TECHNOLOGY AND THE SIX C'S OF PROFESSIONAL EDUCATION
Content, Certification, Control, Convenience, Community & Cost

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Like a moth drawn to the flame, education has long been drawn to the bright light and great potential of new technologies. The printing press dramatically changed life among scholars and students in the universities of the Western World during the 16 and 17th[th] centuries as scrolls gave way to books. Several sources credit James Pillans of Scotland, the headmaster of the Old High School of Edinburgh, as having "invented" the blackboard sometime in the late 1700s. The migration of the slateboards and chalk from student laps to the classroom wall, first in Scotland and later, perhaps as early as 1801 in the United States, was hailed as a new technology that would transform education.[1]

But the printing press and the blackboard are just early examples of education's enthusiastic "dance" with new technologies over the past 200 years. More than a century ago the American inventor Thomas Edison proclaimed his belief that film would supplant books as the medium of instruction by the late 1930s. However, it was the experience of using film for propaganda and training purposes during the Second World War that served, in part, as a catalyst for moving film into schools during the 1950s and 1960s. Although primarily an entertainment medium during its early days in the 1920s and 1930s, radio also served as an instructional medium, "broadcasting education" to new audiences. The proliferation of television in consumer markets across the globe in the 1950s and 1960s also fostered great hopes about the benefits of this new technology across all levels of education – primary, secondary, and postsecondary.

And then, of course, there is the computer and information technology. Beginning in the mid-1960s, many in and around the educational community began to articulate great aspirations for the role of computers and information technology in teaching, learning, and instruction:

> Both the processing and the uses of information are undergoing an unprecedented technological revolution. Not only are machines now able to deal with many kinds of information at high speed and in large quantities, but it is also possible to manipulate these quantities so as to benefit from them in new ways. This is perhaps nowhere truer than in the field of education. One can predict that in a few years, millions of schoolchildren will have access to what Philip of Macedon's son Alexander enjoyed as a royal prerogative: the services of a tutor as well-informed and as responsive as Aristotle.[2]

The speaker here is Patrick Suppes, a professor of philosophy at Stanford University: the year is 1966. (Suppes may have been the first person to teach an online course – using punchcards!) Suppes' predictions about the role of computers in education "in the coming years" still stand as a set of great aspirations: "the services of a tutor as well-informed and as responsive as Aristotle."

Enter the Internet. Roughly three decades after Suppes, in the early years of what Thomas Friedman has called the "Netscape revolution"[3] and many of us remember as the first years of the "dot.com" era, large numbers of analysts predicted an exploding global market for technology enhanced and delivered education and training. Consider, for example the introduction to *The Knowledge Web*, a widely cited report published by the investment firm Merrill Lynch in May 2000:

> The new economy moves at a pace never seen before. The new economy is a knowledge economy based on brainpower, ideas, and entrepreneurism. Technology is the driver of the new economy, and human capital is its fuel…
>
> Ubiquitous PCs and high speed band-width will facilitate access to knowledge anytime, anywhere. The Internet democratizes knowledge, increasing access to it, lowering its cost, and ultimately improving its quality. We believe combining the "richness" of an offline experience and the "reach" that only the Internet provides creates a network effect that allows scale knowledge enterprises to be born. Moreover, we see significant potential advantages that offline operators can achieve by leveraging their experience and brand online…

[1] "What is the History of the Chalkboard?" www.wisegeek.com/what-is-the-history-of-the-chalkboard.htm; "About Blackboards." www.ergoindemand.com/about_chalkboards.htm

[2] Suppes, Patrick The uses of computers in education. *Scientific American* (**215** , pp. 206-220) 1966.

[3] Friedman, Thomas. *The World is Flat.* (New York: Farrar, Straus and Giroux), 2005.

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> The Internet creates one economy and one market. As large as the online higher education market is in the United States, the global opportunity is significantly greater…. We predict that in the next five years there will global virtual universities with potentially millions of students enrolled.[4]

Other important voices preceded this glowing assessment of the coming global market for technology-enhanced postsecondary education. During the late 1990s, Cisco Systems Chairman and CEO John Chambers repeatedly proclaimed education to be the "killer application" of the Internet. In 1997, three years before the publication of the *Knowledge Web* report cited above, management sage Peter Drucker's perspectives on the role of technology in education angered many of his colleagues in the academic community by declaring that

> universities won't survive… higher education is in deep crisis. Already we are beginning to deliver more lectures off-campus via satellite or two-way video at a fraction of the cost [of traditional courses]. The college campus won't survive as a residential institution. Today's [college] buildings are hopelessly unsuited and totally unneeded.[5]

Drucker's assessment was striking, coming as it did from a world-class scholar who spent his career in traditional academic institutions in Europe and the United States. But Drucker was also keenly aware of emerging trends in corporate education, as well as the growing corporate and "dot.com" interest in exploiting the Internet and the Web. Too, Drucker's pronouncements may have been fueled by his personal experience of teleconferencing sessions with his corporate clients when it became difficult for him to travel during the last decade of his life.[6]

All this serves as background for my presentation today, which focuses on the role of technology in professional education. My presentation – my task – has four components. The first task is to establish a common language or set of reference points for the concept of profession and, by extension, professional education. The second task is to look back at the paper and digital trails that document great aspirations and grand projections for the role of technology in education. The third task is to deconstruct the key roles of technology in professional education: what it is that technology does for and to professional education, and how does information technology in its various forms – hardware, software, the network, and digital content – impact professional education. The fourth and final task – and clearly the most dangerous for the author given the digital trail of past projections and predictions – is to offer some reasonable assessments about viable options and opportunities for the deployment and impact of technology in professional education over the next decade.

Asked to explain his success as an athlete, Wayne Gretsky, the Canadian hockey star who dominated hockey in North American the way that Pelé dominated football across the globe, responded that he skated to where the puck was going, not to where it was. (Pelé, I suspect, might explain his success in similar terms – he focused on where the ball was going, not where it was.) In this context, my assignment today is also to provide a grounded assessment about the future direction of the digital ball/digital puck of professional education.

A final clarification: "professional education" was once the domain of guilds and the apprenticeship experience later migrating to the university. Today, however, we know that professional education involves a wide range of venues, providers, and formats. To ignore these shifts would be both foolish and irresponsible. Consequently, my comments today reflect an expansive concept of professional education.

I: The Professions and Professional Education

At the risk of a little backtracking, we should begin with some common – or at least consensual – definitions of the professions and professional education. Not surprisingly, sociologists have studied various aspects of the professions including attributes and culture. Four attributes of a profession emerge from the extensive sociological literature, which often focuses on the three most traditional professions – law, medicine, and the clergy:

- *A common body of knowledge*, based on a well-developed and widely accepted or acknowledged (often theoretical) base;
- *A system of certification* that confirms [that] individuals possess the knowledge and accompanying skills before being licensed or certified to practice;
- *A calling or commitment* to use the specialized knowledge for the public good, sometimes accompanied by a renunciation of the goal of

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4 Moe, Michael and Blodgett, Henry. *The Knowledge Web* (San Francisco: Merrill Lynch) May 2000, p. 3. http://internettime.com/itimegroup/MOE1.PDF

5 Lenzner, Robert & Stephen S. Johnson. Peter Drucker: Still the Youngest Mind. *Forbes Magazine*, 10 May 1997 http://www.forbes.com/forbes/97/0310/5905122a.htm

6 *Disclosure:* This author is a visiting scholar at the Claremont Graduate University in California where Prof. Drucker spent the last years of his productive career. In 1999 I used a teleconferencing facility at the university to address a conference in South Africa. I was told that the facility had been constructed primarily for Prof. Drucker, to enable him to confer with his corporate clients who were scattered across the globe. As for the prediction that "universities won't survive [and today's] college building are totally unneeded," we might respectfully (if rhetorically) ask Prof. Drucker where he would prefer his grandchildren and great-grandchildren begin their undergraduate studies: at the kind of residential, "high-touch" institutions where he resided during his distinguished career, or with the "high-tech" providers he predicted would dominate the landscape.

wealth (or profit maximization) in return for professional autonomy and monopoly power; and
- *A code of ethics*, with provisions for individual compliance to the code and a system of sanction for enforcement.[7]

Of course the concept of professions precedes the work of 19th and 20th century sociologists. For example, philosophers may have been the first "professionals" in ancient cultures – at least in the sense that professionals are an educated elite who share a common body of knowledge, a calling, and a code of ethics. (Certification was somewhat ambiguous for philosophers.) On the other hand, by current convention the individuals who centuries ago designed and presided over the construction of the Egyptian pyramids, the Greek, Roman, and Aztec temples, the Sistine Chapel, the Taj Majal, the Portuguese churches in Bahia, and other architectural icons of the 17th and 18th century world were, in the context of their times, professionals. Even with an uncertain knowledge base, few would argue that Columbus and Magellan were "professional" navigators.

Although the definition of a professional may be precise, today the use of the term "professional" has become expansive, if not porous. Beyond the three traditional professions – law, medicine, and the clergy – we now routinely speak of professional money managers, meeting planners, secretaries, auto mechanics, and politicians. Plumbers are "professionals." Governments across the globe now describe their armies as "professional" military organizations. Pelé was a professional athlete. And Tony Soprano occasionally employed the services of a "professional" assassin (a "hit" man) to resolve some of his business problems. While some of these "professions" may have a particular knowledge base, not all have formal certification, a calling, or a (formal) code of ethics. Moreover, what makes one person an amateur and another a "professional" may simply be a matter of full-time employment – think of actors and athletes, or perhaps even politicians.

These examples and others affirm that the common or consensual reference to *profession* and *professional* tends to focus on the knowledge or by extension, the skills of a practitioner. Yet philosophers, sociologists, and writers would also argue that *ethics* are a key attribute of a profession – and perhaps by extension, professional education. For example, Goethe's *Faust* predates the work of the sociologists. Goethe allowed Mephistopheles to ruminate on the ethics of the professions in his conversation with the Student in [the Part One of *Faust* (Act III). The Student, about to begin his studies at the university, tells Mephistopheles who is in Faust's study and wearing Faust's academic robes, that he "has come with strength of heart and courage please / And well provided with professor's fees," but complains that "I hope for something worth the knowing." Mephistopheles (as Faust) first assures the Student that "it's just a matter of experience / A child perhaps denies the breast at first / Yet soon delights to slake its infant thirst." Then, in the guise of offering what today we would call academic or career counseling, Mephistopheles leads the Student down the ethical slope of the three professions. Of the law, Mephistopheles says that: "They've statues, clauses, rights, and in such a smother … Sense becomes nonsense, charity a nuisance." Turning to theology, Mephistopheles comments that "the aspirants who chose that learned field / May fail to see the pitfalls… It's hard to tell the poison from the cure." Finally, Mephistopheles counsels that "Ah, Medicine, I see no hardship there … A bedside manner sets [women's] hearts at ease / And then they're yours for treatment as you please."[8]

Today, of course, Mephistopheles might make similar disparaging comments about the ethics of the "professional" auto mechanic, computer technician, or holistic healer. Moreover, in ways that would no doubt please Mephistopheles, we often see corporate executives and politicians – deemed "professionals" by virtue of their education and experience – celebrated for their accomplishments and also chastised for what many deem to be their greed and ethical lapses.

II. The Third Decade of the Technology Revolution

Some of the most important conceptual work outlining the impact of technology on education and learning was published in 1991 by Robert Kozma and Jerome Johnson, professors at the University of Michigan. Although their work predates the explosion in Web-based education fostered by the Internet, it remains valid and valuable in the era of the Internet and Web. 2.0 technologies.

Drawing on extensive campus and classroom case studies, Kozma and Johnson identified seven ways that information technology transforms teaching, learning, and instruction – key components of professional education. Summarizing their work, technology moves us:

- *from reception to engagement:* with technology, students move away from a passive reception of information to active engagement in the construction and application of knowledge;
- *from the classroom to the real world:* technology breaks down the walls that often separate the

[7] Based on a summary prepared by Rakesh Khurana, Nitin Nohria, and Daniel Penrice, "Management as a Profession" (Boston, MA: Harvard Business School), March, 2004.

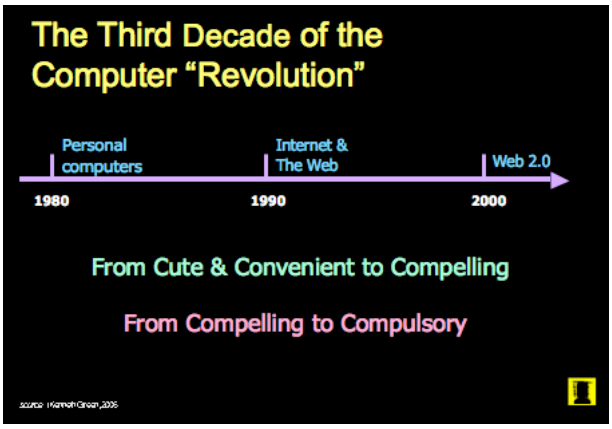
[8] Goethe, *Faust*, part one. (London: Penguin Books, 1972).

structured learning experience and the real world of work and professional practice;

- *from text to multiple representations*: technology expands our ability to express, understand and use ideas and other symbols; technology facilitates visual learning.
- *from coverage to mastery:* computers can teach and drill students on rules and concepts that are essential to performance and professional development.
- *from isolation to interconnection.* Technology has helped to advance learning from an individual to a collaborative activity; and
- *from mechanics to understanding in the laboratory.* The science lab is one of the most expensive areas of professional education, yet one that often involves time-limited learning opportunities. Simulations allow us to replicate classic experiments and also afford time to explore alternative hypotheses.[9]

We are now in the third decade of the much discussed "technology revolution" in education – particularly postsecondary education – that began with the arrival of microcomputers in the 1980s. Although all decades have brought forth a wide range of new technologies, each decade has been marked by a single *differentiating* and *defining* technology: the microcomputer in the 1980s, the Internet and the Web (Tom Friedman's "Netscape" revolution) of the 1990s, and the social networking/Web 2.0 technologies of the current decade.

The defining technologies of each decade have shared a common diffusion pattern: in the beginning each was cute, became convenient, and quickly evolved into compelling. In the fourth step of the diffusion curve, compelling became compulsory.



Consider the electronic spreadsheet: if in 1980 you saw VisiCalc, the first spreadsheet, on an Apple II computer, no question that it seemed crude: however, it was also cute as you watched the cascading calculations down and across the cells of a complex budget or financial modeling document. The electronic spreadsheet – Visicalc, followed by Lotus 1-2-3, and then Excel - was a great leap forward; it was the *killer app* [killer application] that also transformed the value of the early Apple II computer (and later the IBM PC) from cute to convenient to compelling. Following the spreadsheet, other desktop applications such as word processing, graphics, and even the early versions of email also followed the path from cute to convenient to compelling to compulsory. In the late 1980s, universities often talked about these applications as skills students would need for work *after* graduation; by the mid-1990s, universities recognized that these were critical skills students needed for success in the undergraduate curricula ahead of receiving their degrees.

Similarly, if you saw the long scroll of text on a first generation Mosaic or Netscape web browser in 1994 or 1995, it was, again, initially cute and then convenient. But as content and then commerce migrated to the Internet, the Web became compelling, and then, quickly compulsory. Consider the experience of buying an airline ticket: a decade ago the standard experience was to call the airline. The Web offers a rich array of on-demand travel information about schedules, ticket pricing, and specials not available from the TAM or VARIG agent who takes your phone call. So not only does the phone conversation – what once was standard service – provide less information and less service but you may also pay a surcharge the "privilege" of speaking with a reservations agent.

Which takes us to Web 2.0 and the global proliferation of a rich range of new technologies focused on user-generated content – Blogger, Flickr, Orkut and Facebook, Wikipedia, and YouTube, among others. Again, as above, Web 2.0 technologies have followed the four-step diffusion process: cute, convenient, compelling, and finally compulsory – especially if you are under age 25!

But something else has happened over the past three decades. The computer and the Internet were technologies that migrated from the university to the consumer experience and to corporate markets. Today, the migration pattern has been reversed: key Internet-based technologies now migrate from consumer and corporate markets to the university and other professional education providers. Three decades ago "going to university" often involved a first exposure to computers. Yet across the globe today full- and part-time students ages 16-86 come to on-campus and online programs with prior technology experience, expertise, and expectations: They come expecting to *learn about* – and to *learn with* – technology. Their expectations about technology resources and services have been fostered by their experiences in an increasingly wired

9 Kozma, Robert H and Johnson, Jerome. The technological revolution comes to the classroom. *Change* **23:** 1 10-23. January 1991.

and connected consumer economy: Amazon, Google, banks, mobile phone service providers, digital music, and social networking sites. Unfortunately, when students compare their experiences in the consumer economy against seemingly similar resources and services from education programs and institutions it is not surprising that they find the educational resources and IT infrastructure sorely lacking.

If our reach (our hopes for technology in education) continues to exceed our grasp (what we are doing/ accomplishing with IT), we still must acknowledge dramatic change and technology-enhanced gains in many aspects of the teaching, learning, and instructional experience. Admittedly, it is easy to identify one key component that *has not* changed - the structured (many might say stiff if not aging) lectures of professors and instructors, either in classrooms or via video over the Internet. Concurrently, technology has been a catalyst for dramatic change in the teaching and learning resources available to students that complement the lecture experience: across the disciplines we have seen an explosion of increasingly accessible digital content and engaging simulations, and new ways for students to use these resources, along with new ways for students to engage in collaborative learning.

III. The Six C's of Professional Education

We now come to the third task: technology and the six Cs of professional education. What are the six critical C factors?

- *Content:* what is the core knowledge of the profession? how does technology enhance the content of core knowledge.
- *Certification:* how can technology enhance/ improve the certification process?
- *Control:* does technology provide more control over the curricula and the learning experience?
- *Convenience:* does technology facilitate access to professional education? If so, in what ways, and with what benefits?
- *Community:* does technology help to foster a sense of professional community?
- *Cost:* does technology increase or decrease the total cost of developing and delivering professional education for providers? Does technology involve hidden costs for providers and transfer other costs from providers to students?

Organizations involved in professional education have no choice but to recognize and address the opportunities and the challenges posed by these six factors.

Content

As noted above, a key attribute of a profession is a *common body of knowledge*, based on a well-developed and widely accepted or acknowledged (often theoretical) base. Over the past three decades, technology has transformed the kinds of content – elements of the knowledge base – that inform professionals. It has also transformed core notions about access to the content. Information technology has

- *expanded and enhanced* the research methodologies that inform the professions and professional practice;
- *transformed* the way we convey that knowledge, from traditional text formats to simulations and visual learning; and
- *facilitated* access to the content – the knowledge base of professional practice – via digital content and the Internet.

The examples are numerous and involve professional education in both traditional classrooms and online courses: in Brazil and elsewhere, technology fosters professional education opportunities for remote learners: teachers, health care workers, and others who reside away from population centers now have new, often on-demand access to the knowledge base and professional training. Despite the shadow of the "dot.bomb" experience eight years ago, millions of students and working professionals across the globe are enrolled in online courses: some just want short-cycle courses and programs, other are pursuing degrees or special certificates.

While many would cite access to content as a key benefit of technology, we need to acknowledge that the forms and format of instructional content have also changed dramatically. As noted by Kozma and Johnson, technology fosters engagement because the content is more than just the text which has dominated instruction (and instructional resources) for the past 200 years. Rich visual simulations – cascading numbers, rotating images, and moving molecules – offer new opportunities for learning and understanding that go well beyond traditional text-based resources.

Any discussion about content would be remiss without acknowledging that technology poses questions about – and challenges to – prevailing laws and practices involving copyright. In many fields, course design and the creation of instructional content is moving from traditional textbook publishers to groups of educational designers and individual faculty. Learning management systems - such as Blackboard, e-College, and Moodle – make it easier for faculty to prepare their own content for online consumption, and to do so in the instructional "style" most favored by the individual instructor. But the ease with which students and faculty find and use (clip and copy) content from

the Internet often violates copyright law and practice. Plagiarism, of course, is the original sin of academe. But the laws and nuance of copyright – the ownership of intellectual property that may include text and images – are less well understood.

Because technology has expanded access to the "knowledge base" it has also, to cite the terms employed by Moe and Blodgett in their introduction to their 2000 Merrill Lynch report, "democraticized" knowledge. While generally seen as a good thing, democraticization poses some interesting challenges for professional education – and for professors and instructional designers. For example, students in wired classrooms (or online chat rooms) can access databases and research reports that allow them to challenge the presentations (and aging lecture notes) of their professors. Civilians have access to many of the same libraries and reference resources used by professionals. And new, web-based businesses have emerged to help "civilians" navigate complex scientific, legal, medical, and governmental databases that were once the exclusive domain of selected professionals.

Certification

Descartes' proclamation of *cogito ergo sum* in 1644 might work for philosophers, but it is not appropriate for lawyers or physicians. Indeed, sociologists affirm that a system of formal certification is a key attribute of a profession: certification confirms competency; certification means that professionals possess the core knowledge and essential skills of the field.

Medieval guilds were the first gatekeepers of certification. Universities followed by awarding degrees. Today the professions (and many occupations) use some combination of education and independent examination to certify practitioneers. Moreover, some sociologists and economists comment that the certification process reflects a pact between professional organizations and government regarding the monopoly power of individual professions, particularly law and medicine. In exchange for submitting to government approved or regulated certification, the professions retain some monopoly power over markets and consumers.

The fields of medicine and health care provide excellent case studies regarding the role of certification. Although medical training moved from the apprenticeship to the university several centuries ago, many examples confirm that a university degree was not always a reassuring indicator of a physician's competence. Consider this assessment of the students at the Harvard University Medical School in 1880, offered by one of the medical school professors:

> [The university president] actually proposes to have written examinations for the degree of doctor of medicine. I had to tell him that he knew nothing about the quality of the Harvard medical students. More than half of them can barely write. Of course they can't pass written examinations…. No medical school has thought it proper to risk large existing classes and large receipts by introducing more rigorous standards."[10]

Then as now we know that seat (or screen) time is not a proxy for competence in either the traditional professions or the wide range of new professions and occupations that require specialized education and training.

Certification plays an increasingly important role in the technology industry: not too long ago individuals could simply proclaim their competency in the computing and information technologies that have emerged over the past thirty years. We all know the story of a 14- or 17-year old self-taught computer genius. Today, however, we now have a global market for technology curricula and certification, fostered in part by international standards and examinations. These certification programs are often supported by the firms that create and market these new technologies and occupations. Bookstores offer review guides for Java, Microsoft, Novell, and Oracle certification exams. A decade ago Cisco Systems launched its Network Academies to promote training in network technologies and also to certify students, ages 16- 60, who complete these programs.[11] Certification is the often the bond that connects groups of Java or Open Source code writers employed by multinational firms – whether they work together in one location or collaborate on projects across time zones and over the Internet.

Interesting, ethics has emerged as an area of technology-based certification. Multinational corporations, government agencies, and professional associations are using interactive programs to provide information and training about key policies and ethical issues, and also to certify the completion of this training. (Given my earlier reference to *Faust*, we can only imagine what damage a modern day Mephistopheles could do were he to hack the content of an online ethics tutorial!)

The proliferation of Internet based degree-mills adds to the importance of certification. For example, four days before leaving California for Belo Horizonte I received an email informing me that I had been "nominated" for an MBA degree. The email promised that "diplomas were available in the field of my choice and recognized in most countries… there are no examinations, and no one is turned down." The solicitation said that I could also become a "doctor and receive all the benefits that comes with it." Of course

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[10] Barry, John, *The Great Influenza* (New York: Penguin Books, 2005) p. 33

[11] Cisco Networking Academy Program - Program History. www.cisco.com/edu/emea/academy/academy_history_home.shtml

this would be a fraudulent degree. Yet this example speaks to the importance of independent certification, and the market value of even fraudulent certificates and degrees.

Control

Beginning with the industrial revolution, manufacturing technology brought new control and precision to the factory and to the shop floor. And while many traditional academics would react strongly to any notion of their institutions exercising "control" over their courses, we know that technology provides new kinds of control – some would argue consistency - over content (what is taught) and instruction (how it is taught). A good example here is the University of Phoenix where courses and curricula go through a central planning process. A core group of faculty and instructional designers develop the courses at Phoenix: the faculty in both on-campus and online courses teach the content developed by the University rather than develop their own content. Consequently, a Phoenix course in accounting, marketing, or organizational behavior is the same for all students, regardless of where or how they take the course.

Quality is an important dimension of control: even with centrally designed courses and curricula, how does a university control for the quality of the instructional experience? What metrics should be used to measure instructor quality and student performance? If we are teaching the same course content, do we use the came examination and grading procedures for all students?

Another control issue involves the development of courses and curricula for online instruction by different operating units – think campuses or offices – of the same organization. In the United States, the general practice is that individual universities are free to develop courses intended for classrooms. But universities that are part of multi-campus systems are increasing exercising control over courses and curricular developed for online learning programs. The concern here involves duplication: why should the parent organization pay several different operating units to develop the same content: core lectures in key fields, a simulation that could be used in many different classes and academic programs, an archive of instructional materials, an introductory science course that applies to students in several academic and professional programs. Consequently, in the US and elsewhere we now see "parent organizations" – system offices for public universities and corporate offices for the small but growing for-profit sector – exercising new controls over courses and curricula development, in part to control costs, in part to provide for consistency in the curricula and the learning experience.

Even as technology offers new kinds of controls for instructional providers, it also offers new levels control over instructional content to learners. In contrast to the traditional classroom experience that involves lectures with no "replay" button, online videos and simulations offer opportunities "play it again" and "do it again" until the student feels he or she has gained mastery over the subject matter.

Finally, the role of technology in examination presents the major control issues in the area of identify management: who is sitting in front of the screen? Online program must develop policies and procedures to control access to an online examination and to assure that the individual taking an online examination is, in fact, the individual scheduled to take that test.

Convenience

Technology brings an enabling level of convenience to professional education – a convenience that may help to promote broader access, enhanced programs, and better opportunities for professional development. But let's be clear that convenience involves more than just promoting access to professional education, more than just "making it easy" for individuals to take additional classes or pursue specialized certification. Concurrently, convenience does not mean any loss of quality or rigor in the learning experience or the certification process.

Consider convenience in the context of today's "knowledge worker" – be he or she a member of the traditional or the new professions. Rapid advancements in professional knowledge and practice, including changing standards that affecting professional ethics, mean that today's professionals must continually invest in formal and informal professional education to maintain and update their knowledge and skills. Technology – access to digital content and to online courses – facilitates these opportunities and can be a catalyst for fostering interest in initial or continuing professional education.

Let me cite an example of the importance of convenience drawn from the aerospace and defense industries that once employed large numbers of professionals where I live, in Los Angeles. The United States experienced a recession in the early 1990s. The downturn in the economy reflected in part the so-called "peace dividend" that followed the fall of the Berlin Wall and the end of the Cold War with the Soviets. The aerospace and defense industries based in Los Angeles lost some 300,000 jobs during this period. Many of these individuals were working adults - highly trained professionals who had undergraduate or graduate degrees. They did not need another college degree to train for a new job; they needed to update and expand their professional portfolios with individual courses in the new technologies emerging in the early and mid-1990s. And the educational organizations that offered this training in ways that were convenient for these professionals – evening and weekend courses, primitive versions of what today would be online courses,

courses offered at the work location – these organizations prospered. The organizations that recognized the importance of convenience, most often community colleges, had a distinct competitive advantage over more traditional providers because they provided the right combination of content, certification, cost, and convenience. Those of you involved in SENAC programs know that for working adults, convenience is critical issue.

A similar example can be seen in the downsizing of the automobile industry in the United States and Europe. (News reports indicate that the automobile industry in Brazil is growing rapidly – a strong economy, rising wages, and rising employment in the auto industry; not so in the US, where we cut an estimated 100,000 manufacturing, service, and executive jobs in the US auto industry just in 2007).[12] Convenience plays a key role in the retraining of workers who previously worked in the automobile industry but who lost manufacturing and executive positions due to downsizing.

Community

Guilds and universities function as communities. Professional associations also foster identify and community. The rapid growth of social networking sites such as Orkut remind us of the power of technology to shape and serve communities.

Some of you may be familiar with Metcalfe's Law, named for Bob Medcalfe who was a co-inventor of the Internet and a founder of the networking company 3Com. Metcalfe's Law states that "that the value of a telecommunications network is proportional to the square of the number of users of the system."[13] More broadly, Metcalfe's Law is a reference point to help explain how individuals use technological and social networks: the more people on the network, the more valuable the network becomes.

Consider the undergraduate who is fortunate to have a residential experience at a university. He or she joins new communities defined by an academic program, where they live, their personal interests, and their past, current, or future work experiences. These communities function as networks; they add value to the educational experience. More networks suggest a richer educational experience. The random hallway conversation with a peer or a professor can have as much impact as a lecture or a lab experience in helping a student comprehend key content from a course.

In this context technology expands the opportunities we have to become part of new communities – new networks – transporting us past the boundaries of time, space, and place. Technology allows teachers and health care workers in remote areas to connect with professors who bring them new content and with peers who confront similar challenges in their jobs: the peer-to-peer contact can be as valuable as the contact with the instructors.

Communities are "sticky" – they draw us in, they engage us, they encourage us to invest our time and energy to help develop and maintain the community, to support others. Communities encourage us to share our expertise with strangers – individuals we may not know personally but who we know via "the network." Emerging virtual communities such as Second Life allow us to enhance our identities or create new ones, and to find new peers who share common interests. (Referring to her avatar, one of my colleagues, the deputy CIO at a major American university, says that "I'm hot" in Second Life.)

Cost

Whether we sat or slept through an introductory economics course, most of us share the consensual wisdom about the relationship between technology and productivity, a relationship defined during the Industrial Revolution: technology contributes to improved productivity, which in turn results in lower costs. In fact there are three ways to define the relationship between technology and productivity. The application or introduction of technology yields improved productivity when

- quality remains constant and the cost of producing a product or service declines;
- quality improves and the cost of producing a product or service remains constant;
- quality improves *and* the cost of producing a product or service declines.

Looking back to the dot.com era, there is no question that the promise and potential of technology to reduce costs helped fuel the business plans and online program development activities of a number of old and new education providers across the globe. The emergence of the Web in the mid-1990s fueled great expectations for opportunities – and profits! – among both non-profit and for-profit postsecondary education providers. The simplistic logic of the time – all you need is content (a syllabus) and an enabling infrastructure (the Internet) – led many providers to develop a "build it and they will pay" philosophy for online and distance education programs. While SENAC, the University of Phoenix, the Indira Ghandi Open University in India, and some of emerging Open Universities in the Middle Eastern Gulf States are the obvious success stories, the dot.com era also generated a number of expensive educational "dot.bombs" among both successful providers (the British Open University's efforts in the United States; Columbia University's Fathom initiative) and new

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[12] *The Guadrian.* Brazil's auto industry cruises as economy booms. (www.guardian.co.uk/business/feedarticle/7536510) 3 May 2008; A Big Year for [US]Auto Layoffs www.allbusiness.com/manufacturing/3895023-1.html 11 March 2007

[13] Wikipedia, Medcalfe's Law. http://en.wikipedia.org/wiki/Metcalfe%27s_law

entrants (University Associates, Hungry Minds, and uNext).

Unfortunately, the literature about technology and postsecondary education generally fails to document the kinds of productivity seen (or expected) in other sectors – either reduced operating costs or increased quality (as measured by rising student performance). Part of the problem is one of definition: economists have a precise definition for productivity, and governments across the globe collect data that allow for useful analysis and reasonable comparisons. In contrast, one can easily imagine the terse tone and tenor of a faculty discussion about "academic productivity" and the appropriate metrics for measuring faculty productivity. That said, it is important to note that the conversation about academic accountability and productivity is under way in both developing and developed nations, as education ministries, corporate sponsors, corporate investors, and individual students struggle to assess various metrics for the individual, institutional, and governmental return on investment (ROI) in postsecondary education.

Ample institutional experience suggests that investments in technology involve significant fixed as well as recurring costs: hardware, software, personnel, storage, and network infrastructure, as well as content development and licensing, plus licensing fees learning management systems. Managing these costs poses important challenges for providers: the experience from the United States suggests that the full, true costs of developing a complete online college course may run from $100,000 to $500,000, or more – sometimes *much* more! Additionally, the short half-life of hardware, software, and curricula, often just two or three years, means that technology requires continuing investment. Although non-profit and for-profit organizations amortize these costs in different ways, these are still significant costs.

Technology in professional education also poses transfer costs for students. The cost of various resources and services previously provided by educational institutions may be transferred as a hidden or indirect cost to students. The most obvious (if widely accepted) costs involve computers and network access. But there are other costs. For example, students in both traditional classes and online courses may opt to print materials that in the past may have been provided as part of course enrollment. Students may be asked to pay licensing fees for reference materials once readily available in campus or corporate libraries, or for simulations and other learning resources previously provided as a "free good." Lab fees increasingly include digital resources and not just the materials used in biology, chemistry, or health science courses.

Unfortunately too many educational organizations view technology as a capital as opposed to an operating cost. The assumption that technology is a "one time purchase" is simply wrong. As noted above, technology involves regular and recurring costs for people, software, content, networks, training, and licensing fees. Placed in proper perspective (with accurate accounting) hardware – primarily computers and servers – really accounts for a just small portion of the annual technology budget.

IV. Mapping the Future of Technology in Professional Education

In the realm of technology, change is the only constant. Moore's law about the price/performance gains in computer chips has become a metaphor for the technology industry: performance doubles and price falls by half every 18-24 months. In contrast, we know that educational organizations resist change. Elson Floyd, president of Washington State University in the United States, frequently reminds his faculty that in the conversation about change in postsecondary education, "culture eats strategy."

Conscious of the tension between change and the culture of educational organizations, I believe that three issues will dominate the conversation about the technology and the future of professional education for the next several years.

Impacts and Outcomes

The smart business owner or corporate executive who invests in technology to improve a product or service will ask several questions ahead of making the investment.

- How does the technology work?
- Why does it work?
- How does it work compared to other options, other technologies? *and*
- How much *better* does it work compared to current practice and other options?

We know that we can use various technologies to deliver and enhance professional education. Just because we *can* use some technological resource does not always mean we *should* use the resource. In the end, technology is just a tool; as in other instances, the challenge is not to use the tool, but to decide if we need a tool and then to select the right tool for the task at hand.

Unfortunately, we often know more about the ways to deploy the technology and less about the ways that technology *improves the outcomes* – the educational or learning experience. Too often the claims for the impact or benefit of various technologies on student learning and educational outcomes are based on epiphany (what I believe or feel) rather than evidence (what I can document with data).

Consider, for example, the headline of an article dated 10 September 2007 published in *Folha de Sao Paulo:* "Aluno a distância vai melhor no Enade."

(Students in distance learning do better.) The article proclaimed that students enrolled in technology-delivered distance learning classes performed better on Federally-administered exit examinations than their peers in traditional classes in seven of thirteen subject areas. At face value this would seem to be hard evidence that distance learning courses are as good and perhaps better than traditional courses. Yet for both program directors and researchers, the headline raises a number of questions, the most important being "Why did the students in the distance learning classes perform better on the exit examinations." Was it the same curriculum? Were these better – or different kinds of – students? Did the students in the online courses have better professors or advisors?

Similarly, in 2004 a national survey in the United States asked provosts – the chief academic officers of universities – to compare the quality of their online learning programs against the traditional degree programs at their institutions: fully half (50.6 percent) reported that the learning outcomes for their online courses were "as good" as the outcomes in traditional (classroom based "face-to-face") courses; just over a tenth (11.0 percent) assessed the learning outcomes as better in online courses, while roughly two-fifths (38.5 percent) judged the learning outcomes to be inferior in online courses.[14] All very interesting, but how to the provosts know: are they personally monitoring these courses? Are their institutions engaged in extensive research to assess comparative outcomes for online and traditional (classroom-based) courses? Or, as is the case with so many things in postsecondary education, are the survey respondents making an "informed" judgment absent hard evidence.

We in the educational community now find others imposing the "Deming Dictum" when they hear our claims about the impact of technology on education and learning. W. Edwards Deming is recognized across the globe as the grandfather (or godfather) of statistical quality control. The Deming Prize is the highest honor in Japanese industry. And what is the Deming Dictum? In short Deming tells us to *tazer dados* - bring data. More directly, Deming stated that *Confiamos em Deus; todos os demais devem trazer dados*! (In God we trust; all others bring data.) This is the new imperative – the demand that we bring data – that we engage in meaningful and useful assessment – to serve our students and to enhance our programs. And we must sure to use data as a resource to improve programs, not as a weapon to punish instructors and program directors. The key questions to ask are (a) what are we doing well? (b) what must we do better? (c) how do we do better? and (d) what data do we need to document our effectiveness?

Respect and Acceptance

The education "dot.bombs" notwithstanding, the prediction offered by Moe and Blodget in their 2000 Merrill Lynch report, *The Knowledge Web,* has come true, at least in part: while there are not [as yet] "global virtual universities," today millions of students (and working professionals) ages 18-68 are taking courses over the Internet and are enrolled in online certificate and degree programs.[15]

Distance learning programs conducted via correspondence (through the mail) or by broadcast (radio or television) have a long history. In contrast, online certificate and degree programs are relatively new entrants into the marketplace, often less than a decade old. Across the globe, demand for these online programs on the part of "consumers" – potential students – appears strong and is growing. But what about the demand from the organizations that hire these students? How do the hiring organizations view the "quality" of online programs and technology-enhanced professional education? Here as with the conversation about assessment, the evidence is mixed, and incomplete. The reputation of the programs – and the respect afforded and opportunities available to program graduates – may be a function of several factors:

- The reputation (halo) of the "parent" or sponsoring organization
- The performance of early graduates in the marketplace; or
- Legislative mandates that deem online and traditional programs comparable.

Student performance matters. It is an essential category of data – feedback – that can help to enhance programs and also provide new opportunities for students. Consequently, professional education programs must invest time and resources to survey learners and employers as part of efforts to assess the quality and impact professional programs. As above, the questions are (a) what are our students doing well? (b) what must they learn to do better? and (c) how can we help them do better? and (d) what data do we need to document the effectiveness of students who compete our professional education programs?

Integrating New Technologies

There is an old joke from the technology industry: God could create the world in seven days because there were no legacy systems and legacy users. As noted

[14] Sloan-C Consortium: *Entering the Mainstream: The Quality and Extent of Online Education in the United States, 2003 and 2004.* (Boston: Babson College) 2004. www.sloan-c.org/publications/survey/survey04.asp

[15] Moe and Blodgett, *The Knowledge Web, op. cit.* Some prominent universities are making course content readily available over the Internet (e.g., the MIT OpenCourseWare project - http://ocw.mit.edu). However, these are not "global virtual universities" as envisioned by Moe and Blodgett.

above, technology is a metaphor for change even as educational organizations are highly resistant to change ("culture eats strategy").

As we approach the fourth decade of the technology revolution we must recognize that new technologies will offer new opportunities and present new challenges, even as we continue to struggle to incorporate "third decade" technologies into our programs. Our clients (our students) will find these new technologies interesting and engaging, even as some of us may find them confusing and unnecessary. (Be honest, if you are over 50, think back to 1985: did you ever think you would need email, let alone find your life dominated by email?)

As noted above, technology is just a tool: the challenge is not to use the tool, but to use the tool appropriately – and to help students and instructors make appropriate use of the tool to upgrade and enhance courses, programs, and the skills of those seeking professional education. We must engage in a kind of technology triage: what technologies are important and useful now, which ones are emerging that may be of value in the near future, and which ones can we pass on – at least for the moment.

This paper has wandered the landscape of professional education, touching on many issues. But what really is the most important issue in the conversation about technology and professional education: recognizing *change* as the seventh C and acknowledging that technology really is a metaphor for change.