Course Management Systems in the History and Future of Higher Education

Columbia Teachers College President Arthur E. Levine describes a higher education future in which providers will become more numerous, “brick and click” and “click” colleges and universities will assume a place alongside traditional “brick and mortar” institutions, and education will become more personalized and focused on learning. New information technologies are identified among the major drivers of these “inevitable” changes. At the same time, University of California at Berkeley Professor Emeritus Martin Trow counsels us that “technology is embedded in and used by institutions that have a history.” Trow argues that our institutions’ histories will likely constrain the progress that technology can make, leading to the emergence of new institutions “where the weight of history does not condition and constrain technology’s use.” Similarly, Richard Eckman and Richard Quandt emphasize that the mere existence of hardware and software does not give direction to future technology implementation.

The opposing forces of technology and tradition have long shaped the landscape of postsecondary education. The introduction of course management systems is only perhaps the latest skirmish in this evolutionary saga.

This study on course management systems describes this struggle in considerable detail. To those responsible for integrating new capabilities into tradition-bound activities (activities that in most cases have been operating effectively for decades), the findings of this study may neither surprise nor alarm. Effecting change when something is broken is hard. Introducing change to activities that are often highly effective is very hard, and occasionally wrong-headed. Nevertheless, Levine is likely right: new technologies will inevitably alter—even revolutionize—all aspects of our lives, including how we communicate, conduct commerce, create communities, teach, and learn. The study’s findings related to faculty perceptions about student IT literacy, the limited early pedagogical gains associated with CMS adoption, faculty concerns about curricular control, and the seeming focus on course management systems’ administrative capabilities reflect both the nascent (and evolving) state of the technology and, more importantly, the dynamics of change in institutions (and people) constrained by proud histories. Understanding the place of these systems in our institutions suggests a need to understand a bit of this history.

As Table 10-1 illustrates, the history of higher education is one of balancing peda-
Mobility and Student Centricity in Early Modern European Education

Before the construction of the first modern European universities, secular scholarship was organized under the auspices of students who pooled funds in the earliest unions to attract itinerant instructors to their towns so that the young scholars (referring then to learners) could take instruction. Historical texts describe itinerant instructors traveling in bands through the countryside for their livelihoods in search of students. Such instructors carried with them in carts or sacks the books and other accoutrements of their craft. In some colorful (and perhaps apocryphal) accounts, students dissatisfied with some aspect of their tuition ran their professors out of town without pay. In this early age of ecclesiastical or practical education, access was limited economically to the ruling elite (second and third sons) of a society and geographically to those in towns and cities served by either cathedrals or itinerant instructors. The challenge of distance in an agrarian and largely preliterate Europe was enormous and was mediated by the slow exchange of scholarly correspondence throughout Europe, notwithstanding war, plague, and the early modern systems of transport.
The “technologies” to support instruction in this environment were strictly limited—first to what instructors could carry, more profoundly by what the church allowed, and finally to what scholarly and historical literature could be copied by hand in medieval *scriptoria*.

The social compact between instructors and their students, the limitations of the economic and geographic marketplace for “higher education,” the limitations on the permitted scope of scholarship, and the agrarian economy’s necessary focus on craft production all conspired to shape medieval pedagogy. Notwithstanding the mercantile relationship between medieval scholars and their roving bands of instructors, the craft of education was conducted in the manner of all early modern crafts. Young students became apprentices to noted authorities, often traveling with them between cities and towns. Instruction, like the times, was slow and measured, revolving largely around scriptural reading, reflection, recitation, and, more infrequently, discourse.

**Growth of the Modern University**

The twelfth century witnessed the emergence of the University of Paris, the University of Bologna, and the University of Oxford, among other modern and extant universities. These important new social institutions served both secular and ecclesiastical purposes, operating under charters from both kings and popes. The creation of learning venues provided safe haven for instructors and, as with monasteries, abbeys, and *scriptoria*, created environments for the collection, presentation, and protection of the world’s recorded scholarship. It also compelled students to show up at these institutions where teaching and learning took place. In a very positive way, the emergent universities created specialized facilities—including lecture theatres for demonstrating surgical and anatomical studies—where teaching and learning could occur without interruption. These institutions also weakened the influence of the student unions and strengthened the role of the instructors, who themselves organized into disciplinary guilds. Indeed, the well-documented fourteenth-century student riots over these painful transitions led to the emergence of residential colleges at the universities of Oxford, Cambridge, and elsewhere. The modern university was on its way to becoming what Clark Kerr described as cities of intellect, removed and protected from the broader societies in which they operated.

The invention of the printing press in 1454, the Protestant Reformation of the sixteenth century, and the Industrial Revolution of the eighteenth century contributed to a proliferation of European universities and to the broadening of the university’s purposes. In an Age of Enlightenment, the purposes of the modern European (and colonial American) university came to embrace not only the transmission and amplification of religious scripture but also the pursuit and dissemination of knowledge in the physical sciences, philosophy, and political economy. In the United States, post-revolutionary colleges and universities were established and soon charged (under independent charter) with the Jeffersonian ideal of preparing young men to become enlightened citizens in a democratic society. Higher education in the service of an emerging industrial economy became characterized by the technologies of books, including textbooks that captured and standardized leading professors’ lecture notes, classrooms, laboratories, lecture halls, and social spaces.

In England and Scotland in particular, and also in the United States, universities
were regarded as fuel pumps for the Industrial Revolution, and comparative advantage among nations was defined in part by the quality and quantity of university-educated engineers. Furthering this trend in the United States, the Morrill Act of 1862 established one so-called land-grant university in each state for the express purpose of educating the masses and serving as a source of applied knowledge in support of the agrarian and industrial economy of the day. This shift in higher education’s major purpose—from the education of social elites in religion, natural philosophy, and liberal philosophy to the instruction of ordinary citizens in “the practical and mechanical arts” to improve agriculture, foster industrialization and urbanization, and develop and transfer practical technologies—was profound.

In pursuing the emerging purposes of the land-grant university and its European equivalents, the challenge of educating an increasingly literate and professional population became an issue for the first time. Access to higher education was certainly not a birthright and remained largely a province of white males, with only 24 coeducational colleges in the United States at the end of the Civil War. By 1880, there were more than 150 such institutions. In this environment, important modern concepts such as course credits and a variety of credentials (most notably graduate degrees) emerged as important markers of educational attainment and mechanisms for regulating and augmenting the flow of graduates through the postsecondary education system. These changes reflect, to a large degree, a shift in higher education’s role away from the narrow preparation of young men for the ministry and toward broader roles in American society. The lecture hall became a fixture at land-grant universities, a means of leveraging the time of scarce experts in the professoriate.

In sum, it is reasonable to suggest that the modern university, particularly the land-grant university, is a social institution designed to increase the supply of needed professionals in the service of increasingly urbanized and industrial nations. To meet this mandate, craft-based pedagogies yielded to standardization and more highly leveraged teaching techniques, namely the textbook (the course management software of its day) and the lecture hall. The market for higher education grew by this time, including not just educational elites but also large numbers of citizens across a spectrum of educational goals at the local, state, regional, national, and even international level. By the twentieth century, American universities like Johns Hopkins University and the University of Chicago, and German universities like Humboldt University, had integrated research, technology transfer, and graduate education into their missions in important and enduring ways.

It is important to recognize that while the history of higher education is partly one of linkage with the societies it serves (agrarian, industrial) and also one of increasing educational access, this history is not characterized by the replacement of one pedagogical paradigm (craft apprenticeship) with another or of one institutional purpose (preparation of enlightened citizens) with another. We can more accurately summarize higher education’s history in terms of two dominant forces: educational access and institutional tradition. While instructors at land-grant universities have struggled to preserve the craft of instruction and to nurture apprentices, these practices have had to yield, in undergraduate contexts, to the use of teaching assistants and other scaling techniques, to preserve the intimate, face-to-face opportunity for upper-division courses. In particular, however, the cultural precepts of personal mediation of instruction, craft, aca-
Academic mentorship, and preparation of civic leaders remain vibrant in graduate instruction and in the mission of liberal arts colleges. Academic tradition has been able to occupy (or perhaps retreat to) ecological niches in the broader context of higher education’s increasing “massification.”

At the same time, according to the American Association of Community Colleges, “the country’s rapidly growing public high schools were seeking new ways to serve their communities. It was common for them to add a teacher institute, manual learning (vocational education) division, or citizenship school to the diploma program. The high-school-based community college, as first developed at Central High School in Joliet, Illinois, was the most successful type of addition. Meanwhile, small, private colleges such as Indiana’s Vincennes University had fashioned an effective model of higher education grounded on the principles of small classes, close student–faculty relations, and a program that included both academics and extracurricular activities.”

Finally, the emergence of “big science” during World War II, through the establishment of national wartime laboratories at Cambridge (Lincoln), Berkeley (Lawrence Radiation), Los Alamos, and Oak Ridge, emphasized even more the importance of education to the wealth and security of nations, furthering the notion of postsecondary education as a public good, if not a public right. Importantly, the emergent role of science also signaled the broader recognition of research as a function of the university to serve the social/public good.

**Higher Education in the Knowledge-Driven Era**

The passage of the Servicemen’s Readjustment Act on June 22, 1944, marked the beginning of higher education’s next wave of “massification.” U.S. college and university classrooms swelled by more than two million students in the years immediately following the end of World War II. Absent new technologies, lecture halls got bigger, residence halls became more crowded, “temporary” structures dotted many campuses, and the United States graduated unprecedented numbers of degree holders while Europe rebuilt from the devastation of war. In 1950, the U.S. National Science Foundation was established, and in 1958 the U.S. Defense Education Act pumped nearly $500 million into colleges and universities to promote the study of strategic foreign languages and to stimulate the creation of and market for textbooks. This burgeoning public policy of promoting the growth of higher education in the United States gained momentum from both the Supreme Court’s decision in *Brown v. Board of Education* (1954) and the rapid growth of community colleges in the 1960s. More than 1,100 community colleges now educate nearly one-half (45 percent) of all freshmen in the United States, reflecting the growing shift in U.S. public policy to one making access to a postsecondary education a public right. This shift has been furthered by waves of financial-aid legislation designed to lower economic barriers to educational participation.

Efforts to balance the public policy of expanding access to education with the traditions of the professoriate have, in the main, been successful. In fact, today 43 percent of all U.S. high school graduates enroll in college. Until recently, this balancing act was achieved through various combinations of economic rationing: private versus public education, programmatic bifurcation (large lower-division courses taught by teaching assistants versus small upper-division seminars taught by ladder-rank faculty), or other largely traditional (undergraduate versus graduate) means.
Breaking Traditions in the 1970s and Beyond

Since 1970, four major developments have further promoted higher education’s evolution and challenged our traditions. These events have promoted increased access to higher education while breaking with traditional higher education modes and methods.

British Open University

Established in 1971, the British Open University was built on a small but time-tested correspondence school movement. The Open University was designed to provide access to higher education for Britain’s working-class students without requiring the commensurate growth of Britain’s residential educational infrastructure. The Open University was, at the time, the first and largest attempt ever to standardize a curriculum and its delivery across multiple professors and tutors. Instead of honoring higher education’s longstanding tradition of treating each professor as the inventor, producer, and distributor of a course, the Open University invested massively in the design of a standard course and in the training of those empowered to deliver it. The model has been a historic success, and today more than 150,000 learners make up the Open University’s enrollment, including more than 25,000 learners outside the United Kingdom.

University of Phoenix

In 1976, John Sperling founded the University of Phoenix. This university has achieved nearly unprecedented scale, breaking with several traditions by

- capitalizing its education efforts through private market equity offerings;
- standardizing and centralizing curriculum wherever possible;
- focusing on the underserved market of working adults;
- sharply abridging its academic offerings on the basis of economic criteria;
- bringing the faculty to students by seeking accreditation and locating across U.S. political jurisdictions;
- focusing on outcomes assessment, measurement, and formal continuous improvement;
- unbundling core instructional activities such as course design and delivery, and assessment of student performance;
- eschewing a traditional library in favor of an all-digital library, and
- applying information technology strategically to a variety of instructional and support tasks.

The achievements of the University of Phoenix have been extraordinary. Growth exceeded 20 percent per year for more than two decades, and 117 campuses now serve more than 125,000 students, making it among the largest universities in the United States.

Knowledge-Driven Era

The third major development or trend to affect the course of higher education’s recent history has been what some call the emergence of the “knowledge-driven era.” While the growth of higher education in the past 200 years was largely propelled by the recognition that industrialization requires education, education and so-called “intellectual capital” have clearly replaced land, labor, and financial capital as the dominant source of wealth. In the short run, the emergence of the knowledge economy has placed the United States in a position of comparative advantage because of the size and quality of its postsecondary education system and the high participation rate of U.S. citizens in postsecondary education.

In the longer run, developing nations eager to compete and win in global markets are committed to providing unprec-
edented educational access to their citizens. In this context, and owing to the introduction of robust communications technologies, higher education has become a global market. For example, an official poll indicates that ordinary citizens of China are now spending 44 percent of savings on their children’s education, compared with 38.4 percent on pensions and 20.3 percent on housing. In 2000, colleges and universities admitted 1.6 million Chinese high school graduates, increasing admissions over the prior year by 47.4 percent. In the same year, a total of two million students passed China’s rigorous standard college admission examinations.6 Higher education’s story of increasing massification continues and, indeed, accelerates.

Course Management Systems

Finally, and importantly, the past 30 years have witnessed the emergence of the course management system (CMS) as an integral part of higher education’s instructional infrastructure. Developed simultaneously at a number of institutions, but most notably by Murray Goldberg, then at the University of British Columbia, instructional technologies have evolved from small and often sub-rosa tools used by quirky faculty to streamline effort or to illustrate points with students in new and novel ways, to become dominant elements of higher education’s system of educational delivery. This transition has occurred in less than a decade and, for most students or providers, less than three years. The introduction of the enterprise-level CMS in higher education begins a new and important “journey of a thousand miles.” And like other journeys of this nature, the implementation of these systems in the early part of the twenty-first century represents just a first step.

Because of their importance, the EDUCAUSE Center for Applied Research (ECAR) has invested significant effort in the study of course management systems, looking especially at how colleges and universities institutionalize these new capabilities, how faculty are socializing the new skills, and how campus organizations support students and faculty as they confront these new tools. Several lessons become evident.

A CMS Is an Enterprise System

In late 2002, ECAR conducted research on enterprise systems in higher education, focusing on the three big administrative systems: student, financial, and human resources. Among that study’s many findings is that implementers of these systems initially experience a loss of functionality and a degradation of performance as effective employees grapple with new technologies and the new processes these systems require. Trow describes this as technology’s propensity to “cut its own channels.” The ECAR study of enterprise resource planning (ERP) systems concluded that as users assimilate new systems into everyday practice and master the technology, productivity gains become apparent and the institutional dialogue becomes less about stabilization and more about improvement or even transformation.7 This process repeats, though with less productivity loss, during upgrades.

In the context of course management systems, ECAR research suggests a similar socialization curve, illustrated in Figure 10-1. It demonstrates that a short-term loss in productivity often accompanies the implementation of new software as users assimilate new tools, methods, and processes.

Teaching and learning are inherently and historically social activities. As such, they are especially subject to dislocations associated with new techniques and technologies. If the incorporation of information technology into the social mix is the “new work” of teaching and learning, Shoshana Zuboff advises us that “the new work depends
upon a radically different approach to the distribution of knowledge and authority, according to principles of equal access and equal opportunity. In this light, introducing course management systems into a community of scholars with more than a millennium of tradition is a radical and disquieting act.

Who Will Be at the Helm?

Eckman and Quandt are of course correct in observing that the existence of hardware and software does not give direction to its future use. The saga of course management systems has shifted from one based on the bottom-up energy of a small cadre of inventive faculty to the embodiment of a top-down institutional strategy. Very likely, as with traditional ERP, expectations for these investments are unclear because the motivations for their acquisition are often unstated, unclear, or ambiguous. Those who select systems are often not the same people who will use them. Course management systems have significant change management implications. As related in this study, course management systems automate and standardize elements of higher education’s mission that have been refined and protected for nearly a millennium. The instructor’s dominion over the classroom is a long-established principle of academic governance, and while the CMS does not dictate either a discipline or a pedagogy, it does possess structure that threatens faculty hegemony.

Importantly, CMS structure is simultaneously an area of great strength and one that can incur possible resistance or even rejection. The strength lies in the potential of a CMS to interoperate with its helmsman (the faculty member) in an inquiry into the nature of effective pedagogy. One of the ironies of higher education’s evolution and history is that while universities have fostered the production of great insights into learning, members of the academy have been free to largely ignore these insights in favor of what they learned from their apprenticeship or even from trial-and-error experience in the classroom. Course management systems carry with them the potential to guide instructors through course plans anchored in the learning theories of Skinner, Piaget, Gagne, Bloom, Kolb, Maslow, and others. This structure creates the potential to adapt the teaching to each learner’s needs and learning style. These systems’ developers,
sponsors, and early adopters see for the first time the potential to customize and tailor instruction without sacrificing the scale of delivery. This is critical, as the history of higher education is largely about balancing trade-offs between access and instructional intimacy (and presumably quality).

The University of Wisconsin data and analysis reinforces the ECAR experience with enterprise systems. When the systems are first put into service, users work hard to adapt them to their own structure and pre-dispositions. Colloquially speaking, most of us “pave the cow paths.” We not only struggle to force the system to conform to our view of how the planets are arranged, but we also struggle with the new technology. In this environment, most of us abandon large parts of a system’s functionality in a quietly desperate attempt to master at least part of what is new. As practitioners gain experience, they will likely (as with ERP) venture to use more CMS features, eventually achieving comfort, if not mastery, with large elements of the system’s capabilities. The challenge facing educators and those who manage these enterprise investments is whether and when faculty attention can shift from adapting existing course structures and mastering difficult and newly evolving technology to thoughtful experimentation with customizable pedagogies. Anecdotal evidence suggests that precocious and adventuresome teachers are actively experimenting with new techniques to use the CMS to restructure instruction for more effective results. Empirically, Carol Twigg has demonstrated that course management systems used within new course structures can materially and positively influence both teacher and learner productivity at no cost to learning outcomes.10

A Long Way Yet to the Holodeck

In Star Trek, instructional activities on board starships occur in the holodeck, an immersive three-dimensional simulated environment designed to foster what Kolb described as experiential learning.11 This type of learning focuses on a cycle of immersion, reflection, conceptualization, and planning, as Figure 10-2 depicts.

![Figure 10-2. The Experiential Learning Cycle](source: D. A. Kolb)
To approach the holodeck, course management systems will need to become more robust and flexible. They will have to enable students and faculty to choose among customizable pedagogies embedded in their structure. Their designers must aspire to make them the fabric of the educational experience, much as chalk, blackboards, paper, textbooks, uncomfortable chairs, touchscreen monitors, erasers, and presentation software have become part of the historical fabric. This will likely happen.

For them to become part of the fabric, students and faculty must make these systems a priority within their teaching and learning objectives. *Faculty Use of Course Management Systems* demonstrates how far we must move in this direction to achieve the ideals described in a growing body of literature about online communities of practice. It can be disheartening to note that students’ most common activities in these systems include the retrieval of passwords forgotten, presumably, because of infrequent use. Notwithstanding such laments, we must recognize that we have only begun to socialize these technologies; we have not yet rendered them seamless, relevant, rich, and interesting. The classroom experience has drawn similar complaints despite a millennium of use.

In 2000, Massachusetts Institute of Technology President Charles M. Vest described higher education as being at a “proverbial fork in the road” where “cognitive science, virtual environments, and new modes of interacting will all come into play in powerful ways.” The goal of this new synthesis, according to Vest, is quite simply to bring a high-quality learning experience to students wherever and whenever they need it.

**The Future Is Bright**

The path to the holodeck will be incremental. Colleges and universities are communities of skeptics, and skepticism will constrain progress in CMS adoption. Colleges and universities are also communities of explorers, however, and the curious will further the adoption of course management systems. Vest described the path toward e-learning as “somewhat chaotic, intellectually entrepreneurial evolution, as opposed to overwhelming revolution.”

**Course management systems will change power relationships.** The glib observations about a shift from the “sage on the stage” to the “guide on the side” are correct. Zuboff is right to warn us that these new systems will alter the distribution of knowledge and authority according to principles of equal access and equal opportunity. Some faculty know this or sense it intuitively, and the trend likely underlies their concerns about “loss of control.”

Even in *Star Trek* there’s an academy. Higher education eras overlap, as do pedagogies and missions. CMS and e-learning zealots proclaim the arrival of higher education’s messiah, while detractors decry these systems as the work of devils. The history of higher education is one of endurance through adaptation. In organic fashion, each new stimulus or challenge to the academy led to the production of new shoots and new growth. Only rarely have new technologies fundamentally threatened old root systems. Face-to-face education is very unlikely to be replaced by emerging online forms of education. Rather, educators will experiment with new forms, methods, and techniques, and those that enhance the educational experience will likely prosper and be integrated into both virtual and face-to-face offerings.

**Course management systems will cut new channels and create new issues and new opportunities.** Clifford Lynch suggested that course management systems will not only create challenges in expected areas re-
lated to the ownership of intellectual property in course materials, but will also raise new issues related to the ownership rights and privacy of students who contribute materials to online courses via these systems. These systems inherently blur the distinctions between teachers and learners as online learning communities begin to form. The traditional hierarchies of the guild and craft may not withstand these democratizing influences.

Over time, learning outcomes will improve. Despite the newness of course management systems and the lack of clear model practice in their deployment, management, support, and assessment, the evidence is clear that these technologies do not erode the educational experience or outcomes. Increasingly, there is credible evidence that course management systems—when implemented within a cohesive programmatic and management framework—can enhance student performance, reduce drop-withdraw-failure rates, and foster active student participation in course activities. Even as faculty at the University of Wisconsin work to assimilate the most basic CMS capabilities, they report rewarding increases in communication with their students.

The future is exciting. The implementation of course management systems in higher education is truly a small first step in what is likely to become a significant reshaping and renewal of one of higher education’s most cherished and important activities. As software providers introduce greater sophistication and functionality, and as faculty and students become more proficient in CMS use, a major global upgrade of education may become possible. Commercial software developers, faculty, and students are today working on new tools that promise to lower the economic, pedagogical, linguistic, and technical barriers to full global online participation in a high-quality postsecondary education. These technologies promise to alter forever the trade-offs between quality and access that have dogged higher education since its inception. And even so, these technologies will make it possible to retain places and environments in which our most cherished traditions can prosper.

Endnotes

4. One might note that even the modern practice of using teaching assistants conforms closely to the hierarchical guild roles of apprentices’ taking instruction from journeymen working under the guidance of the masters of the craft.
9. Eckman and Quandt, op. cit.

13. Ibid.


17. Anonymous Ugandan educator corresponding with MIT President Charles Vest, in Vest, op. cit.