



Education for a Smarter Planet: The Future of Learning



Executive Insights

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The Future of Learning: Enabling Economic Growth

Signposts for the Future

Leaders from education and government aspire to improve their institutions' outcomes and value to society. They strive to meet rising expectations from students, communities and business with limited and increasingly constrained resources.

Nations hold their educational systems accountable for a high level of performance for good reason. Education will be the critical determinant of success for communities in the 21st century just as land was key to agrarian societies and capital investment was critical to industrial economies.

Looking into the next decade, the education industry will continue to face evolving challenges in shaping its relationships with its constituencies. Changes in technology, commerce, politics and demographics will require educational systems to adapt to serve their citizenry and to contribute to the future economic success of nations, states and regions.

Signposts for the future are already visible – signaling significant changes to all segments of education as well as to their funders. These five signposts – technology immersion, personalized learning paths, knowledge skills, global integration, and economic alignment – are rapidly converging to produce a new and transformative paradigm that we call the “educational continuum”.

This continuum will further dissolve the traditional boundaries between academic segments, education providers, and economic development initiatives to create a single view of learning, skills development, and workforce training. The educational continuum creates a smarter way of achieving national objectives.

To anticipate and embrace these challenges, educational and governmental leaders can take action now to understand shifting dynamics and to transform their organizations to deliver better student performance, greater workforce flexibility, and enhanced value to society.

Education's Signposts

Five interrelated signposts have emerged over the last few years directly impacting the rate and direction of change in education.

Five signposts for the future of education indicate a series of challenges dramatically impacting students, workers and institutions.

A ten year old student today will experience a dramatically different global society as she enters the workforce in the year 2020. Technology advances will drive profound change for today's students. The current rate of information growth roughly doubles the amount of knowledge in the world every two years. If today's first grader could carry the entire world's knowledge in their backpack, they would need sixty-four backpacks by the time they graduate high school in 2020 to carry the world's information. But how does one use that much information?

The service-based economies of tomorrow will increasingly require the meta-skills of critical thought, information literacy and creativity to solve problems that haven't yet been encountered. Knowledge workers of the future will function within a web of collaborators and almost limitless information and computational resources. Education must begin today to build a student-centered industry that develops in each citizen the skills necessary to prosper and thrive in that world of tomorrow.

Governments and educational institutions must begin to see themselves as part of a holistic system that anticipates the needs of its citizens by directing investments and resources to embrace the future. But how do educational systems respond when they are facing the challenges of limited resources, inflexible infrastructures, entrenched processes, increasingly incoherent and incompatible data, and rising consumer demands?



TECHNOLOGY IMMERSION
Technology immersion of students



PERSONAL LEARNING PATHS
Personal and varied learning paths



KNOWLEDGE SKILLS
Knowledge skills for service-based economies



GLOBAL INTEGRATION
Global integration of systems, resources, and cultures



ECONOMIC ALIGNMENT
Education's critical role in a 21st century economy

Five signposts of educational trends can be perceived as challenges to traditional institutions – or – as opportunities for meaningful and long-lasting systemic transformation to systems of education.

How an educational system responds to these trends will determine not only its value to its students but ultimately, its long-term value to society.

An investigation into each of these areas is useful for understanding the direction and rate of change, as well as to developing realistic and actionable strategies for education policy, investments and programs.



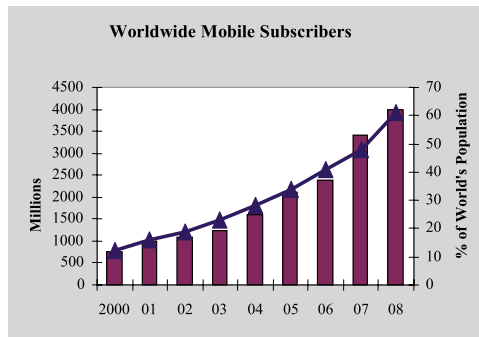
TECHNOLOGY IMMERSION

For the first time in history we have a generation of digital natives – these students of the Internet generation have grown up immersed in the use of information technologies.

Unlike generations past, these students are at ease with technology and easily adapt and integrate new functionality from smart phones, laptop computers, mp3 players, game stations, and virtual reality worlds. They arrive at school expecting to leverage technology in the learning environment just as they do in their personal lives.

First among these signposts is the predominance of students who have technology integrated into their daily lives. In much of the world today, young people have come to depend on digital resources for communications, learning and entertainment activities at home, school or workplace.

This revolution of mobile technology is being driven by innovations in the consumer marketplace. New devices and services are being introduced around the world, even in emerging market economies.



The 21st century student is “wired” in a way that could not have been imagined even 10 years ago. According to the International Telecommunications Union, 4 billion subscribers of cell phones are expected by the start of 2009, representing 61% of the world’s population. Cell phone usage is projected to grow at an annual rate of over 20%.¹

In addition to cellular communications, other forms of wireless connectivity are also providing access to regions that previously have had minimal Internet access. Broadband local wireless, radio frequency, and satellite devices are enabling new services and greater access in many regions. At the Connect Africa Summit in 2007, countries pledged 55B USD to expand infrastructure connectivity to the entire continent by 2015.²

A plethora of new devices will emerge over the next decade as microchips proliferate, technology becomes more affordable and connectivity becomes globally pervasive. According to SEMI, a global association for micro and nano-manufacturing, the demand for the basic components in consumer devices will grow at an average of 17% annually over the next five years.³



PERSONAL LEARNING PATHS

As students and parents evaluate their educational opportunities made available through technology, they begin to define highly individualized paths for learning and skills development. Increasingly, students value programs and services tailored to their abilities, lifestyle, needs and preferences

The rate of increase in online course enrollments at all levels – from primary school to universities – indicates a student willingness to pursue educational offerings delivered through technology.

Expectations for the digitally-enabled student lead to the second signpost of the future – a rapid rise in the educational options for students of all ages. No longer are educational offerings constrained by physical place and time. Students and parents are free to choose from a wide variety of primary and supplementary educational service providers that complement their needs, abilities, means and preferences.

The Internet generation students are much more likely to embrace online learning. Recent studies in the US have indicated online course enrollments grew at a compound rate of 73% for K-12 from 2000 – 2006.⁴

Secondary school students often prefer online courses to face-to-face classes because they consider them more responsive and adaptable to their individual needs. Students cite the following advantages to online learning:

- To learn at my own pace (37%)
- To get extra help (29%)
- To accommodate my schedule (28%)
- To take a class not offered at school (38%)
- To earn college credit (43%)
- To learn about a subject (28%)⁵

The Economist magazine recently reported that more than two-thirds of higher education institutions offer online courses, and these courses are embraced by students as legitimate alternatives to face-to-face education.⁶

The rich variety of online offerings for youth and adults allows students to select individual learning opportunities from a broad range of institutions and providers, both public and private. In effect, students are behaving more like consumers, and in response, education systems must increasingly behave as customer-oriented service providers in the future.

This transformation is creating a more personalized learning experience within the classroom – whether online or in a traditional setting. Students can seek out relevant instructional materials to help them master particular concepts. Students today augment their experiences with online videos from the Internet, with supplemental courseware, and tutoring services. Instructors are beginning to have access to more tailored, specific learning materials to build personal learning programs for remediation of low performing students or acceleration of more challenging paths for advanced students.

New teaching methods for the next generation of active learning are integrating Web capabilities into personalized delivery and presentation of coursework. Opportunities are expanding for two-way interaction via a number of collaborative, social and virtual modes.

Personalization for students has extended outside the classroom into the curricular structure of their individual learning process. Students expect greater flexibility to pursue their own pathways to achieve skill objectives and certification. As students learn at their own pace within a classroom, it is quite possible they will increasingly want to control which classes they participate in – and when. Educational institutions are experimenting with greater accommodation and flexibility by offering programs based more on certification of competency, versus the traditional “time in class” model.



KNOWLEDGE SKILLS

The worker of the future needs different skills to compete in an increasingly services-dominated job market. As demand for agricultural and industrial workers continues to decline, students need to acquire skills that prepare them for knowledge-based professions.

Teachers and faculty members are developing new teaching methods using tools for interactivity, personalization and collaboration to engage students in real life situational experiences that convey concepts, promote learning and develop lifelong skills.

The third signpost for the future is a shift in the requirements for workers' skills toward more knowledge-based competencies. Over the past 25 years in developed and developing countries, service-based jobs have increased over 11% while positions in the industrial and agricultural sectors have both decreased commensurately.⁷

Educational providers are responding to this shift by integrating 21st century teaching methods into their curricula. These new teaching methods are important in two dimensions: first, to deliver traditional courseware in a more interactive mode in order to increase what a student learns, and second, to develop lifelong, 21st century skills in how a student learns and works.

Employers increasingly hire workers who possess both job-related skills and foundational competencies that indicate an individual's potential to adapt to changing market and economic circumstances. At its 4th Annual symposium, the Asia-Pacific Economic Cooperation emphasized the importance of 21st century skills to respond to a rapidly changing global economy. They identified adaptable skills, global awareness, language learning, and information technology proficiencies as top priorities for competitiveness.⁸

The worker of tomorrow will be expected to solve problems that have not been encountered before, assimilate data from disparate sources, derive insights to make decisions and communicate effectively across language, country and societal boundaries.



GLOBAL INTEGRATION

Advancements in technology have eliminated traditional lines that defined the boundaries of an educational institution.

Global integration has:

- raised the awareness of the potential for improved outcomes with greater personalization and productivity
- allowed new service providers to enter well established educational markets
- introduced opportunities for institutions to extend their linkages to new populations of youth and adult learners

With these new models for teaching and learning, education is confronted by the fourth signpost – How does an educational institution participate in a globally integrated world?

A globally integrated world will create opportunities for institutions to reach new learners, for learners to access new resources, and as a result, create a more integrated web of collaborators and resources. While this leads to more competition, it also means greater need for collaboration skills among the workers of tomorrow, greater ability to access and manage information, and greater cultural awareness.

The Internet has made alternative educational models and systems easily visible to students, parents and funding agencies worldwide. Evidence and testimonials of improved quality, productivity and outcomes are raising expectations of performance. These constituencies respond by demanding comparable performance from their institutions, or by abandoning their traditional educational providers for alternative offerings. Whether competing for individual student enrollments, or measuring performance of an entire system against other countries around the world, global benchmarking is a key driver of education in the 21st Century.

Viewed positively, global integration presents opportunities for innovative institutions to remove barriers and broaden their reach. Advancements in technology allow students at every level to discover and access resources and services from any institution. Those that can provide compelling, sophisticated and effective learning will continue to remain vital and valued.

The future of learning will incorporate open services and resources that will challenge the value of individual institutions and their learning resources. To compete, institutions will need to harness these resources and add unique value for their students. As budgets tighten and viable alternative offerings abound from global providers, institutions must determine what to “build” and what to “buy” in order to provide their students and faculty the tools they need at an affordable price.

The cost of building and operating state-of-the-art systems and infrastructure represents a significant financial challenge to most schools and higher education institutions. Likewise, the cost of not participating in a globally integrated educational service environment may restrict their ability to deliver on their missions.



ECONOMIC ALIGNMENT

A rapidly shifting economic environment requires that governments be nimble to respond to opportunities for growth and sustainability.

Governmental leaders and economists have recognized that education is a key differentiator in economic prosperity in the 21st century.

The final signpost for the future of education is a growing understanding of the critical role that educational systems play in service-based economies. Local and national leaders are calling for closer alignment between educational systems and their region’s economic development initiatives and goals.

Governments are responding to shifts in demographics and market opportunities by strategically investing in selected markets and stimulus programs.

Education systems that adapt and respond accordingly are critical to a successful return on those investments. The educational systems that can best demonstrate their adaptability and responsiveness will be the ultimate winners in receiving favorable government treatment and funding.

But how will those contributions by education to the economy be measured? The current systems of accountability that focus on outcomes within an educational system are inadequate in assessing whether the system’s programs and investments are preparing students for the skills they will need to succeed outside that education system. Aligning educational outcomes to the demands of tomorrow’s workforce will dominate the accountability discussion at the local level; while on a public policy level, concerns about global competitiveness will compel policymakers to intensify educational accountability across the full spectrum of educational services.

The Educational Continuum

These signposts for the future of education clearly indicate a move away from the traditional path of education for students, teachers, faculty and institutions. Academic training has been viewed as one where all students pass through a straight and narrow path from primary to secondary school, on to vocational training or university, and then to the workforce. As the dynamics of education, employment and the economy change, this view of the traditional experience is more the exception than the rule.

As a result, educational and governmental leaders must rethink the traditional view of educational segments and embrace the notion of an education continuum – a more instrumented, intelligent and interconnected educational system

The US National Governors Association has recognized the critical importance of better alignment of secondary and post-secondary education. In their February, 2009 position document, High School Reform to Lifelong Learning: Aligning Secondary and Postsecondary Education, they outline legislative and policy recommendations for a broad set of changes, including preschool through college alignment, diverse education offerings, and dual enrollment in multiple institutions.

“Governors recognize the importance of promoting innovation and integration among secondary, postsecondary, and industry-recognized institutions. Federal policies should encourage—not discourage—promising state efforts in dual enrollment programs that permit students to obtain high quality college-level credits or provide the opportunity to earn an industry-recognized credential while still in secondary school.”⁹

The traditional boundaries defined by preschool, primary, secondary, and higher education are no longer adequate to define a student's path through his or her preparation for the workforce.

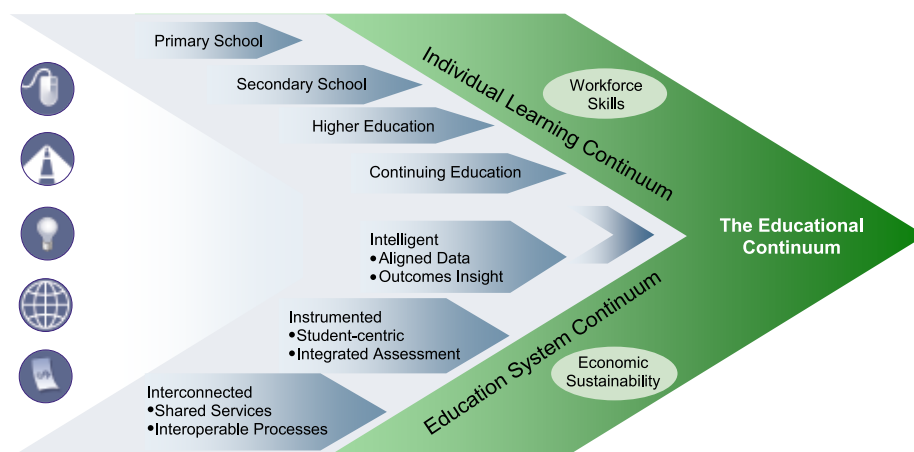
The educational experience is often much less linear, more complex and varied, with many different paths of educational

attainment. These pathways are all acceptable and often very effective avenues for academic and skills development, such as employment retraining, vocational education, technical training, apprenticeship, internship, and informal learning programs.

Over the next decade, students and workers will have increased control to define their own personal continuum of learning experiences that better corresponds to their aspirations, available jobs and individual needs. The boundaries between discrete learning experiences at each level will also further dissolve.

We see this continuum providing a more interconnected, instrumented and intelligent educational system. Learning services and resources will become more interconnected and seamless. Information about student needs and skill gaps will become more instrumented and non-intrusive to the teaching process. Decision-making will be informed by intelligent insights based on an integrated view of learning.

In the educational continuum, the vast majority of students will follow more dynamic and individualized courses throughout their lifetimes. Their courses of study would include emphasis at an early age on foundational skills, advance toward specialized competencies corresponding to their strengths, passions and employment opportunities, and continually provide for retraining throughout their lifetimes as changes occur in the employment market.



What do these signposts indicate for Education in the next decade?

The signposts of change will require educational systems to respond boldly in a variety of ways.



TECHNOLOGY IMMERSION

Any Device Learning

First, we expect significant advancements in the digital resources available in the consumer marketplace.

As a result of this increase in functionality, mobility and access, students of all ages expect to receive information, entertainment, and learning across a variety of devices that will accommodate their preferences, abilities and needs. Over the next decade, more of these resources will be stored remotely from the device, and “fed” as required to the student of the future. Because of this digital transformation, technology will increasingly become the key enabler of their life-long learning experiences, starting at an early age and continuing throughout their lifetimes.

Each of these consumer devices represents an opportunity for the delivery of learning services. Students immersed in technology will increasingly demand to engage in learning experiences on the device of their choice. Institutions of the future will have processes for constant adaptation and enhancement to their services. Anytime, anywhere learning will include the concept of any device learning.



PERSONAL LEARNING PATHS

Student-Centered Processes

Second, students following their personal learning paths will force educational providers to work together and share information, processes, resources and data seamlessly and transparently. Integrated student processes will transcend individual institutions and allow for exchange of student data, learning programs and outcome metrics.

Other industries have come to understand that consumers will not be held captive by a single provider, and that alternatives are available for all services and products. The healthcare industry provides a useful model for this industry collaboration. Standards for processes and data interchange are being defined to allow for multiple providers to deliver services, and record that activity in common formats.

We expect the evolution of comparable, collaborative models in education. Processes will become more student-centric, versus institutionally focused. Learning programs will seamlessly bridge between institutions. Individual achievement will be collected in shared repositories with a single view of the student throughout his or her lifetime.

Academic accomplishments and digital artifacts will be collected in personal academic records, or e-Portfolios. Systems must better formalize the broader curricular learning requirements for various certificates and improve portability of qualifications through ePortfolio tools. These actions will have the direct effect of leading to more personalized lifelong learning pathways.



KNOWLEDGE SKILLS

Learning Communities

Third, we expect that teachers and faculty will be provided with professional development training and tools to enhance the delivery of education to new forms of learning communities. Curriculum and courseware will be designed to build 21st century skills in students. New pedagogical tools will cultivate new competencies required for success as an employee. Individuals will be empowered to become informed consumers and proactive citizens.

Globally connected students and institutions will enjoy much greater real-time collaboration between educators, students, and administrators. 3D virtual worlds, telepresence, social community sites and interactive learning resources will create a comprehensive environment for multi-faceted student teams, project-based learning and collaboration.



GLOBAL INTEGRATION

Services Specialization

Fourth, global economic dynamics will continue to place immense strain on educational systems to deliver more with less. They will be expected to gain greater productivity, higher quality and better outcomes with lower budgets.

It will no longer be affordable for every institution within an educational system to provide all services and resources. Instead, educational institutions will need to “specialize” in their core competencies and understand their differentiating value. They can then fulfill remaining requirements for resources, tools, service or expertise from the most cost-effective source.

In a globally integrated educational system, institutions will combine forces to create a model where many services are shared – allowing for resources to be pooled and centrally managed across educational systems. Mimicking the models and success of high-performing organizations in other sectors, institutional services sharing will have a profound effect on improving efficiencies and reducing cost. Standards for open architectures, platforms and applications and for securing data and privacy across institutions will help drive this change.



ECONOMIC ALIGNMENT

Systemic View of Education

Finally, governmental leaders worldwide increasingly view education as an integral component to a sustainable foundation for economic recovery and long term health.

Educational systems will transition from outcome metrics that assess the performance of individual institutions to measuring the efficacy of the entire system in contributing to economic goals.

To incubate new economic initiatives, communities and nations must plan to develop a broad spectrum of skills to nurture new business and industries.

Economic initiatives will require the support of the entire education system. For example, funding to a top-tier research program will require coordination at all levels of the educational system to be successful. Investments in research must coincide with intense focus on building the skill base and workforce capabilities needed to quickly staff new firms and grow new industries. Research programs would help define critical learning programs, provide mentoring to younger students, and inspire a new generation of learners and workers.

Educational and governmental leaders will require the tools and resources at their fingertips to make informed investment decisions in programs and initiatives. Data must be integrated at an aggregated and individual student level from all education providers to give decision makers a “single” view of the educational system.

A view of the future of Learning

Primary School: Olivia

Olivia is a sixth grade student awaiting her bus to school. On her personal digital assistant, Olivia edits a video story on a recent earthquake in Japan that she is working on with a student from the affected area. From her digital assistant, Olivia is able to access video, news articles and other information about the earthquake to compile the article. While she works on the report, her assistant communicates continuously with a centrally located assessment service that records her activities and progress.

The assessment tool provides her teachers, parents, education specialists and Olivia herself with progress tracking against objectives. The system can help tailor activities that will help speed and enrich her learning process.

At school, Olivia shares the news of the earthquake with her classmates, who become interested in the story and begin their own research. Her teacher is alerted to the class interest in the event, and he decides to adjust his lesson on physical sciences to incorporate more detailed lessons on seismic activity. Olivia and a classmate are teamed together in researching another earthquake in the last century in Alaska.

While reading the report aloud, Olivia's classmate has trouble with some of the unfamiliar, scientific words. A voice recognition reading program evaluates the fluency of reading, and alerts their teacher's personal digital assistant to the student's difficulties. The teacher is provided with recommended activities for the student to practice reading, and he selects the appropriate activity to assign for that evening.

Later that evening at home, Olivia and her father are reviewing her progress and they have a question about a follow-on assignment from the earthquake report. They establish a video connection with her teacher and are able to clarify the assignment. Her father recommends one of his colleagues to the teacher, a seismologist as a subject matter expert for the next day's class.

Olivia's learning is seamlessly integrated into her formal and informal activities at home and in school. She has access to people, resources and information around the globe to help her create a personalized path for her learning. Her progress is continually tracked through the integrated assessment of her activities, so her learning is not interrupted by testing.

Higher Education: Dr. Kelly

A faculty member at Global Networked University is preparing for her class on the History of Western Thought. Dr. Kelly's university has many locations around the globe, and her current class has students in both the United States and in the Middle East.

In preparing for the class, Dr. Kelly ensures that she has her RFID campus badge which gives her access to her personal data repository, systems and archives from any device with access to the Internet.

She begins her class with a welcome by the president of the university, Dr. Winston. As he is not physically in either the US or Middle East location, he speaks to the class via a holographic telepresence system. While his 3D, virtual image is projected to both locations, he is able to see the participants in the two locations and respond to their questions in a conversational mode.

Dr. Kelly begins her class by activating the interactive video wall by using simple gestures that are recognized by the device. She is able to project her lecture materials, classroom-aware student information, and the live feeds from both class locations.

A Lecture Console provides her with a variety of data, insights and resources that help inform that day's class activities. She can see on the console that her class is being recorded and indexed for easy cataloging and retrieval from the university's digital library. Dr. Kelly also sees information about each student attending the lecture, their progress, and their real-time interaction and participation. The students are able to interact continuously through the class via collaboration technologies and tools.

Worker Retraining: Debra

Debra is a medical technologist who is taking advantage of a government-sponsored educational program to train more workers in geriatric physical therapy. Her program allows her to continue her regular employment while participating in learning activities at home, in small group settings and in clinical experience.

From home in the evening, Debra participates in a real time interactive clinic with her classmates. They are preparing for the next day's appointment with an elderly woman who recently suffered a hip injury. The group collaboratively reviews the patient's records and develops a proposed course of treatment. As they review the case, Debra's digital assistant collects the information that is presented, as well as journal articles and background materials that will complement her learning activities.

Her supervisor asks Debra to demonstrate the correct method for assisting a patient with a hip fracture to begin walking. Using a virtual reality system, she is able to authentically simulate the experience and gain feedback on her techniques from her classmates and instructor.

After meeting with the patient, Debra presents her findings to her professor. He is able to post his critiques, suggestions and assessment to both Debra's, as well as her supervisor's, personal digital assistants.

Without leaving her current job, Debra is able to gain valuable skills that will serve the needs of her community. She is able to weave learning into the fabric of her life seamlessly at her convenience.

The future of learning is both challenged and enabled by technology. Institutions, educational systems and societies can be transformed by the power of innovation.

Transformative technologies for smarter education system

Several emerging technologies are enabling the transformation to the educational continuum:

Open Technologies – The history of the IT industry has been the slow, steady development and adoption of open technologies – technologies not controlled or monopolized by a single commercial partner or organization. Open standards have acted like the “railroad gauge” of the 19th Century – defining the rules and specifics to enable a variety of commercial firms to deliver services within a common framework. This approach has enabled customer choice and flexibility, provided investment security, and fostered rapid innovation. Open platforms have emerged across servers, software and networks in the technology industry. The best example is the Internet, which enabled an explosion of connectivity through common protocols.

Today, open standards are gaining traction throughout the IT industry. Open source projects, like Apache for web platforms, Eclipse for application development, and Linux for servers are helping foster and drive more common, open frameworks. Applications are becoming more open through service-oriented architectures and open-source projects, like Sakai, Quali and Moodle.

These open systems are critical to the future of learning to enable a seamless education continuum that is centered on the student, not the institutions. Common data and processes will allow better management of outcomes, more personalized learning pathways, and lower costs of operation.

Cloud Technology - Open technologies have driven costs down across hardware and software infrastructures. Computing services, storage and networking bandwidth are approaching prices that shift the balance from scarcity to abundance. This has changed the economic dynamic of IT to focus on the scarcity of other factors: power and cooling costs, IT support staff, floor space, management time, and others. The growth of bandwidth and internet scale computing capabilities spell the end of the 20th century model of distributed computing. The new paradigm, dubbed “cloud computing” is really about shift toward true utility models of computing. Computing will shift “into the clouds” and be available whenever, wherever it is needed.

Cloud computing seeks to achieve economies of scale to lower costs, while using a utility delivery model to improve user services. The future will be composed of both “public” and “private” clouds. Public clouds will offer consumer level services and can be integrated into an enterprise to provide common user services. However, institutions and communities will build their own private clouds to provide unique services to their constituents. Integrating these services will be a key function of IT departments in the future.

The cloud computing paradigm will provide new opportunities for education institutions and governments to create shared services across regions and systems. This will improve access to both urban and rural communities, improve quality of services from providers, and lower costs from reduced duplication and enhanced efficiencies.

Consumer IT - Cloud computing evolution will be complemented by continued growth in the mobile technology and device market. This presents both an opportunity and risk for developing IT strategy. The risk is that organizations will find themselves flailing in developing and deploying a coherent enterprise strategy and architecture as they chase the latest consumer craze. Savvy institutions will build an open environment for their enterprise that accommodates and leverages the consumer market, but is not driven by it.

The time is past where enterprise IT is built around the end-user platform. Education institutions in the future should no more care about the type of user device than they care about the model of a student's stereo. The new enterprise IT will be based on open technologies, private cloud services, and will capitalize on the consumer marketplace to distribute user devices and to source public cloud services.

A call to action

What are the key policies that governments and education institutions should consider to proactively build smarter education systems? We recommend several critical policies be evaluated to enable education system transformation.

Adopt and promote a vision of personalized learning within institutions and across educational systems for students as well as teaching staffs. This vision will encourage better use of data to manage and tailor the learning process for individuals across institutions. Teachers and faculty will receive the resources and tools they need to help their unique student population succeed. Services and tools should support learning flexibility, customization, and migration.

Establish student-centric versus institutionally-centric processes. Building smarter educational systems will require a new focus on managing and improving the entire process of lifelong learning. Common data and services will help improve quality through better insight, interventions, and opportunities.

Promote open standards and open platforms in technology. To achieve personalized learning and student centered processes, the technology environment must be built on common platforms and standards. Open, standardized technology will enable the broad market of commercial providers, foundations, and educational developers to all contribute toward innovation. Interoperability

will improve services, increase flexibility, and lower costs, both within and across institutions.

Consolidate services across institutions and agencies. The economic benefits of cloud computing will be impossible to avoid in the future. Organizations should identify the key differentiated competencies that will define their service to their constituents and partners. They will source some services from public providers, and will share some capabilities with peers or members of their national or state education system. Consolidated services will be a significant driver for lowering costs across educational systems, but will also help enable broader access. No longer will student access to technology be dependent on the depth and breadth of IT staff and support costs an institution can field. Students throughout a state or region can expect common services delivered through the "Education Cloud" of their system.

Support the transformation of educational systems with all stakeholders. Improved outcomes from education systems will only be achieved with full community engagement. Employers, families, agencies, and non governmental organizations must actively engage in dialogues, contribute to planning efforts, commit resources and be accountable for success of the entire educational system.

Collaboration for Transformation

The common denominator in these policies is a commitment to collaboration. Educational institutions, commercial partners, foundations and all others supporting education must make a serious commitment to sustained, energetic collaboration. We must collaborate within and across educational institutions to build new processes and services. Commercial partners and institutions must collaborate to create new standards and platforms to enable innovation. And educators must collaborate to harness new technologies, build best practices, and enable a new model for teaching and learning.

Primary Contributors

Dr. Jim Rudd is an IBM Distinguished Engineer for IBM Global Business Services and leads the Customer Experience Strategy and Design Practice for IBM Interactive. He may be reached at jimrudd@us.ibm.com.

Ms. Patricia Sullivan is the Education Solutions Executive for IBM Global Education and leads the development of emerging offerings to schools and higher education. She may be reached at pasulliv@us.ibm.com.

Mr. Michael King is the Vice President for IBM Global Education and leads strategy, marketing and sales for schools and higher education. He may be reached at mdking@us.ibm.com.

Mr. Fran Bouchard is the Managing Partner for Education in IBM Global Business Services. He leads the consulting practice for education. He may be reached at franb@ibm.com.

Mr. Kevin Turner is the Director of Sales for IBM Global Business Services in Education. He may be reached at kevin.turner@ibm.com.

Mr. Mark Olson is an associate partner in IBM Global Business Services for Education and leads the higher education segment. He may be reached at maolson@ibm.com.

Ms. Kirsten Schroeder is a partner in IBM Global Business Services for Education and leads the Department of Education segment. She may be reached at kirsten.e.schroeder@us.ibm.com.

Mr. Alex Kaplan is an associate partner in IBM Global Business Services for Education and leads the school segment. He may be reached at alex.kaplan@ibm.com.

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IBM Global University Programs

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IBM Open Source and Linux

Ms. Robin Willner,
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Route 100
Somers, NY 10589
U.S.A.

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