WILL VIDEO KILL THE CLASSROOM STAR? THE THREAT AND OPPORTUNITY OF MASSIVELY OPEN ONLINE COURSES FOR FULL-TIME MBA PROGRAMS

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Abstract

This report examines the emergence of the Massively Open Online Course (MOOC) and its impact on business schools. Business schools provide a bundle of benefits to students, only one of which is learning specific academic subjects. The focal technology relevant to business schools is not the MOOC but rather a technology embedded within the MOOC — chunked asynchronous video paired with adaptive testing, a technology we call "SuperText." The SuperText technology opens up at least three pathways for business schools. Via one pathway, SuperText allows institutions to serve more students better and/or more efficiently. Via a second pathway, institutions can serve existing students with fewer faculty members. Along a third pathway, the functions of a business school are unbundled and business schools as we know them are substantially displaced by alternatives. These pathways can be thought of as a menu of options for a business school contemplating how to use the new technologies. Alternatively, these pathways are scenarios that could unfold with or without the active participation of an institution. Although our focus is on business schools, we believe the analysis is relevant to higher education more generally.

Key Words: MOOC, massively open online course, educational technology, MBA, business school, technology, innovation

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1. Introduction

This report examines the emergence of the MOOC and its impact on business schools. Our goal is to contribute to the discussion of how technology in higher education is likely to develop and what its impact will be on existing institutions, faculty, and students.

In sum, our argument is as follows: (a) business schools provide a bundle of benefits to students, only one of which is learning specific academic subjects; (b) the focal technology relevant to business schools is not the MOOC but rather a technology embedded within the MOOC — chunked asynchronous video paired with adaptive testing, a technology we call "SuperText"; and (c) at least three pathways are possible for business schools, and the schools themselves play a role in determining which of those pathways emerge in practice.

Full-Time MBA Programs

The Master of Business Administration (MBA) degree is offered by thousands of institutions globally. Business schools exhibit a curious market structure. The size of a full-time MBA program correlates quite closely with the prestige of the degree — in other words, bigger programs are more prestigious. (In contrast, in many product and service markets, the most prestigious brands sell smaller quantities than the mainstream brands.) This pattern occurs most likely because only a few schools have sufficient brand prestige to attract a large number of applicants willing to quit their jobs and pay program tuition that may exceed $120,000.[1] Full-time MBA programs generate enough cash for each marginal student, and schools will admit as many students as possible who meet the admission standards required to preserve the reputation of their graduates. This market structure applies only to *full-time* MBA programs. The size of part-time and undergraduate programs does not appear to correlate at all with prestige.

For the purposes of this report, we focus on business schools with the largest full-time MBA programs, those matriculating at least 200 students per year. We list these schools in Table 1. Of course this is an arbitrary size cutoff and other definitions are possible. However, readers scanning Table 1 hopefully recognize that these schools represent the largest and most successful business schools in the world.

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[1] All dollar amounts are given in USD throughout the report.

Table 1. *Large Business Schools (Matriculating At Least 200 Full-Time MBA Students per Year)*

Program	Duration (Years)	Students Per Year	Total Program Tuition	Average Graduate Starting Salary	Full-Time Faculty
INSEAD	1	1,024	70,808	115,200	145
Harvard	2	926	112,350	120,700	259
Wharton (University of Pennsylvania)	2	873	114,052	120,605	290
Hult International Business School	1	670	69,800	92,073	48
Columbia	2	640	121,440	116,153	154
Kellogg (Northwestern University)	2	610	113,100	116,864	260
Booth (University of Chicago)	2	588	117,520	116,302	200
IE Business School	1	486	75,800	97,134	95
Ross (University of Michigan)	2	471	100,000	111,417	205
Fuqua (Duke University)	2	434	110,600	112,751	147
London	1	409	53,892	108,212	135
Stanford	2	405	119,100	125,592	237
Sloan (MIT)	2	402	122,880	118,406	112
Stern (New York University)	2	393	114,936	107,450	346
IIM Ahmedabad	2	380	21,562	31,354	105
Anderson (UCLA)	2	362	97,446	104,728	160
Rotman (University of Toronto)	2	334	91,460	83,067	102
Darden (University of Virginia)	2	314	96,804	111,171	108
Johnson (Cornell)	2	312	116,384	109,000	95
Schulich (York University)	2	310	62,724	80,000	94
Kenan-Flagler (UNC)	2	288	63,020	105,397	115
Yale	2	280	114,400	110,656	72
Tuck (Dartmouth College)	2	280	123,210	115,031	97
McDonough (Georgetown University)	2	257	101,856	102,177	132
McCombs (University of Texas)	2	256	66,596	106,277	117
Haas (UC Berkeley)	2	249	24,490	117,738	216
Marshall (USC)	2	248	100,990	103,325	264
Tepper (Carnegie Mellon University)	2	212	114,912	110,405	135

Note: *In-state tuition shown for public institutions.*

Abbreviations: *IE, Instituto de Empresa; IIM, Indian Institute of Management; MIT, Massachusetts Institute of Technology; UC Berkeley, University of California, Berkeley; UCLA, University of California, Los Angeles; UNC, University of North Carolina; USC, University of Southern California.*

Sources: *Business Week, Poets and Quants, Princeton Review, and individual school websites.*

Much of the value of the degrees delivered by these large programs derives from their exclusivity. A self-reinforcing cycle of low admission rates, highly qualified students, high starting salaries, and high numbers of applicants preserve the perceived value of the schools' degrees.

Many additional schools have large part-time MBA programs (e.g., Colorado State University with 1,268 students). These schools typically offer a very small full-time MBA program under the widespread belief that a full-time MBA program enhances the school's overall reputation, possibly because rankings are conducted separately within the full-time, part-time, and executive MBA categories. These schools typically run their small full-time MBA programs at a financial loss, using scholarships and other subsidies to attract students.

Our Perspective

We have taught thousands of Wharton full-time MBA students in both core and elective subjects and have taught in the full-time MBA programs of several other schools listed in Table 1. Several of our doctoral students are now faculty members teaching in MBA programs. Thus, we feel we know business schools quite well. Since 2012, we taught two of the first (and largest) MOOCs in the history of higher education and have been involved in the Wharton Foundation Series MOOCs, which have enrolled more than one million participants.

While this report focuses on business schools, we believe that it has implications throughout higher education and corporate learning. In our view, business schools are a particularly useful microcosm for studying how online learning will impact universities.

This report is organized in four remaining sections. We next describe the key activities within full-time MBA programs and analyze the basic economics of instruction. In Section 3 we describe the focal technology embedded within the MOOC, which we call SuperText. Section 4 outlines three possible pathways that may play out for business schools given the promise of SuperText. Section 5 provides implications for business schools themselves and for the institutions participating in other areas of business education.

2. Activities and Economics of Full-Time MBA Programs

In order to understand the potential impact of a new educational technology on business schools, we need to understand the existing educational systems. This section lays out the functions of a business school, its organizational structure, and its basic economics.

In their journey through a full-time MBA program, students engage with many different parts of the business school and spend their time on a wide array of activities. The first interaction is usually with the school's admissions office. In most business schools, the admissions process is managed by staff members, not faculty, sometimes in combination with interviews conducted by current students or alumni.

Once admitted and matriculated, students participate in three sets of activities:

1. **Career management.** MBA students come to business school to accelerate or change their careers. The career management function in most business schools is therefore heavily staffed. Faculty are rarely involved in this activity. However, fellow students are essential and help by giving advice, providing connections, and assisting with interview preparation.
2. **Teaching and testing.** Teaching and testing is the domain of the faculty. Courses are generally offered by professors holding doctoral degrees. Testing happens exclusively at the course level. Unlike with the bar exam for lawyers or medical board certifications, the MBA is a collection of course credentials. Testing at the course level at the end of each course not only reduces student anxiety but also minimizes faculty coordination.
3. **Cocurricular activities.** MBA students exhibit impressive skill at organizing outstanding events, including conferences, career treks, outdoor expeditions, golf tournaments, international culture shows, and comedic stage performances. As much as the MBA program serves as a launch pad for the next career move, it is also a time to collect interesting experiences and to develop leadership skills. Such cocurricular activities are almost exclusively organized by students.

After graduation, MBA students join the alumni networks of their schools. Alumni provide an important social connection, help oversee the administration of the school, and provide substantial amounts of funding in the form of gifts. Business schools typically employ dozens of staff members dedicated to alumni relations and fundraising.

In its traditional form of on-campus delivery, an MBA program requires a set of support processes. These include human resource functions, finance and accounting, information technology, classroom support, and various campus services (security, food, janitorial, purchasing, etc.). Some of these services are outsourced to third parties, but many are provided by school or university staff.

The activities that create an MBA program are summarized and stylistically represented in Figure 1. The figure shows the previously discussed activities alongside the constituency in charge of executing the activities.
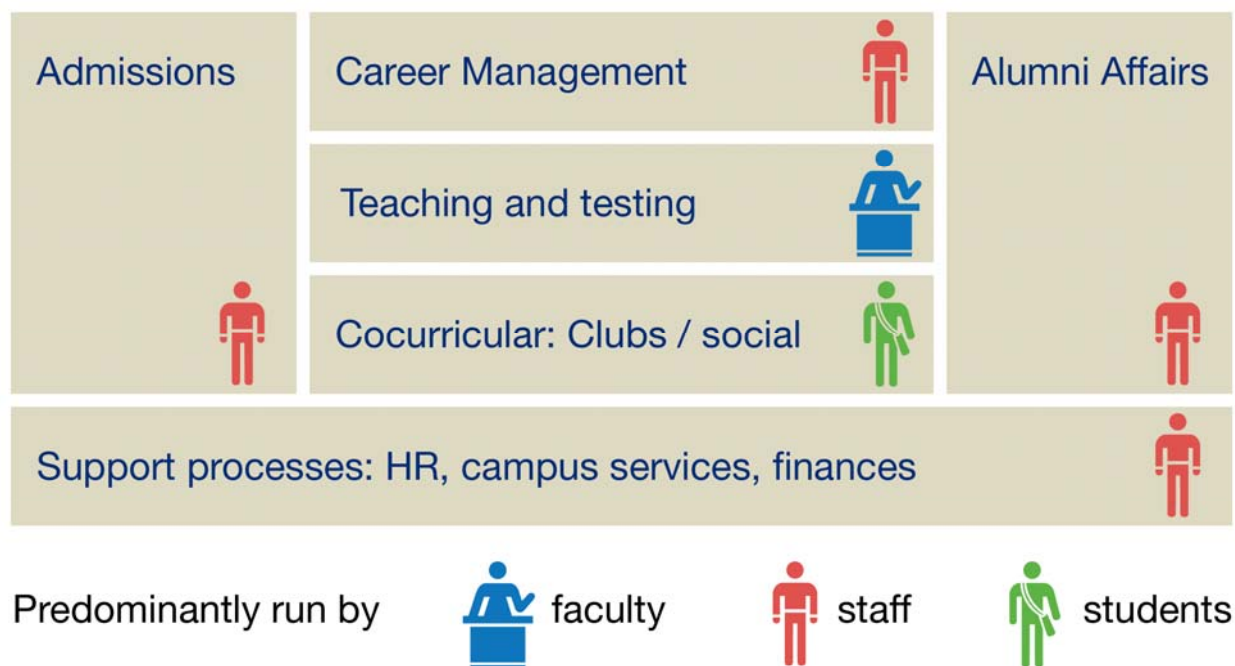

Figure 1. *Activities and associated responsible personnel for the functions of an MBA program.*

Organizational Structure

As in all of higher education, the budgets of business schools are driven primarily by personnel expenses. Business schools typically have 1 faculty member for every 10–20 students. In addition to the faculty, the schools typically employ about 1 staff member for every 5–10 students.

Though schools vary in their exact organizational structure, business schools share a number of organizational characteristics, including the following:

- Faculty are organized in academic units that are created based on research disciplines (e.g., Finance, Marketing, Accounting, etc.).
- Faculty report to a unit leader (e.g., department chair) or directly to the dean's office. Most schools have a special position for the dean overseeing the entire faculty, such as deputy dean or dean of faculty.
- Academic units (with more or less guidance from their unit leaders) make many critical decisions, including recruiting new faculty, creating new courses, and staffing existing courses.
- Each of the 20 or so discrete courses taken by a student typically maps to a particular academic department.
- The MBA program is typically led by a faculty member (often with a title, such as associate dean or vice dean of the MBA program). This position directs a sizable support staff doing many of the MBA-related activities described in Figure 1 (e.g., admissions, career management, advising, etc.). However, the position rarely has formal administrative influence on the faculty teaching courses.
- The role of the faculty in an MBA program tends to be confined to just one of the five functions of the program: teaching and testing.

We observe that business schools have a rather modular structure. A key characteristic of modular systems is that elements of the system can easily be exchanged or replaced. In the context of business schools, modularity facilitates recruitment of new faculty and minimizes institution-specific investments by the faculty. It also enables the school to outsource some of the courses to visiting or adjunct faculty. This modularity also enhances the possibility that faculty can be displaced as instructors.

Modular systems also tend to have low coordination costs, a feature that minimizes the demands on faculty time to design and deliver courses. Once the academic disciplines are defined and agreement reached about how much of a particular subject is taught in the MBA program, the administration of an MBA program and the faculty offering the courses require limited coordination. The same is true for the coordination among academic departments. Once curriculum is established, academic departments operate relatively independently.

How Much Does It Cost to Teach an MBA Student?

Any cost calculation requires assumptions about the allocation of faculty time. Based on the time commitments we observe and to keep the analysis simple, we assume that faculty members spend 50 percent of their time on instruction. Based on the publicly

available faculty salaries at state schools among the public business schools in Table 1 (i.e., Michigan, Berkeley, North Carolina), we observe that the average tenured or tenure-track business school professor across all ranks is paid about $200,000 per year. If one adds other costs, such as benefits, sabbaticals, and administrative support, the cost of employing a tenured or tenure-track faculty member grows to about $300,000 per year.

In return for this compensation, the faculty engages in research, teaching, and administration. At most of the schools in Table 1, a full-time faculty member teaches 3 courses (with an average of about 35 contact hours per course). Thus, if half the cost of a faculty member were allocated to instruction, then the cost of instruction would be (50 percent of $300,000) / 3 courses = $50,000 per course. If we add costs for teaching assistants, teaching materials, and some indirect costs related to facilities and assume an average class size of 40 students, we see that it costs $1,475 to provide a student course via a tenured or tenure-track professor in a large full-time MBA program (Table 2).

In order to estimate the *price* a student pays for a course, we have to make an assumption about how much of the tuition revenues ought to be allocated to coursework. Again, in the interest of simplicity, we allocate 50 percent of tuition to coursework, with the balance associated with the other elements of the program. The full tuition for a 2-year MBA education at a private institution in 2014 is about $120,000. This implies that the student pays $60,000 for the 20 courses typically required for an MBA, or $3,000 per course (Table 2). This is the "list price"; some students actually pay less because of scholarships and grants.

Part-Time Faculty

An increasing fraction of instruction in higher education is done by part-time and adjunct faculty. Based on an informal survey of colleagues at other institutions, part-time faculty at the larger business schools seem to be paid from $15,000 to $25,000 per course. (Note that adjunct business school faculty are paid quite well relative to part-time instructors in, for instance, the humanities.) Let's assume pay of $20,000 per course and employee benefits and other administrative support costs of an additional 50 percent, for a total cost of instruction by an adjunct faculty member of $30,000 per course. At that cost and with an average class size of 40 students, the instructional cost drops to $975 per course and student (see Table 2, right column). This is considerably less expensive than the cost of full-time faculty, unless one assumes full-time faculty members allocate less than about a quarter of their time to instruction.

Table 2. The Economics of a Large Business School: Instruction Cost and Price for a Course

	Tenure-Track Faculty	Adjunct Instructor
Faculty salary, benefits, and overhead per year	$300,000	—
Allocation of faculty cost to teaching	50%	—
Number of courses taught per year	3	—
Instructor cost per course	$50,000	$30,000
Teaching assistant cost per course	$2,000	$2,000
Infrastructure cost per course	$5,000	$5,000
Total cost per course	**$57,000**	**$37,000**
Average enrollment per course	40	40
Cost per student per course	$1,425	$925
Text/SuperText fee per student	$50	$50
Instructional cost per student per course	**$1,475**	**$975**
Total tuition from student	$120,000	$120,000
Allocation of tuition to coursework	50%	50%
Number of courses	20	20
Effective "list price" per course	**$3,000**	**$3,000**

The Cost of Scholarship

Even though instruction is expensive, tuition substantially exceeds instructional costs in most MBA programs. Much of that excess is used to support scholarly research by faculty members.

Many believe that scholarly research helps to increase the reputation of a school and is central to the mission of the institution, and so almost all large business schools heavily invest in research. Research is largely carried out by the tenured or tenure-track faculty.

Just as we estimate the cost of educating a student in the classroom, we can estimate the cost of creating a unit of knowledge via faculty research. To be consistent with the teaching analysis, assume faculty members spend 50 percent of their time on research. For our analysis, we consider the published academic paper as the atomic unit of knowledge. Business school faculty members publish in scholarly journals, such

as *Management Science*, *Marketing Science*, and the *Journal of Finance*. Though there are hundreds of such academic journals, the academic community holds at least an implicit agreement that only some of these journals are top journals (also referred to as "A journals"). So, what does it cost to create a unit of knowledge that is of sufficient quality to appear in an A journal? Based on an informal survey of faculty vitae, we observe that faculty members at top business schools publish about 0.75 A journal articles each year with an average of 1 coauthor. As we show in Table 3, it costs a business school about $400,000 for every article published in an A journal.

Table 3. The Cost of Creating an A Journal Article

Faculty salary, benefits, and overhead per year	$300,000
Allocation of time to research	50%
Number of A journal articles produced per year	0.75
Cost per author publication	$200,000
Number of authors	2
Cost per article	$400,000

3. What Is the Focal Technology?

The MOOC, or *Massively Open Online Course,* is a new educational experience defined by these four attributes:

- A very large number of participants per offering of the course. For the Wharton MOOCs, registration has ranged from 20,000 to 150,000 each time the course is offered. Thus, massively.
- Very low cost, often free, with no admission requirement. Thus, open.
- Content delivered asynchronously via the World Wide Web. Thus, online.
- Structured and sequenced content, with periodic assessment. Thus, course.

Wharton has created 14 MOOCs, including 4 courses that comprise the foundation series (i.e., marketing, operations, accounting, and finance). The foundations series has attracted over one million registrants.

A common pattern of MOOCs is the large difference between the number of students that enroll in a course and the number who actually complete the course (enrollment is free after all). In line with other MOOCs, the completion rate for our MOOCs has been slightly over 5 percent. In other words, over the course of the last 2 years, over 50,000 student course equivalents were delivered by Wharton faculty via the MOOC.

The cost structure of the MOOC is very different from that of traditional instruction. Once a course is developed, it can be offered over and over again at low marginal cost. Based on our courses, we estimate development costs of about $70,000, with $50,000 for faculty time and $20,000 for video production resources. The actual out-of-pocket spending at Wharton was much less than this, as the initial MOOCs were largely developed by enthusiastic faculty with limited support staff or additional compensation. However, we believe $70,000 is a fair estimate of the long-run actual and opportunity costs of developing a MOOC. After 4 offerings, our Operations Management course had cumulative enrollment of 250,000 students, of which about 12,500 fully completed the course. This course was unusually successful, so in our analysis we assume 10 offerings to achieve enrollment of 250,000. Table 4 shows that the cost per enrolled students is about $0.56. If one considers that business schools may pay $1 or more to Google for a click on an AdWords ad, this can be thought of as very inexpensive advertising. Even if one only counts the students who complete a course, the cost per completed course is about $11 per student, still a factor of 100 improvement in productivity relative to the cost of instruction in the conventional MBA program. Given this large cost difference, we feel the qualitative insights we derive are not terribly sensitive to the assumptions in our estimates.

Table 4. The Cost of a MOOC

Development cost (faculty)	$50,000
Development cost (production)	$20,000
Total development cost	**$70,000**
Teaching assistant (per offering)	$2,000
Technology and support (per offering)	$5,000
Marginal cost of each offering	**$7,000**
Total cost for 10 cycles of offering	$140,000
Total students registered over 10 cycles	250,000
Cost per registrant	**$0.56**
Total students completing coursework (5%)	12,500
Cost per completing student	**$11.20**

The SuperText Technology

One could characterize the MOOC itself as a technology. However, we do not believe that the "MOOC-ness" of the MOOC is the main threat to business schools. Participation in MOOCs is global, and the typical participant is an educated adult usually seeking education for enjoyment or to address a particular problem at work (Christensen, Alcorn, Emmanuel 2014). Those distinctive aspects of the MOOC seem only loosely relevant to the typical full-time MBA student, who is seeking the prestige associated with a degree limited to just a few graduates per year.

We believe that embedded within the MOOC is a more focused technology, which we will call SuperText. This technology is characterized by:

- Content authored by a recognized expert and delivered primarily via short video segments.
- Chunking of content so that a specific instance of a course can be customized to particular learning objectives.
- Within an instance of a course, semisynchronous pacing in which a batch of new content and assignments are released by a course administrator periodically (usually weekly). Between releases, students consume the content when and how they wish.
- Assessment that can be adapted to the learning objectives set by the course administrator.
- Students interact with a course administrator and with each other but not typically with the expert content author.

It is SuperText that poses the threat and the opportunity. The MOOC, we argue, is a Trojan horse: While public attention was focused on the *massive* and *open* characteristics of the courses, the SuperText technology quietly proved highly effective as a learning technology.

SuperText offers substantial promise for further improvement. In future generations of the technology, we can imagine that delivery of content and assessment may be adaptive and responsive to learner needs and capabilities. Production and delivery mechanisms are also likely to improve quickly as the new technology matures.

One might ask, What is so special about SuperText? What can it do that cannot be done with a printed textbook? Technically, the SuperText content could be substantially equivalent to a printed textbook . However, we believe that the dominant pedagogical approach will probably be driven by average student preferences, and

those preferences appear to be for video. The apparent preference of current students for video coincides with the popularity of YouTube, TED Talks, Lynda.com, and the Khan Academy, among other media distribution channels. From the perspective of the next student generation, SuperText is more convenient and more enjoyable than a printed textbook.

In addition to cost, convenience, and enjoyment, we obviously care about learning outcomes. Research has demonstrated that, for a given student population, online instruction leads to learning outcomes at least as good as those of conventional instruction (Means et al. 2010).

One might hypothesize that SuperText would be limited to structured and analytical course content and thus would be inferior in tackling complex or loosely structured domains. This may have been true of early efforts at distance learning when content was broadcast via television or distributed in the mail. However, the recent developments in technologies supporting online communities enable rich, unstructured interaction among students. Figure 2 shows an example of a course project from our Coursera class on design — hardly an outcome of rote learning. Similarly, our operations class engaged students with projects related to their jobs, and the outcomes impressed students and faculty alike. Moreover, the asynchronous and remote technology allows participants to engage with SuperText while being employed at work. Instead of faculty writing up business situations in the form of case studies and bringing them to the classroom as documents, SuperText challenges the boundaries between class time and professional life.

Figure 2. Example of a student project from the Coursera design course
(Source: abdallacoursera.weebly.com).

SuperText as the New Frontier

All organizations educating students face a fundamental trade-off between cost and quality. One might argue that such trade-offs exist for all organizations, including restaurants, automotive companies, and health care providers. In education, the trade-off between cost and quality is most visible in the student-to-faculty ratio, which is a result of how much time, on average, a teacher can spend with a student. Consider the resource of faculty time, be it for one individual instructor or the collective faculty time of a business school. Figure 3 describes the school's trade-off between cost and quality. We can think of two extreme ways in which faculty time is deployed:

- One-on-one (e.g., teaching in office hours). With one student at a time, the professor is able to adapt her teaching exactly to the needs and interests of the student. (Where does the student struggle? What career is the student interested in?) The result of this interaction is a large degree of learning for the student per unit of faculty time. Yet, this learning mode is not an efficient use of faculty time.
- Lecture or case discussion. The same professor could teach a group of 60–80 students, a typical business school cohort. From the school's perspective, this substantially improves efficiency. For the same amount of faculty time, many more students can be educated (and charged tuition). However, quality suffers to some extent, as the professor has to follow a one-size-fits-all strategy. (Of course, there may be other benefits to learning in a cohort beyond efficiency.)

The cost-quality line does not have to be as neat and smooth as depicted in Figure 3. Moreover, the line is likely to vary across faculty, with a good professor being able to engage students, draw on the diverse background of the students, help students to learn from each other, and adapt the pace as needed. Nevertheless, we argue that schools face a cost-quality trade-off and that economies of scale are substantial in education. This trade-off is the basis for the efficient frontier of conventional instruction.

The SuperText technology discussed in this section shifts the efficient frontier in education. The technology combines the adaptive nature of office hours, the charisma of the best educators, the convenience of "anywhere and anytime," and economies of scale in production. Unlike most previous innovations in education, the shift of the frontier is large and, in the case of the MOOC, can translate to a hundredfold increase in productivity.
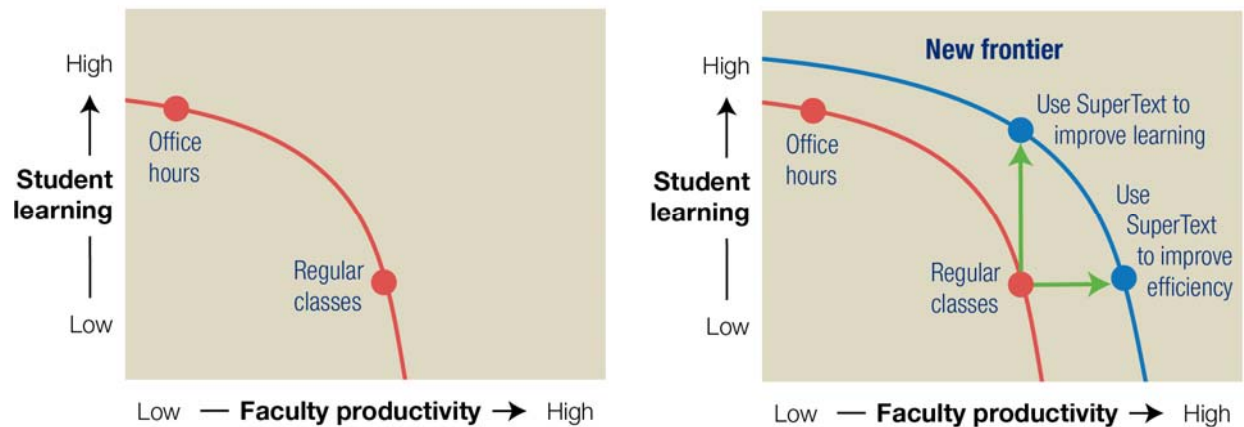
Figure 3. The efficient frontier and the impact of the SuperText innovation.

4. Implications of SuperText

We now articulate three pathways for how business schools can take advantage of, or be passively influenced by, the new technology and the shifted efficient frontier.

1. Pathway 1 assumes that the size of the faculty is fixed. With a fixed amount of faculty time, a more efficient technology will lead to more output.
2. Pathway 2 assumes that, because of a limited job market for elite students, the production of graduates is fixed and the more efficient technology will reduce the input of faculty time.
3. Pathways 1 and 2 both assume that the SuperText innovation only affects the teaching and testing function of the business school. The innovation is contained in one component of the bigger system. Pathway 3 challenges this assumption. In Pathway 3, we discuss the possibility that the entire architecture of business school education could be altered by the SuperText technology.

Pathway 1: Status Quo Plus

By construction, Pathway 1 is relatively close to the status quo; we call it "status quo plus." Pathway 1 is based on the dual assumptions that the architecture of the business school stays the same and the number of faculty employed stays roughly constant. Using the same input and a substantially more efficient technology enables a school to either increase the amount of learning per student or to increase the number of students. Consider each of these two alternatives.

Serving Additional Students

Technically, a school could just grow. However, we believe that the full-time MBA populations for the largest business schools cannot grow significantly. Elite business schools by definition serve a small population in their degree programs. If they did not, their degrees would lack prestige. The number of MBA graduates that can be considered elite globally is probably less than 10,000 per year (see Table 1). This corresponds closely to the number of professional and managerial jobs with annual salaries more than $100,000 that are offered each year to 27–32 year-old graduates.

While growth in full-time enrollment is unlikely, business schools can reach additional nondegree students using SuperText. One way to do so is by using the MOOC previously discussed. Spending pennies per enrolled student, the MOOC is an efficient mechanism to build reputation. Instead of relying on scholarly research to support the brand of the school, MOOCs can showcase the quality of the faculty directly. Based on our previous cost estimates, we observe that a single A journal article (at a cost of $400,000) is enough to pay for the development of about six MOOCs.

In addition to using SuperText for outreach, schools might also turn to SuperText to generate additional revenues through continuing education for working professionals, usually referred to as executive education. Presently, we observe two types of online executive education offerings in the market. In one case, a faculty instructor is heavily involved not just in the development of the content but also in its regular delivery. With this approach, the costs of delivery are comparable to traditional in-class education. The main benefit to the participant is convenience. Price points for such programs tend to be in the range of $2,000 to $4,000 per course. An alternative is to offer the course in a format more similar to a MOOC, though potentially with some more support in the form of a course administrator. In this alternative, the faculty member is involved in the production of the course but not in its delivery. Therefore, such offerings can be profitable even with a price point of a few hundred dollars. Table 5 is an estimate of the relative economics of these two approaches to online executive education.

Table 5. *Online Executive Education*

	Online Executive Education with Tenure-Track Faculty	Online Executive Education Using SuperText
Development cost	$35,000	$70,000
Recurring teaching cost (faculty)	$50,000	—
Course administrator	$2,000	$20,000
Technology and support for delivery	$5,000	$5,000
Recurring cost per offering	$57,000	$25,000
Enrollment per offering	40	1,000
Enrollment over lifetime	400	10,000
Development cost per participant	$88	$7
Delivery cost per participant	$1,425	$25
Total cost per participant	$1,513	$32
Price point per participant	$4,000	$400
Surplus generated over lifetime	$994,800	$3,680,000

More Learning for a Fixed Student Population

In addition to increasing the number of students that interact with the business school, Pathway 1 can also direct the efficiency gain toward those who already interact with the school and thereby provide them with a better learning experience. This can happen in three different forms:

- Before coming to campus. Certain requirements for incoming students might be taught online using SuperText, possibly even making performance in preparatory courses part of the admissions process.
- While on campus. If the business school finds a way of moving some content via the SuperText technology to outside the time of traditional class hours, it frees time for new experiences. These could take the form of site visits, global immersion programs, design projects, or other activities that enhance learning through experience. Recently, Wharton launched a series of global modular courses. In one course, a group of 27 Wharton MBA students traveled to Rwanda to learn about the country's economic transformation and its renewal following the tragic 1994 genocide. Such experiences could take a more prominent role in the MBA program if SuperText frees up time in the curriculum.

- After graduation. One stakeholder group that we noticed in our Wharton MOOCs is Wharton alumni. Instead of limiting the learning of students to their time on campus, SuperText enables the school to catalyze ongoing learning in the alumni community.

Pathway 2: Displacement of Faculty by SuperText

Prior to the 20th century, entertainment was predominantly delivered in playhouses and in public places where clowns and actors performed live. The advent of motion pictures changed entertainment. Why go and see a local clown in the town square if you can watch one of the best in the world on the big screen? Motion pictures changed entertainment for those consuming it, but even more so for those who provided it — most of whom lost their jobs. Are business school faculty the clowns of the 21st century?

As along Pathway 1, with Pathway 2 business schools remain essentially intact as institutions, perform similar functions as today, and educate the same number of students. However, because of the shift in the efficient frontier, the number of employed faculty members declines dramatically.

SuperText could be used by a course administrator, which we refer to as a "preceptor" (Harker 2013). The students could meet once or twice per week in a conventional classroom setting, having previously completed portions of the SuperText. Classroom time could be used for discussion, to clarify topics, to work problems in small groups, or for other experiential activities. This approach has sometimes been called "flipping the classroom." Its key characteristic, however, is that the subject matter authority is channeled via the SuperText and a less authoritative figure, the preceptor, coordinates any live interactive sessions. Indeed the preceptor would ideally be more skilled at the live interactive elements than would be the typical content author. For instance, the preceptor might be particularly good at working with small groups, at diagnosing common learning obstacles, or at facilitating group activities — none of which necessarily require cutting-edge subject matter expertise.

As the preceptor is paid a lower salary and commits a higher percentage of time to education, the cost per course decreases substantially. The analysis shown in Table 6 demonstrates that costs go down by about 40 percent. This is certainly a much smaller change compared to our MOOC analysis, however, the preceptor model is offered in the same class sizes and in the same campus settings as traditional education.

One might argue that Pathway 2 is unlikely to occur. After all, the top business schools do not seem to be under significant price pressure. We do not believe that there is significant pressure on the list price in full-time MBA programs. Students will remain willing to pay $120,000 to obtain a prestigious credential and a high-paying job. The competition will not be seen in the list prices at these schools, but instead in the discounts offered to the best students in the form of scholarships and grants and in the amenities and cocurricular elements of the programs. The top business schools already provide lavish student lounges, remarkable global travel (including to Mount Everest and Antarctica), and amazing athletic facilities. Scholarships, grants, and these extras impose a crushing force on business school budgets. If an institution is offered a technology, SuperText, that offers a 40 percent cost advantage, we believe the technology is likely to be irresistible and adopted in the long run.

Another argument against the occurrence of Pathway 2 is that scholarly research is essential for a quality business school education. Research may be essential to the quality of education, but we do not feel that this belief has yet been supported empirically. (We understand that this is a highly controversial position, particularly among our faculty colleagues.) The prestige of business schools and scholarly research are indeed correlated, and there may actually be some causal relationship between scholarship and the prestige of a degree. However, some of that causation may be via the metrics used to construct rankings, which makes the connection fragile. The fact that Stanford and Harvard, arguably two of the most prestigious business schools, can have diametrically opposed approaches to scholarship (one highly theoretical and one based in field work) suggests that the relationship between scholarship and prestige is not large or direct.

Pathway 2 may not play out for a large number of institutions. If it does, however, there will be dramatically fewer tenured and tenure-track faculty in business schools. Interestingly, those who remain may actually be paid more as individuals. To the extent that the faculty members who remain are the authors of SuperText content, they will likely be able to capture some of the value created by the new technology, probably in the form of royalties.

Table 6. Cost Analysis of the Preceptor Model

	Tenure-Track Faculty	Preceptor
Faculty salary, benefits, and overhead per year	$300,000	$120,000
Allocation of faculty cost to teaching	50%	100%
Number of courses taught per year	3	6
Instructor cost per course	$50,000	$20,000
Teaching assistant cost per course	$2,000	$2,000
Infrastructure cost per course	$5,000	$5,000
Total cost per course	**$57,000**	**$25,000**
Average enrollment per course	40	40
Cost per student per course	$1,425	$675
Text/SuperText fee per student	$50	$150
Instructional cost per student per course	**$1,475**	**$825**
Total tuition from student	$120,000	$120,000
Allocation of tuition to coursework	50%	50%
Number of courses	20	20
Effective price per course	**$3,000**	**$3,000**

Pathway 3: Unbundling of Business School Activities

We constructed Pathway 2 from the perspective of the school, the organization supplying the education. Because teaching a course is a modular component in the functioning of a business school, the SuperText technology can replace a large chunk of the faculty with relatively little impact on the student and the rest of the business school. As we construct Pathway 3, we now shift our perspective from the school to its students. This shift to the demand side allows us to find more radical ways to alter the way the students' needs are met.

As discussed in Section 2, students seek to fulfill several needs in their time at business school: learning skills and knowledge, making career transitions, connecting into a social network, and establishing a prestigious credential. Can these needs be served with a very different approach, one that potentially unbundles the functions of the existing business school?

Consider the role of credentialing first. Being chosen out of a large applicant population, being willing to forego two years' worth of salary, and paying $120,000 all

provides a strong signal of quality. But is this the only way for students to distinguish themselves? Advances in technology, some of them related to SuperText and MOOCs, now offer alternatives. Imagine a student who ranks in the top 100 students in a class of 100,000 students. Imagine a student whose design was chosen among 5,000 competing proposals. SuperText in the context of a MOOC allows job seekers to differentiate themselves from the crowd by displaying knowledge that is highly relevant to employers. Other ways of standing out from the crowd may emerge as well. For instance, "hackathons" have become an important mechanism for identifying talent in software engineering, and similar events may provide that function for managerial talent.

Next, consider the educational aspect of business school. Why does a student want to learn a particular element of knowledge? Unlike some areas of higher education, in which knowledge is pursued for its intrinsic value, business schools are focused on providing professional skills that have some future value in the workplace.

In that sense, getting an MBA education is like purchasing a Swiss army knife — you buy it today to use it one day in the future — but you know neither when you will use it nor which part of the knife you will use first. The Swiss army knife analogy reveals a few weaknesses in our current way of delivering business education. These include the following:

- A long time can elapse between learning a chunk of knowledge and applying it.
- The delay between acquiring the knowledge and benefitting from the knowledge makes it difficult for students to judge if and to what extent the content they learn is useful. Short of immediate feedback, instructors struggle to select the most relevant material and students may lack the motivation to learn.
- Another consequence of the delay between knowledge acquisition and deployment relates to salaries. Students want to benefit financially from the acquired knowledge through a higher salary upon graduation and not wait until they have benefitted from the deployment of their new knowledge on the job. For them to be compensated for something they have not done yet, certification of their skills and ability is important.

From the students' perspective, the Swiss army knife metaphor follows this pattern: learn-learn-learn-certify-wait-wait-wait-deploy. And that is the best-case scenario, omitting scenarios in which the student learns something that was either useless or forgotten along the way.

Does business school education have to be like this? The main reason that this pattern exists is because education at business schools is fundamentally driven by scale economies. Students come to one location and they take the courses whenever there are enough students to make a course offering economical. As we have seen, the strength of the SuperText technology is that it can break the trade-off between cost and quality. Once content is developed, scale economies are not needed — students learn anything, anywhere, whenever they want. So what new business models then become feasible for a business school?

With SuperText, business education has the potential to move to mini-courses that are delivered to the learner as needed, *on demand*. This eliminates the wait between learning and deployment. The new pattern becomes learn-certify-deploy, learn-certify-deploy. This pattern is the analogue to the just-in-time production strategy in manufacturing.

In fact, this model can be taken even one step further. Certification of skills is really a by-product of the current way of learning. Because it takes a long time between acquiring the business knowledge and deploying it, certification is needed. Why certify a skill if it gets deployed the next day? In a world of immediate deployment, the attractiveness of a manager on the job market does not hinge on what has been certified but what has been demonstrated.

Some have referred to this form of business school education as the iTunes model. Consumers used to buy albums of artists to obtain their music, typically by purchasing a compact disk from a retail outlet. iTunes empowered consumers to buy only the songs they wanted and to enjoy that music whenever and wherever desired. Cloud-based computing, software-as-a-service, and entertainment subscription services have the same on demand business model.

The for-profit education provider Lynda.com, with its slogan "What do you want to learn today?", probably comes closest to what we have in mind for Pathway 3. The website offers an assortment of more than 4,600 courses focused on job-related skills. Earlier this year, Lynda.com secured over $100 million in funding, an amount that is 100 times larger than what Wharton has invested in its MOOC initiatives.

Would such iTunes-like business education models wipe out the full-time MBA program? Not necessarily, but it would at least dramatically change the way in which business education is delivered. Scale economies would continue to exist, though they would shift from the delivery to the production of the content.

The biggest change, however, would lie in the development of content. For every bit of content a school creates within the on demand model, it directly observes how many students seek the material. The event that triggers enrollment to a course shifts from "I need to complete my degree" to "I face this problem on the job right now." This increased visibility into the application of business knowledge would give both students and faculty an increased appreciation of which chunks of knowledge really do get applied on the job and hence lead to a better match of supply with demand. This has the potential to guide research and development of new content to where it adds the most value to the learner.

5. Implications and Recommendations

In the previous section, we articulated three pathways corresponding to various ways that the SuperText technology may relate to business schools. We use the word "pathways," as we believe that, taken together, these technology applications constitute a menu of actions that are available to the institutions. To some extent, schools can choose and determine their own digital future. However, we also can think of the pathways in a more passive way. Even if a given school decides not to use the SuperText technology at all, chances are that the technology will still be adopted by a rival. This might be driven by decisions by other incumbents, but it also might be the result of new entrants into the business school market, aspirational schools that see opportunity in the wave of change created by the new technology, or new for-profit entrants. In that sense, we can think of the three pathways as three scenarios, outlining various possible future states of the world.

We believe that the three pathways we articulate in this report have far-reaching implications for individual faculty, business schools, and the educational community more broadly.

We recommend these actions for individual faculty members:

- Every faculty member should enroll in an online course related to their area of teaching. Enrolling in a course is the fastest and cheapest way for faculty to understand the current status of the SuperText technology and to make one's own assessment of whether and how it can alter business education.
- Every faculty member should experiment with some elements of the SuperText technology. Instructors should take advantage of the new technology as described in Pathway 1. This allows them individually to shift their efficient frontier for their own teaching. At least in the short term, the shifted frontier

allows them to improve student learning for the same amount of faculty effort or deliver the same outcome with less effort.

- Move into or create forms of teaching that will not be captured by SuperText. At a price point of over $100 per session, a classroom encounter between students and faculty should be a significant event, a true experience. In the future, it will become increasingly difficult to justify this price to the student for a lecture that can easily be delivered via SuperText. To the extent that faculty perceive SuperText as a significant threat to their employment, such focus on classroom experiences provides an advantage unlikely to be eroded.

Some of the implications for individual faculty members translate directly to implications for the business schools at the institutional level. Schools need to strengthen the experiential aspects of their programs. They also should experiment with the SuperText technology to prepare them for whatever scenarios might unfold. Beyond this, we recommend the following:

- Experiment with the SuperText technology where it creates new demand rather than where it is a potential substitute. As discussed in Pathway 1, the natural place for business schools to experiment are noncredit courses offered to students who would otherwise never be in contact with the school. Alternatively, schools can free up resources using the efficiency of SuperText and reallocate them toward further increasing the quality of their educational experiences.

- Build a clear strategy mapping SuperText applications into learner segments. At many schools, the current debate around SuperText has the flavor of "should we offer a MOOC or not?" We believe that this question is misleading. The school should start its discussion around SuperText by first identifying a set of populations it wants to engage. The school should then create targeted SuperText offerings for these segments. Here are some examples: A school might use a MOOC for building its brand in the population at large. It might offer an online course for newly admitted students with a focus on spreadsheets or statistics. And it could offer highly specialized courses that it cannot offer on a regular basis to its currently enrolled students or use SuperText to support placement and waiver decisions.

- Consider MOOCs as an alternative brand-building mechanism for the general public. A population that can be served at relatively low cost with SuperText is the general public. MOOCs provide business schools with ways of reaching an enormous audience, attracting applications, increasing yield, or increasing prestige. As we have seen, MOOCs allow schools to reach individuals at very low cost. While we do not know the exact cause, applications at the University

of Pennsylvania rose an amazing 15 percent in 2014, the first year following the launch of our Coursera offerings.

- Create new course load policies that accommodate teaching with the SuperText technology. Tenured and tenure-track faculty at business schools have clearly defined teaching loads, usually "three courses per year." What does it mean to teach three semester-long courses using SuperText? How does a MOOC with 100,000 students count toward fulfilling that teaching load?

- Intellectual property policies. By convention, faculty members own the copyright to their published work and usually do not share royalties with their employer. Textbook royalties can easily exceed a million dollars over several editions, and SuperText royalties offer even greater revenue potential. Will royalties be paid to authors? Will those royalties be shared with universities?

- Explicitly account for the cost of research. Business schools have created MBA programs with a very modular architecture. This has allowed them to reduce coordination costs across courses. It also enables a clearer demarcation between the teaching function and the research function, which in turn facilitates the recruitment of new, adjunct, and visiting faculty. However, to the extent that the SuperText technology provides a more cost-efficient alternative to the teaching function of the business school, cost pressure is likely to mount. This increased cost pressure will make it even harder for schools simply to fund their research activities through cross subsidies from tuition. This should be a healthy force in business schools, causing reflection on the value of faculty scholarship and requiring that scholarship be funded explicitly.

- Be careful with faculty size and tenure. Unlike professional services, significant adjustment in faculty size for business schools requires decades. Given the current uncertainty about the diffusion of SuperText and its potential impact on the teaching and testing function (especially in the case of Pathway 2), we caution schools against a heavy investment in faculty growth.

Generalizing to other institutions of higher education requires care. We believe that the impact of the SuperText technology on the large research universities will be similar to that for business schools. The similarity will be the greatest for domains in which outside funding of research is rare and so a similar cross-subsidy from teaching to research exists as it does with business schools. For instance, we expect the impact of SuperText on humanities and social science departments will be more similar to that of business schools than will be the impact on departments of engineering or the hard sciences, whose activities are funded to a significant extent by research grants. (Those units face their own challenges related to declining government funding.)

Most colleges and universities face greater cost pressure than the top business schools. This suggests that the starting position on the efficient frontier is likely to be biased further toward efficiency. Nevertheless, the possibility of shifting the frontier should be even more attractive for these organizations; thus, the three pathways outlined above still apply. Moreover, we believe that these organizations are much more likely to be willing to embrace Pathway 2 and actively use SuperText content created from other (most likely, more prestigious) universities.

We expect the impact of the SuperText technology to be least for the small liberal arts colleges. Some aspects of Pathway 1 are still applicable, and these colleges might use SuperText to offer courses they would not have the capacity to staff internally. However, these colleges offer a different learning experience in which students and faculty have a much closer interaction, an element that may be harder to displace with SuperText.

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