Strong signs are indicating that higher education is finally on the verge of a long-awaited digital shift. Given that experts have been prophesying such a shift for more than forty years, with little if any real change, it's reasonable to approach such a statement with healthy skepticism. Various factors—some cultural, some technological—have indeed retarded progress along this path to the future. Nevertheless, the unprecedented challenges facing the educational system, combined with higher education’s cultural success at solving daunting challenges through the widespread application of information technology, have created the conditions for rapid change. In the coming months, we will see major shifts in the role that technology plays in the creation, distribution, consumption, and improvement of learning experiences. And education will never be the same.

By Adrian Sannier
The Problems Are Daunting
Our educational system is under increasing pressure. At the very moment that economic and cultural forces are driving the need for people to develop new skills at an accelerating pace, the educational system seems to be losing ground in preparing students. At the very moment that we need more from education, we seem to be getting less.

Evidence of this strain abounds. Nearly three in ten students who take the ACT are not ready for college.1 Public institutions are searching for ways to help underprepared students. U.S. students’ performance in math and science continues to slip relative to students’ performance in other countries. Dropout rates are staggering. For example, according to Postsecondary Education Opportunity, out of every 100 Arizona ninth-graders, only 9 earn a bachelor’s degree within six years of their high school graduation.2

But if educational performance is not improving exponentially, demand for it certainly is. As U.S. President Barack Obama noted: “Education is the economic issue of our time. It’s an issue when the unemployment rate for folks who haven’t gone to college is double the rate for those who have gone to college. It’s an economic issue when we know beyond a shadow of a doubt that countries that out-educate us today will out-compete us tomorrow.”3

If we are to keep up with the accelerating demands and possibilities of society, it is not sufficient to arrest the decline in education. Education must begin to improve at a pace that matches society’s rate of change.

Solving Problems with Technology
We are used to solving daunting problems through the application of technology. In some ways, as difficult as the education challenge may be, it is arguably not the most daunting problem we face. Global warming, energy depletion, population growth, unregulated economies, scarcities of basic resources—all of these are very real, exponentially escalating challenges facing the modern global society.

And though we sometimes doubt our institutions’ ability to meet these challenges, we retain our faith in the future, largely because we have developed technologies that have helped us address similar challenges in the past. We are capable of so much, and our capacity to improve grows so quickly, we feel confident that if we are in a race with the horsemen of the apocalypse, we can at least give them a run for their money. And why not? We have always managed to find technological solutions before.

Nearly forty years ago, Eric Ashby and Ralph Besse wrote in a Carnegie Commission report: “Higher education [and education generally] now faces the first great technological revolution in five centuries…. The technology… that has had a profound impact on society generally in recent decades promises to have powerful influences on higher education… [however] faculty members, we find,… tend to be resistant or apathetic in their attitudes toward instructional technology.”4 Ashby and Besse compared technology’s impact to the three other great revolutions in education: the invention of schools, the invention of writing, and the invention of the printing press.

Ashby and Besse were certainly ahead of their time. Thirty years later, Frank Rhodes, president emeritus of Cornell University, also raised the expectation that the broad and deep use of information technology could and should have a transformative impact on how we teach.
and how we learn. But Rhodes observed: “The business of learning . . . remains largely untouched by this revolutionary technology . . . Most instruction is still a cottage industry, little influenced as yet by the benefits and support of modern technology . . . In their basic business of teaching resident students, [universities] have not diverged much from the methods of Socrates . . . except most faculty members have moved inside.”

Rhodes wrote this ten years ago. Over the last decade, numerous advances in materials, energy, information technology, and consumer services have changed lives in the developed world. But by and large, education is the same as it ever was. In a 2010 Slate magazine article, Linda Perlstein talked about her “Laura Ingalls Test.” As Perlstein goes about her day, she asks herself: “What would Laura Ingalls, prairie girl, make of this freeway interchange? This Target? This cell phone? Some modern institutions would probably be unrecognizable at first glance to a visitor from the 19th century: a hospital, an Apple store, a yoga studio. But take Laura Ingalls to the nearest fifth-grade classroom, and she wouldn’t hesitate to say, ‘Oh! A school!’ Very little about the American classroom has changed since Laura Ingalls sat in one more than a century ago.”

After forty years of waiting for technology to make a difference in education and bring exponential improvement in speed, effectiveness, and scope, as it has in so many other walks of life, perhaps the only conclusion we can come to is that technology hasn’t had the anticipated impact—or even shown signs of an impact—because it can’t. All this time, while technology was reinventing every other aspect of our lives, education stayed the same perhaps because it can’t be improved by technology.

It’s possible that we have reached education’s state-of-the-art. It’s possible that education has remained relatively static in the face of all this change because we have reached a kind of convergence, a pinnacle of organization and approach that technology cannot perfect. Some people would go so far as to argue that education is a fundamentally human-to-human process and that it has proven immune to attempts to inject technology into that process because technology creates barriers between teacher and learner. We all have memories of great teachers who suggest a kind of perfection that technology will never reach.

It’s possible, but for humanity’s sake, I certainly hope not. Because if it’s true that the way we teach and learn now is as good as it’s ever going to get, if the kind of progress we can make by applying technology just won’t work in education, then our society will not be able to meet the demand. Improving at human pace doesn’t work if the world is growing more complex at an industrial or information age pace.

We’ve got to solve this problem. We’ve got to find some way not to incrementally improve education but to dramatically improve it—the way we’ve improved so many other consumer goods and services. And I think that, with technology, we will.

The Three Superpowers
It’s not simply wishful thinking that makes me predict that technology is poised to finally bring its transformative power to education. Over the past decade we have seen a confluence of trends:

- The advent of consumer-oriented broadband and wireless technologies
- Widespread, worldwide mobile, cell, and smartphone adoption
- The exponential proliferation of social networking and online media
- The new generation of personal devices such as the iPod, Kindle, and iPad
- The collection and mining of patterns of human behavior to extract intelligence

The confluence of these trends has resulted in the emergence of three new superpowers that technology can now harness to drive exponential improvement in human capability in education: telepathy, total recall, and communication with perfect fidelity. Because these powers have snuck up on us bit by bit, we don’t easily recognize the change, and because we think we know how they work, we are no longer amazed. Nevertheless, these powers are real, and they are amazing.

First, with the advent of ubiquitous, instant communication through phones, texts, e-mails, Tweets, and blog posts, we are all telepathic. We have a thought, and we can immediately send it to anyone we know, nearly at the speed of thought itself. We regularly do this now, and no one thinks twice about it. If you somehow invented “real” telepathy today, you wouldn’t be able to sell it. You’d be too late, because AT&T, Verizon, and others have already shown the world how to do that trick. Their way is cheap, and it makes sense to billions of people.

The second superpower that we gained in the last decade is total recall: the ability to augment the memory capacity...
of our biological processor with an infinite store of out-of-body memory and calculation. And here’s the best thing: not only can we recall things saved to this offline store but we also can “recall” things we never even learned in the first place. Consider my iPhone. This little piece of storage is how I recall phone numbers. I used to use my brain to do that, but I could remember only a few phone numbers, recalling a number sometimes took thirty seconds or more, and I often transposed digits or just forgot the numbers outright. Worst of all, I had to learn the numbers and commit them to memory through a process of repetition that was tedious and error-prone. Now that I have off-loaded my phone numbers to my iPhone, things work so much better. For one thing, I don’t use the numbers at all. I just say the person’s name. And I can do that even when I’m calling a person for the very first time, provided my phone has stored the number from, say, a company database or campus directory or if the person has called me before. This new memory store is not restricted to phone numbers: Google and Wikipedia, for example, have also made ever-increasing stores of the world’s knowledge accessible in the same way.

The third superpower is the ability to communicate with perfect fidelity. The proliferation of cameras, both still and video, combined with the ability to send emails, Tweets, and Facebook links to various media allows people to understand in much more detailed ways and with much greater fidelity. The clear communication of increasingly complex ideas between people is now possible. Think about the power of this in communicating with your spouse. “Honey, I told you to take out the garbage. You never did.” Click. You take and send a photo of the garbage. There it is. Perfect fidelity.

So, why aren’t these three superpowers making a difference in education? Because these new skills are being acclimated from the young to the old, instead of the other way round. When you first learned to use an ax, did you go to your parent and say: “Hey, I found this in the garden. It seems really sharp. It should be great for cutting things, like my leg!” No. We teach the young, through education, the purposes and correct uses of advanced tools like axes and pens. But because our education system changes so slowly, and because these new powers have arisen so quickly, we have yet to adjust our curricula to embrace them.

The opportunity is here. The potential for radical improvement is here. We are now poised to capture the value. The stage is set. The long-awaited digital shift in education can begin. Get ready for the Four Beyonds.

**The Four Beyonds**

How will we know that the digital shift has finally begun? Watch for these four signs of change, what I call “The Four Beyonds”:

- **Beyond Textbooks**
- **Beyond Bookstores**
- **Beyond Learning Management Systems**
- **Beyond School**

Within five years, all four of these will be shattered. And when that happens, the world of education will never be the same.

**Beyond Textbooks**

Although e-books have been available in various forms for almost two decades, they have yet to have any significant impact in higher education. Professors don’t assign them, students don’t like them, and publishers don’t invest in them. There have been few signs of progress in the e-book field. Until now.

In May 2011, Amazon announced: “By July 2010, Kindle book sales had surpassed hardcover book sales, and six months later, Kindle books overtook paperback books to become the most popular format on Amazon.com. Today, less than four years after introducing Kindle books, Amazon.com customers are now purchasing more Kindle books than all print books—hardcover and paperback—combined.” The trade book industry knows there is no going back. And when governments from South Korea to Georgia are beginning to look to tablets, computers, and smartphones as a replacement for textbooks by as early as 2014, it’s clear that the cracks in the dam are beginning to leak.4

The conversion to digital is not just a cost-cutting measure. Tablets have
ushered in a new era of interactivity for the e-book. Publications like National Geographic and Wired have completely reinvented themselves as digital magazines for the iPad, incorporating multidirectional scrolling, audio and video clips, and various other interactive features to make the new form not a substitute for but, rather, a reinvention of the traditional form. In another example, the New York Times technology columnist, David Pogue, wrote about Al Gore’s recent app version of his 2009 book Our Choice: “The interactivity, the zooming into graphic elements and the videos aren’t a gimmick. They actually add up to a different experience. . . . You can spend many hours with this ‘book,’ immersed and exploring. For once, here’s an e-book that really does redefine the net effect of an e-book.”

Beyond Bookstores

The second sign that the digital shift is imminent is the stress that campus bookstores are under. Campus bookstores have been one of the core institutions of higher education, distributing learning materials to students for a century or more. Uniquely adapted to serve as the middleman between professors’ textbook choices and students’ needs to buy, return, and sell those texts, bookstores have filled a local niche, ensuring the necessary supply of eclectic materials that students would otherwise have to travel far and wide to obtain. As digital forms of these materials have been created, bookstores have turned them into physical products, in the form of access cards and the like, fitting them into the brick-and-mortar business model rather than adapting to the speed and flexibility of electronic retail.

But recent distribution innovations made possible by the Internet have inverted this dynamic, fitting physical texts into the high-speed, high-choice landscape of e-retail. Amazon, Barnes & Noble, Chegg, and a host of smaller e-retailers offer many of the staples of the campus bookstore at lower prices and even by rental—putting serious pressure on the retail margins of campus bookstores. And as more products move into digital format, the old business models that kept campus bookstores in the distribution game are being replaced by direct sales, which cut the store profit but provide a better price for students and greater convenience for professor and student alike.

The same forces that brought the once-mighty Borders to bankruptcy in 2011 are arrayed against the campus bookstore. In its place will be a direct distribution model for learning materials, one that streamlines the adoption and distribution of digital solutions. This will no doubt cause short-term disruption as the old model unravels, but the end result will be a much wider choice of learning materials and more fluid distribution.

Beyond Learning Management Systems

For the past fifteen years, the Learning Management System (LMS) has been nearly synonymous with academic technology in higher education. The promise of the LMS was that putting a broad, discipline-neutral, integrated set of learning tools in the hands of individual professors would allow them to create rich digital learning experiences in a consistent environment. The reality today is that the lion’s share of professors use the LMS administratively—as an electronic way to hand out papers (e.g., syllabus, notes, grades) at the beginning of class and to collect papers (e.g., assignments, quizzes, homework) at the end of class. Although there are examples of innovative pedagogy based on the LMS, they are outliers.

Beyond the LMS lies a new focus on rich digital learning experiences, which will be created by teams of subject-matter experts, instructional designers, and developers, informed by data, and continuously improved.
the world are doing in the digital classroom,

- makes it easy for professors to adopt those new ways, once discovered,
- makes it easy to continuously improve on what has come before and to share those improvements with the community, and
- makes it easy to distribute digital learning content of all kinds directly to students.

Beyond today’s LMS is a new and open platform for learning, deployed to professors and institutions at no cost for licensing or for hosting. The new platform will eliminate barriers between practitioners and enable progress. And it’s right around the corner.

Beyond School
Where will all these advances take us? Beyond school as we know it, pushing at every boundary. Higher education institutions will reach down into the last two years of high school to offer courses that guarantee admission to—and adequate preparation for—incoming freshmen. Broad confederations of institutions with unbundled curricula will allow students unprecedented freedom to construct degree programs and other forms of certifications with collections of credits. Integrations between higher education institutions and corporate training programs will facilitate professional development for the workforce through changing economic cycles. The development of broad-based online education programs, at scales of 100,000 or more students, will carry the well-established brand and reputation for quality of a traditional institution of American higher education.

Nor will the movement beyond school be confined to the institution. Courses too will move beyond their traditional boundaries as more and more content is presented “over the wire” and as contact hours are shifted away from the lecture and toward interaction. Personalized, adaptive learning programs will play an ever-greater role in tutoring students and providing professors and academic advisors with more accurate pictures of their students’ skills and deficits.

Finally, new ways of organizing and funding education, including alignments of public and private interests, will emerge to help change the scales and price points that educational models can reach. The past decade has seen the rapid rise of new forms of for-profit education and the huge demand for accessible education. Combinations of old institutions and new business models will create new forms of “school” to meet the escalating demands for and challenges of education in this century.

Notes

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