Summer 2012

ACUTA Journal of Telecommunications in Higher Education

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<th>Event</th>
<th>Date</th>
<th>Location</th>
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<tr>
<td>Fall Seminar</td>
<td>October 14–17, 2012</td>
<td>Hilton Americas</td>
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<td>Houston, Texas</td>
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<td>Winter Seminar</td>
<td>January 13–16, 2013</td>
<td>Hyatt Regency</td>
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<td>Tampa, Florida</td>
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<td>Annual Conference</td>
<td>April 14–17, 2013</td>
<td>Manchester Grand Hyatt</td>
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<td>San Diego, California</td>
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<td>Fall Seminar</td>
<td>October 6–9, 2013</td>
<td>Renaissance Grand Hotel</td>
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ACUTA's Core Purpose is to support higher education information communications technology professionals in contributing to the achievement of the strategic mission of their institutions.

ACUTA's Core Values are:
- Encouraging and facilitating networking and the sharing of resources
- Exhibiting respect for the expression of individual opinions and solutions
- Fulfilling a commitment to professional development and growth
- Advocating the strategic value of information communications technologies in higher education
- Encouraging volunteerism and individual contribution of members
10
Supporting BYOD in Education
Neil Anderson
Anderson suggests that campuses embrace BYOD as an opportunity to engage learners and enhance staff productivity. He addresses some of the challenges, such as policy preparation, security, control, training, network capability, and resiliency.

27
Land Grab: Why Every Institution Needs to Stake a Claim on Google+
Joe Dysart
As social media sites expand their networks into hundreds of millions of members, Google+ is the new kid on the block but growing fast. Dysart talks with some institutions that agree it's where you need to be.

15
A Tough Cell
Curt Harler
Many colleges revised cell phone policies a decade ago, when the IRS made some clarifications on personal versus business use. Now, however, with unlimited minute pools and smartphones, the landscape is different. Harler describes how six campuses manage cell phones for personal and campus use.

30
Mobility Plays a Leading Role in the Teaching Environment
Vicki Sells EdD
Authentic experiences enabled by interactive mobile devices can engage learners in ways that transcend traditional classroom walls. The author describes how a class in instructional technology employed their mobile, touch-screen devices to make their work with a local special-education class more meaningful.

20
State of the Residential Network 2012
Infographic
ACUTA published the results of a nationwide survey to learn more about residential networks. See the infographic here for some interesting facts.

33
Data Sifting: The Next Frontier in Emerging Opportunities
James S. Cross PhD
What is Big Data, and why would we want to sift it? In this article, Dr. Cross answers these questions and provides information about who the key players are.

24
How Secure Are Your Mobile Devices?
Paul Korzeniowski
In spite of VPNs, firewalls, IDs, passwords, and other security devices, criminals still find ways to gain access to information through the cell phone windows. This article looks at what the bad guys are doing and how the good guys try to stop them.

37
Institutional Excellence Award: Honorary Mention
IU Mobile at Indiana University
How connected is your campus?

Laptops, tablets, smartphones. Your students, faculty and staff use wireless technology every day to perform research, complete their work and keep in touch. Meeting the growing demands of your communications network can be a difficult task.

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To truly utilize our mobile devices, we can never be untethered from the constant flow of information and communication.

Vickie Sells

page 30
Track 1: Voice Communication Trends

IP technology and mobility are continuing to move voice and video communication technology and support in new and exciting directions. Endless opportunities exist for improving collaboration and communication by integrating voice and video with enterprise applications or increasing accessibility and productivity through mobility, often at lower costs than traditional telephony services can provide. This track will explore ideas for leveraging and integrating voice and video technologies in new ways.

Track 2: ICT Supporting the Campus—Facilities, Safety, and Instruction

Information technology and communications infrastructure enable campuses to offer engaging instructional and research facilities; support faculty who need to collaborate globally and on the move; and interconnect building systems to increase the safety, efficiency, and functionality of the campus’ physical environment. This track will explore how campuses are leveraging technology to make their campus’ physical infrastructure more responsive to the community’s needs.

Budget reductions have meant taking a serious look at all our programs and making some hard choices for the future. Comparing circumstances and solutions with peers makes that exercise more meaningful and the outcome more valuable. I’m looking forward to reconnecting with the ACUTA network in Houston.

Riny Ledgerwood
San Diego State University

www.acuta.org
The landscape of higher education is changing rapidly as students, faculty, and staff are coming to campus with smartphones, tablet computers, and laptops. This trend is called bring your own device (BYOD). The “WWW” that we knew as World Wide Web has now transformed to mean Whatever, Wherever, and Whenever. The traditional roots of higher education included the standard classrooms with rows of seating where the instructor lectured and the students sat quietly and took notes. This style of learning is transforming today to become more collaborative as students actively participate in the learning process. The illustration below represents the current higher-education landscape.

Today there are synchronous and asynchronous collaboration tools that make it possible to break the traditional mold and break free of the classroom. Synchronous collaboration tools include real-time interaction such as chat, traditional videoconferencing, audio conferencing, and online video collaboration such as Skype or WebEx. Asynchronous collaboration tools include learning management systems, e-mail, document management systems such as SharePoint or Google Docs, and social networking.

To illustrate this rapidly changing landscape, we need to look back at where we were 10 years and 5 years ago. Ten years ago we had expensive and proprietary classrooms and meeting rooms. Fax machines were used pervasively and POTS—“plain old telephone service”—was the norm. Distance education consisted of very expensive rooms that included a studio booth and that had a technician in the booth handling the technology for the class session.

Five years ago, we moved to standards-based videoconferencing (H.323) that included a less expensive video unit, like a Polycom or Tandberg, and did not need a dedicated technician to make the video connection work. POTS was still the norm but was evolving to VoIP, and fax machines were starting to gather dust. Electronic whiteboards started to be installed in classrooms and meeting rooms with some success, and online collaboration tools were being used as network capabilities to the home improved. Asynchronous collaboration became available with course management systems.
Today we have standards-based videoconferencing with H.323 and SIP protocols that allow interinstitutional interoperability. There are also proprietary videoconferencing applications, like Skype and Microsoft Lync, that are closed systems with limited interoperability. Students, faculty, and staff are using their own devices for communications and collaboration and expect those tools to be supported wherever they go.

At Indiana University (IU), we are seeing a sharp increase of instructors and staff members using Web collaboration with our Adobe Connect meeting service. Web collaboration provides a virtual environment for sharing presentations, images, and desktop applications with remote participants. It also offers audio- and videoconferencing, text chat, a digital whiteboard, and polling. Remote participants do not need to download a proprietary application; rather they only need to use a Web browser to connect to the meeting.

Distance education is still necessary to provide learning for students who cannot physically be in the same location as the instructor. There is still a need for physical teaching spaces, but they need to be enhanced to allow for collaboration with and integration of distance students. The experience needs to create one classroom out of two physical spaces.

IU has two experimental classrooms that we call “Immersive Classrooms” that are on two different campuses separated by 50 miles. The classrooms seat 15 students each and provide a comfortable and natural experience by using round tables, café-height tables and chairs, and two 80” TV monitors. Each classroom has one monitor that displays the far-end participants and another monitor that displays the instructor’s content. We are using an automatic tracking two-camera system that provides a TV studio-like experience without needing an operator. The far-end viewers experience a very natural transition between the cameras and give a feel that they are in the room with them.

Flip teaching is a form of blended learning that leverages all the collaboration tools, so an instructor can spend more time interacting with students instead of lecturing in the physical space. This could include instructor-created videos, lecture capture, students collaborating using the learning management system to share documents, and online collaboration tools to facilitate real-time interactions.

Future trends for higher-education collaboration include more applications moving to the cloud. We will be much more reliant on commercial tools and will no longer dictate what tools to use. There will be a tighter integration between synchronous and asynchronous applications, and collaboration tools will integrate with other applications such as lecture capture, media management (video storage), and social networking. The trend will move away from the interoperability that we have with H.323 videoconferencing and will be replaced with the proprietary downloadable applications that provide features and flexibility that simply aren’t available with the older standard protocols.

Below is the higher education landscape in 5 years. Look for plenty of discussion about these ideas and other innovations in the coming months at ACUTA events and on the ACUTA Community. Keeping up with the pace of change is one of the many reasons to be a part of the great ACUTA network.

Contact me at any time at jvh@indiana.edu.

![Diagram](image-url)
Mobility is a word that may convey different meanings to different individuals even in the realm of information communications technology. But no matter what the definition, ACUTA is here to help you understand it, evaluate it, and determine how or if it can work for you. We make connections. We excel at providing platforms where networking occurs with more than 2,000 of your colleagues and the representatives of the corporations that supply and support your endeavors. Here are four examples of how ACUTA strives to meet your needs:

- ACUTA’s own mobile experience. As the next strategic plan unfolds, you will notice that the mobility theme plays an important role in the future of the organization that is vital to the success of your institutions by connecting you no matter when or where you are. You are the key to the future.

ACUTA needs you to help us model good use of new technologies. An example of our most recent foray into mobility is the provision of the conference app for the ACUTA 2012 Annual Conference held in Indianapolis April 29–May 2. The intent was to enhance the experience for conference attendees and exhibitors, and according to the overwhelmingly positive feedback received, the objective was attained. To increase the value of the conference, fast, easy, custom information and networking opportunities were provided to iPhone plus, iPod Touch, iPad, Android, and all other phone types including BlackBerry and all Web browser-enabled phones.

“Mobile technology is highly integrated into the daily lives of the majority of our members,” observed Lisa Thornton, ACUTA’s director of meetings and events. All of our members recognize the effort involved in project management and the need for lessons learned. Look for future enhancements of the conference app that may possibly include account information available on multiple devices, the ability to save PDFs, and an easier friend process.

- Member-in-Transition. ACUTA wants to support its members in whatever ways benefit the most people. The recently approved Member-in-Transition membership status is another example of a supportive value-add. We offer a six-month complimentary individual membership to any former employee of an ACUTA member school or company who becomes unemployed. This membership level allows our valued members to continue communicating with the extensive ACUTA network as well as register for events at the member rate.

- 2012 ACUTA ResNet study. Knowing that your responsibilities as well as your needs are constantly changing, ACUTA looks for opportunities to stretch in new directions. One of our recent publications is the 2012 ACUTA ResNet Study, the result of a survey conducted in February. (View the report at http://www.acuta.org/wcm/acuta/pdf/022912a.pdf). It is a comprehensive survey designed to measure the broad variation in practice and policy within higher education and lay the groundwork for long-term trend analysis and benchmarking. It’s ACUTA’s first study to target all higher education institutions in the United States with on-campus residential housing and to focus exclusively on issues affecting the residential student network. The survey results underline the student, faculty, and staff demand for campus mobility and are depicted in the compelling ResNet Infographic on page 20 of this issue.

- Coverage of legislative and regulatory affairs. ACUTA covers information communication technology legislative and regulatory affairs like no one else. We could not keep abreast of the congressional and regulatory activities if it weren’t for Dow Lohnes, LLC, the legal firm in Washington, D.C., that continually monitors issues on...
our behalf. Monthly newsletters are distributed to all members, who are asked to relay the updates to their general counselors. The newsletters are reviewed in depth with the ACUTA Legislative/Regulatory Affairs Committee members each month by Ken Salomon and J.G. Harrington, principals with Dow Lohnes, who also help us remain vigilant.

Of particular note is our meeting during the ACUTA Annual Conference with Henning Schulzrinne, the recently appointed FCC chief technology officer, who is also the Julian Clarence Levi Professor of Mathematical Methods and Computer Science Professor of Electrical Engineering and chair of the computer science department at Columbia University in the City of New York. He recognizes the technical expertise in higher education, views us as early bellwethers, and encourages us to continue sharing with him. He is eager to learn from your technical notes or overviews of current implementation plans (anecdotes or numbers) as well as anything we think the FCC could do to help in the areas of IPv6, security, and VoIP/voice peering.

Henning represents our higher education advocate in the FCC and sees campuses as having much technical expertise. I will gladly be your conduit: If you think your technical notes, white papers, Wiki implementation progress reports, etc., would be useful for the FCC to read, send them to me at choch@acuta.org. Together we will continue to make a difference.

Technology has truly enabled our work as well as our lives to be more mobile. You can take IT with you as you connect to the campus network from home or some other remote location, and as you network with your peers through ACUTA. I encourage you to explore the ACUTA website—especially if you are not a regular visitor—and learn more about the many benefits available to our members.

Share your thoughts with me anytime at choch@acuta.org.

*
Supporting BYOD in Education

For teachers, institutions, and the IT professionals who support education, bring your own device (BYOD) is a powerful wave that hasn’t yet crested. Whether students are in high school or college, they’ve grown up learning, living, and playing on mobile—they want to use these tools inside and outside the classroom. Likewise, teachers, administrators, and staff are working smarter and more efficiently thanks to their tablets and smartphones.

Attempting to force the growing numbers of people on school and college campuses to abandon their mobile devices, even for a few hours, isn’t the solution. The answer instead is to embrace BYOD as an opportunity to engage learners and enhance staff productivity, while getting the most out of present technology platforms.

Yes, there are challenges. Policy preparation, security, control, training, network capability, and resiliency are some of the critical issues. This puts schools under intense pressure to create and implement policies and deploy the appropriate supporting technology, while controlling costs.

The Upside of BYOD

Today, many schools are shifting their focus from prohibiting the use of mobile devices on campus to embracing BYOD as a way to enhance teaching and learning, improve student engagement, improve operational efficiencies, boost staff productivity, expand collaboration, and expand the capabilities of existing technology infrastructures. The right BYOD solution enables schools to protect their technology investment by building on what they already have, while retaining the flexibility to adapt to new services, solutions, and devices as they emerge.

Challenges for IT Organizations

Adopting BYOD comes with a set of challenges for the IT organization. Many of the benefits of BYOD, such as having the choice of any device and anywhere, anytime access, are somewhat antithetical to traditional IT requirements for security and support.

1. Providing device choice and support. Traditionally, IT predetermined a list of approved workplace devices—typically a standardized desktop, laptop, and perhaps even a small, standardized set of mobile phones and smartphones. Employees and students could choose among these devices, but generally were not permitted to stray from the approved devices list.

   With BYOD, IT must approach the problem differently. Devices are evolving so rapidly that it is impractical to pre-approve each and every device brand and form factor. It is also somewhat impractical to expect IT organizations to have the same level of support for each and every device that employees may bring to the workplace.

   Hence most IT organizations have to establish, at a macro level, what types of devices they will permit to access the network, perhaps excluding a category or brand due to unacceptable security readiness or other factors. Support must also be considered, such as adopting more IT-assisted and self-support models.

2. Maintaining secure access to the network. Device choice does not mean sacrificing security. IT must establish the minimum se-
curity baseline that any device must meet to be used on the institution’s network, including WiFi security, virtual private network (VPN) access, and perhaps add-on software to protect against malware.

In addition, due to the wide range of devices, it is critical to be able to identify each device connecting to the network and authenticate both the device and the person using it.

3. On-boarding of new devices. Most BYOD implementations will have a wide range of devices, including desktop PCs, laptops, netbooks, smartphones, tablets, e-readers, and so on. It is likely some devices will be institution-owned and managed, while other devices will be student or employee purchased and self-supported.

On-boarding of new devices—bringing a new device onto the network for the first time—should be simple and self-service, with minimal IT intervention, especially for employee-bought devices. IT also needs the ability to push updates to on-boarded devices as required. Ideally, on-boarding should be clientless, meaning no preinstalled software is required. This has an added benefit: If a self-service on-boarding model is successfully implemented, it can be easily extended to provide access to guests as well.

4. Enforcing institution usage policies. Educational institutions have a wide range of policies they need to implement. Adoption of BYOD must provide a way to enforce policies, which can be more challenging on consumer devices like tablets and smartphones.

Another complication results from the mixing of personal and work tasks on the same device. Smartphones are likely used for business and personal calls, and tablets likely have both personal and business/academic applications installed. Access to the Internet, peer-to-peer file sharing, and application use may be subject to different policies when users are on their personal time and network and when they are accessing the network during work hours.

5. Visibility of devices on the network. Traditionally a user had a single desktop PC or laptop on the network and possibly an IP desk phone. If the user called IT for support, it was likely straightforward to locate that user’s device on the network and troubleshoot the issue.

With BYOD adoption, each user is likely to have three, four, or more devices connected to the network simultaneously. Many of the devices will have multiple modes, that can transition from wired Ethernet to WiFi to 3G/4G mobile networks, moving in and out of these different connectivity modes during a session. It is critical for IT to have tools that provide visibility of all the devices on the corporate network and beyond.

6. Protecting data and loss prevention. One of the largest challenges with any BYOD implementation is ensuring protection of data. If a corporate asset, such as a laptop, is used to access business applications and data, typically that asset is tightly controlled by IT and likely subject to more restrictive usage policies.

Institutions need to comply with confidentiality regulations like HIPAA, security compliance regulations like PCI, or more general security practice regulations like Sarbanes-Oxley and others. Organizations need to show that compliance is possible with BYOD adoption, which can be more challenging than with a corporate-owned and -managed device.

A student- or employee-owned tablet or smartphone is likely being routinely used for personal access and business applications. Cloud-based file sharing and storage services are convenient for personal data, but can be potential sources of leakage for confidential data.

IT must have a strategy for protecting data on all devices, whether corporate managed or student/employee self-supported and managed. This may include a secure business partition on the device that acts as a container of corporate data and that can be tightly controlled and may also include the need for a virtual desktop infrastructure (VDI) application to allow access to sensitive or confidential data without storing the data on the device.

7. Revoking access. At some point in the lifecycle of a device, it may become necessary to terminate access to the device. This could be due to a lost or stolen device, students leaving the institution, or faculty/staff changing roles within the institution. IT needs the ability to quickly revoke access granted to any device and possibly remotely wipe some or all of the data (and applications) on the device.

8. Potential for new attack vectors. Because the devices accessing the network have wide-ranging capabilities and IT may not be able to fully evaluate, qualify, and approve each and every device, there is the potential for new security attack vectors to be opened.

For example, many tablets have the capability to enable an ad hoc WLAN. If an authenticated device has other devices tethered to it through an ad hoc WLAN, it may be possible for nonauthenticated devices and users to gain access to the corporate network by connecting through the authenticated device. The same is true when tethering a laptop over Bluetooth through a smartphone.

The challenge for IT is how to permit the growing number of devices and capabilities to be used, while still maintaining the control to enforce policies, such as automatically disabling an ad hoc WLAN function on an authorized connected device.

9. Ensuring wireless LAN performance and reliability. As wireless access becomes pervasive, performance and reliability expectations are the same as what is expected from the wired network, including reliable connectivity, throughput, application response times, and increasingly voice, video, and other real-time collaboration applications.

This fundamental shift demands that IT change the service level of the WLAN net-
work from one of convenience to a mission critical business network, analogous to the wired network. Design and operation of the WLAN must include high availability, performance monitoring and mitigation, as well as seamless roaming.

10. Managing the increase in connected devices. The increasing number of devices connected to the network, most likely with each user having many devices simultaneously connected, can lead to IP address starvation, as most legacy IP address plans were created under the assumption of fewer devices. This may hasten the need for IPv6 deployments, both at the Internet edge and inside the enterprise network.

Challenges for End Users

The demand for BYOD is largely driven by users who want to choose the devices they use in the workplace. From a user perspective, there are challenges to address.

1. Keeping it simple. BYOD solutions and technologies are quickly evolving; however, one of the largest challenges is how to make it simple for people to get connected to and use network resources. The number of device possibilities, the range of connection types and locations, and the lack of widely adopted approaches can translate to difficulties for users.

Each device brand and form factor may require slightly different steps to be onboarded and connected. Security precautions and steps may also vary depending on how and where the user is trying to connect. For example, the institution’s WiFi may require credentials, whereas connecting through a public WiFi hotspot may require not only credentials, but also a VPN and other security steps. Ultimately any BYOD solution needs to be as simple as possible for users, provide a common experience no matter where and when they are connecting, and be as similar as possible across devices.

2. Mixing personal devices with work. BYOD brings a mix of personal and work tasks on the same device. Contact lists, e-mail, data files, applications, and Internet access can pose challenges. Ideally, users want to separate their personal data and activities from work. Personal photos, text messages, phone calls, and Internet browsing performed on their own time needs to be subject to personal privacy, while documents, files, applications using corporate data, and Internet browsing performed on company time needs to be in compliance with corporate policies.

Some institutions make connecting with a student- or employee-owned device contingent on signing an agreement in order to monitor compliance and acceptable use policies and to protect sensitive data. In some cases this may include remote wiping of all data on the device—potentially including personal data—which obviously can be a source of contention between IT and users if not properly managed.

3. Getting the productivity and experience needed. As discussed earlier, one of the major drivers of BYOD is users who want to take advantage of productivity tools they use as consumers. Institutions want to embrace and benefit from that productivity, but also need to apply the appropriate security and policies to protect data.

If such security measures are too intrusive, they could erase any productivity gains. For example, a common complaint is that institutions that lock down access to applications and data through deployment of VDI clients on a tablet device degrade the user experience to the point where a user does not get a tablet experience. VDI clients are likely to improve, including user experience, as deployments of tablets and smartphones continue to grow.

Considerations for BYOD Adoption

For any widespread adoption of BYOD, there are a number of considerations that need to be thought about beforehand.

1. Understanding user segments and needs. It is important to understand that there are different segments of users within any BYOD implementation. One recommendation is to conduct a user segmentation analysis within the organization to help understand needs and likely level of required support.

Every organization is different, and must evaluate for itself employee roles against the need for mobility and mobile applications and against the likely level of required support. BYOD deployments are easy with users who only need low levels of IT support, possibly using self-support communities to share best practices. Deployments may be more difficult with users who have high mobility needs but also require high support levels, such as executives.

Conducting such an analysis will help understand entitlement policies and support models and may prevent frustration and cost overruns in the IT budget.

2. Deciding on a BYOD adoption strategy. Different organizations will approach BYOD with different expectations across a spectrum of adoption scenarios. Every institution needs a BYOD strategy, even if the intention is to deny all devices except those that are IT-approved and -managed. On page 13, Figure 1 shows a number of possible adoption scenarios into which most organizations fit.

Institutions involved in government research may need to take a restrictive approach with BYOD adoption to protect sensitive data. Devices may need to be tightly controlled and managed as in the traditional IT approach, which may still be valid in these instances.

For many organizations, adoption will range from allowing a broader set of devices with restrictive access to applications to embracing BYOD in full, encouraging broad adoption of many or all device types and deploying security measures to enable access to a broad set of enterprise applications and data. In the broadest sense, some institutions will adopt a “mobile first” strategy, whereby their own internal applications development will be priorit-
tized on tablets and smartphones, seeking efficiencies by leveraging the broadest set of productivity tools and devices.

Understanding where your organization will fit now and in the future along the adoption spectrum is useful to prepare for security policies, entitlement, and overall strategy for the BYOD initiative.

3. **Considering application strategies.** Securing and preventing the loss of data is a top concern when implementing BYOD. It is important to understand three possible application architectures and the trade-offs involved: native, browser, and virtual. (See Figure 2 on page 14.)

In native mode, applications running on the device communicate directly with the application server in the host data center (or cloud). Data may be exchanged and stored directly on the BYOD device. Typically the application performance and user experience are closest to the specific device; in other words, a business application functions much like any other application on the device. All the productivity benefits and device behavior are preserved, and applications can be tailored to provide enhanced experiences.

A browser approach is increasingly being adopted for application access due to the ease of portability across devices and operating systems. Essentially any device with a standard HTML browser capability can be used to access the application. The disadvantages are that much like native mode, data may be exchanged and stored directly on the BYOD device, leading to security challenges and concerns about data loss. In addition, there may be some sacrifice of user experience.

In contrast, in virtual mode, applications exist on the application server in the data center (or cloud) and are represented through a VDI client on the device. Data is not stored locally on the BYOD device. Only display information is exchanged and rendered on the BYOD device. While this method provides maximum data security, user experience may be compromised due to the translation from an application server to the form factor and OS native to the BYOD device. Early adopters of this approach have provided somewhat negative feedback.

It is important to make decisions about which mode—native or virtual—will be relied on for the application architecture. Many companies or institutions may use a hybrid approach, using native mode for many standard business applications and virtual mode for a subset of applications with stricter confidentiality or sensitive data requirements.

4. **Extending collaboration to BYOD devices.** Ultimately, people want to connect to the network not only for access to data applications, but also to collaborate with one another. Just as in traditional work spaces, users with BYOD devices want access to their institution's voice, video, and conferencing services.

Stand-alone approaches, such as relying on the smartphone's cellular communications, can be somewhat effective. To be truly effective, it is essential to have an integrated approach that makes people easily reachable within their organization's communications directory and systems. Another consideration is how then to extend these services to devices without cellular voice capabilities, such as an Apple iPad?

A complete BYOD solution must consider how to extend the full suite of collaboration applications to BYOD devices, including integrated voice, video, IM, conferencing, application sharing, and presence. Any solution needs to consider not only the users using BYOD devices, but also others trying to collaborate with them.

5. **Have an encompassing end-user agreement.** Although not part of the network architecture, one area that must be well thought out prior to any BYOD implementation is the end-user agreement (EUA). Because of the mixing of personal and
corporate data, and the potential of having employee-owned devices being used for work, it is critical to outline policies up front and be sure to communicate these to employees in advance.

IT organizations need to familiarize themselves with laws, including the Computer Fraud and Abuse Act, the Wiretap Act, and Communications Assistance for Law Enforcement Act (CALEA).

What will institution policies be? Will communications be subject to monitoring? Will policies apply to both corporate and personal? Areas to be addressed include (but are not limited to):

- Text messaging
- Voice calling
- Internet browsing
- Instant messaging
- E-mail
- GPS and geolocation information
- Applications purchased/installled
- Stored photographs and videos
- Device “wiping”

As a simple example, many businesses regularly filter and monitor Internet access to ensure compliance with policies against accessing inappropriate websites at work. Most BYOD devices have direct Internet access through public WiFi and/or 3G/4G mobile Internet access. It would be common to have a policy against browsing inappropriate websites on a device connected through the corporate network. Will the same policy apply if employees decide to browse sites on their employee-owned device, on personal time, through public Internet access?

As another example, it would be common to have policies against transmitting inappropriate e-mails containing very personal photos through e-mail or text messaging while using a corporate-owned device or corporate network. Will the same policies apply to personal e-mails or personal text messaging on an employee-owned device? Which communications will be monitored? Which will not?

Recently, there have been several legal challenges for cases involving an employer who remotely ”wiped” an employee-owned device, including both the corporate and personal data it contained. Imagine your surprise as an employee when by using your new tablet to access the corporate network, you unknowingly agreed to let IT delete your favorite family photos. Other challenges exist around potentially illegal wiretap situations, where employees are challenging that their text message conversations were being illegally monitored by their company who failed to notify them.

The key to avoiding legal liabilities is to notify, notify, and notify again. Make it clear to employees in a written policy that they must accept how the company will treat corporate and personal data and communications on the BYOD device. By agreeing to the EUA, make it clear what rights the employee is forfeiting to gain access to the network with an employee-owned device.

6. Having a lost- or stolen-device policy. Similar to the previous discussion about having a complete EUA in place, organizations should have a plan in place for how lost or stolen devices will be handled. What will be the process for notification by employees? What are the necessary steps to remove access to the network? What steps can and will be taken to remotely remove local data stored on the device?

Different solutions offered in the market provide varying degrees of capabilities to reach out to a device remotely and destroy data or applications to ensure they remain confidential. Consider the types of data that are likely to be stored on BYOD devices, and integrate mitigation plans into the overall BYOD strategy before deployment.

Neil Anderson is the director of systems architecture with Cisco and has been leading systems development at Cisco for over 10 years. He has more than 25 years of broad systems experience, including public telephone networks, mobile phone systems, and IP networks.
A Tough Cell
Managing Cell Phone Usage Challenges Telecom Managers

Remember blackboards? Blackboards hang on the wall at the front of a classroom, are black or green, include a chalk tray and erasers, and were used mainly by the teacher. It is a safe bet there are more cell phones on your campus than blackboards. The blackboards, however, are far easier to manage. As a result, many colleges are revising their employee cell phone policies. Looking over their shoulders—always—is the Internal Revenue Service (IRS) to be sure taxes are levied when appropriate.

The trend on campus, if there is one, is constant change, revision, and updating as wireless becomes ubiquitous. Many colleges revised cell phone policies a decade ago, when the IRS made some clarifications on personal versus business use of cell phones. Now, however, with unlimited minute pools and smartphones (with 99 cent apps), the landscape is different. The IRS still has policy, but the internal regulation of cell phones is taking a different hue.

When the new interim president at Missouri State University (MSU) in Springfield took over, a mandate went down to do away with the old stipend-type cell phone policy.

“We just implemented a new policy,” says Debbie Gere, telecommunication services coordinator at MSU. This past December, the old policy was updated and departments lost much of the flexibility and independence they might formerly have enjoyed with cell phone usage.

The MSU policy states, “The university will not contract for cellular/wireless service for individual employees. In rare cases, if approved by cost center heads, cellular/wireless services may be provided to departments for mission-critical university-related activities.” Anything beyond that requires approval and written consent by the president or the provost.

Kathleen D’Aguanno, manager, telecommunications and technology infrastructure at Brown University in Providence, Rhode Island, is working on a new cell phone policy right now. While they have a written cell phone policy, she notes that since it dates back to 2004, it is out-of-date. They have worked up new guidelines for which they still need approval.

Employees at Brown select from a predefined list of phones. They have a choice among three carriers, two smartphones, or a phone-only or push-to-talk-only model, D’Aguanno says. They also can pick an associated voice/data plan.

“The employee provides a business justification regarding need for a phone and plan,” she continues. This requires a sign-off by the department management and the provost’s office.

“Our cell phone issues are handled through our purchasing department, with the policies through human resources,” says Ken Richmond, who handles telecom services for Dixie State College (DSC), St. George, Utah.

DSC’s latest policy update was in 2006. As written today, DSC employees may receive up to $48 per month as a cellular service stipend, paid quarterly in advance, to cover reasonable expenses for cell phones. DSC will also reimburse up to $100 each fiscal year for telephone equipment, as approved by the appropriate budget administrator.

DSC’s president and vice presidents, because of high usage and the use of data services, are eligible for a $100 per month
stipend and data-enabled equipment reimbursement of $250 per fiscal year. Other key employees may be eligible for this higher stipend and equipment reimbursement based on the recommendation of their supervisor and with the approval of the vice president.

At Drexel University in Philadelphia, Pennsylvania, there is no formal, university-wide policy for cell phone usage. “We don’t centralize cell phones here,” says Marjory McCoy, director of telecommunications services at Drexel. Each department is responsible for developing its own cell phone policy. In some cases, the employee expenses personal cell phone usage. Other departments provide phones. McCoy’s department, IRT/telecommunications, does provide cell phones to its employees. “We are required to have the phone with us, and it has to be on at all times,” she says. Employees get an iPhone or Smartphone. Downloading any app that entails a fee is forbidden.

“At Texas A&M, we currently have a mixture of users on a stipend and a corporate account that telecommunications manages,” says Jana McDonald, manager of telecommunications. It is up to each department which route they wish to follow.

Beginning January 1, 2012, the A&M system cut the stipend amounts roughly in half. “As recently as last fall, a stipend covered 100 percent of the cell phone bill, while also including a portion to cover the payroll taxes,” McDonald says. “With the new policy, only about half of the cellular bill will be covered.”

Princeton University currently has a corporate account with each carrier and a decentralized environment. Grant Weed, OIT manager of telephone services for Princeton, says, “Our policy states that if you are getting reimbursed for a mobile device, you must be on the university corporate plan.

“At Princeton, we are moving toward pooling and centralizing to control cost because of the rapid growth of wireless,” he continues. “Getting everyone into an unlimited plan scenario could protect us from overages and simplify the billing. We have account managers in each department who handle paying the bills, upgrades, and the like,” Weed explains. He has a staff in the campus center that assists with the more complex issues that arise. They also help with the run-of-the-mill everyday recommendations.

### Good Policy Decisions

If you are looking for a one-size-fits-all cell phone policy, you are going to be disappointed.

However, for some workable ideas or text to include while developing your own cell phone policy, check out these websites:

- www.brown.edu/Administration/Controllers_Office/payable/phones/
- www.missouristate.edu/policy/Op12_01_CellularService.htm

Princeton’s written policy is fresh—it was updated last year. “It basically says the department must approve, and you need to meet certain criteria,” Weed says. These include such items as frequent travel, working at a remote location, and so on. Workers must show a need to receive or initiate communication in emergency situations or the need to be accessible and available during nonbusiness hours or by electronic means at all times.

According to Weed, every employee’s cell phone use is determined and approved by the department head or chair for each department.

### International Use

When it comes to international travel, a cell phone probably ranks second only to a passport as a vital piece of baggage. At many schools, international use parallels domestic use. That is to say, ACUTA member policies for international usage are all over the place.

At Brown, D’Aguanno says, the policy is the same for domestic cell phones as for international use.

“We don’t take care of any of their cell phones internationally,” says MSU’s Gere. Missouri State does have a number of faculty and staff who travel internationally. China is an especially popular destination right now. Gere’s experience is that most professors will pick up a cell phone in the country they are visiting.

Weed says Princeton adds an international plan to the domestic plan when faculty or staff leave to protect the university from excessive fees. Princeton employees traveling for business get service, and the school is protected.

### What the IRS Says

Whether employees are home or abroad, the IRS monitors their cell phone expenses. The key document to consult is IRS Publication 15-B, Employer’s Tax Guide to Fringe Benefits. Specifically, “What’s New: Employer-Provided Cell Phones” near the bottom of page 1 of the publication will provide authoritative answers to questions.

In short, the IRS says that acceptable business purposes are things like a need to contact the employee at all times for work-related emergencies after hours, a requirement that the employee be available to speak with clients at times when the employee is away from the office, and a need to speak with clients located in other time zones outside the employee’s normal workday.

A college cannot exclude from an employee’s wages the value of a cell phone provided to promote good will of an employee, to attract a prospective employee, or to provide additional compensation to an employee.
The IRS issued Internal Revenue Bulletin, Notice 2011-72 on September 19, 2011, to clarify several points about business use and taxing policy for cell phones.

Before that, the Small Business Jobs Act of 2010 (SBIA, Section 2043) removed cell phones from the definition of listed property for taxable years beginning after December 31, 2009. That act did not otherwise alter the requirement that an employer-provided cell phone is a fringe benefit, "[T]he value of which must be included in the employee’s gross income, unless an exclusion applies, or the potential treatment of an employer-provided cell phone as an excludible fringe benefit," IRS policy says.

Since enactment of SBIA, the IRS has received questions about the proper tax treatment of employer-provided cell phones.

Many colleges provide their employees with cell phones primarily for noncompensatory reasons. The value of the “business use” of an employer-provided cell phone is excludable from an employee’s income as a working condition fringe to the extent that if the employees paid for the use of the cell phone themselves, such payment would be allowable as a deduction for the employees.

This following paragraph is taken exactly from the IRS statement by Joseph Perera of the Office of Associate Chief Counsel (Tax Exempt and Government Entities): "An employer will be considered to have provided an employee with a cell phone primarily for noncompensatory business purposes if there are substantial reasons relating to the employer’s business, other than providing compensation to the employee, for providing the employee with a cell phone. For example, the employer’s need to contact the employee at all times for work-related emergencies, the employer’s requirement that the employee be available to speak with clients at times when the employee is away from the office, and the employee’s need to speak with clients located in other time zones at times outside of the employee’s normal work day are possible substantial noncompensatory business reasons. A cell phone provided to promote the morale or good will of an employee, to attract a prospective employee, or as a means of furnishing additional compensation to an employee is not provided primarily for noncompensatory business purposes."
In short, when a college provides an employee with a cell phone primarily for business reasons, the IRS will treat the employee’s use of the cell phone for reasons related to the employer’s trade or business as a working condition fringe benefit.

In addition, Perera says the IRS “will treat the value of any personal use of a cell phone provided by the employer primarily for noncompensatory business purposes as excludable from the employee’s income as a de minimis fringe benefit.”

That rule went into effect for any use of an employer-provided cell phone occurring after December 31, 2009.

DSC’s and some other colleges’ written policies leave no doubt about the taxable status. “These stipends are not taxable income since they represent an employee reimbursement for the business use of their phone,” DSC’s written policy states.

Setting Limits

Princeton currently gives employees a base 450-minute plan, unless they can demonstrate to their department that they need more. “Pooling the entire university account will wind up changing this entirely,” Weed says.

They do not restrict phone type at all. “If you are eligible for a smartphone, you can choose the one you want (within reason, of course).” He adds, “Most smartphones these days are the same price.”

For Drexel’s IRT/telecommunications employees, all minutes are pooled. “We tell people to try to stay under 500 minutes (a month),” McCoy says. In most cases, that is plenty for business and the occasional personal use.

At DSC, all plans are at the discretion of the individual employee. “The plans are their responsibility, with the college reimbursing a portion as a stipend,” Richmond says. Individual department heads have discretion for approval on the business uses of cell phones. But there are a few hooks: DSC’s stipends are paid only to employees willing to have their cellular phone number published for DSC use and who are willing to be available for DSC calls by keeping their cell phones on during working hours each weekday.

“By cashing the stipend checks, you acknowledge that the cell number on record with the college is still operational and available to college employees for business calls to you,” DSC policy states.

Each month, MSU’s computer services, networking and telecommunications department reviews department-owned cellular/wireless invoices for accuracy of charges. The invoice is forwarded to the department for payment processing.

The responsibility to ensure proper usage of cellular/wireless services each month rests with department heads who are required to review invoices and submit invoices for payment. “All personal use is to be marked on the invoice, and the employee responsible for the usage is expected to reimburse the university for any such charges,” according to the policy.

“We rely on cell phones too much!” declares McCoy. However, there is no sign on any campus that cell phone use is in decline. That established, it is best to have an up-to-date policy that pleases both the IRS and the administration.

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Executive Broadband Communications

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GAI-Tronics Corp.

Graham's Wireless Solutions

Graybar

HairVision Network Video

Hi Country Wire & Telephone

HP Networking

Infinite Conferencing

IPC Technologies

Jabra

JTM Associates

JTS

Listen Technologies Corp.

Mapcom Systems

Match Systems

Micro Technology Services

Microsemi

McICT

Mutale Software

Optelian

Parlance Corp.

Phybridge Inc.

Professional Computing Resources

Professional System Services

Public Telephone

PVR

RAMTEL

RCC Consultants

RedSky Technologies

Relational Technology Solutions

ReTele Communications

Ronco Communications

Sentri

Siemens Communications

Skyline Group

snom technology Inc.

SonicWALL

Stealth Concealment Solutions

Stoneware

Strategic Telecom Supply & Solutions

Sumitomo Electric Lightwave Corp

Superior Essex

Syn-Apps

Talk-A-Phone Co.

TE Connectivity

Techni-Tool

Telchemy

Telecom Reseller

Telecom Technology Resellers

TeleMate.Net Software

T-Metrics

VALCOM

Vantage Technology Consulting Group

The VIA Group

VistaOne Corp.

Walczak Technology Consultants

Windstream

Wyde Voice

Z-Band
ACUTA published its first annual State of ResNet Report this spring. The report, a comprehensive survey designed to measure the broad variation in practice and policy within higher education and lay the groundwork for long-term trend analysis and benchmarking, is its first study to target all higher education institutions in the United States with on-campus residential housing and to focus exclusively on issues affecting the residential student network.

During a period of significant budget tightening, demands on the student network continue to grow at an accelerating pace, adding pressure on colleges and universities to address critical cost and management challenges. The study addresses issues such as bandwidth and connectivity challenges, budget and staffing demands,
and rising student expectations in an environment of competitive enrollment pressures and ever-changing network standards and technology. The ACUTA study will develop a long-term body of knowledge-building on earlier ResNet research.

"An unprecedented perfect storm is forming on the horizon of network technology while IT budgets tighten across the country," said Joseph Harrington, ACUTA immediate past president and director of networking at Boston College. "In this changing environment, efficient management of the ResNet is fast becoming a top priority for CIOs. With this study, ACUTA will begin shedding light on diverse practices, actively contribute to developing standards and provide a central knowledgebase that will better equip IT administrators to make decisions for the future."

Key highlights of the report are incorporated into this infographic. The full report is available on the ACUTA website (www.acuta.org).
Q & A with the CIO

ACUTA: Faculty and staff, like students, want to be able to use their own devices over the university’s wireless environment, and have access to the same service destinations. Can or should we fulfill their wishes without compromising service? How are you planning for the increased bandwidth requirements to support mobility?

Dubach: Mobile device is the “wave of the present”; I do not believe we have much choice except to work to “fulfill their wishes.” Continually increasing bandwidth demand has been a phenomenon as far back as I can remember so this is nothing new; our demand for both on-campus bandwidth and bandwidth to the outside Internet has almost doubled annually for many years.

What is new here is the plethora of device types, the new types of traffic, and, at least for the near future, the unpredictability of new demands. Over the past two summers we moved our residence halls (with approximately 12,500 residents) from an aging wired network to a wireless-only network; the number of network-attached devices per student roughly tripled.

ACUTA: With respect to security and distribution of confidential data, how do you manage the mixture of institution-provided and personal mobile devices? What do you see as today’s biggest security threats in your organization? What is your plan for striking the balance between information sharing and information security? If the best defense is a good offense, what approach(es) have you taken as a CIO in this application-centric, device-agnostic environment?

Dubach: I would have to be either incredibly arrogant or incredibly brilliant to claim that we had anywhere near adequate answers to these questions. Having barely gained adequate control of security of data in a massively distributed environment before mobile devices, I can hardly claim solid solutions to the current dilemma presented by these devices. And, we are definitely playing catch up. I have been in meetings recently discussing the development of security approaches and policies for mobile devices with at least half of the people in the room taking notes on their iPads.

I do, however, believe that the solutions lie in a combination of technology and policy. We have some units on campus that have refused to let their staff use a variety of devices because they cannot meet our current security policy standards; not an acceptable solution. Of course, there are others who insist they want to use the latest devices before the campus has come to grips with the security issues of the device; also not acceptable. Confidential data must be restricted to the campus “cloud” with access, e.g., “virtual desktop” approaches; no “local” copies of confidential data can be permitted on the mobile devices.

Mobile devices must be configured to require authentication (for the device, not just the downstream application) if they are to be used to access confidential information. It would be convenient to think that technology could fully dictate such solutions, but policy development and policy compliance will have to be a greater part of the solution than ever before.

ACUTA: With the installation of distributed antenna systems (DAS), cellular voice and data services are more available on campus. Does this impact the need for enterprise wireless? Or is DAS used primarily for voice and SMS?
Dubach: We are only now looking at deploying campuswide DAS, so I have no immediate experience to offer in this area. However, I believe that the balance between DAS and enterprise wireless will be determined less by technology and more by financial considerations that have yet to shake out.

Over the next very few years campuses will have to be asking: What level of devices do we supply our faculty and staff, and what devices do we assume they will provide? In the old days, we supplied faculty and staff with a desk phone (landline) and usually required them to pay us back for personal use (e.g., personal long-distance calls from the office phone). It is now becoming more likely that faculty and staff have their own cell phone, smart phone, iPad or similar device, and so on. Will we compensate them for business use of their personal equipment, and, if so, how? How does this influence choice of vendors and “plans”? These fiscal considerations will inform the overall balance between campus-based DAS and enterprise wireless in the coming years.

ACUTA: In your opinion, is mobility having an impact on your campus computer-refresh planning? For instance, faculty and staff want to negotiate the type of device they wish to use as a campus computer such as an iPad or tablet instead of a standard desktop. If this is happening on your campus, how do you plan for issues such as extended warranties or an adjusted refresh rate (one for computers and one for mobile devices)? How are you planning to look at ROI and TCO issues such as productivity, increased cost to support these additional devices, and more?

Dubach: This past year was the first in which we offered in the faculty “computer-refresh” program the choice of an iPad beyond the previous choice between desktop and laptop. A few years ago, we saw the most common request transition from desktop to laptop; but this transition included a year or two when faculty said they really wanted both a desktop and a laptop. This year faculty tell us they really want both a laptop and an iPad; I interpret this as a sign that we are in a transition to the iPad and similar technologies and that, if we provide the right support, the mobile devices will be the choice in future years. The question of ROI and TCO issues is an open one at the moment. Increased productivity behooves us to support these devices without doubt; how well “standards” evolve in the coming year or two will go a long way to determining the cost to support them.

ACUTA: Do you have any additional thoughts on mobility and its impact on your campus?

Dubach: BYOD is a “brave new world” that presents all manner of new challenges, challenges that I see as perhaps the most unnerving of recent years. However, IT is much about never-ending change at an every-accelerating pace. I offer one of my favorite quotes, which I have seen attributed to race car driver Mario Andretti, though I cannot be sure the attribution is correct: “If you feel like you’re in control, you’re not going fast enough!”

Thanks to John Dubach for sharing his insights and experiences with us.
How Secure Are Your Mobile Devices?
Rush to Adopt Smartphones and Tablets Leaves Schools Vulnerable to Malware

"Deliver it first, secure it later." Unfortunately, that is often the IT mantra. Organizations are in such a rush to take advantage of the latest technology that they deploy it even though it lacks robust security checks. Such is the case now with mobile devices. "In the current BYOD (bring your own device) era, the single biggest challenge that institutions face is protecting critical institutional data stored on handheld devices," said Jack E. Gold, principal analyst at J. Gold Associates, LLC, an IT consulting firm.

There is no doubt that cell phones are ubiquitous on campus. The Institute for Mobile Media Research at Ball State University found that 99 percent of students now have a mobile phone—and not just any old phone. About 7 in 10 students own a smartphone. That number has nearly tripled from what it was in February 2009. Tablets are on an even faster acceptance track: Gartner, Inc., noted that the worldwide tablet unit sales rose by 261 percent in 2011.

As expected, the escalating number of mobile devices has caught the attention of the bad guys. A report from Lookout Mobile Security determined that the volume of malware found in Google, Inc.'s Android marketplace increased by 400 percent in 2011. In addition to traditional attacks, the mobile devices offer crooks a few new options, such as text messaging fraud. Consequently, higher-ed telecom and IT security professionals find themselves staying up at night, trying to balance two conflicting imperatives: providing users with needed device flexibility, while thwarting threats to institutional data.

"We have been spending a lot of time trying to determine how to best manage our mobile devices," stated Casey Hanson, vice president of IS and CIO at Washington State University in Pullman, Washington.

Changing Usage Patterns

Not only have mobile phones become nearly universal on college campuses, but the devices' capabilities have also changed. Traditionally, cell phones were supplements to tethered phones and provided users with voice communications. Now, they often replace desktop or laptop computers. In fact, Ball State University found that 77 percent of smartphone users access the Internet several times a day. Students rely on their tablets to update Facebook accounts, access movies, play games, download music, deliver news, watch YouTube videos, and learn about the current happenings on campus.

This flexibility presents several challenges to IT/telecommunications managers. The first stems from the variety of devices. Facing intense competition, vendors have been delivering a wide array of novel solutions. For instance, more than a dozen suppliers have developed hundreds of smartphones running Google's Android operating system. Now the IT department must become conversant in the nuances found among the different systems.

In addition, IT has little to no control over how the phones are purchased and later used. During lunchtime, employees and students can walk into the local store, examine half a dozen tablets, select one, return to campus, and expect to immediately start using the device to access college
data. These selections are often taken without the IT department's knowledge or its blessing.

Surprise, Surprise, Surprise.

As a result, many institutions do not have much (if any) insight into who owns these devices or how they are used. "Whenever audits are conducted, managers are surprised at how many individuals use personal handheld devices for work-related activities," noted Phillip Redman, research vice president at Gartner Inc.

Consequently, schools find themselves in a precarious position, especially since once employees turn on their smartphones or tablets, they operate them like a PC. They access business applications, store personal data on thumb drives, and copy and paste data from corporate databases—and often in a cavalier fashion. "Employees usually are not very concerned about securing institutional data; instead, they complain whenever the college puts safeguards in place that interfere with how they work," stated Gold.

This attitude can cause several problems. The handheld devices do not come with any security software. As a result, students, faculty, and staff can dial into bogus sites, download malware, and spread it to other systems on the campus network. Also, hackers can break into the handheld systems and access sensitive information, such as grading information, confidential e-mail exchanges, Social Security numbers, or credit card numbers.

Lost but not Found

Because these devices are so portable, users carry them everywhere, and sometimes they lose them. In fact, airports often now have more lost smartphones and tablets than travel bags. If the user has not protected the university information with basic security checks, such as encryption software, all a crook has to do is turn the device

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**A Sampling of Mobile Management Solutions**

Help. Academic institutions need it in managing their mobile devices, so a number of vendors have emerged to deliver such tools. Many are small, private companies. But illustrating the market's growing importance, a few have been purchased by established vendors who want to bring these solutions under the aegis of their central management platforms, which have been in use since the 1980s.

- **3LM**, a subsidiary of Motorola Mobility that is owned by Google, Inc., works with phone suppliers, like HTC Corp., Sony Ericsson, and Sharp Corp., to make changes to the Android OS that enhance its security and manageability. For instance, its software encrypts application data.
- **BoxTone**, headquartered in Columbia, Maryland, is an enterprise mobility management (EMM) software and services provider. The company offers a series of plug-and-play software modules designed to ensure that Apple, Inc., iPhones and iPads; Google, Inc., Android, Microsoft Corp, Windows Phone, and Research-in-Motion, Inc., BlackBerry devices are secure and operate at optimal service levels.
- **Enterprizm**, Inc.'s flagship Divide platform combines cloud-based management with device-level technology to impose enterprise security and management policies on mobile systems.
- **Good Technologies, Inc.**'s solution secures enterprise data and protects against potential enterprise data loss by the use of end-to-end 192-bit AES encryption and National Institute of Standards and Technology Federal Information Processing Standard certification.
- **Numara Software, Inc.**'s FootPrints and Track-It management tools to monitor their mobile devices. In January, BMC Software purchased the mobile device management supplier and planned to integrate its offerings into its Software as a Service line.
- **Sybase, Inc.** developed Afaria, a management application that enables IT department to add, update, or remove applications, data and content without user involvement.
- **Tangoe, Inc.**, developed the Communications Lifecycle Management software to help universities track their communications assets. It features planning and sourcing, procurement and provisioning, inventory and usage management, invoice processing, expense allocation and accounting, and asset decommissioning and disposal functions.
- **Zenprise, Inc.**'s Mobile Managers features user self-service device enrollment. The product distributes configuration, policy, and application packages in an automated manner, based on a user's role.

These vendors could be joined by others. With the move to mobile devices having so much momentum, academic institutions will need tools to help them monitor the handhelds and ensure that they do not poke new security holes in academic networks.
on, sift through the confidential information, and have himself a party.

While there is the potential for myriad problems, there are also steps that universities can take to protect themselves. First, they need to determine how closely they want to monitor the mobile devices: Their options range from minimal to significant IT interference.

Some academic institutions have taken a minimalist approach to securing mobile communications. "Restricting access will not stop users; some will be clever enough to find a way around whatever security checks are in place," stated Eric Hawley, associate vice president for technology at Utah State University (USU). "Rather than play a game of cat-and-mouse, we let users rely on whatever type of device they want and provide them with access to whatever information they need."

Founded in 1888, USU has evolved from a small agricultural college into a school recognized internationally. The university has 850 faculty and more than 23,000 undergraduate and graduate students, including 10,000 enrolled in continuing education programs throughout the state of Utah.

Advise, not Penalize

Instead of a punitive role ("you cannot"), USU's IT department has taken on an advisory one. It periodically scans all the systems using the network, looking for devices that are infected. Once identified, the department will notify the user and recommend steps, so the system can be cleaned up. "We have a handful of systems with problems each week," noted Hawley. Typically, users follow the IT department's advice and clean up their systems.

More cautious routes start by restricting access to the school's network. Universities can create a network perimeter by building a firewall. Theoretically, it will funnel all connections into a central location and block malicious outside traffic. Here, users can access information only after clearing a few security checks. In the simplest case, they would need to present an ID and enter a password before accessing any applications.

Washington State University, which serves approximately 25,000 students, 1,300 faculty, and 4,300 staff from its main campus in Pullman, as well as satellite locations in Spokane, Tri-Cities, and Vancouver, has followed that path. The school, which has an operating budget of $1.57 billion and an endowment of $638.4 million, has determined that the mobile devices should be subject to the same security checks as individuals working with PCs and laptops. Staff and students, who can choose from more than 200 fields of study and a dozen colleges, must enter an ID and password before accessing university computing resources.

VPNs: A Proven Solution?

In other instances, schools segment their networks. To access the school's business systems, users need to establish a virtual private network (VPN) connection, which requires special software on their end devices.

However, the effectiveness of firewalls and VPNs is an open question in today's environment. "Today, there are many holes in traditional firewalls," stated Gartner's Redman. Historically, specific ports on routers were used for interactive transmissions, so it was easy for security vendors to figure out where to sit and monitor information flows. With movement to more dynamic, interactive, peer-to-peer programs, holes open up in other network locations. In addition, students tend to be more computer savvy and more mischievous than employees working for a business, so the probability that they will search for, find, and exploit security loopholes is quite significant.

For more control, universities can purchase smartphone management tools designed to monitor handheld systems and lower their potential exposure. A number of vendors, including 3LM, BoxTone, Enterprid, Good Technologies, Numara Software, Research in Motion, Sybase, Tango, and Zenprise, (see sidebar on previous page) have begun delivering such solutions.

A Lot of Choices

The products vary widely in design and capabilities. In essence, these solutions divide personal and business information on handheld devices. Some products segregate personal and corporate data by creating a buffered "data lock box" with a different user interface on the handheld device. In other cases, they sequester the company data but offer users a consistent interface between their personal and corporate information.

In addition, the management systems help companies enforce mobile policies. For instance, they can block users from copying and pasting information from a database into a personal mail system, like Google, Inc.'s Gmail.

While beneficial, even these products are more a stopgap measure than a long-term fix. "To truly be effective, security functions have to be built into mobile operating systems," noted Gold. Currently, only Research-in-Motion Blackberries have such capabilities. Google has begun pushing Android in that direction, but Apple and Microsoft have put other enhancements higher on their priority lists. As a result, schools will need to recognize the potential problems that mobile devices present and put checks in place to limit the possibility that their networks will be compromised.

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Land Grab: Why Every Institution Needs to Stake a Claim on Google+

Joe Dysart

While Google+ with its 60 million members is still relatively small for a social network, many institutions have wasted no time scrambling to set up their own pages.

“CDU aims to have a presence on all major social networking sites as part of our overall marketing strategy,” says Damian X. Lenshek, director of operations, Catholic Distance University (https://plus.google.com/105275478505016192762/posts). “In a recent review of CDU’s online presence, Google+ was one network that stood out as a potential way of increasing CDU’s reach.”

Adds Vitaliy Darovskikh, new media director at Cornell University (https://plus.google.com/116871314286286422580/posts): “At Cornell we pay close attention to emerging technologies. We realized the potential for Google+ early and established our presence right away.”

Getting in on a Good Thing

Search engine optimization (SEO) experts say the land grab—which began in early November 2011, when commercial pages were first allowed on the network—is a smart move, since firms and organizations with a presence on Google+ are expected to move up higher on Google search engine returns.

Web security experts are also urging institutions to set up shop on Google+ to ensure that their brand names are not snapped up by a competitor or some other ne’er-do-well—in much the same way squatters appropriated the brand names of global corporations during the dawn of the Web.

Internet marketing analysts say some of the new social network’s more innovative features—like “Hangouts,” which enables a group of people on Google+ to video chat simultaneously—make Google+ too promising to ignore.

The social network, which was launched summer 2011, is Google’s answer to Facebook—which now has more than 800 million members and represents an ominous threat to Google’s advertising revenue base.

There are marked differences between the two animals. But they share a core mission: to provide a virtual meeting place where millions of people can socialize using chat, posts, photo and video exchange, and other Web communications tools.

Institutions, of course, continue to be avidly interested in how activity on social networks can be parlayed into increased brand recognition. Plus, they’re fixated on ways they can extract the most mileage from word-of-mouth recommendations from students and others who are popping up across social media in the millions.

“When the Google+ Business Pages was officially launched this fall [2011], it was imperative that we secure our brand presence, as many other companies had already done, given this latest social media site’s enormous potential for growth,” says Lucy Niro, director, Web communications, Concordia University in Quebec (https://plus.google.com/116149085917275098005/posts).

On Facebook, for example, legions of members have been signaling their endorsement of a product or service by clicking a “Like” button—a nod that became immediately coveted by businesses the moment it surfaced there. On Google+, members offer the same kudos by clicking a +1 recommendation button.
Ali Husayni, founder of Master Google (www.mastergoogle.com), a search engine marketing firm, says that Google’s +1 recommendation button makes forging a business page on Google+ “absolutely essential.”

Besides seeing marginally improved search engine rankings short term, Husayni says businesses that establish a presence on Google+ may very well see significant sales gains as Google+ grows beyond its critical mass, and as more and more people begin using the +1 recommendation button, exchanging recommendations for goods and services on the network.

In fact, Husayni says Google’s increasing reliance on word-of-mouth recommendations when ranking search engine returns could dramatically alter the way company webpages get found during the next few years. Instead of seeding company webpages with carefully selected keywords and key phrases to attract traffic, SEO experts will most likely need to find ways to ensure that their clients have as many recommendations from Facebook, Google+, Twitter and other social networks as possible, he suggests.

“My initial thought is that Google is shifting the power from SEO companies toward networks and circles,” Husayni says. “It’s kind of like the past, when word-of-mouth was more important than anything else. We’re almost moving in that backward direction, but on the virtual world of the Internet.”

Marcie Lasseigne, social media manager, St. Edwards University (https://plus.google.com/108836167173695552285/posts), agrees: “We believe that having a Google+ presence will increase our Google search engine results. Having the +1 feature on our Google+ account enables people to use the +1 feature, which can be considered a powerful recommendation. If we post an interesting blog entry, engaging images, or a thought-provoking video, someone can +1 our post, and this will help our information have a stronger weight on Google, helping others find that information faster.”

Cornell’s Darovskikh adds: “Google+ is a social fabric for Google products, including two top search engines, as well as Gmail, Google Earth, and Android. Therefore, Google+ content is well positioned for optimum integration and search optimization.”

He Who Hesitates...

Meanwhile, Web security experts say institutions that take a wait-and-see approach to establishing a presence on Google+ could get burned. Currently, anyone can stake a claim to a business name on the Google+ social network, whether or not that person is in any way associated with the company.

Bank of America is still smarting from that hard truth, after pranksters put together a parody page of their brand in November 2011. The rogue Bank of America page openly mocked homeowners facing foreclosures—as well as those who would come to their aid.

Chillingly, the unauthorized Google presence went up complete with a Bank of America logo, as well as links to the company’s real website, a legitimate address and legitimate telephone number. One of the snarky posts made in the name of Bank of American hissed, “Big company party in foreclosed house #2340087 tonight!”

Google does enable companies to formally verify their presence on the Google+ network. (For an excellent tutorial on how to verify your institutions’ page on Google+, go to: http://www.socialmedia.biz/2012/03/07/how-to-verify-your-google-plus-page/). But like many things Web, it’s still the Wild West on Google+.

Google Has Hangouts

For Web video marketers, being able to take advantage of Google+’s Hangouts feature—which enables a group of people to video chat simultaneously—is another key reason your brand should have a page on Google+.

For everyday institutions, uses for Hangouts are expected to include video chat student service, video chat focus group, and other more traditional institution-to-student communications that can be greatly enhanced by real-time, interactive video.

With just a webcam and a typical computer, users can quickly join a Hangout chat with a circle of friends, colleagues, business partners, or students. In practice, the video chat pops up on the user’s PC screen as a giant image of a chosen participant, which is displayed front and center. Smaller thumbnail videos of others participating in the chat run along the bottom, and can be swapped in-and-out of the main video stream at will.

“A huge selling point for Google+ is how easy it is to create and segment Circles from the onset,” says Concordia’s Niro.

“And these Circles can be further segmented. For example, we could decide to create a prospective student Circle that we could then further segment into user interests or topics—such as fine arts, athletics, sciences, or engineering. We could even invite prospective students to join a Hangout on a particular topic or field of study in which they’ve expressed an interest or for which they posted a query, thereby expanding our recruitment capabilities. Or a professor could decide to create a Hangout for a class that would be restricted to those students.”

St. Edward’s Lasseigne adds: “Hangouts are one function that is very appealing on Google+. St. Edward’s is a global university with partnership institutions in nine countries. Google+ will allow our students to connect and interact with students at our global partner institutions. By holding Hangouts, students will be able to see and interact with other students and their potential professors in real time. One of our partner institutions could potentially
‘sit in’ on one of our classes held here in Austin.”

“For you and me, this means we can now hang out live with the local bike shop or discuss our wardrobe with a favorite clothing line or follow a band on tour,” says Vic Gundotra, vice president of engineering, Google. “For businesses and brands, Google+ pages help you connect with the customers and fans who love you. Not only can they recommend you with a +1 or add you to a circle to listen long-term; they can also actually spend time with your team, face-to-face-to-face.”

Get Started

Fortunately, if you’re looking to set up a Google+ page for your institution, the logistics are painless. If you’d like to simply plunge in and see what all the fuss is about, sign into your free Google account, go to www.google.com/+business/#utm_source=google&utm_medium=cpc&utm_campaign=pages and follow the prompts.

You can also get some additional background with a webinar (www.buddymedia.com/products/conversationbuddy/google-plus) from Buddy Media on how to get the most from a business Google+ page, although the tutorials include a pitch for the company’s social media product, Conversation Buddy.

And SEO, Inc., a Web marketing firm, has put together a fairly thorough white paper (www.seoinc.com/seo-blog/google-pages-for-business-download-free-white-paper) on maximizing Google+ for business.

Bottom line: there’s really no downside to establishing a business presence on Google+—only opportunity and potential.

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Mobility Plays a Leading Role in the Teaching Environment

The proliferation of mobile devices means that access to information is always available. Students are connected not only to each other but also to a vast array of interconnected information and resources. This connection can be an important tool for teaching and learning by allowing the teaching environment to extend beyond the traditional classroom and encompass a wider world.

Smartphones and tablets allow both teachers and students to interact with each other in new and creative ways. Having computing power that is portable and always available allows for learning experiences that are not confined to a particular time and space. Authentic experiences enabled by interactive mobile devices can engage learners in meaningful ways that transcend the traditional classroom walls.

My own observations suggest that younger students in particular seem to understand the use of mobile devices in an intuitive way. As these students grow older and enter higher education, the entire textbook publishing business will most likely change. Currently, many students still prefer print for textbooks, but in the not-too-distant future, it is likely more and more students will be comfortable with electronic books. They will expect the interactive and rich media experience possible with electronic texts and be entirely comfortable with books and materials available only via a mobile smartphone or tablet, such as an iPad, Kindle, or the like.

For institutions, the increased use of mobile devices means the network infrastructure—and particularly the wireless network—becomes an ever more critical service. In fact, WiFi and cellular services become even more mission critical. To truly utilize our mobile devices, we can never be untethered from the constant flow of information and communication.

This also means that network planners in an institution of higher education must now plan not only for better and faster wireless networks but also for coverage for additional spaces and outside areas. Students can take tablets and smartphones into living laboratories in nature, capture data, and send and receive information. They are no longer confined to the traditional classroom space but can move into the natural world, whether a rural forest or an urban neighborhood. Network planning
must also include ever-more redundancy so that the connection is never broken.

A Learning Experience

Recently, I taught a class in instructional technology for prospective teachers at Sewanee: The University of the South. I decided to issue each student an iPad so that together we could explore and think about what mobile, touch-screen devices mean for education. The course also had a service-learning component. Each student was paired with a local special-education teacher who had also just received an iPad.

We began with an introduction to the iPad. I intended to check out the devices to students and then explain how to connect and get them set up. A similar project with a group of graduate students several years ago was chaotic and required a great deal of individual assistance. This time, I was prepared! The first surprise of my experience in teaching the class occurred when I discovered that the students had the iPads on and connected before I had finished checking them all out. They needed very little instruction in the basics of using a mobile or touch device because (1) these devices have grown easier to use, and (2) for the most part, students already had iPhones, Androids, and Blackberries and were digital natives who do not remember a time without the Internet.

Since we did not have to struggle with the basics, we began a discovery of what the use of mobile technologies can mean in education—both K–12 and higher education. We used Google Apps for Education for communication. We used Google Docs to create and share text documents, spreadsheets, and presentations. This led to our first discoveries. The students were excited to learn that they could create documents and presentations, save and share them in the cloud, and access them with the iPad (or other mobile device) at any time or place. Almost everyone had suffered through PowerPoint font and version problems when creating a presentation and then trying to share it on a different computer. We developed Prezi presentations on the history of the Internet and on ways to use technology in teaching. I discovered that although as a group they were very quick and proficient in using mobile devices, they did not always know how to use features and functions of the cloud for their work.

I asked them to use the iPad as their own for the semester and reflect upon how it did or did not change the way they worked and studied. We explored the use of e-books and the huge number of free books and read a text online using both iBooks and the Kindle app. (The text we read was The World Is Open: How Web Technology Is Revolutionizing Education by Curtis J. Bonk). We learned to tweet and create movies to share. The classroom was our initial meeting point, but we did not have to stay in that space. Instead, we could move both outside and inside as needed.

The students were nervous about working with the special-education teachers. They feared they would not know enough to be truly helpful to the teachers. This fear proved unfounded. By the time the visits with teachers began, they were fluent in the use of the iPad and knowledgeable concerning apps useful for special-education students.

Sessions with the special-ed teachers proved to be one of the most valuable experiences of the class. Students kept a log of their tutorial sessions with teachers and shared those experiences with each other. All of the teachers had only recently received the iPads, so students were able to help them become familiar with many of the basics of using the iPad. A few teachers did not know how to download apps or organize apps. In some cases, they could not access a wireless network. The difference in being a digital native and a digital immigrant became quickly apparent to my students.

Very quickly the students were able to assist teachers with the basics and move on to assisting with educational apps. In many cases, my students actually worked with students in the special-education classes.

As we discussed the service-learning project with the special-education teachers, my students reflected upon the importance of network access, the utility of cloud computing and resources, and the need for more teacher training in the use of mobile devices of all kinds. The very best experiences for my students involved working with the children. There are many apps available for students with communication problems and cognitive problems. The experiences my students reported highlighted one of the most important aspects of mobility in education: the proliferation of useful apps at little to no cost.

Rather than assign a traditional research paper to my students, I asked them to create an online portfolio using Google Sites and to create an e-book using iBooks Author. In their online portfolio, they linked all of the presentations, videos, and other documents they had created in the class, as well as included the observations of their visits to the local special-education teachers. The e-books they created included video shot and edited on the iPad, interactive questions, photo galleries, and text. The resulting e-books reflected the experiences of the semester in a professional-looking, interactive format that could be shared with other mobile devices and computers.

The Impact of Mobility

What I learned from my students reinforced my conviction that mobility in the teaching environment is increasingly important and positive. The students reported on their use of the iPad in other classes. They used the devices to look up information on the Internet during class and to access our library's electronic journals and databases when doing research projects.
They took notes on the iPad and recorded lectures for later review. They created presentations using the Prezi app and Google Docs. They watched movies from NetFlix and Hulu and, of course, used the ubiquitous Facebook app, as well as Twitter, to communicate with others.

Why is this important? I believe it is critical that educators learn to engage students with the tools and resources of the 21st century. We need to meet them where they are, not expect them to remaster old technologies and ways of teaching and learning.

Of course, anytime-anywhere access to information also leaves us all open to misinformation as well. Part of being successful in the Information Age means knowing how to discriminate between information that is legitimate and that which is useless or even false.

Rather than ban Facebook and texting and mobile devices in the classroom, we must learn to use these tools to engage interest and reinforce learning. Motivation for learning is critical, and we must recognize and always remember that we are preparing students for the world they are living in now, not the world of the past.

Conclusion
Mobile devices, smartphones, wireless tablets, and other electronic devices have forever changed our approach to finding and using information. We are now able to look up the answer to a question at any time and any place. We do not have to make a trip to a library to find the answer to an obscure question. This is not a value-laden proposition. It is not necessarily better or worse; it simply is. The tools and resources of time present are much different from those of time past.

It is up to us—both educators and other participants in the educational process—to provide for the wise use of the vast array of mobile tools and devices and, by extension, information. We must provide the requisite infrastructure as well as the knowledge of how to make the most effective use of our ever-increasing mobility.

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Data Sifting: The Next Frontier In Emerging Opportunities

Convergence, cloud computing, computer-based data analytics, and data sifting have ushered in a new era in accessing and exploiting vast troves of data. Continuous innovation in computer processing power, storage, artificial intelligence techniques, neural networks, statistical software, virtual machine definition, and cloud computing–based analytics have made the once impossible a reality in data sifting. More and more companies are trying to make sense of what their data reservoirs can tell them about how to do business worldwide, refine their products and services, and create the future.

Although business, industry, government, and academia have made substantial investments in data collection, storage, retrieval, and visualization, many do not have the know-how to uncover the valuable insights, data patterns, anomalies, and information/knowledge nuggets in their big data reservoirs. For example, what is the impact of smartphones and social media on political systems, marketing/retailing, social engineering, and language lexicons?

A recent industry survey of business-intelligence professionals reports that 51 percent of data-mining projects never left the ground, did not realize value, or produced results that were not measurable.¹

What Is Big Data?

Beyond the inherent upfront risks of engaging in what is essentially a discovery process, just identifying a starting point can be intimidating and mystifying. Despite its elusive nature, predictive analytic data visualization has surpassed the flash-in-the-pan “miracle tool” stigma. Success stories are highlighted frequently in mainstream publications indicating improved operational efficiencies, enhanced business intelligence, residual payback, and new business opportunities. Facebook, Groupon, Human Genome Sciences, TellApart, The Climate Group, Cataphora, and LivingSocial rely on terabytes and even zettabytes* of data to design their products and services. The practice is called big data. It is huge in scope and power, with the potential to affect many industries.

Technology has always empowered people and changed the way things are done. For years, the academic, scientific, and research communities have used powerful computers to sift through volumes of data on global warming and its impact on changing weather patterns, rising ocean levels, and natural disasters. With advances in cloud computing and virtual machine definition, organizations are now able to define virtual big data reservoirs across multiple computing platforms at multiple locations. This enables organizations to define a virtual central repository of all organizational data. Users are now able to analyze data from many different perspectives, dimensions, and angles in summarizing data relationships, patterns, and various characteristics that can be used to increase revenue, cut costs, and develop new products. The process involves the visualization and extraction of implicit, previously unknown, and potentially useful information from data by searching for, locating, running

* A zettabyte is a measure of storage capacity that is 2 to the 70th power bytes or, in decimal, approximately a thousand exabytes or a million terabytes.
and uncovering valuable predictive insights, patterns, relationships, and anomalies hidden within big data reservoirs. It involves using a combination of machine learning, pattern recognition, statistical analysis, modeling techniques, and database technology to find patterns and subtle relationships that allow discoveries about the past and predictions about the future—such as the impact of digital forensics on the criminal justice system, in the fine arts industry, and in validating authenticity of artifacts.

Data, Information, and Knowledge

Data refers to any facts, numbers, or text that can be processed by a computer. Today, organizations are accumulating vast reservoirs of data in different formats, including the following:

- Operational or transactional data, such as sales, cost, inventory, payroll, and accounting
- Nonoperational data, such as industry sales, forecast data, and macroeconomic data
- Metadata, which is data about the data itself, such as logical database design or data dictionary definitions

The patterns, associations, and relationships among data items generate information. For example, analysis of retail point-of-sale transaction data can yield information on which products are selling and inventory replenishment requirements.

Knowledge discovery is the process of finding correlations or patterns among data items and the extraction of implicit, previously unknown, and potentially useful information from the data items: for example, summary information on the impact of black carbon versus carbon dioxide on global warming.

Data Reservoirs and Data Warehouses

Dramatic advances in data capture, processing power, data transmission, and storage capabilities are enabling organizations to integrate their various databases into data reservoirs. Data warehousing is defined as a process of centralized data management and retrieval. Data reservoir is a relatively new term, although the concept itself has been around for years. Data reservoir represents an ideal vision of a central repository of all organizational data to maximize user access and analysis. Dramatic technological advances, state-of-the-art data-analysis software and cloud computing are allowing users to access this data freely. For example, the advertising and retail community can now analyze sales in light of consumer advertising and promotional efforts to determine which items are most susceptible to promotional campaigns.

Fueling the Next Decade of Winners

With a broad range of analytics capabilities, organizations are now better able to explore all aspects of their business:

- To Think: Answering key business questions
- To Connect: Building and sharing insights to gain alignment
- To See More: Experiencing the freedom to see the big picture and discover more opportunities
- To Speculate: Imagining future possibilities and scenarios
- To Make Smarter Decisions: Driving better results and achieving goals
- To Execute: Bringing insight to the point of maximum impact in creating the future

Exploring, analyzing, slicing, and dicing data until patterns and anomalies become obvious implies digging through tons of data to uncover these patterns and relationships—for example, the impact of biomedical engineering on geriatric care, drug development, social engineering, and healthcare in general. The practice has become an important part of the research community and customer relationship management (CRM). In spite of the barriers to success, organizations are actively pursuing emerging technologies and innovation, to improve insights, performance, and business dynamics in their quest to be the engine that leads the world’s economy back to economic growth.

IBM continues its quest to be in the forefront by adding to its cloud-based analytics expertise the acquisitions of software vendors Emptoris and DemandTec. The acquisitions enhance IBM’s smarter commerce initiative, which focuses on providing companies with tools for analyzing and responding to consumer buying trends. In addition to the traditional computer vendors, such as IBM, HP, Cisco, Oracle, Alcatel-Lucent, VMware, and EMC, many new firms are emerging that specialize in industry-specific analytic analysis and data visualization of big data reservoirs.

Data-Sifting Vendors

As more companies seek to make sense of what big data reservoirs can tell them, a recruiting war for top talent is being fueled by the demand for people who can help organizations uncover the information and knowledge nuggets hidden in their data reservoirs. Here are some of the better known vendors in this area:

- Cataphora markets a suite of software solutions that allow organizations to identify the least and most valuable components of an organization in an objective manner by examining how human interactions relate to specific workflows. Although data analytics itself is not new, it is changing how an organization makes decisions, allocates resources, anticipates risks, shapes future outcomes, achieves better results, and gains a deeper understanding of trends, opportunities, weaknesses, and threats. Elizabeth Charnock, CEO of Cataphora, states that everyone leaves a digital charac-
• Greylock Partners is a venture capital consulting firm that supports innovative entrepreneurs who are obsessed with solving customer problems across the enterprise and helps them build viable businesses that stand the test of time. David Patil of Greylock Partners says it "is on a perpetual search for a rare breed of talent with a brain for math, finesse with computers, the eyes of an artist, and more. There's one common element across the rare breed of talent that stands out above everything, and that's curiosity. It's an intense curiosity to understand what's behind the data."

Patil compares raw data to clay: shapeless until molded by algorithms that can churn through billions or trillions of data points and show where patterns emerge and what matters and what doesn't in a huge trove of data. For example, data-visualization patterns indicated early on that mothers were heavy users of social networks, which in turn led to the creation of social circles.2

• The proliferation of innovation and new technologies facilitates our ability to interact, collaborate, think differently, initiate change, and rethink everything. Cybersecurity, counterterrorism and fraud detection have emerged as top concerns in the business and government arena. Palantir Technologies develops and markets highly sophisticated data-sifting and -visualization tools that help government agencies, banks, and other organizations conduct cybersecurity, counterterrorism, and fraud detection. Palantir's software provides the ability to assimilate incredibly large amounts of data (up to a million gigabytes) from disparate databases and allows investigators to apply different functions, such as mapping, filtering, timelines, and searches. A point-and-click interface allows enforcement officials to sift through it using language they understand, such as "fraudster" and "suspicious account."  

• David Friedberg, CEO of The Climate Corporation, says his company uses weather measurements from 2.5 million locations and 150 billion soil observations to create weather insurance for farmers. Friedberg

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approach to understanding what’s happening,” says Chris Kemp, CEO of Nebula, a storage and computing capacity vendor. Big data give consumers better tools so they can do a better job of predicting dynamics in their marketplace.2

Summary
We are in a de-leveraging environment that’s here to stay, as we gear up for what will likely be another tumultuous year in the 2010 decade. There is political unrest in the Middle East, Europe is in a financial crisis, Japan is recovering from the Fukushima disaster, Russia is in turmoil, China’s economy is looking wobbly, and there is political  

cal gridlock in Washington. As national boundaries lose importance, choosing the right strategy, product, company, or industry to invest in is critical to future success.

Companies and governments alike are turning to data sifting to identify new opportunities as they continue to gather and keep vast troves of national and international data about population demographics, shopping behavior, brand preferences, product surveys, changes in weather patterns, financial transactions, payment history, traffic patterns, and so on. Organizations are now able to integrate and analyze massive amounts of data to align the latest insights to business processes and make faster, more accurate business decisions. By gaining deeper insights, businesses can uncover critical patterns, not only to react swiftly to market shifts across geographical regions but also to predict the effect of future actions.

Current state-of-the-art of business analytic tools continue to fuel the demand for an increasingly socially savvy workforce. More and more organizations and firms are trying to make sense of what the big data troves can tell them about future business dynamics, how to do business better, future market trends, and emerging opportunities as they seek to create the future in an increasingly global society.

Jim Cross is a past president of ACUTA and a frequent contributor to the ACUTA Journal. Now retired, he can sometimes be reached at jsCross22@gmail.com

References:

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IU Mobile at Indiana University

The key goal of IU Mobile, Indiana University’s official application for handheld devices, is to enable convenient anytime, anywhere access to IU information and services on any device. IU Mobile is Indiana University’s implementation of the Kuali Mobility product. IU is also a lead contributing school in the Kuali Mobility project, which provides higher education with an open-source option for mobile initiatives. By sharing solution sets, the project is helping to foster innovation and drive down overall development costs for higher education participants.

The Kuali Mobility project began as a partnership with five initial investors and a unique product-evolution strategy. Indiana University took the lead in the formation of the Kuali partnership, partnering with Cornell University and the University of Michigan as well as commercial affiliates HTC Global and Vivantech. The project also focused on reinforcing an agile approach to evolution and adoption. In the first phase, IU diverted all existing investments in mobile technology into the Kuali model, propelling the project into production at IU on a very short time line to prove the technology and ensure no lingering dilution of mobile efforts.

The Kuali Mobility project is leveraging HTML5 as the primary technology powering the application. As the platforms and operating systems in the mobile space continue to evolve, that HTML5-based approach creates reuse potential. Additionally, we recognize that the marketplace is demanding native applications that people can download from stores for each of the major devices and operating systems. So while our application is primarily HTML5 based and reusable across platforms, we are leveraging open-source software that wraps this functionality (PhoneGap) into a native application. By doing this, we are also able to tap into device functionality that is not currently exposed to pure HTML5 in the browser on the phone.

Planning, Leadership, and Management Support

As a partner in the Kuali Mobility project, Indiana University is participating in two evolving sets of organizational dynamics. First and foremost, IU is committed to delivering best-of-breed mobile experience to its constituents (students, faculty, staff, prospects, alumni, and others). Secondly, as a means of production, we see Kuali and a shared project-ownership model as a means to help share the costs associated with our mobile initiatives.

Each organization that comes into a Kuali-managed project contributes resources to the project; the project then pools those resources and has a project manager allocate them according to priorities based on governance rules established in the project charters. Typically, Kuali projects have a governing board and a functional council made up of members from all of the contributing institutions. This allows for a shared-governance model that takes into account the vision and goals of the collec-
tive group of institutions investing in the project.

In addition to the coordinated multi-institutional governance, each institution evolves its own governance model for participation in order to maximize the value gained through project membership. Therefore, at IU we have internal governance and efforts in addition to the collective efforts required for active participation in the project. To ensure transparent sharing of goals and objectives, IU's IT team has partnered with university communications and marketing in a shared institutional-ownership model. This internal governance is critically important, as coordinated IT spending allows for shared returns rather than each campus, department, office, or group forging a mobile direction on their own.

Promotion of Technology and Maturity of Effort

Indiana University is highly invested in establishing itself as one of the top tier IT institutions in higher education. This investment has led to a series of additional investments (internal, external, and grant related). To maximize these resources, IU helped steer the formation of the Kuali Mobility project, with the intention of transparently sharing investments in the larger higher education space, as well as production costs.

Before the formation of the Kuali Mobility project, IU had invested in local solutions for the institution. After a couple of years of internal evolution, we saw an opportunity that was part technology and part organizational. Organizational awareness of mobile efforts had become the norm, and almost all institutions of higher education had some sort of investment in mobile delivery of services and applications. The technology advancements that occurred at the same time created a new investment model that made it possible to invest in HTML5-based approaches, and to extend a pleasing experience to users across devices and operating systems.

The timing of the project and selection of the technologies leveraged in the project are indicative of a tipping point in time. Web delivery of mobile investments was seen as a second-class citizen in comparison to native applications that users could download and install from application stores. IU had recognized this and, prior to the Kuali Mobility project and the adoption of a technology direction, we invested in native application development across multiple platforms—development that was becoming very expensive to maintain and keep consistent for users. Moving forward in the Kuali space, we knew that we needed to deliver an approach that would work across technology platforms. In addition, we needed to ensure that it met the basic expectations of users accustomed to native applications that work well on their handheld platforms.

We became adopters of early versions of two key technologies that helped us achieve this vision. First, we needed an HTML5-based approach that met user expectations related to native application functionality. For this element of the project, we selected jQueryMobile, which is a subproject of the jQuery project. Next, we needed a bridging technology that allowed us to make use of our HTML5-based investments in creating downloadable applications for publication in application stores. For this technology, we selected PhoneGap. The combination of the two technologies allowed us to rapidly deliver native applications with all of the traditional benefits of HTML5 web-based development and maintenance. When a defect is identified, we can isolate and resolve the issue without needing to resubmit to the application store and wait for approval (in addition to the user updating the application). Combined with our own investments, these two core technologies have enabled us to rapidly develop and deploy functionality to mobile devices at a rate that we could have only dreamed of a couple of years ago.

Quality, Performance, and Productivity Measurements

Going into the effort, we had a wealth of experience with previous investment models for mobile deployment of applications and services. We knew that a large investment would be required to deliver our services on a single mobile platform, and we also knew that we wanted to deliver our service ubiquitously across the ever-evolving range of platforms (over which we have no direct control). Due to our previous investments, we already had some pretty strong indications of quality, performance, and productivity. We also had a great desire to reduce the level of investment required to keep pace with productivity measures.

By moving to a write-once/consume-on-any-device model, we inherently increased productivity related to platform- and operating-system disparity. In fact, we increased productivity by a measure of three, as we had been maintaining three different platform implementations for our services. After initial implementation, we continue to see enhanced productivity. We have also expanded our base of users, who can add value by developing tools in a primarily Web-based development approach for which trained staff are available in large quantities. In addition, we have benefited from a surge of investors from across the institution—all interested in ensuring that their services are included in IU mobile.

Cost, Benefit, and Risk Analysis

The primary cost driver has been human resources. We placed responsibility for IU Mobile and our Kuali Mobility endeavors on an existing team within our central IT group. We added two additional staff to match the demand for quick turnaround and to meet our resource obligations to the Kuali project.
In addition, we get the benefit of the collective human resource commitments from other institutions to Kuali Mobility. This provides a net resource base that is larger than it would have been if we had done this project on our own. It also helps control costs going forward and allows for innovation and sharing on the mobile platform.

All software used on the project is open source; therefore no software investments are required. The remaining costs are associated with travel expenses for staff on the Kuali project. Generally speaking, we categorize these costs as “costs of collaboration,” required to bring the development staff, board, and services council together for face-to-face meetings at least twice a year.

The benefits of moving the IU mobile platform in the direction of HTML5 are numerous. As mentioned, we have increased our productivity by a factor of three. We have also made it possible for people outside of the core team to participate in developing IU Mobile services, leveraging Web application programming tools they already use for their websites and applications. Finally, we can much more easily recruit and retain talented staff, as the skill set required is widely available (especially compared to limited availability of native application developers for each of the platforms).

Our risk exposure has also been significantly reduced by moving in the HTML5 direction and by further engaging in a collaborative open-source Kuali project. The risks of building Web applications are widely known and already a standard measure that we encounter in most projects. Our ability to leverage our collective experience related to Web-based application delivery mitigates any IT security risks. In addition, the risk of stalled projects or failed projects—mainly due to the lack of proficient staff—is greatly mitigated by leveraging a common skill set. The risk of cost overruns and staying relevant are also mitigated by engagement with the Kuali Mobility project.

Customer Satisfaction and Results to Date
The key organizations involved in the initiative have been the central IT group (University Information Technology Services, or UITS) and the university communications and marketing group, which is responsible for managing gateway sites that have some direct parallels to our mobile initiatives. The key audiences that we have targeted with the IU Mobile application include students, faculty, staff, and alumni. We intend to continue to roll out services with targeted value for prospects, parents of students, donors, and the general public. (There is a combination of both public and authenticated services deployed into IU Mobile today.) In addition, our one instance of the application handles the mobile presence for all eight IU campuses. Many of the services are shared across all campuses; however, each campus has the capability to add tools specific to their campus.

The overall reaction to the initiative has been very positive. As the number of smartphone users has dramatically increased on our campuses, so has the demand for delivery of IU services that work well on those devices. We have used a number of techniques to assess needs and satisfaction. First, we conducted fairly extensive user-experience testing at several phases of the project. Second, we built a feedback mechanism into the application to allow users to express their desires or satisfaction/dissatisfaction with the service. Finally, we have engaged with user groups to assess their needs and help prioritize the activities of the development team. Together, these feedback mechanisms have created an agile approach based on feedback and usage statistics to help steer our efforts.

One specific example where user input really made a difference had to do with user feedback requesting that we put in place a tool for accessing information from the student information system (SIS), and from the learning management system (LMS). We worked with users to identify the parts of these systems that they wanted to access on mobile devices, and then built out the integrations and ultimately deployed a tool called My Classes. The authentication-required tool now allows students and faculty to quickly access records for their current classes with combined data from the SIS and the LMS.

The main challenge has been related to coordination: Our desire to be a very agile project means that communication and coordination are essential. And it is imperative that the distributed development team stay in near constant communication. In addition, the services council for the project needs to have effective coordination and communication to avoid a stall in specifications for the developers. We have set up processes both online and offline to mitigate these challenges, and at this point they are operating pretty smoothly.

For a closer look, here are some links to additional information.

• Project Site: http://www.kuali.org/mobility
• IU Mobile Android Marketplace Site: https://market.android.com/details?id=iu.android&hl=en
• IU Mobile Website Access: https://m.iu.edu (viewable on the web, but best on a mobile device)

For more information, contact Brian McGough, director, enterprise integration, and chief technical architect, University Information Technology Services, Indiana University, bmcgough@indiana.edu
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