



INNOVATION, ADOPTION, and LEARNING IMPACT

Creating the Future of IT

By Rob Abel

The September 2006 report *A Test of Leadership: Charting the Future of U.S. Higher Education*, by the commission appointed by U.S. Secretary of Education Margaret Spellings, identifies many areas of improvement for U.S. higher education and specifies numerous recommendations (totaling more than fifty, according to some counts) for consideration by states, the federal government, institutions, policy-makers, businesses, faculty, and accreditors.¹ Reports such as this, and the various initiatives that may follow, will undoubtedly influence future institutional goals and objectives. Yet heeding the commission's calls for improved access, affordability, accountability, quality, and innovation and mapping them to the return on investment in specific technology strategies is a challenge. We might call this the challenge of "mission-to-technology alignment."

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U.S. higher education operates in an increasingly complex, diverse, and global socioeconomic system whose rewards continually change in response to market forces.



Navigating this gap and achieving alignment is the key to enhancing institutional performance via technology. When reading the title of the Spellings Commission report, one might ask, “Whose leadership is being tested?” Whereas collecting more data and undertaking more assessment is certainly good IT *management*, does it qualify as *leadership*? Leadership in the higher education IT arena involves working with the college/university cabinet to ascertain developments in the external environment and aligning new strategies to those developments while staying true to the core purposes of the institution. Still, as argued by Kenneth C. Green,² the Spellings Commission report does portend an active role for IT leaders in the critical planning and policy discussions about institutional assessments and outcomes. By participating in these discussions, IT leaders in higher education can help to define the reality that the institution will aspire to and that students will eventually experience.

Defining Reality for U.S. Higher Education

The first responsibility of a leader is to define reality.

—Max DePree, *Leadership Is an Art*

Despite the tone of alarmism in the Spellings Commission report (and in many other reports), the sky is not falling. According to one ranking, seventeen of the world’s top twenty universities are in the United States.³ Although the United States appears to be slipping in

some metrics (such as the percentage of population with college/university degrees), the unparalleled diversity of the U.S. higher education system, in terms of both the students served and the approaches taken, is so different from anywhere else in the world that it is extremely difficult to compare data. There are clearly some warning signs, but they are very uneven across the spectrum of U.S. institutions.

While promising a “carrot” of a new federal grant program that would reward reporting on student learning, Secretary Spellings appears to be ready to use the “stick” of accreditation to stimulate change.⁴ This means that many colleges and universities may soon be feeling pressure at the cabinet level to examine the issue of accreditation and learning outcomes. In addition, the Spellings Commission report is simply one more instance of an unavoidable trend toward accountability. In 1977, Robert K. Greenleaf predicted that with higher education institutions in service to 50 percent of the population, the scrutiny was bound to increase,⁵ and it has. U.S. higher education expenditures in 2003 were estimated at 2.9 percent of gross domestic product (GDP), with about 43 percent of those expenditures representing public allocations.⁶ There is significant interest in higher education, and that interest will continue to grow.

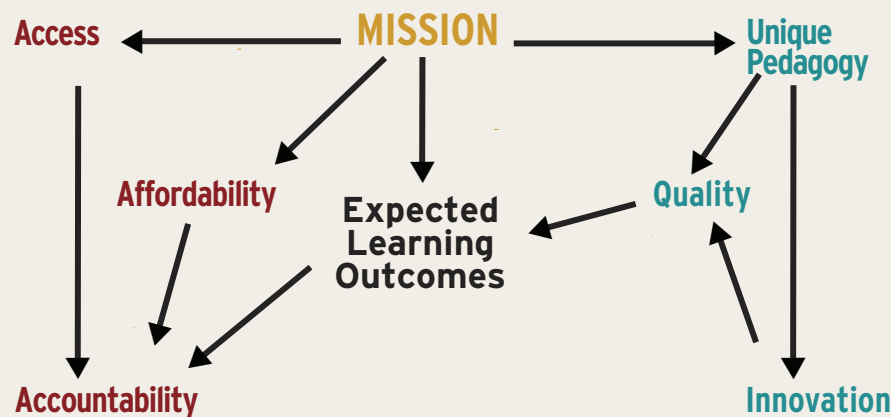
The bottom line is that as the wealthiest nation on earth in the knowledge age, the United States is expected to have the best higher education system in the world. The quality of U.S. students, faculty, and researchers should be the

best, given the U.S. economic advantage. However, in the U.S. socioeconomic system, the incentives for wealth obtainment, which drives most citizens’ choices in educational alternatives, create challenges to ideals that do not prioritize economics. Although some are hoping that “consumerism” never comes to dominate higher education, the reality is that it is already here. For instance, even though the Spellings Commission report admirably calls for increasing federal and state investment in the STEM (science, technology, engineering, and mathematics) fields, many students have already figured out that the formerly high-reward engineering fields are now being outsourced by global business,⁷ making them less economically attractive. Thus, regardless of the educational investment in STEM fields, the payoff will not be realized unless the jobs themselves are made more attractive—something over which the government has little control.

U.S. higher education operates in an increasingly complex, diverse, and global socioeconomic system whose rewards continually change in response to market forces. The U.S. higher education system has been very successful and has evolved to a very diverse state in response to this environment. It can be expected that such evolution will continue. The evolution that occurs will help to define the very essence of what it means to be *learned* in a knowledge-driven world. And since calls for various types of accountability are bound to increase in a world in which the product of the system is so inextricably connected

FIGURE 1

Learning Outcomes at the Core of Higher Education



to the shaping of knowledge, higher education itself must ultimately define what it means to be accountable.

The Integrity in the System

Changes do not occur randomly in any direction. They always are consistent with what has gone on before, with the history and identity of the system.

—Margaret Wheatley,
Leadership and the New Science

Although some commentaries on the Spellings Commission report note its emphasis on access, affordability, and accountability, the report focuses equally on quality and innovation, two areas that also need to be addressed by U.S. higher education. But how should colleges and universities respond? Many commentators have stressed that a one-size-fits-all approach will not work in U.S. higher education and could be counterproductive.

Higher education merits its high status as an *institution* for good reason. The Nobel Prize-winning economist Douglass North developed compelling research that documents the linkage between culture, economic success, and those icons of society that merit institutional status.⁸ In short, North stated

that *institutions* capture certain aspects of culture over time and serve as a stabilizing factor in the face of change. The mix of stabilization and aptitude for change, reflecting the culture itself, is key to a society's ability to evolve in an economically successful way. Higher education also exhibits a high degree of internal forces that drive toward consistency and create resistance to change—referred to as *institutional isomorphism*.⁹ Higher education thus exists in a complex system in which it is both influenced by and exerts influence on society. When society exerts a new pressure, such as increased emphasis on and revenues for research, the higher education system responds in a way that considers its core values and mission. And so it will be with increasing pressures for accountability.

In the highly diverse U.S. system, this core integrity, reflected in mission and values, must be institution-specific. Figure 1 depicts a possible framework that ties together the Spellings Commission recommendations of quality and innovation to access, affordability, and accountability. Desired learning outcomes, driven by mission, are at the intersection. This represents a compromise between the view of those who believe that accountability can be standardized and the view of those who are not in favor of any

formal metrics of accountability. It puts an emphasis on establishing unique, measurable learning outcomes that are based on the mission of the institution or, in many cases, of the individual department. This emphasis stresses the need for institutions and departments to be reviewed with respect to achieving their mission and, in doing so, to applying learning innovation. The diagram provides a framework for a cabinet-level discussion regarding how an institution can voluntarily address greater scrutiny by investing in a core competency of mission-directed learning innovation that yields measurable outcomes.

A Decade of Progress in the Application of Technology to Learning

A change is something you do, and a fad is something people talk about.

—Peter Drucker,
Managing in the Next Society

In the cabinet-level discussion that has been framed according to Figure 1, the other side of the mission-to-technology alignment—that is, the technology—must also be considered. The challenges in applying technology to learning have caused some to recoil with a disdain for the application or even the relevance of technology to learning. It is important that we develop some perspective, then, on where we are in the evolution of the application of technology to learning.

In the last ten years, since the ubiquitous availability of the Internet via the World Wide Web, there have been significant changes in the evolution of the application of technology to support learning. Certainly at the root of these changes, at the infrastructure level, has been the proliferation of high-performance networks, Internet access, and mobile devices. The use of the course management system (CMS),¹⁰ though primarily in communication and administration rather than in support of learning,¹¹ has increased significantly. These course management systems have played a major role in supporting better ways to provide distance learning, a segment of the U.S. higher education industry

The technologies of learning have always had a great impact on defining how learning is achieved and, thus, on defining learning quality.



that now involves an estimated 3.2 million students.¹² As a result, there are massively more end-users—including students, faculty, and staff—of Internet-based learning technology than there were ten years ago.

Because the Internet has not revolutionized education in this time period, some researchers have gone as far as to declare e-learning a “bust.”¹³ But as Peter Drucker pointed out in *Managing in the Next Society*, the information revolution, like the industrial revolution two centuries earlier, has not changed what we do with information but, rather, *how* we do it. Drucker noted that the first fifty years of both revolutions saw routinization of existing processes in numerous areas, as opposed to true breakthroughs.¹⁴ The progress in learning systems in the last ten years represents solid technological innovation that is here to stay.

The Future of Learning Technology: Visionary and Pragmatic

I never teach my pupils; I only attempt to provide the conditions in which they can learn.

—Albert Einstein

The natural question to ask now is, “What is coming next with respect to technology applied to learning?” There are two answers to this question. The first addresses a relatively rare and interesting crossroads that we are approaching in terms of new ubiquitous technologies that affect how the brain works and, therefore, that affect learning. The second addresses the pragmatic constraints already mentioned with

respect to changing “how” versus “what” and considering other theories of adoption of technological innovation.

The technologies of learning have always had a great impact on defining how learning is achieved and, thus, on defining learning quality. Timothy Shutt points out that in literature, before the widespread adoption of writing, the epic took the form of verse, in order to facilitate memorization.¹⁵ In other words, poetry was an early *learning technology* used to facilitate oral learning. In concert with the technology, learning quality was reflected in one’s ability to remember, recite, and even improvise on verse. The rise of written language and printing presses has obviated the need for what today would seem like incredible feats of memorization.

As mentioned earlier, it takes many years for a technology to truly change what we do. Similarly it takes many years for new learning technologies to be inculcated into the psychology of learning. Relatively new fields such as cognitive psychology and cognitive neuroscience are helping us to understand what happens in the mind and brain when learning occurs. In the last several decades a new science of learning has emerged. The new field of media psychology addresses the impact of media on cognitive and behavioral psychology.¹⁶ The daily influence of media technology has caused students’ brains to be wired differently from their teachers’ brains.¹⁷ As a result, although students may not be any more savvy in terms of the use of technology for learning—in fact, they need to acquire true computer and information

literacy skills through the curriculum¹⁸—they do have built-in preferences for certain types of media that they find familiar and comfortable. Therefore, whereas auditory skill was once of paramount importance through verse, we may now be seeing the reemergence of the importance of auditory learning—this time in conjunction with a greater emphasis on visual learning, due to the rewiring of the brain for multimedia.

When considering “learning technology,” we should consider “technology” to be broadly defined as the application of learning science (by whatever means). In other words, the structure of the verse is as much a technological innovation as the way in which it is transmitted. The instructional technology and the transmission technology form a system through which learning content is delivered. The transmission system can make certain instructional strategies more effective, and vice versa. The effective use of learning technology requires the combination of instructional strategies with effective transmission systems. The emerging science of learning is unfolding new principles that support a range of *learning types*, including information retrieval, transfer of knowledge to application, and metacognitive skill—that is, the ability to understand the level of one’s knowledge. Elsewhere I have reviewed twenty-five learning theories and considered how each might be supported by rich media technology.¹⁹ Drawing on the timeframes of Drucker, I would not be surprised to see the emergence of a ubiquitous psychology of learning via media in the next fifty years.

FIGURE 2

IT Support of Learning

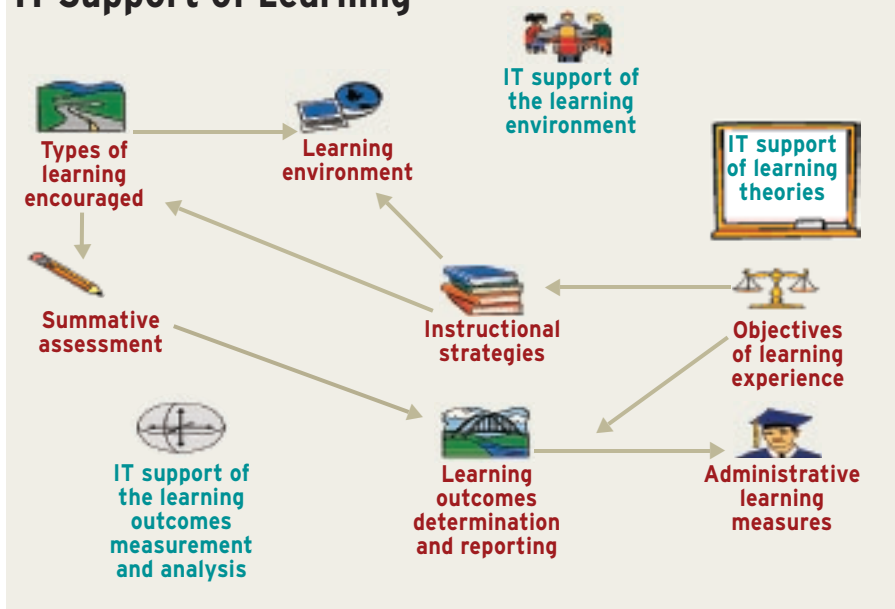


FIGURE 3

Compelling New Learning Technologies

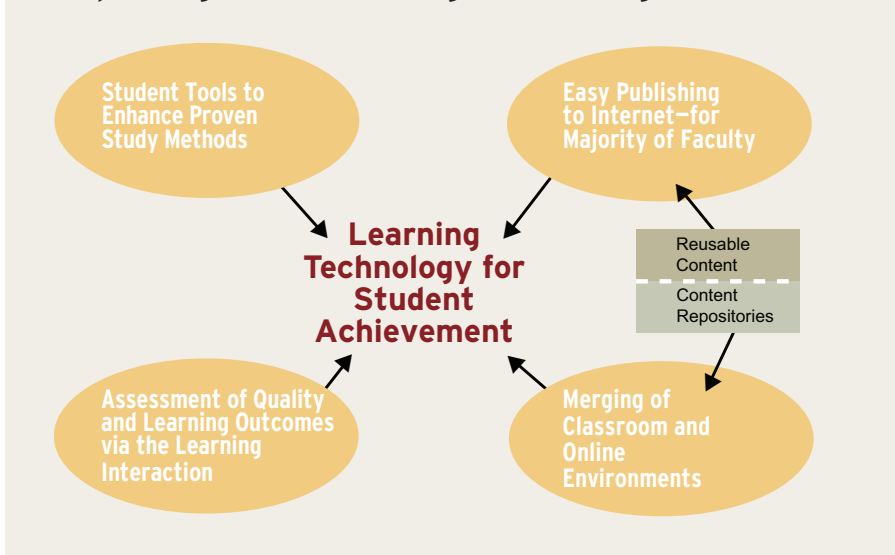


Figure 2 presents a simplified diagram of how the emerging science of learning will enable the learning types desired to guide the design of the learning environment and also the approach to summative assessment. The learning environment consists of four components:

- Background, needs, and interests of the learners
- An organized body of knowledge

- A learning community
- Formative assessment²⁰

The summative assessment measures learning outcomes. Instructional strategies, the learning environment, and analysis of learning outcomes—representing a breadth of applied learning technologies—will all be supported by information technology.

This “visionary” view of what is com-

ing next in learning technology will likely take many decades to unfold in its entirety and to achieve wide adoption. Doing so will require somewhat more sophisticated tools than we have today, tools that can allow the design of the interplay among learning objectives, environment, and desired learning outcomes. However, the reality is that some form of this interplay—sometimes aided by information technology, many times not—already exists today in all our educational experiences. Yet the interplay is most often tacit, as opposed to explicit. Examples of new approaches that make the interplay more explicit include pioneering work in adaptive tutoring products and the work in course redesign conducted by the National Center for Academic Transformation (<http://www.center.rpi.edu/>). In addition, an innovative new technical specification language, called “Learning Design,” is emerging for capturing this interplay.²¹ However, because we are not yet used to explicitly capturing the interplay among learning objectives, environment, and desired learning outcomes, this future vision requires changing what we do as opposed to just how we do it.

A more “pragmatic” prediction of what is coming next in learning technology takes into account the challenges associated with the adoption of new technologies, as summarized in the report “What’s Next in Learning Technology in Higher Education?”²² Figure 3 illustrates the conclusions of this report. Having been screened for compelling need, ability to meet the requirements of users for whom current products are too complex, and routinization of well-established processes (changing “the how” instead of “the what”), tools emerged that address one or more of five areas:

- Enhanced effectiveness of students’ study
- Easy Internet publishing of content and organization of courses and learning strategies for a majority of faculty
- Merging of classroom and online environments
- Formative assessment via learning interactions between faculty and students

The key is for each institution to configure its approach to assessment so that the approach is aligned with the learning types and outcomes it professes to produce.



- Content management of faculty-generated, publisher, and recorded rich media

The Sum of the Parts

An education isn't how much you have committed to memory, or even how much you know. It's being able to differentiate between what you know and what you don't.

—Anatole France

Clearly, both the visionary and the pragmatic views on what is coming next in the use of technology to support learning have a strong tie to assessment, an area in which technology has played an increasing role for a long time. As with learning design, assessment occurs, whether tacitly or explicitly. Students succeed (or not) in passing a course, graduating, or getting a job. The science of learning indicates that students develop better learning skills when given feedback. Likewise, accountability advocates see assessment as a way to compare the performance of institutions. An approach such as the Collegiate Learning Assessment (CLA), referenced in the Spellings Commission report, is particularly interesting. This type of approach, focused on measuring outcomes that are, in theory, fundamental across disciplines (outcomes such as critical thinking, analytic reasoning, and written communication), promises to provide an institution or department with useful feedback, within the limits to which similar theories of learning and outcomes are embraced.²³ Assessment enabled with technology can also provide individuals with feedback they

can use to hone their learning skills. The most important role of assessment is to provide feedback that improves the learning experience.

For the purposes of this discussion, the key is for each institution to configure its approach to assessment so that the approach is aligned with the learning types and outcomes it professes to produce. This requires connecting the science of learning with the institutional mission with the appropriate learning technology. It seems to me that one of the unwritten and underlying assumptions of the Spellings Commission report is: "We pretty much know how to do this better and just need to hunker down a bit and we can improve things." I think that assumption is incorrect. Since the challenge is leadership and the challenge is better education, the solution requires leadership in innovative approaches to achieving clarity of and delivering on learning outcomes. This is all very tacit stuff today. To pull together this sum of the parts into a true vision of leadership for developing the next phase of higher education, we must come to grips with what we know and what we don't know about our own learning processes. Considering information technology by itself is inadequate for addressing the whole solution. Expert skills in learning science and technology must be brought together into the discussion.

The Little (Potentially Big) Engine That Could

"I'm not very big," said the Little Blue Engine. "They use me only for switching trains in the yard. I have never been over the mountain..."

Then she said, "I think I can. I think I can. I think I can." And she hitched herself to the little train.

—*The Little Engine That Could* (1954)

The discussion so far has developed an argument for focusing attention on a core strategic conversation that aligns mission to learning outcomes to technology. A basis for considering where technology fits into the support of learning and potential future trends has also been discussed. We now need to address the fiscal realities.

Today's level of technology investment that is focused on supporting innovative approaches to learning is minimal. The Spellings Commission report highlights the FIPSE grant program, funded at a whopping \$22 million in FY2006 and at the same level in the FY2007 budget.²⁴ The FIPSE program supports and disseminates innovative reform projects that promise to be models for improving the quality of postsecondary education and increasing student access.

The most recent EDUCAUSE Core Data Survey indicates that institutions of higher education spend an average of 5.2 percent of total campus expenses on centralized IT. The same report notes that 10.8 percent of the centralized IT staff work in instructional technology, multimedia services, and student computing and that an additional 3.2 percent work in research computing or academic computing. For those institutions that could provide an estimate, centralized IT staff compose 60.7 percent of the total IT staff campuswide.²⁵ Assuming that these workers are of average salary across the IT salary range and that there is an equal

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distribution of decentralized staff in the academic-related services, an estimate for the portion of the annual campus expenses that is spent on all (centralized and decentralized) academic-related IT services calculates to 1.2 percent.²⁶

What should we expect in terms of resources spent on instructional innovation? In my opinion, the answer depends on what the expectation is with respect to U.S. higher education leading in the application of the science and technologies of learning. U.S. industry typically spends between 6 percent and 12 percent of annual sales on applied R&D. In industry, applied R&D is expected to drive innovation in new products and services.

In higher education, an interesting phenomenon has occurred in the last five to eight years as the Internet has enabled better forms of distance learning. Many of the bright spots of learning technology practice have occurred in community colleges and small private institutions focused on nontraditional students, as well as in the flagship public institutions. A study looking at best practice in “Internet-supported learning” across twenty-one institutions revealed that the most successful institutions redesigned academic programs for online or hybrid delivery, which achieved higher perceived quality than the traditional counterparts.²⁷ In another, related development, the recent report of the National Survey of Student Engagement reported: “Compared with campus-based students, distance education learners reported higher levels of academic challenge, engaged more often in deep learning activities, and reported greater developmental gains from college.”²⁸

The above research, taken together with the previously referenced large number of students involved in online learning, indicates that there are some positive signs of innovative practice in learning supported or even enabled by new uses of technology. However, this success conjures up an image of “the little engine that could”: it is not the institutions that have the most resources that are making these gains. In addition, most colleges and universities are not investing 6–12 percent of their operating budget in applied R&D for instructional innovation. Yet as mentioned previously, across the United States, higher education expenditures totaled 2.9 percent of GDP in 2003, which amounts to over \$300 billion. One presumes that \$18–36 billion spent per year in effective applied R&D could have a major impact on U.S. leadership in the science and technologies of learning.

Innovation, Adoption, and Learning Impact

The value of an idea lies in using it.

—Thomas Edison

Although there has been much talk about “leadership” through accountability, wouldn’t true leadership shift the discussion to leadership through the achievement of new breakthroughs in education? Why do we ignore the obvious potential role of higher education, in conjunction with industry and government, in taking the lead in developing, applying, and disseminating new knowledge in the enabling fields

of learning science and technology, just as higher education aspires to do in many other fields—ones not nearly as germane to its core reason for existence? In February 2006 I had the honor of being appointed the CEO of IMS Global Learning Consortium, a nonprofit organization founded in 1997 to focus on the development of interoperability specifications for educational technology. Like many other standards organizations, IMS is organized to create and support a level playing field that encourages the establishment of new product categories from a healthy multiplicity of sources. However, since February 2006, the IMS board of directors, staff, technical advisory board, and newly formed executive strategic council have been developing the organization into an industry advocacy group that encourages technology innovation, adoption, and impact on learning worldwide (see <<http://www.imsglobal.org>>).

IMS provides a unique venue and opportunity for higher education institutions that want to join forces in a collaboration that accelerates innovation in learning. The organization has a unique mix of members and subscribers from across the globe: educational institutions, government organizations, and commercial product and service providers. With a genesis from within higher education, IMS focuses exclusively on educational and learning technology, which has been, and continues to be, a developing industry. An institution that participates in IMS becomes involved in the multiple perspectives regarding what some have called the public and private

interests in, or benefits of, education in a global context.²⁹ IMS provides a venue for U.S. higher education to interact and collaborate with corporate and global counterparts. Although the previously discussed expenditures on applied R&D in learning are too low to engender the rate of innovation required, they are further diluted by being distributed across thousands of institutions trying to make ends meet. A true collaboration is needed to pool resources and to work together, not separately, on innovation. If one believes, as I do, that improving education requires such a collaboration, IMS provides a platform to make it happen.

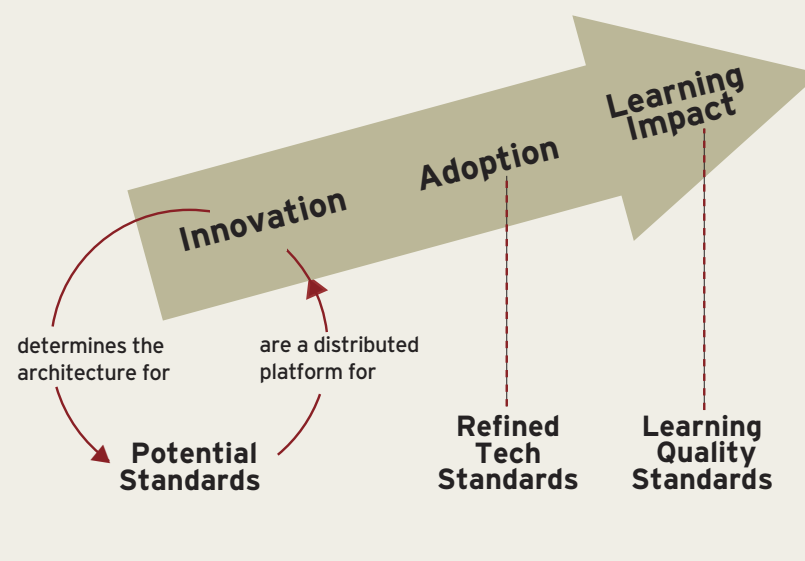
IMS work has been widely adopted by standards organizations—in the United States and around the world—that are focused on a variety of segments, in addition to higher education.³⁰ This is because IMS has repeatedly been involved in early innovation in learning technology with wide applicability. John Norman, of the University of Cambridge, has remarked that IMS specifications “reduce the friction of innovation” and provide a “blueprint for new categories of products.”³¹ IMS work has been and continues to be a catalyst for innovation in learning platforms, assessment, and digital content. The reinforcing cycle in which innovation creates a candidate architecture on which standards can form, and in which standards can then provide a platform for distributed innovation, is shown in Figure 4. The figure also shows how innovation, although good, is only the first step.

The decision to move IMS into industry advocacy was based on several key needs of the community:

- The emerging science and technology of learning needs an advocate in order to attract the appropriate level of investment. *IMS has formed project groups that are focused on providing solution templates to solve important enterprise learning challenges and to justify expenditures through ROI.*
- IT and learning technology leaders require more information in order to participate in the alignment between mission goals and the emerging science and technology of learning. *IMS*

FIGURE 4

Relationship between Standards and Innovation



has created an extensive set of executive leadership interviews and resources to provide case studies and share information on industry developments.

- Learning innovation is new, is relatively scarce, and needs to establish clear benchmarks of impact. *IMS has established a unique program that recognizes high measurable impact, guided by experts with executive perspectives on global learning industry challenges, and an annual conference focused on learning impact.*
- Even when innovation in learning is achieved, significant work remains to engender widespread adoption. *IMS has established best practices and industry satisfaction research for the purpose of engendering the adoption of learning innovation.*
- The future of IT leadership involves an in-depth understanding of the high-impact application of technology to learning. *IMS provides quarterly meetings and webinars focused on enabling a new generation of Chief Learning Officers (CLOs).*

IMS sponsors active workgroups in the following areas: digital content; assessment; academic enterprise and analytics; interactive learning environments, tools, and rich media; accessibility; feder-

ated architecture; enterprise content management; best practices in Internet-supported learning; and learning outcomes. These are designed to help lift up the practitioners and leaders who want to understand how technology can effectively support and enable better learning and to collaborate with peers and suppliers to achieve levels of progress that would be impossible on their own.

The Challenges and the Opportunity

When written in Chinese, the word “crisis” is composed of two characters—one represents danger, and the other represents opportunity.

—John F. Kennedy

For the growing number of academic and instructional technologists involved in the application of “technology” to learning, the potential for improvement to core mission elements such as access, affordability, accountability, quality, and innovation is clear. In addition, some have argued that the *only* way to achieve major breakthroughs in these gap areas is through the combination of process redesign and technology.³² The Spellings Commission report scolded the state of innovation: “Little of the significant research of the past decade in areas such as cognitive science, neurosciences, and

organizational theory is making it into American classroom practice.”³³ But will scolding result in the necessary changes? Drucker observed, “When you have a malfunction across the spectrum, you don’t have a people problem, you have a systems problem.”³⁴

For those who practice it, the effective application of technology to support and enhance teaching and learning has not been easy. Although the Spellings Commission report or other reports may make this sound simple, there are several significant challenges:

- Even though learning is natural to us all, and we think we know it when we see it, we are just beginning to develop a *scientific* understanding of how learning occurs and what constitutes true innovation in learning.
- Although there are certainly examples of learning innovation, we are very early in discovering them and have developed few models for widespread adoption within single

institutions, much less among many.

- To the extent that any organization improves its products, services, and core competencies, that organization makes investments in applied R&D, which is not happening at anything but a trivial level in U.S. higher education today.

The notion that U.S. higher education can lead the world in new levels of performance with respect to learning without concomitant investments in the science and technologies of learning makes little sense. By all means, we must collect data and be accountable, but it seems strange to call this leadership. IT leadership in this circumstance must recognize the core, foundational connections between the quality of learning and learning outcomes, the science and technologies that support learning, and the role that higher education needs to play as an important institution in U.S. culture to set new standards of excellence.

So, how should colleges and uni-

versities respond to a laundry list of fifty-plus recommendations put forth by an esteemed commission of experts? How should those in IT respond? The answer depends on whether the desire is to respond with management or with leadership. Leadership in IT will require investigating how the appropriately defined learning outcomes can be enabled by applied *innovation*; it will require engendering widespread *adoption*; and it will require being accountable and taking the lead in establishing and ascertaining the *learning impact* of an institution's strategic investments in technology. But most of all, leadership in IT will require understanding the alignment of external factors—access, affordability, perceived quality—to the core mission and integrity of the institution. *e*

Notes

1. U.S. Department of Education, *A Test of Leadership: Charting the Future of U.S. Higher Education*, a Report of the Commission Appointed by Secretary of Education Margaret Spellings (Washington, D.C., 2006), final report, September 2006, <<http://www.ed.gov/about/bdscomm/list/hiedfuture/reports/final-report.pdf>>. For a discussion of the recommendations, see Stephen Burd, “Plenty of Ideas about Student Aid, but No Road Map,” *Chronicle of Higher Education*, September 1, 2006; Karin Fischer, “Lengthy Fights Are Expected over Measures on Accountability,” *Chronicle of Higher Education*, September 1, 2006; and Elyse Ashburn, “Commission Calls Colleges ‘Self-Satisfied’ and ‘Risk Adverse,’” *Chronicle of Higher Education*, September 1, 2006.
2. Kenneth C. Green, “Bring Data: A New Role for Information Technology after the Spellings Commission,” *EDUCAUSE Review*, vol. 41, no. 6 (November/December 2006): 30–47, <<http://www.educause.edu/er/erm06/erm0661.asp>>.
3. *Academic Ranking of World Universities*, 2006, <<http://ed.sjtu.edu.cn/ranking.htm>>.
4. Kelly Field, “Spellings Promises Fast Reforms in Accrediting,” *Chronicle of Higher Education*, December 8, 2006; Burton Bollag, “Education Department Penalizes Accreditor, Raising Fears of Federal Standards for Colleges,” *Chronicle of Higher Education*, December 15, 2006.
5. Robert K. Greenleaf, *Servant Leadership: A Journey into the Nature of Legitimate Power and Greatness* (New York: Paulist Press, 1977).
6. Organisation for Economic Co-operation and Development (OECD), *Education at a Glance: OECD Indicators 2006* (Paris: OECD, 2006), tables B3.2a, B3.2b.
7. For instance, the IEEE has expressed concerns that outsourcing has affected unemployment for U.S. engineers. See *Testimony of Ronil Hira, Ph.D., P.E., Chair, R&D Policy Committee, the Institute of Electrical and Electronics Engineers, United States of America, to the Committee on Small Business, United States House of Representatives, on Global Outsourcing of Engineering Jobs: Recent Trends and Possible Implications*, June 18, 2003, <<http://www.ieeeusa.org/policy/policy/2003/061803.html>>.

8. Douglass C. North, "Economic Performance through Time," *American Economic Review*, vol. 84, no. 3 (June 1994).
9. See Walter W. Powell and Paul J. DiMaggio, *The New Institutionalism in Organizational Analysis* (Chicago: University of Chicago Press, 1991).
10. Also referred to as LMS (learning management system) and VLE (virtual learning environment) on other continents.
11. Robert Kvavik, "Convenience, Communications, and Control: How Students Use Technology," chapter 7 in *Educating the Net Generation*, ed. Diana G. Oblinger and James L. Oblinger (Boulder, Colo.: EDUCAUSE, 2005), e-book, <<http://www.educause.edu/educatingthenetgen/>>.
12. I. Elaine Allen and Jeff Seaman, *Making the Grade: Online Education in the United States, 2006* (Needham, Mass.: Sloan-C, 2006), <<http://www.sloan-c.org/publications/survey/index.asp>>.
13. For instance, see Robert Zemsky and William F. Massy, "Why the E-Learning Boom Went Bust," *Chronicle of Higher Education*, July 9, 2004.
14. Peter F. Drucker, *Managing in the Next Society* (New York: St. Martin's Press, 2002), 5–11.
15. Timothy B. Shutt, *Monsters, Gods, and Heroes: Approaching the Epic in Literature* (sound recording) (Prince Frederick, Md.: Recorded Books, 2004).
16. John D. Bransford, Ann L. Brown, and Rodney R. Cocking, eds., *How People Learn: Brain, Mind, Experience, and School*, expanded ed. (Washington, D.C.: National Academy Press, 2000); Bernard J. Luskin and Lilli Friedland, *Task Force Report: Media Psychology and New Technologies* (Washington, D.C.: Division



- of Media Psychology, Division 46 of the American Psychological Association, 1998), <<http://www.apa.org/divisions/div46/articles/luskin.pdf>>.
17. See Diana Oblinger and James Oblinger, "Is It Age or IT: First Steps Toward Understanding the Net Generation," chapter 2 in Oblinger and Oblinger, *Educating the Net Generation*, <<http://www.educause.edu/educatingthenetgen/>>.
18. As indicated in Kvavik, "Convenience, Communications, and Control."
19. Rob Abel, "The Potential Impact of Online Rich Media in Higher Education and Implications on the Design of Learning" (2006), available at <<http://www.imsglobal.org/articles/index.cfm>>.
20. Derived from Bransford, Brown, and Cocking, *How People Learn*.
21. Learning Design has been developed in the IMS Global Learning Consortium. See <<http://www.imsglobal.org/learningdesign/index.html>>.
22. Rob Abel, "What's Next in Learning Technology in Higher Education?" (October 18, 2005), available at <<http://www.imsglobal.org/articles/index.cfm>>.
23. For an overview of and rationale for the CLA, see Richard H. Hersch, "What Does College Teach?" *Atlantic Monthly*, November 2005, <<http://www.theatlantic.com/doc/200511/measuring-college-quality>>. For the theory underlying the CLA, see Stephen P. Klein, George D. Kuh, Marc Chun, Laura Hamilton, and Richard Shavelson, "An Approach to Measuring Cognitive Outcomes across Higher Education Institutions," *Research in Higher Education*, vol. 46, no. 3 (May 2005): 251–76.
24. See U.S. Department of Education, *Fiscal Year 2007 Budget Summary* (February 6, 2006), <<http://www.ed.gov/about/overview/budget/budget07/summary/edlite-section2e.html>>.
25. Brian L. Hawkins and Julia A. Rudy, *EDUCAUSE Core Data Service Fiscal Year 2005 Summary Report* (Boulder, Colo.: EDUCAUSE, 2006), 18, 7, 9, <<http://www.educause.edu/coredata/reports/2005/>>.
26. 5.2 percent divided by 60.7 percent multiplied by 14 percent equals 1.2 percent.
27. Rob Abel, *Achieving Success in Internet-Supported Learning in Higher Education: Case Studies Illuminate Success Factors, Challenges, and Future Directions* (Lake Mary, Fla.: Alliance for Higher Education Competitiveness, 2005), <http://www.a-hec.org/IsL_orig_study.html>.
28. National Survey of Student Engagement, *Engaged Learning: Fostering Success for All Students, Annual Report 2006* (Bloomington, Ind.: Center for Post-secondary Research, School of Education, Indiana University Bloomington, 2006), <<http://www.ecs.org/html/Document.asp?chouseid=7205>>, 13.
29. For a good summary of these benefits, see *The Investment Payoff: A 50-State Analysis of the Public and Private Benefits of Higher Education* (Washington, D.C.: Institute for Higher Education Policy, 2005), <<http://www.luminafoundation.org/publications/InvestmentPayoff2005.pdf>>.
30. IMS work is the basis for standards work in SCORM, IEEE, ISO, BSI, and JISC/CETIS, to name a few.
31. Private conversation with John Norman, Director of CARET, University of Cambridge.
32. William H. Graves, "Improving Institutional Performance through IT-Enabled Innovation," *EDUCAUSE Review*, vol. 40, no. 6 (November/December 2005): 78–99, <<http://www.educause.edu/er/erm05/erm0564.asp>>.
33. U.S. Department of Education, *A Test of Leadership*, 14.
34. Drucker, *Managing in the Next Society*, 109.