accredited, mostly E-Learning and competency-based consortium of state institutions headquartered in Salt Lake City. WGU's enrollments have grown from 500 in 2003 to about 25,000 today (Gravois, 2011). The new WGU Indiana program already has over 1700 students and has graduated its first class of 76 students.  It offers over fifty accredited programs in business, teacher education, nursing and other specialties and is adding a hundred new students per month (WGU Indiana commencement summary, 2011).

Another interesting innovation for WGU-Indiana is its tuition system. A six month term has a fixed fee, currently $2,890, for as many courses as a student can complete. Does WGU-Indiana represent an abrogation of a university's role as a physical place of learning? Possibly, but for residents of Indiana who can now get a college degree on-line such a distinction is probably unimportant. How much has been saved by avoiding the costs of creating an entirely new physical campus in Indiana? It's not easy to measure but the economies of easy course availability, breadth of course and program selection, not to mention the avoidance of major construction, added permanent, tenure-track faculty and staff hiring expenses are probably in the several billion dollar range, over a ten year period.  The unit cost to students is also significantly lowered. Let's assume that a student could take the college courses needed for an undergraduate degree over a period of three years (including summers). That's about $18,000 for three years of college.. Add the convenience and other advantages and it's a major saving to students, not to mention the systemic annual institutional savings, mentioned above, from a voiding the added costs of a new physical university structure. And that's just for one of the fifty states in the US. Incidentally, WGU-Indiana's outsourcing is not unique at all. Many universities are already quietly outsourcing entire academic programs to for-profit contractors.  For example, over a dozen online MBA's from mainstream institutions (George Washington University, USC, etc.) are outsourced to contractors (Parry, 2010). Through the assistance of internet education contractor 2tor, USC's on-line Masters of Arts in Teaching, has increased its on-line student population from 144 to 1400 in two years (Parry, 2011).

WGU-Indiana may have been an early pioneer, but now Texas's Governor Rick Perry has established a strategic vision of a low-cost college degree and the state has implemented WGU-Texas, with identical goals as its Indiana counterpart (WGU Texas Web Site, 2011).  Many additional state models of this type are expected soon.  The current plan for WGU Texas is a yearly tuition of about $6,000 and there are already dozens of available, accredited bachelors and masters programs offered. (See below for Texas's "$10,000 college degree") The WGU approach, once regarded in education circles as eccentric and unwieldy, has now become a significant reality and is growing. US Education Secretary Arne Duncan stated that he hopes WGU can eventually become the new "normal" higher education approach (Levin, 2011b). Since it is almost exclusively an on-line university, it gives a window on how much savings might be possible through wider implementation of its approach. The major offsets would be faculty costs (few permanent professors, no tenure requirement, etc.), reduced expenses for services like library, registration, etc., and very large cost avoidance expenses for buildings, land, etc.  There are problems, of course. Many object to the possible lack of rigor or quality of competency-based courses like WGU's (even though they are fully accredited), and the data concerning job success after completing a non-traditional college degree are troubling in some cases. Researcher Anya Kammenetz, whose recent

book on the transformation of higher education included this phenomenon, summarized the situation this way, "For some people, it will mean going from a good education to a great one. For others, it will mean getting some kind of education, instead of nothing" (Levin, 2011a).

Another competency-based topic is the issue made popular recently by Texas Governor Rick Perry, the $10,000 college degree (Haurwitz, 2011). The subject has received serious consideration in the Texas legislature and the *New York Times* featured a detailed debate on it recently (New York Times, 2011)  A surprising number of experts felt that it was possible, at least for a group of students willing to forego some aspects of normal college life. Clearly, E-Learning and lecture capture are crucial to the $10,000 degree. Note that the WGU degree, described earlier is in the $18,000 range already, approaching the $10,000 goal. For the goal to be attained, many of the faculty changes described above would be crucial.

It should be reiterated that E-Learning will only bring down college expense of it reduces the unit costs of teaching a course. So the obvious offset is to allow more students to be reached by the same faculty member.  It's never a popular notion but here is a comment by Richard Vetter, director of the Center for College Affordability and Productivity at Ohio University.  Speaking specifically about the University of Texas and its proposed $10,000 college degree, which would depend heavily on E-Learning he says:

> My sense is that at U.T. if most of the faculty taught even half as much as those shouldering most of the teaching burden and the savings from needing fewer faculty (and slashing the attached administrative costs) were solely devoted to tuition reduction, tuition could be roughly cut in half (Vetter, 2011).

Several universities in the Texas system have implemented this project, like UT Permian Basin, Texas A&M University-San Antonio and Texas A&M University-Commerce, for specific disciplines but it is too early to determine outcomes.

The strategic problem associated with this paradigm is a reluctance of faculty and administrators to change from a tradition of classroom teaching.  The costs of WGU are in the range of one half or less of a traditional college degree at a public university and all courses are accredited by regional bodies; indeed, they are all given through the auspices of state universities, but  implementation of a major acceleration in this paradigm might be slow because of the reasons just mentioned.

*THE FOURTH PARADIGM--PUTTING IT ALL TOGETHER: THE EXPORT IMPORT MODEL*

Assume for a moment that that MOOC's, NCAT proliferation, and WGU were eventually achieving full scale results. There would certainly be major personnel savings through NCAT and WGU, perhaps $20 billion per year system wide, equating to about a five percent drop in higher ed cost.  But the real payoff would be when MOOC's like Stanford's and Ed X were made available as part of a full scale credit granting process. Currently these courses are free to the user but there is no credit granted, except in the case of the European universities.   The obvious example is the University of Freiberg giving its own credit for the Stanford AI course, described above.  A recent article described export-import process as working in the following way (Ruth, 2012). If University A offered MOOC materials as a 3 credit course there would be a fee of, say, $25 per student credit hour paid to the MOOC owner, possibly Ed X, Coursera, Stanford, etc. Assume that four 20-student classes enrolled in the course at University A for the

semester. The fee to the MOOC exporter would be $6000 (3x20x4x25). At University A, the importer, the instructor would offer optional face-to-face or on-line Skype-based discussion sessions every week or two while reviewing exam scores and student comments generated by the MOOC. Where are the savings? In three major areas. First, the instructor relieved of the tasks of lecture preparation and delivery, slides, course worksheets, grading, etc., could handle not just four, but probably six or eight classes of this type, possibly more. Secondly, the instructor would not need to be a tenured or tenure-track employee. After all, the high caliber content and the lecture is part of the fee to the MOOC owner. Other issues, like security of examinations, cheating, and the like, should not be a challenge, since they have been solved for millions of students who annually take for-credit E-Learning courses already. Third, administrative costs could go down at the same rate as the faculty costs. Administrative cost has been rising much faster than faculty expense in recent years (Green, Kisida & Mills, 2010). Some colleges have more administrators than instructors, according to Fried (Fried, 2011, 11). With export-import procedures in effect both costs could be sharply reduced.

## CONCLUSIONS AND DISCUSSIONS

There are numerous strategic questions about methodology, but applying an export-import approach where one university offers high quality content to another—for a price—is intriguing. Students would not necessarily be deprived of interaction since, as mentioned, there are technology approaches in MOOC's that can allow face-to-face-contact with a local instructor/mentor and other fellow students in a blended format. Even the Stanford courses, with tens of thousands of students participating, offered a mentored link to the instructors. The exporting professors would attain greater visibility, and greater rewards. If this approach were to become prevalent, there would be less need for tenured or tenure-track teachers, since the best lectures and teachers would reach many more students. The export/import lecture capture model might be divisive, since in some situations it would significantly reward the most popular lecturer, that is, the one that has the highest requests for importing, but the potential benefits to students and possible cost savings might be significant.

Obviously, this is a controversial issue and would have to evolve slowly, but the idea has appeal on several fronts. First, it opens wide the gates of the academy, allowing the very best presentations available in the world to be available in a for-credit college course anywhere. That has to be a good thing. Each importing institution would use the lectures as needed and could supplement them with discussion groups—some face-to-face and others not. As mentioned, there are many models already available for handling homework, exams, presentations, etc. Since, as mentioned, close to a third of US college students already take at least one course on-line, the various methodologies are widely reported and discussed, in books articles, dissertations, etc. Second, the abundant literature on lecture capture and MOOC's seems ripe to be exploited and leveraged. If most tenured and tenure track faculty are initially reluctant, the bonus available of wider distribution of their presentations and ideas through MOOC's may be a significant incentive. If not, there will still be plenty of courses to be taught in the traditional manner throughout their careers. Third, MOOC's could make a major difference in the cost of a university education. The savings would come from lower instructional and administrator expense, that is, significantly lower unit costs, due to higher impact of imported materials. The class sizes of the Stanford and early Ed X MOOC's (in the hundreds of thousands) would not be typical but they indicate that each imported lecture might be seen by perhaps ten to hundred times the number of students as today's one-on-one classroom talk.

Losing the personal touch is a problem in this sort of arrangement. Many students feel that classroom interaction is a crucial part of the college experience, and they are probably right, at least for some courses. But for these paradigms to succeed, it need not be used by all the courses, or even half of them. Students may opt for many classes that are taught in the traditional manner. But if a young freshman with a big student loan in prospect and working two jobs to offset it, were given the option of taking half the classes in an untethered mode and getting the best lecturers in the world in the virtual classroom as contrasted with leaving work early to sit in on an Econ lecture half way across town, he or she would probably be glad for the flexibility of a MOOC.

To sum up it, does seem that new forms of E-Learning are going to change things, maybe not the tsunami that *New York Times* columnist David Brooks  predicts (Brooks, 2012) but still some major differences over the long term due to the apparently inexorable rise of  tuition costs. The comments of MIT's president Susan Hockfield at the ceremony introducing Ed Ex are probably the best way to view this complex subject:

> Online education is not an enemy of residential education, but instead a powerful and inspiring ally. What we will discover together will help us do what we do better (Hockfield, 2012).

## REFERENCES

Allen, E., &  Seaman, J. (2011). *Going the distance -- Online education in the United States*. Babson Survey Research Group. Retrieved from http://www.onlinelearningsurvey.com/reports/goingthedistance.pdf

American Association of University Professors (2010, September). *Tenure and Teaching-Intensive Appointments*.  Retrieved from http://www.aaup.org/NR/rdonlyres/ 3B21B7EB-86D7-498D-9498-10978175B5DA/0/TenureTeachersRpt.pdf

Archibald, R., &  Feldman, D. (2008). Explaining increases in higher education costs. *Journal of Higher Education*,  *9*(3) , 268-295.

Brooks, D. (2012, May 5). The campus tsunami.  Retrieved from http://www.nytimes.com/2012/05/04/opinion/brooks-the-campus-tsunami.html

The College Board (2011). *Trends in College Pricing 2011*, 3, Retrieved from http://trends.collegeboard.org/downloads/College_Pricing_2011.pdf

CS 221 Stanford course web site (2011). Retrieved from http://www.stanford.edu/class/cs221

Circuits and Electronics 6.002x course web site, MIT (2012).   Retrieved from https://6002x.mitx.mit.edu/

CDW-G  (2010). *CDW-G's 21st Century Campus Report,* 16. Retrieved from http://webobjects.cdw.com/webobjects/media/pdf/newsroom/CDWG-21st-Century-Campus-Report-0710.pdf

Ed X (2012). Introduction at Harvard/MIT. Retrieved from http://www.edxonline.org/

Fairchild, C. (2011, April 21). Record debts loom after graduation, *Chronicle of Higher Education*. Retrieved from http://dukechronicle.com/article/record-debts-loom-after-graduation

Fried, V. (2011). Opportunities for efficiency and innovation: A primer on how to cut college costs. *American Enterprise Institute Working Paper, 2011-02.* Retrieved from http://heartland.org/sites/default/files/Opportunities-for-Efficiency-and-Innovation-Fried-FINAL.pdf

Gravois, J. (2011). The college  for-profits  should  fear. *Washington Monthly,* September/October 2011. Retrieved from http://www.washingtonmonthly.com/ magazine/septemberoctober_2011/features/the_college_forprofits_should031640.php ?page=4#

Greene, J,  Kisida, B. & Mills, J. (2011). *Administrative boat at American universities: The real reason for high costs in higher education*, Goldwater Institute Policy Report No. 239. Retrieved from
http://goldwaterinstitute.org/sites/default/files/Administrative%20Bloat.pdf

Haurwitz, R. (2011, April 27). Agency embraces Perry's $10,000 degree plan. *Austin American Statesman*. Retrieved from
http://www.statesman.com/news/local/agency-embraces-perrys-10-000-degree-plan-1438689.html

Hockfield, S. (2012). Quoted in MIT and Harvard launch a 'revolution in education.' Retrieved from http://web.mit.edu/newsoffice/2012/edx-launched-0502.html

Jaschik, S. (2011, December 7). Teaching Large Courses, *Inside Higher Ed*. Retrieved from http://www.insidehighered.com/news/2011/12/07/educators-hear-advice-how-teach-large-courses

Koller, D. (2011, December 5). Death knell for the lecture: Technology as a passport to personalized education. *New York Times*. Retrieved from http://www.nytimes.com/2011/12/06/science/daphne-koller-technology-as-a-passport-to-personalized-education.html?_r=1&pagewanted=all

Kolowich, S., (2011), Open CourseWare 2.0, *Inside Higher Ed.* December 13, 2011 , Retrieved from http://www.insidehighered.com/news/2011/12/13/stanfords-open-courses-raise-questions-about-true-value-elite-education#ixzz1gbxoY3gB

Lederman, D. (2010). A Marriage Made in Indiana, *Inside Higher Ed*, Retrieved from http://www.insidehighered.com/news/2010/07/14/wgu

Levin, T. (2011a August 25th) Online enterprises gain foothold as path to a college degree *New York Times.* 2011  Retrieved from
http://www.nytimes.com/2011/08/25/education/25future.html?_r=1

Levin, T. (2011b, November 29). Official Calls for Urgency on College Costs, *New York Times*, , 2011 Retrieved from http://www.nytimes.com/2011/11/30/education/duncan-calls-for-urgency-in-lowering-college-costs.html?_r=1

Mak, T, (2011, November 11). Unpaid student loans top $1 trillion. *Politico*. Retrieved from http://www.politico.com/news/stories/1011/66347.html

Miller, B. (2010). The course of innovation: using technology to transform higher Education: T*he education sector.*  Retrieved from http://www.educationsector.org/sites/default/files/publications/NCAT-Report_RELEASE.pdf

Mullin, C.  (2010). Jjust how similar? *Community Colleges and the For Profit Sector*, American Association for Community Colleges. Retrieved from http://www.aacc.nche.edu/Publications/Briefs/Documents/JustHowSimilar_11162010.pdf

National Center for Academic Transformation (2010) *Program in course redesign: round III--projected and actual savings*. Retrieved from http://www.thencat.org/PCR/R3Savings.html

National Center for Education Statistics (2010, a, Table 27). *Expenditures of educational institutions, by level and control of institution: Selected years, 1899-1900 through 2008-09.*  Retrieved from http://nces.ed.gov/programs/digest/d09/tables/dt09_027.asp?referrer=list

National Center for Education Statistics (2010, b). *Enrollment in postsecondary institutions, fall 2009; graduation rates, 2003 & 2006 cohorts; and financial statistics, fiscal year 2009 first look*. Retrieved from http://nces.ed.gov/pubs2011/2011230.pdf

National Center for Education Statistics (2011). *Digest of Education Statistics.* Retrieved from http://nces.ed.gov/pubs2011/2011015.pdf

*New York Times* (2011, September 5). Room for debate—The $10,000 college education. Retrieved from

http://www.nytimes.com/roomfordebate/2011/09/05/rick-perrys-plan-10000-for-a-ba

Open Course Consortium (2010). Open course consortium web site. Retrieved from http://www.ocwconsortium.org/en/courses/search

Open Culture course web site (2011). Retrieved from http://www.openculture.com/2011/11/seven_new_stanford_courses.html

Parry, M. (2010). Outsourced ed: colleges hire companies to build their online courses *Chronicle of Higher Education*, Retrieved from http://chronicle.com/article/Outsourced-Ed-Colleges-Hire/66309/

Parry, M. (2011) Think you'll make big bucks in online ed? Not so fast, experts say. *Chronicle of Higher Education*. Retrieved from http://chronicle.com/blogs/wiredcampus/think-youll-make-big-bucks-in-online-ed-not-so-fast-experts-say/30663

Robinson, B., & Moore, A. (2006). The math emporium virginia tech,  in oblinger, diana, editor, *learning spaces--an educause e-book*. Retrieved from http://www.educause.edu/learningspacesch42

Ruth, S. (2010). Is E-Learning Really Working?   The Trillion Dollar Question, *IEEE Internet Computing* 14(2), March April 2010, pp 80-85

Ruth, S. (2011). Can ICT do more to reduce higher ed costs? A return on investment perspective. *International Journal of Technology in Teaching and Learning*, 6(2), 89-102.

Ruth, S. (2012) The import/export paradigm for high-quality college courses: An answer to tuition's through-the- roof cost spiral?" *IEEE Internet Computing* 16(2), 82-86

Sammons, M., & S. Ruth (2007). The invisible professor and the future of virtual faculty. *International Journal of Teaching and Technology* 4 (1). Retrieved from http://www.itE-Learning.org/Journal/Jan_07/article01.htm

Schell, G. (2004). Universities marginalize online courses: why should faculty members develop online courses if the effort may be detrimental to their promotion or tenure? *Communications of the ACM* 47 (7), 53-56.

Schumpeter (2011, July 9). How to make college cheaper, *The Economist*. Retrieved from http://www.economist.com/node/18926009?story_id=18926009&fsrc=rss

Surowiecki, J. (2003, July 7). What ails us? *The New Yorker*. Retrieved from http://www.newyorker.com/archive/2003/07/07/030707ta_talk_surowiecki

Twigg, C. A. (2011). The math emporium: Higher education's silver bullet. *Change*, 43 (3), 25-34.

University of Freiburg (2011). *Introduction to AI web site*. Retrieved from http://www.informatik.uni-freiburg.de/~burgard/ai_exams/

Vetter, R. (2011, September 5). Controlling campus. *New York Times*, Room for Debate. Retrieved from http://www.nytimes.com/roomfordebate/2011/09/05/rick-perrys-plan-10000-for-a-ba

Warger, T., & Oblinger, D. (2011). Surveying the landscape, *Educause Review* 46 (6). Retrieved from http://www.educause.edu/ero/educause-review-magazine-volume-46-number-6-novemberdecember-2011

Washington Post (2011). *With an extra letter, MIT will offer certificates for coursework in popular online offerings*. Retrieved from http://tinyurl.com/cxedzb4

WGU-Indiana commencement summary (2011).  Retrieved from http://indiana.wgu.edu/graduation_summer2011

WGU-Texas Web site (2011). Retrieved from http://texas.wgu.edu/