The Role of Technology in the New Normal of Higher Education

David Lassner
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University of Hawaii
david@hawaii.edu
## Focusing on Mission

<table>
<thead>
<tr>
<th>Core Higher Education Challenge</th>
<th>Technology Opportunity</th>
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<tbody>
<tr>
<td>Raise Efficiency and Performance</td>
<td>Increase Institutional Cost-Effectiveness</td>
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<tr>
<td>Improve Learning Outcomes and College Completion</td>
<td>Reduce Time to Degree</td>
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<td>Advance Research and Innovation</td>
<td>Expand Affordable Access to Learning</td>
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<td>Foster Effective Learning</td>
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<td>Facilitate New Forms of Discovery</td>
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<td>Enable Research Collaborations and Communities</td>
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And drilling down...

<table>
<thead>
<tr>
<th>Core Higher Education Challenge</th>
<th>Technology Opportunity</th>
<th>Examples of Relevant Uses of IT</th>
</tr>
</thead>
</table>
| Control Costs                    | Increase Institutional Cost-Effectiveness | - Data analytics/business intelligence (e.g., total cost of ownership, return on investment, benchmarking)  
- Redesign/consolidation of operations and services (intra- and interinstitutional)  
- Outsourcing/cloud services  
- Demand aggregation/collaborative procurement or service provision  
- Energy management/green IT  
- Remote/distributed workforce support (e.g., telecommuting) |
| Improve Learning Outcomes and College Completion | Reduce Time to Degree | - Online/hybrid courses and programs  
- Course/program sharing, degree consortia  
- Course redesign  
- Open educational resources  
- SIS interoperability (e.g., SHEEO voluntary data standards) fostering student transfer  
- Learning analytics  
- Academic support/intervention (e.g., coaching, counseling, tutoring)  
- Competency-based assessment |
|                                 | Expand Affordable Access to Learning | - Learning analytics  
- Adaptive testing and instruction  
- Gaming and simulation  
- Deeper learning and engagement (e.g., student-created content; student participation in research projects/communities) |
| Foster Effective Learning        | Facilitate New Forms of Discovery | - Cyberinfrastructure  
- Data visualization/simulation  
- Federated identity management  
- Cloud services  
- Research community portals/online tools and support |
| Advance Research and Innovation  | Enable Research Collaborations and Communities | - Cyberinfrastructure  
- Data visualization/simulation  
- Federated identity management  
- Cloud services  
- Research community portals/online tools and support |
Shifts in Research

- Research is a Team Sport
- Research is increasingly interdisciplinary
- Research is increasingly international
- Research is increasingly data-driven and computationally enabled

Competitiveness in research, and research-driven innovation, requires adapting to the shifts
Cyberinfrastructure for Research

- Data collection devices -- large & small & globally distributed
- Large databases -- may be distributed
- Complex computational models & High Performance Computing
- Visualization
- Collaboration tools -- real-time and asynchronous

- Supported by people who “get it”
- Empowered by high speed networks
Cyberinfrastructure Initiatives

- High performance computing
  - Hawaii Open Supercomputing Center / MHPCC
- Research data storage and curation
  - Hawaii Geospatial Data Repository
- Collaboration tools
  - Synchronous and asynchronous tools for virtual organizations
- High-speed network connections
  - On campus, within the state and beyond
- Pending: Computational Science & Data Analytics (aka Big Data) Curriculum Initiative (systemwide/statewide)

Emerging Area for Institutional Support at UH and Research Universities Nationwide
Infrastructure Challenges

- Rising expectations
- Shrinking budgets, especially support
- Deferred technology infrastructure maintenance and backlog
- Culture of decentralization
- Unstable marketplaces
- Security and compliance imperatives
**Infographics!**

The 2011 ECAR National Study of Undergraduate Students and Information Technology

### Instructors

- **Students value the technologies instructors use and use effectively.** Percentage of students who say their instructors use technology:
  - Associate’s: 79%
  - Doctorate: 83%
- **Projector:** 69%
- **Laptop computer:** 74%
- **Wi-Fi:** 72%
- **Document camera:** 62%
- **Interactive whiteboard:** 60%
- **Scanner:** 47%
- **Webcam:** 27%

... but instructors at associate’s colleges are more effective. Percentage of students who say their instructors use technology extremely effectively:

<table>
<thead>
<tr>
<th>Instructor Type</th>
<th>Associate’s</th>
<th>Doctorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projector</td>
<td>75%</td>
<td>79%</td>
</tr>
<tr>
<td>Laptop computer</td>
<td>69%</td>
<td>74%</td>
</tr>
<tr>
<td>Document camera</td>
<td>62%</td>
<td>67%</td>
</tr>
<tr>
<td>Interactive whiteboard</td>
<td>61%</td>
<td>63%</td>
</tr>
<tr>
<td>Scanner</td>
<td>47%</td>
<td>58%</td>
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<tr>
<td>Webcam</td>
<td>27%</td>
<td>40%</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Applications most frequently used by students</th>
<th>Many students say they lack software skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processor</td>
<td>93%</td>
</tr>
<tr>
<td>Institution website</td>
<td>86%</td>
</tr>
<tr>
<td>Presentation software</td>
<td>86%</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>83%</td>
</tr>
<tr>
<td>Course learning management system</td>
<td>73%</td>
</tr>
<tr>
<td>E-books or e-textbooks</td>
<td>57%</td>
</tr>
<tr>
<td>Programming language</td>
<td>52%</td>
</tr>
<tr>
<td>Email</td>
<td>52%</td>
</tr>
</tbody>
</table>

Many students want specialized software skills. Percentage of students who say “I wish I knew how to use it better!”, **Programming language**

**Speech recognition**

Windows vs. Apple: Age makes a difference in undergraduates’ platform preferences:

- **25 years old and younger:**
  - Windows: 57%
  - Mac: 31%
- **25 years old and older:**
  - Windows: 77%
  - Mac: 13%

The number of different software activities engaged in by the average student:

Communication tools:

- Email: 75%
- Text messages: 74%
- Facebook: 60%
- Almost all students use e-mail (99%), text messaging (87%), and Facebook (59%)

### Hardware

A majority of undergraduates own about a dozen devices. Technology ownership:

<table>
<thead>
<tr>
<th>Device</th>
<th>5%</th>
<th>11%</th>
<th>38%</th>
<th>53%</th>
<th>55%</th>
<th>56%</th>
<th>62%</th>
<th>64%</th>
<th>70%</th>
<th>78%</th>
<th>81%</th>
<th>87%</th>
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</thead>
<tbody>
<tr>
<td>iPad</td>
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<tr>
<td>Netbook reader</td>
<td></td>
<td>12%</td>
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<tr>
<td>Games/Computer device</td>
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<tr>
<td>Web cam</td>
<td>5%</td>
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<tr>
<td>Smart phone</td>
<td></td>
<td>12%</td>
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<td>HDTV</td>
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<td>Games</td>
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<td>Thumbs</td>
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<td>DVD player</td>
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<tr>
<td>Printer</td>
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<tr>
<td>Computer Laptop</td>
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**Essential technology:** Percent of students responding “extremely valuable” for academic success to these technologies:

<table>
<thead>
<tr>
<th>Technology</th>
<th>57%</th>
<th>44%</th>
<th>73%</th>
<th>79%</th>
<th>81%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Device</td>
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<tr>
<td>Thumb drive</td>
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<td>Printer</td>
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<tr>
<td>Wi-Fi</td>
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<tr>
<td>Computer Laptop</td>
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Count the ways: How smartphone owners use their devices for academics:

- Email pirates                   | 64% |
- File sharing                     | 62% |
- Texting other students in class  | 61% |
- Looking up information on the internet | 45% |
- Texting professors               | 19% |
“When I was president, I got a big break ... and I just put the hammer to it, which is that information technology exploded through every aspect of the American economy.”

Bill Clinton, July 9, 2011 *National Journal* (speaking about factors in spurring the economy; also lamented that there’s been an absence of an innovation big enough to spur change)
Infrastructure Challenges

- Rising expectations
- Shrinking budgets, especially support
- Deferred technology infrastructure maintenance and backlog
- Culture of decentralization
- Unstable marketplaces
- Security and compliance imperatives
Elements of Infrastructure

- Systems
- Processes
- People

plus

- Networks
Top Three IT Issues in September 2011

- Integrating IT with the strategic mission of the institution
- Using analytics to support critical institutional outcomes such as student success
- The consumerization of IT

What are the urgent IT operational issues your department is tackling or preparing to tackle?

1. Archiving, back-up, and data retention
2. Automated workflow/paperless business environment/document management
3. Identity management
   - Funding implementation of business continuity/disaster (BC/DR) solutions
   - Extending BC/DR beyond central IT
   - Testing BC/DR plans
   - Merges and acquisitions among higher education vendors
   - Storage for large research data sets
   - Telephony architecture/environment
   - Reporting environments
   - Delivery of support services in a consumerized environment
   - Constrained human resources
   - Analytics

What goals, activities, or projects does your IT organization have for improving the organization itself or developing the staff?

1. Developing new skill sets to align with emerging technologies
2. Professional development via association participation
3. Performance development
   - Skills development
   - Competency development
   - Internal documentation
   - Salary studies
   - Structuring the organization to maximize predictability (ITIL, Six Sigma, etc.)
   - Talent management (promote from within, succession planning)
   - Cross-training
   - Staff training
   - Becoming a strengths-based organization

What is the single biggest IT-related issue currently facing your institution?

1. Integrating IT with the strategic mission of the institution
2. Using analytics to support critical institutional outcomes such as student success
3. The consumerization of IT
   - Using IT to transform the business of your institution
   - Quality IT decision-making (IT governance)
   - Transforming the role of IT at the institution
   - Funding
   - ERP replacement
   - Keeping the IT org. relevant
   - Organizational culture
   - Sourcing solutions (e.g., cloud, outsourcing, etc.)
Elements of Infrastructure

- Systems
- Processes
- People

plus

- Networks
Network Infrastructure

- Campus
  - Wired AND Wireless
- Community-Based
- State/Regional/National & International
Network Infrastructure

- Campus
  - Wired AND Wireless
- Community-Based
- State/Regional/National & International
Network Infrastructure

- Campus
  - Wired AND Wireless
- Community-Based
- State/Regional/National & International
Hawaii Broadband Task Force: Background & Charge

• Established through Act 2 of the First Special Session of 2007
• Primary aims
  • Removing barriers to broadband access, including gaining wider access to public rights-of-way
  • Identifying opportunities for increased broadband development and adoption, including very high speed broadband services
  • Enabling the creation and development of new advanced communication technologies in Hawaii
US Lagging Other Nations

Three main measures of a country’s broadband capability are:

- Broadband penetration,
- Speed of generally available technology, and
- Price per megabit per second.

The data paints a grim picture for the United States in all areas.

- HBTF Final Report
Hot in the City: HKBN launches residential FTTH

Hong Kong telco City Telecom’s broadband unit Hong Kong Broadband Network (HKBN) has announced the commercial launch of residential fibre-to-the-home (FTTH) internet access services, adding to its existing portfolio of fibre-to-the-building (FTTB) services. In a press release, it claims that the 'FiberHome' service is the first of its kind in the Special Administrative Region. HKBN is charging consumers USD48.50 per month for a 100Mbps fibre connection (FiberHome100), USD88.20 for a 200Mbps service (FiberHome200) and USD215.40 for its FiberHome1000 package, which gives users a maximum data transfer speed of 1Gbps. HKBN is ceasing to accept new applications for its entry-level bb10 service, which provides symmetrical speeds of up to 10Mbps, and its bb25 (25Mbps symmetrical) service is now the slowest package offered to new subscribers. HKBM introduced its first 1Gbps fibre access service, bb1000, in 2004. Chairman of HKBN, Ricky Wong, said in the press release: 'High speed broadband service (FTTH) is a foreseeable inevitability that we had prepared for three years ago. Holding onto to the belief that a service provider should deliver the best and most up-to-date services available to the public, we are pleased to be able to launch the massively-deployed FTTH version of 100Mbps, 200Mbps and 1000Mbps in Hong Kong, which also contribute to further enhance Hong Kong’s role as Asia’s telecommunications hub.'
High Speed in Japan

**NTT DoCoMo Tests Super-Fast Wireless Data**
By Ed Oswald, BetaNews
July 13, 2007, 1:47 PM

Over the next month, NTT DoCoMo plans to test a Super 3G, or LTE (long-term evolution) cellular system capable of sending data at 300Mbps.

**KDDI to launch 1Gbps fiber-optic service in Oct**
Saturday 27th September, 05:46 AM JST

TOKYO — KDDI Corp will launch a fiber-optic communications service with upload and download speeds each of up to one gigabit per second on Oct 1. The new service will target people living in single-family homes and low-rise apartment buildings. The traffic speeds will be the fastest in eastern Japan, up drastically from the current 100 megabits per second.

With the service, KDDI aims to catch up with Nippon Telegraph & Telephone Corp, which has a share of over 70% in the market for fiber-optic broadband services for single-family houses.

KDDI will charge 5,985 yen in basic monthly fees for Internet and telephone services, down 1,155 yen from the current price, if a user subscribes for two consecutive years.

KDDI will start offering its fiber-optic services, which are now available only in six prefectures in the Kanto region and nearby Yamanashi Prefecture, in four cities in the northern prefecture of Hokkaido.
Korea’s Commitment

How Korea’s IT infrastructure will change in 2012

- High-speed Internet service will provide 1 Gbps service (10 times faster than the current service)
- Wireless broadband service will offer 10 Mbps service (10 times faster than the current service)
- High-definition TV will allow the public to enjoy images that are 16 times clearer than the current ones

Source: Korea Communications Commission
Oceanic debuts turbo Road Runner in Hawaii Internet-service war

By Sean Hao
Advertiser Staff Writer

Oceanic Time Warner Cable today is rolling out a faster version of its market-leading Road Runner Internet service.

Dubbed Road Runner Turbo Plus, the service offers a maximum download speed of 15 megabits per second, or three times faster than standard Road Runner service. That's the fastest, mainstream residential Internet service available in Hawaii so far.

The new service represents the latest salvo in a battle for customers being waged between Hawaii's two main Internet providers — Oceanic Cable and phone company Hawaiian Telcom. Oceanic's faster Internet offering comes just one month after Hawaiian Telcom launched the state's fastest residential Internet service at the time, which featured a maximum speed of 11 megabits per second.

Hawaiian Telcom raises Internet speed limit

The company says it is the fastest residential connection in Hawaii

Star-Bulletin staff

Hawaiian Telcom has raised the speed limit on its Internet service, a move the telephone company says gives it the fastest residential connection in the state.

Depending on where they live, subscribers will be able to get download speeds of 3, 7 or 11 megabits per second (Mbps) under the new service, which the telephone company unveiled yesterday. Upload speeds will be 1 Mbps.

"This acceleration in speed establishes a performance benchmark against which all other providers will be measured," said Mike Ruley, Hawaiian Telcom's chief executive officer.
### Hawaii Internet Speed Test

<table>
<thead>
<tr>
<th>World Ranking</th>
<th>Average Download Speed (megabits per second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South Korea 20.4</td>
</tr>
<tr>
<td>2</td>
<td>Japan 15.8</td>
</tr>
<tr>
<td>5</td>
<td>Sweden 12.8</td>
</tr>
<tr>
<td>9</td>
<td>Netherlands 11.0</td>
</tr>
<tr>
<td>13</td>
<td>Germany 8.3</td>
</tr>
<tr>
<td>28</td>
<td>United States 5.1</td>
</tr>
<tr>
<td>HAWAII</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Hawaii understands that advanced broadband services are an essential infrastructure for an innovation economy and a knowledge society in the 21st century. As a result of proactive policy initiatives, Hawaii residents and businesses throughout the State have access to advanced broadband services of the caliber and at the pricing available in the leading developed nations of the world.
What would we do with more?

- Imagine high-definition videoconferencing enabling you to participate in office meetings from home so you can avoid traffic and reduce your carbon footprint.
- Imagine your father consulting from home with his physician about early-onset Alzheimer's, with the physician able to see confusion on his face.
- Imagine your son uploading the high-definition video he just finished editing to complete his high school capstone assignment.
- Imagine your daughter remotely operating a telescope located at the top of a mountain, while using a supercomputer to visualize the massive amounts of data being collected in real time.

Now, imagine all this going on in your home - at once!
A seven percentage point increase in broadband adoption could result in:

- $92 billion through 2.4 million jobs created or saved
- $662 million saved per year in healthcare costs
- $6.4 billion per year in mileage saving
- $18 million in carbon credits associated with 3.2 billion fewer lbs of CO2 emissions per year
- $35.2 billion in value from 3.8 billion more hours saved per yr from accessing broadband at home

- $134 billion per year in total direct economic impact of accelerating broadband across the United States

Estimate for Hawaii: $578m per year

*Connected Nation, Feb 2008*
Hawaii’s Additional Barriers

- Need 2500 miles of submarine fiber optic cable to get anywhere else; Hawaii has lost our role as fiber cross-roads of the Pacific
  - Engineering advances allow bypass (as happened with airplanes)
  - Hawaii not perceived as “friendly” to new cables that would increase global connectedness
- Population dispersed on 6 different islands
- Mountains on each island
Environmental Scan: Summary

- Broadband is essential in the 21st century
  - Health, education, public safety, cultural preservation, sustainability, economic development
- (Notwithstanding Akamai data) Hawaii is doing ok relative to other States
  - But not compared to other countries
  - Not when compared to leading communities
- We’re all hampered by the (lack of) federal broadband policy relative to other countries
- Wide range of initiatives at the community level in other parts of the country
  - Most of these are too new for us to understand which are most effective in what settings
Task Force Recommendations

1. Establish a forwarding-looking vision that recognizes the importance of broadband as critical infrastructure for the 21st century and works toward 100Mbps symmetric capability at globally competitive prices

2. Merge disparate regulatory functions to create a single, statewide, proactive advocate for broadband in Hawaii

3. Become welcoming of Trans-Pacific submarine fiber projects

4. Stimulate demand for broadband in Hawaii
What Happened

- 2009 Legislature couldn’t pass legislation
- 2010 Legislature passed less ambitious bill
  - Established Telework and Broadband Advisory Council
  - Established Permitting Work Group
- 2011 Legislature passed STRONG permit relief bill based on work of Permitting Work Group
- Broadband Advisory Council just appointed
- Hawaii Broadband Initiative Announced by Governor (at UH-Manoa)
  - Ubiquitous gigabit service by 2018
In the Meantime, Along Came ARRA

- Created new grant and loan programs in the Department of Commerce and Department of Agriculture to deploy broadband in accord with a clearly defined set of statutory purposes and to provide support for broadband adoption and usage.

- Charged the Federal Communications Commission to create our nation’s first national broadband strategy.

- Provided funding for a grant program for state-based data collection efforts to implement the Broadband Data Improvement Act of 2008.
ARRA and Hawaii

- State DCCA designated as mapping and planning entity for State of Hawaii
  - Subaward to UH-managed Pacific Disaster Center
- UH awarded two DoC/NTIA BTOP grants
  - Connecting every public school, public library and public higher ed site (including community colleges) on 6 islands with gigabit or faster direct fiber ($33m federal)
  - ~700 new public broadband-connected computers for public and community college libraries on 6 islands ($2m federal)
- Plus $11.2m from NSF for research networking
  - Two 10Gbps circuits to west coast
American ISPs have convinced us that Internet access is expensive—getting speeds of 100Mbps will set most people back by more than $100 a month, assuming the service is even available. Where I live in Chicago, Comcast's 105Mbps service goes for a whopping $199.95 ("premium installation" and cable modem not included). Which is why it was so refreshing to see the scrappy California ISP Sonic.net this week roll out its new 1Gbps, fiber-to-the-home service... for $69.99 a month.”

- ars technica June 2011
Other Approaches – Municipal Networks

Chattanooga Announces Nation's Only 150 Mbps Residential Internet Offer

*Chattanooga Area Ten Years Ahead of FCC’s National Broadband Plan*

CHATTANOOGA, Tenn. (June 3, 2010) – EPB Fiber Optics, Chattanooga’s municipally-owned fiber-to-the-home network, announced it will introduce a 150 Mbps symmetrical residential Internet product later this month. EPB Fiber Optics’ product, Fi-Speed Internet 150, will be the only offer of its kind in the US.

- www.epb.net
Hello Kansas City, KS and Kansas City, MO!

Google is very happy to bring our ultra high-speed fiber network to your community. Please visit our blog for more details!

Our goal is to deliver Internet speeds more than 100 times faster than what most Americans have access to today.

www.google.com/fiber/kansascity/index.html
Push-Pull Approach: Gig.U

- 29 Research Universities working to push broadband into university communities around the nation
- Will work with private providers through an open RFI/RFP process
- Hope to leverage work done for Google Fiber applicants along with minor financial and policy investments
Personal Observations

- In the current environment, our providers are economic agents that behave in accord with our market structures and regulations -- which are the result of our public policy.
- The countries and communities that have advanced have done so through intentional public policy.
  - We don’t leave it to “the market” to decide whether or where to build roads, sewers or emerging smart power grids.
- Competitive access to shared infrastructure is a common element of success; Otherwise consumers pay for multiple (duplicate) infrastructures.
  - Unbundling failed in the U.S.; Sharing is unnatural here.
- Many countries subsidize broadband infrastructure.
  - U.S. subsidy programs have been substantial, but narrow in scope -- UNTIL LAST WEEK!
Network Infrastructure

Why is this my job?
- Connect to our students, faculty & staff
- Project UH into our schools and communities
  - K12 pipelines
  - Public support
- Enable innovation and economic development
  - Who will develop those NBN apps?
- Enhance sustainability

- Campus
  - Wired AND Wireless
- Community-Based
- State/Regional/National & International
Network Infrastructure

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  - Wired AND Wireless
- Community-Based
- State/Regional/National & International
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<th>Examples of Relevant Uses of IT</th>
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| Control Costs                                       | Increase Institutional Cost-Effectiveness | • Data analytics/business intelligence (e.g., total cost of ownership, return on investment, benchmarking)  
• Redesign/consolidation of operations and services (intra- and interinstitutional)  
• Outsourcing/cloud services  
• Demand aggregation/collaborative procurement or service provision  
• Energy management/green IT  
• Remote/distributed workforce support (e.g., telecommuting) |
| Improve Learning Outcomes and College Completion    | Reduce Time to Degree                  | • Online/hybrid courses and programs  
• Course/program sharing, degree consortia  
• Course redesign  
• Open educational resources  
• SIS interoperability (e.g., SHEEO voluntary data standards) fostering student transfer  
• Learning analytics  
• Academic support/intervention (e.g., coaching, counseling, tutoring)  
• Competency-based assessment |
|                                                     | Expand Affordable Access to Learning   | • Learning analytics  
• Adaptive testing and instruction  
• Gaming and simulation  
• Deeper learning and engagement (e.g., student-created content; student participation in research projects/communities) |
|                                                     | Foster Effective Learning               | • Cyberinfrastructure  
• Data visualization/simulation  
• Federated identity management  
• Cloud services  
• Research community portals/online tools and support |
| Advance Research and Innovation                     | Facilitate New Forms of Discovery      |                                                                                                 |
|                                                     | Enable Research Collaborations and Communities |                                                                                                 |
New Strategies for the New Normal

- Creating economies of scale
- Commitment to “open,” sharing
  - Building a commercial ecosystem
- Intentional collaboration
- Cloud (Above Net) services: commercial/community
- Energy efficiency
- Recreating marketplaces (our needs ≠ their sales)

Examples:
- Kuali, Sakai, I2 Net+ services, CENIC VoIP, UH systems, HathiTrust, CSG negotiations...

Opportunities:
- Scholarly publications, texts, course materials, curricula...