

Hype Cycle for Education, 2009

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The priority for education institutions in 2009 is to balance their continued focus on organizational efficiency with the uptake of innovative technologies that improve personal productivity. IT is driving change in many ways, but the CIO is not always in the driver's seat.

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What You Need to Know

This document was revised on 29 July 2009. For more information, see the [Corrections page](#) on gartner.com.

Many education CIOs will feel the pinch of the recession hit their institutions' budgets going forward. This is especially true in government-funded institutions where there is a delay in the impact that follows from decreasing tax revenue and public-sector budget cycles. This emphasizes the focus on cost-effectiveness that we highlighted in 2008's Hype Cycle, and many CIOs are looking for economies of scale through shared services, open-source software (OSS) or even outsourcing to the "cloud." In particular, shared infrastructural services and administrative solutions are under scrutiny as possible ways out of the pinch.

At the same time, the impact of Web 2.0 tools continues to grow on education and research, increasingly out of the control of the CIO. The CIO must contribute to the strategic balance between IT-enhanced organizational efficiency that is focused on cost containment with innovative, IT-enabled personal productivity.

The career-defining question for the CIO remains: Will the CIO stay as the "professional supplier," or will the CIO develop into the trusted "business partner"? The education Hype Cycle is a tool that will help with timing decisions, as well as internal dialogue and communication that help the CIO stay relevant.

The Hype Cycle

In the 2009 Hype Cycle, we broaden our scope to include both K-12 and higher education. We do this because we see an increase in the crossover of technologies, services and methodologies between the two. We see more vendors of services such as e-learning and ERP solutions that often originated in the higher education space adapt and expand their offerings into the K-12 space. We also see an increasing need for higher education institutions to understand what skills and expectations the prospective students bring with them to their institutions.

The developments in 2009's Hype Cycle reinforce the two major trends we highlighted in 2008. Education technology leaders are facing increasingly new options for delivering established services, while they are being challenged by completely new technology-based demands and behaviors from their core end users. Students are leading the change in many ways through the adoption of Internet-related phenomena, such as social software, user-generated media and the continued use of consumer IT devices. Professors, too, are beginning to discover the benefits of this technology in teaching and learning.

The change among professors is marked by a decreased dependence on institutionally delivered technology and services, and an increased use of user-centric technology. This shift of power from the institution to the individual is similar to what has occurred in the media industry, where expensive production tools and highly controlled distribution channels have been challenged by a ubiquity of inexpensive personal production tools and channels able to generate a high volume of accessible, user-generated content. The major change since 2008 is the increased emphasis on mobility and a proliferation of devices used for education and research.

In addition, the growing trend of "industrializing" IT through new forms of sourcing options, such as "cloud" e-mail and business process outsourcing (BPO), continues to diminish the importance and relevance of the traditional institutional IT department.

But remember that change is an opportunity. The increasing dependence on IT and the opportunity to use IT in all areas of the institution put the CIO in a position to affect the future of the institution. However, CIOs need to develop their ability to optimize alignment in general, and timing in particular, in order to strengthen and demonstrate the value of the IT department to the core "business" of the institution.

Since the 2008 Hype Cycle, several key technologies have made progress, three have disappeared and 13 have been added. Several of the new technologies are more fine-grained entries of previous technologies.

In the area of identity and access management, we have renamed "ID and Access Management — Higher Education" to "Organization-Centric IAM — Education" in order to better discuss it in relation to "Federated Identity Management" and "User-Centric Identity Frameworks."

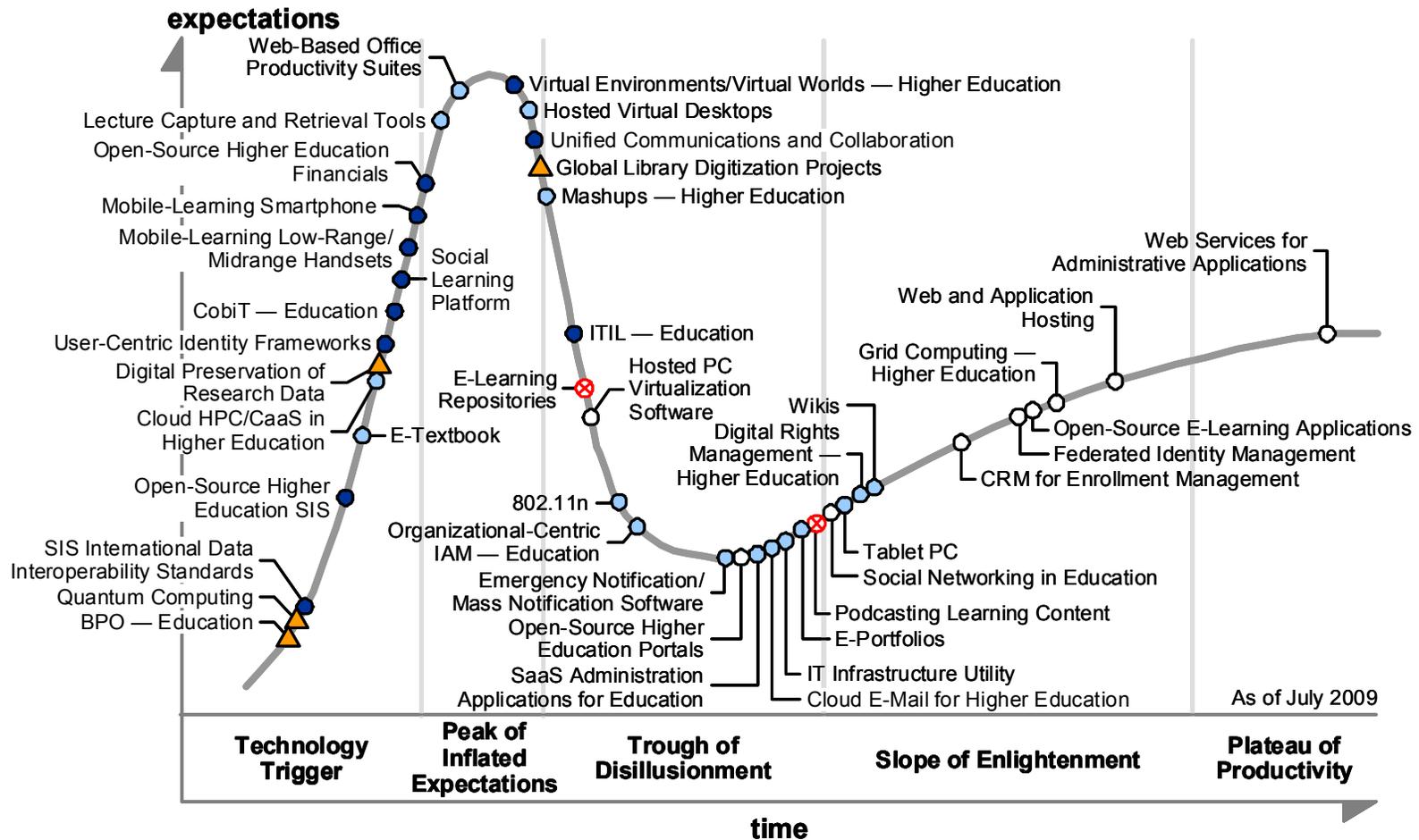
Several of the new entries are related to the industrialization of IT with the need for new standards, operating practices and delivery mechanisms, such as "SIS International Data Interoperability Standards," "Hosted Virtual Desktops," "Hosted PC Virtualization Software," "Cloud HPC/CaaS in Higher Education" and "SaaS Administration Applications for Education."

We decided to continue to follow 802.11x in the form of 802.11n this year, because we see great demand for increased capacity, and we also anticipate another potential clash between a campus-delivered service and wireless as a service (WaaS) through fourth-generation/Long Term Evolution-based networks in the next few years — even if WaaS did not make the education Hype Cycle this year.

"Personally Owned Devices With Campus Network Access" has given way for more specialized learning technologies, such as "Mobile-Learning Low-Range/Midrange Handsets" and "Mobile-Learning Smartphone." The latter category is also very much related to other new entries, such as "E-Textbook," "Unified Communications and Collaboration" and "Emergency Notification/Mass Notification Software," which all have the challenge of catering for a large volume of students.

In the case of "Web and Application Hosting," we made a small adjustment because we have realigned it with the general market, because there is now little difference in maturity and adoption for education in relation to the general market, even though the advent of even more delivery models seems to have slowed down some of the momentum for pure application hosting.

Figure 1. Hype Cycle for Education, 2009



Years to mainstream adoption:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

Source: Gartner (July 2009)

The Priority Matrix

Technologies that have the ability to transform higher education include "Cloud HPC/CaaS" in the midterm perspective; e-learning repositories, unified communications and collaboration, and virtual environments/virtual worlds in the longer term; while global library digitalization projects and quantum computing will take more than a decade to fully affect higher education. Most of these transforming technologies focus on the research, teaching and learning environment, where we expect the transforming power of IT to have the greatest impact.

Figure 2. Priority Matrix for Education, 2009

benefit	years to mainstream adoption			
	less than 2 years	2 to 5 years	5 to 10 years	more than 10 years
transformational		Cloud HPC/CaaS in Higher Education	Unified Communications and Collaboration Virtual Environments/ Virtual Worlds — Higher Education	Quantum Computing
high	CRM for Enrollment Management Grid Computing — Higher Education Open-Source E-Learning Applications Social Networking in Education Web and Application Hosting	Cloud E-Mail for Higher Education Hosted Virtual Desktops Organization-Centric IAM — Education	SIS International Data Interoperability Standards Social Learning Platform	Digital Preservation of Research Data Global Library Digitization Projects
moderate	Federated Identity Management Hosted PC Virtualization Software Open-Source Higher Education Portals Web Services for Administrative Applications	802.11n Digital Rights Management — Higher Education Emergency Notification/ Mass Notification Software E-Portfolios E-Textbook IT Infrastructure Utility Lecture Capture and Retrieval Tools Mashups — Higher Education SaaS Administration Applications for Education Tablet PC Web-Based Office Productivity Suites Wikis	CobIT — Education ITIL — Education Mobile-Learning Low-Range/Midrange Handsets Mobile-Learning Smartphone User-Centric Identity Frameworks	BPO — Education
low			Open-Source Higher Education Financials Open-Source Higher Education SIS	

As of July 2009

Source: Gartner (July 2009)

Off the Hype Cycle

Three technologies have been moved off our current Hype Cycle. "Personally Owned Devices With Campus Network Access" has been moved off the 2009 Hype Cycle because this broadly defined ability is well into the Plateau of Productivity with the continued proliferation of laptops,

net books and smartphones. Instead, we have focused on specific uses of this technology, such as in the case of "Mobile-Learning Smartphone." "RFID Library Materials Management" has been removed because we believe it has reached the Plateau of Productivity in terms of technology maturity, even though the size of the market is smaller than initially anticipated. This smaller market size we attribute to a relatively high price point. Finally, we removed "IP Video for E-Learning" after marking it Obsolete Before Plateau in 2008. Pure synchronous point-to-point streaming of video has to a large extent been subsumed by lecture capture and retrieval tools that add a crucial ability of indexing and later retrieval, or it is part of a larger ecosystem of podcasting, such as iTunes U or YouTube EDU.

On the Rise

BPO — Education

Analysis By: Jan-Martin Lowendahl

Definition: Gartner defines "business process outsourcing" (BPO) as the delegation of an IT-enabled business process to a third party that owns, administers and manages the process, according to a defined set of metrics and interfaces. BPO offerings are categorized in two major categories: horizontal offerings (those that can be leveraged across specific industries) and vertical-specific offerings (those that demand specific industry vertical process knowledge).

Here, we discuss the vertical-specific education BPO. Education BPO includes offerings such as grant management, institutional research (aka business intelligence), and online academic programs.

Position and Adoption Speed Justification: Horizontal BPO is an established service in areas such as payroll, and although it is used by education institutions, it has still not penetrated the education market to the same degree that it has the general market. Vertical-specific BPO, on the other hand, is a relatively new phenomenon, at least as a commercial offering. Very few institutions have had the chance to try this new service, and as a consequence, very little data is known about the potential for uptake in the education community. Because process maturity is generally low, and due to the traditional caution among education institutions, we believe this is a slow mover on the Hype Cycle. However, financial pressure and early successes can change that prediction.

User Advice: Education BPO is an interesting offering, well worth investigating for reasons of quality, cost and focus of core resources. However, institutions considering it need to have a good understanding of their processes in general and process interfaces in particular. Established skilled resources for vendor management are a must, and basic metrics must be in place before a contract can be signed.

Business Impact: The effect on the institutions depends on the process chosen for BPO and the reasons for it. It is likely to assume that the effect will be mostly in the areas of efficiency and quality improvement. However, for areas such as institutional research (aka business intelligence), the effect can be strategic if it leads to more-timely access to higher-quality data.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: Campus Management; Datatel; Oracle; SunGard Higher Education

Quantum Computing

Analysis By: Jim Tully

Definition: In quantum computing, data is represented as qubits (quantum bits), which have the ability to represent all possible states simultaneously. This gives quantum computers the ability to operate exponentially faster than conventional computers as the word length is increased. The data value held in a qubit is affected by the values of other qubits, even if they are physically separated. This effect is known as entanglement and gives the qubit the ability to hold all possible values simultaneously. Qubits must be held and linked in a closed quantum environment and must not be allowed to interact with the outside world because they are very susceptible to the effects of noise. Two stages are involved in quantum computation. Stage one involves execution of the algorithm and stage two is the measurement of the resulting data. Measurement is extremely difficult and typically destroys the quantum state as this involves interaction with the outside world. Some classes of problems would be executed extremely fast with quantum computers, but the technology is unsuited to general office tasks, such as word processing and spreadsheet analysis.

Position and Adoption Speed Justification: To date, no true quantum computing has been demonstrated in a verifiable way. The subject is in the relatively early research stage, but a number of significant advancements have been made during the past several years. Five qubit computation using Nuclear Magnetic Resonance (NMR) was demonstrated by the Technical University of Munich in 2000. This was followed by the first execution of Shor's algorithm using NMR techniques at IBM's Almaden Research Institute and Stanford University in 2001. These demonstrations did not involve entanglement and were not, therefore, "true" quantum computing. In February 2007, D-Wave Systems demonstrated a purported 16-qubit quantum computer, based on a supercooled chip arranged as 4x4 elements. The company followed this with longer qubit demonstrations. The results of these demonstrations were inconclusive. However, the technology continues to attract significant funding, and a significant amount of research is being carried out. Considerable problems exist in increasing the number of linked qubits available for computation because of noise. The slightest amount of interference while computation is occurring will cause the system to drop out of the quantum state and generate random results. It is therefore necessary to enclose the system within an intense magnetic field (or a comparable shielding scheme) for isolation reasons. In practical quantum computers, total isolation would not be feasible, so error-correction schemes are being developed to compensate for small amounts of interference. Much of the current research on quantum computing is focused on these error-correction schemes. Averaging out errors through multiple computations is the most promising approach because it is not clear that fundamental quantum noise can be reduced.

The amount of reported progress in quantum computing has reduced over the past 18 months caused partly at least by the economic downturn. We have, therefore, moved the technology a little further backward toward the trigger point.

User Advice: No concrete actions are needed at this time. Monitor developments.

Business Impact: Quantum computing can potentially have a huge effect, especially in areas such as optimization, code breaking, DNA and other forms of molecular modeling, large-database access, encryption, stress analysis for mechanical systems, pattern matching and, possibly, weather forecasting.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

SIS International Data Interoperability Standards

Analysis By: Jan-Martin Lowendahl

Definition: Student Information Systems (SIS) International Data Interoperability Standards are about the data formats needed to facilitate and even automate global student mobility.

Position and Adoption Speed Justification: Increasing political pressure, such as the Bologna process, a general focus on recruiting international students, and awareness of the cost associated with processing international applications have sparked activity in standardization. Earlier work such as the EduCourse-schema supported by the Shibboleth project has been followed by several others such as the Metadata for Learning Opportunities (MLO), and now we see momentum building by the involvement of the vendor community. This has most recently been shown in the actions of IMS Global Learning Consortium and the Rome Student Systems and Standards Group, which have initiated activities focused directly on SIS interoperability.

User Advice: Institutions that expect to recruit extensively from abroad need to monitor the developments closely to be ready to adopt as soon as possible. Work through your vendor or consortium to establish a road map for adoption. The window during which this can be a competitive advantage is likely to be very small, and institutions should anticipate that it can quickly turn into a competitive disadvantage to not have this capability.

Business Impact: This has a direct impact on the ability to recruit students as well as the cost for recruiting students. Visibility and scrutiny of institutional course offerings will increase with the "PriceRunner" type comparison sites that will likely develop, and it will be important to master the factors that lead to applications from the "right" student profiles. In particular, interoperability of student data will enable a higher degree of process optimization, driving down both cost and risk. Standardization at this level will also facilitate economies of scale of administration through shared services, which is something that the national or state education system will benefit from.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Recommended Reading: "Findings: Bologna Process Demands True International Student and Course Data Standards in Higher Education Throughout the EU"

Open-Source Higher Education SIS

Analysis By: Jan-Martin Lowendahl

Definition: Open-source higher education student information systems (SISs) are developed via open-source or community source models.

Position and Adoption Speed Justification: Open-source SISs have the potential to be part of a nonproprietary and highly customizable higher education administrative application suite or a best-of-breed solution. However, features, functionality, processes, integration and support issues are still undefined. The most promising OSS SIS is Kualu Student as it is supported by the Kualu Foundation. However, release 1 of the Kualu Student system is not due until the fourth quarter of 2009, and not much new information has surfaced since last year.

User Advice: Open-source solutions for SIS are in the early stages and should be monitored for future development. This part of Kualu should probably have fewer issues with national regulations, and thus, it is a likelier candidate for internationalization than the Kualu Financial System.

Business Impact: Student administration and, possibly, integration with e-learning platforms are areas that will be affected.

Benefit Rating: Low

Market Penetration: Less than 1 percent of target audience

Maturity: Embryonic

Sample Vendors: Quali Foundation

Recommended Reading: "Open Source in Higher Education, 2008"

E-Textbook

Analysis By: Bill Rust IV

Definition: "E-textbooks" are defined as content that is delivered electronically on user devices. Unlike traditional print materials, e-textbooks can be edited to include up-to-date information, can be assembled or disassembled to rearrange the sequence or to include content from other sources, offer multimedia representation of information and instructional exercises, and allow users to insert personal notes or diagrams as study aids.

Position and Adoption Speed Justification: The momentum toward the adoption of e-textbooks comes from: (1) educators' view of digital content as a means of staying current in content areas and as a means of keeping students engaged in learning activities; (2) an increasing number of relatively inexpensive, small form-factor devices (either personally or institutionally owned) that are available for deployment in educational settings. Single-purpose devices that now serve as content readers for digitized text are in the vanguard, but e-textbooks on multipurpose devices (i.e., with productivity and communication/collaboration tools) are more attractive options in the eyes of education technology leaders and will signal accelerated adoption.

User Advice: The business case for e-textbooks becomes stronger as the capital cost of user devices decreases; support and infrastructure resources have been put in place; and current content providers offer economic licensing agreements or get pushed aside by content providers willing to do so. In primary and secondary education, now is the time to engage curriculum planners in migrating from a multitextbook adoption process to the identification of e-content, including e-textbooks, that will replace the current print-dependent practice. Institutions of higher education are likely to see wider adoption first in the use of early e-textbooks — those that are electronic forms of the print versions — because of the wider availability of applications for user devices and because the content selection process will not require change.

Business Impact: E-textbooks will become the preferred content delivery mechanism throughout public and private education agencies and institutions. School organizations that currently provide text resources to students will be relieved of liabilities for physical inventory, storage, distribution, repair (rebinding) and replacement due to loss. The conflux of decreases in device cost, the availability of multiple device form factors that can put e-textbooks in the hands of users, and consumer adoption of similar technologies will drive widespread adoption.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Amazon.com

Cloud HPC/CaaS in Higher Education

Analysis By: Jan-Martin Lowendahl

Definition: Computing as a service (CaaS) or cloud high-performance computing (HPC) in higher education deals primarily with on-demand delivery of moderate to massive computing power for education and/or research purposes.

Position and Adoption Speed Justification: CaaS or cloud HPC is a natural extension of grid computing for many higher education institutions, and some grid-computing implementations border on the concept of the "private cloud" even today. Many institutions also collaborate in the HPC area and have already established a "shared-service model" today. This means that cultural acceptance for CaaS is likely to be high. Further advantages include the classic "cloudonomics" such as electricity and cooling savings, pay as you go, right-sizing, etc., as well as the usual drawbacks in issues around intellectual property (IP) protection, privacy and backup, etc. But the most interesting effect is how CaaS is increasing the availability of HPC to smaller institutions and even to students. Altogether, this merits a relatively advanced position on this year's Hype Cycle and a relatively quick adoption speed.

A good example of the impact to the education community is the North Carolina State University's use of an IBM cloud to extend its "virtual computing lab" concept (see <http://vcl.ncsu.edu>). This shows how a virtualization effort designed to meet students' and researchers' needs could easily be extended into the cloud, increase availability and decrease cost. Initial calculation based on 7 million HPC CPU hours and 300,000 non-HPC hours during 2008 indicated that a CPU hour cost of 27 cents could be reduced to 10 to 15 cents per CPU hour.

User Advice: To move to CaaS, institutions need to understand their current total cost of ownership (TCO) and risk level, and they must conduct due diligence to check up on the intended provider (irrespective of it being a nonprofit shared-service consortium or a commercial vendor) on such issues as IP, privacy, storage and backup. CaaS options are most valuable for institutions that face special circumstances, such as short-term projects, variable computing demand and limitations in power grids (such as in downtown London). Institutions that are involved in CaaS often, but not always, need to combine it with storage as a service.

Business Impact: The impact on higher education is potentially transformational, as it puts more computing power in the hands of more students and researchers. The convenience factor is high and will probably lead to increased collaboration around computing-intensive research and education. If it can also be combined with subject-specific services, such as Gaussian as a service (for molecular calculations), and support from parallelization expertise for optimizing the code for the cloud, it has the potential of speeding up research cycles and increasing accessible data volumes tremendously.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Amazon.com; Google; IBM; Microsoft

Digital Preservation of Research Data

Analysis By: Jan-Martin Lowendahl

Definition: Digital preservation in the higher education community context is the issue of dealing with very long-term storage and retrieval of primarily research data. The objective of digital

preservation is to attain the same or better standard of archiving and retrieval that was set by centuries of handling paper archives, which in some countries formally exceeds hundreds of years.

Position and Adoption Speed Justification: Although the problem has been around for some time, the progress is rather slow due to the pace of change in IT, as well as the perceived high cost from a total cost of ownership (TCO) perspective and a lack of monetary return on investment (ROI). The strategies for addressing the problem in theory are well-developed, but the practical solutions are not as strong. Altogether, this results in an early position on the Hype Cycle and a potentially very long road to maturity. However, this year, we do see some signs of a brighter future, and that future is spelled out in maturing open-source software (OSS) governance and collaboration models, as well as in cloud-enabled economies of scale. The concrete evidence is that two major OSS repository communities, Fedora Commons and DSpace Foundation, have joined to create the DuraSpace organization; they envision a "DuraCloud" Web-based service in their road map. This consolidation of resources and the promise of a conveniently accessible preservation service with the potential for a better TCO merit a relative jump on the Hype Cycle, but there is still a long road to maturity and full adoption.

User Advice: Digital preservation, in general, still does not get the attention it deserves. However, apart from the principal relevance to research, the increasing volumes of data and potential cost-benefits in tiered storage will force institutions to adopt an information storage and retrieval strategy that includes digital preservation of research data. The basic strategies available have to be evaluated and preferably tested in pilot projects. The most popular strategy today seems to be the migration of data with metadata attachment. OSS such as DSpace and Fedora is available. This area is well-suited for shared services or cloud computing solutions due to the obvious economies of scale.

Business Impact: Success in handling the digital preservation problem in higher education is crucial for future research, because more and more data exists only in the digital realm. It has the potential, in the long term, to be transformational for research, especially for the ability to revisit raw data for new interpretations and to access very long series of data.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: DSpace; Fedora

User-Centric Identity Frameworks

Analysis By: Gregg Kreizman; Ray Wagner

Definition: User-centric identity frameworks (UCIFs), previously known as personal identity frameworks (PIFs), are architectural constructs and technical product components intended to enable users to control transmission or sharing of their identity attributes when registering for and accessing online services. UCIFs augment, rather than replace, established enterprise identity and access management (IAM) architectures. Client identity selectors, website integration components, and service definition and discovery components are common architectural constructs among different vendors' and development communities' UCIF implementations.

Position and Adoption Speed Justification: UCIF developers have created hype around terms such as "user-centric identity," "Identity 2.0" and the "Identity Metasystem." Development of usable components has centered around three initiatives: OpenID, information card architectures and Higgins, with the latter losing steam:

OpenID is increasingly used with social networking sites and other low-identity-assurance contexts. However, OpenID has rudimentary functionality and some security weaknesses, though some vendors are adding support to OpenID for stronger authentication. Support by AOL, Yahoo, Google and Facebook has improved OpenID's image. Vendors specializing in authentication to cloud-based software are also starting to add OpenID support to their products, or at least to their marketing collateral. There is also some potential for OpenID's registration and authentication capabilities to be augmented with some emerging Web 2.0 authorization capabilities such as OAuth. Such movement will create a continued interference pattern and slow the adoption of claims-based identity as promoted by Microsoft and others.

Microsoft has been developing its claims-based components, collectively named Geneva, with planned production release in fourth quarter 2009. Geneva is to include:

- The next version of Active Directory Federation Services, which also will include a security token service and some limited Security Assertion Markup Language (SAML) support.
- The Geneva Framework (SDK is the developer).
- The next version of Windows CardSpace, the client component that uses a graphical InfoCard card image metaphor to represent users' claims.

CardSpace's use of client software that is ostensibly secure uses X.509 v3 certificate-based site authentication and security token services to better protect against some types of "phishing" attacks to which OpenID implementations are susceptible. We have seen vendors, such as CA and IBM, adding CardSpace support to their Web access management (WAM) tools. Microsoft also claims it is enabling its online services to provide a consistent approach to whether enterprises are accessing those online services or developing claims-aware applications in-house.

The Eclipse Foundation (consisting of IBM, Novell and others) created Higgins, an open-source framework and a set of prototype components designed to support multiple IAM environments and protocols. InfoCard compatibility was an early objective for Higgins; prototype components are available to demonstrate connectivity to Lightweight Directory Access Protocol (LDAP)-based identity stores, SAML-based federations and security token services. However, few new developments have come from the Higgins community during the past year.

User Advice: Consumer-facing organizations should monitor UCIF evolution for potential convergence among these disparate frameworks, or the continued separate paths of claims-based approaches and OpenID. The emergence of identity providers supporting one or more of these frameworks for higher-risk transactions is a sign that these frameworks are gaining momentum and should be considered for enterprise use. OpenID can be used for low-assurance applications. Enterprises with Microsoft-centric development shops should expect that Geneva and the claims-based identity paradigm will be engrained in future Microsoft products and online services.

Business Impact: UCIFs will:

- Reduce user data-entry burdens when registering and revisiting service providers, and potentially increase users' willingness to provide personal information because it is more convenient to do so.
- Reduce sign-on for business contexts (sets of related services) where credentials can be reused or enabled for single sign-on.

- Provide a common user experience for selecting the appropriate digital identities (sets of attributes), and offer them to service providers — an electronic analogy for wallets, purses and remotely managed vaults that hold context-specific identity credentials similar to a driver's license, library cards, credit cards and store-brand loyalty cards.
- Enable identity providers to perform identity proofing for users and to issue credentials to users that can be used for accessing services without requiring further identity proofing.
- Present a standard development framework for developers that can be abstracted from, and can make use of, disparate identity protocols and identity repositories.

All these should reduce friction (by a small amount) that may currently prevent consumers and businesses from conducting transactions online.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: CA; IBM; Microsoft; Novell; VeriSign

Recommended Reading: "Identity 2.0: Tomorrow's Promise and Today's Reality"

CobiT — Education

Analysis By: Jan-Martin Lowendahl

Definition: Control Objectives for Information and Related Technology (CobiT) is an IT governance framework that helps organizations understand primary control objectives and has its origins and primary use in audits. CobiT comprises four high-level domains, such as planning and organization, and 34 subdomains, such as HR management. CobiT is not a complete set of IT processes, but rather a set of 318 control points, such as procurement control, designed to provide reasonable assurance that certain objectives will be achieved. For example, the CobiT framework identifies a software release policy as a control point, but it does not define the process and procedures associated with software release. Tools consist largely of spreadsheets, and they hook into workflow-based tools.

Position and Adoption Speed Justification: Despite an emerging interest in CobiT, few institutions have gone beyond initial discussions toward building an implementation plan. However, we see increased interest and usage in CobiT as an audit and benchmarking framework. The adoption of CobiT is often connected to the adoption of Information Technology Infrastructure Library (ITIL). This explains a relatively slower adoption in this year's Hype Cycle, because ITIL projects are still in the implementation phase and will be there for a while. As the ITIL projects start climbing the Slope of Enlightenment, we expect more interest and focus on CobiT. As with ITIL, we see regional differences that largely follow those of ITIL but following even further behind. Higher education as a whole seems to be ahead of K-12, and Europe ahead of the U.S.

User Advice: Institutions that are unfamiliar with CobiT should begin by examining the framework and the standard process framework used by CobiT. For most institutions today, CobiT is a good audit framework for motivating and monitoring change in institutional governance capabilities. However, if CobiT is used to guide process improvement, the institution must assess: (1) what the organizational scope of the improvement initiative is; and (2) whether the ultimate goal is operational process improvement or business transformation. If the goal is business

transformation, then a more-strategic approach to change involving all the institution's management will be required. In any case, a CobiT-based improvement effort works best when more practically oriented frameworks like Prince2, Capability Maturity Model (CMM) or ITIL are implemented alongside. As with the case of ITIL, a tactical approach based on pain points and metrics will be the most secure way to success.

Business Impact: Large and/or complex institutions will likely find greater financial and performance benefits through improved governance — especially if CobiT is used as one of several tools to identify and rectify weak links in the overall demand chain to supply chain of IT services.

Benefit Rating: Moderate

Market Penetration: Less than 1 percent of target audience

Maturity: Adolescent

Recommended Reading: "Global Standards Can Reduce the Adverse Effects of 'Administrative Freedom' in Higher Education"

"Case Study: The Seven-Year Journey From Chaos to Order at Chalmers University of Technology"

"Combine CobiT and ITIL for Powerful IT Governance" TG-16-1849

Social Learning Platform

Analysis By: Carol Rozwell; Marti Harris

Definition: A social learning platform is an extension of traditional systems for learning management and learning content management that incorporates social software features to support structured social and informal, as well as formal, learning activities.

Position and Adoption Speed Justification: As awareness of the impact of informal and structured social situations on learning grows, employees, customers and partners are expecting social software features to support collaborative learning environments. Vendors are adopting product development strategies that are social-learner-centric, while learning organizations are exploring how to best use new social software options. A social learning platform is emerging, as companies and educational institutions want to tap into the collective knowledge of their employees, customers, partners or students and increase the organization's capacity to learn. The platform supports the desire of learners to receive learning as needed, in smaller doses or courselets. It also acknowledges the importance of social networks and the requirement to access the expertise of colleagues.

User Advice: Organizations that have applications installed for learning and content management should engage with their current vendors to understand the product development road map for enhancing systems with social software features. If their current vendors do not have plans for adding these features, or the time frame for development is too long, organizations should look for solutions that can be easily integrated into the learning architecture. Solutions already in place are preferred to solutions procured specifically for learning purposes. Organizations that do not have systems for learning and content management, or that are looking to consolidate multiple learning applications, should add support for a social learning platform as an important evaluation criterion.

Business Impact: The social learning platform gives learners the ability to: establish a presence, or social profile, that reflects their expertise and interest; create, discuss, share and capture

learning content as learning objects; organize and find learning objects from a variety of sources, such as search or peer ratings; interact with peers in their social network and be able to reach beyond their network to other trusted sources of information; engage in experience-based, learning exercises; and receive real-time, online coaching and support.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Blackboard; Certpoint; Cornerstone OnDemand; GeoLearning; IMC; Learn.com; Meridian Knowledge Solutions; Moodle; Mzinga; Oracle; OutStart; Saba; SAP; SumTotal

Recommended Reading: "The Business Impact of Social Computing on Corporate Learning"

"Are You Providing the On-the-Job Learning That People Really Want?"

"Case Study: EMC Rallies Its Partner Community to Increase Sales"

Mobile-Learning Low-Range/Midrange Handsets

Analysis By: Marti Harris; Nick Jones

Definition: This is mobile-learning (m-learning) or learning administration applications using basic and enhanced phones. Such handsets range from ultra-low-cost devices capable of voice and Short Message Service (SMS), starting at €25, to more-capable handsets supporting Web browsing and Java Platform, Micro Edition (Java ME) retailing at up to €200. M-learning encompasses a very broad range of applications, including but not limited to media delivery (e.g., audio and video), exploratory learning using augmented reality, educational games, collaboration and project work, e-books, surveys, tests, data gathering, real-time feedback, and simulations.

We separate m-learning on basic and enhanced handsets from m-learning on high-end smartphones, such as iPhones, because these will tend to be used in different ways, by different students and in different markets.

Technologically low-end handsets can deliver m-learning in several ways. For example, this could be by using: (1) very simple technologies such as SMS — e.g., for health education; (2) server-side technologies — e.g., the mobile Web or, in some cases, using the handset just as a voice channel to listen to lessons broadcast from a server; (3) more-capable handsets can support stored media such as podcasts or video; (4) native m-learning applications specially developed for low-end handsets and preloaded by the manufacturer — e.g., Nokia's Life Tools; and (5) simple applications developed using widely available tools, such as Java ME. One of the challenges that determine m-learning application architecture in emerging markets is that data communications to a handset are often weak (e.g., general packet radio service [GPRS] or SMS) and sometimes unavailable.

Position and Adoption Speed Justification: A number of experiments have been conducted in m-learning on low-range to midrange handsets, and a few subscription-based services such as Nokia Life Tools emerged in 2008. Simple tests and exams (e.g., vocabulary tests for students learning a new language) have also been tried on low-end handsets. As with all consumer electronics, the capability available at a given price point will continue to rise over the next five years, enabling low-range and midrange handsets to deliver more-sophisticated m-learning. Also, early service experiments will mature.

User Advice: Educational organizations whose students own primarily low-end and midrange handsets should experiment with m-learning technologies and systems that match these devices. M-learning on lower-capability devices will be particularly important in emerging markets.

Business Impact: Organizations such as network operators and handset manufacturers in emerging markets, where few devices are smartphones, should explore the potential of educational services and applications delivered on low-range to midrange handsets. Organizations such as agricultural cooperatives that need to distribute information to large numbers of individuals owning low-end handsets should explore m-learning techniques.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Bharti Airtel; McGraw-Hill; Nokia

Recommended Reading: "M-Learning Opportunities and Applications"

Mobile-Learning Smartphone

Analysis By: Marti Harris; Nick Jones

Definition: This is mobile learning (m-learning) or learning administration applications using smartphones (i.e., handsets with an identifiable operating system capable of supporting installable applications). M-learning encompasses a very broad range of applications, including but not limited to media delivery (e.g., audio and video), exploratory learning using augmented reality, educational games, collaboration and project work, e-books, surveys, tests, data gathering, real-time feedback, and simulations.

Position and Adoption Speed Justification: In 2009, smartphones will constitute around 30% of handset shipments in mature markets such as the U.S. and Western Europe, growing to a range of 60% to 80% in mature markets in 2013. Advanced smartphones, such as the iPhone, have already been used for educational purposes. As smartphones become more capable and more numerous, their ubiquity, sophisticated features and flexibility will make them preferred m-learning tools in mature markets. Although a wide range of m-learning applications have been demonstrated, the domain is still the subject of active academic research — e.g., to understand what type of education is best delivered on mobile devices and how to integrate m-learning with traditional education. Inhibitors in 2009 include the immaturity of the domain, smartphone cost, device limitations, development of m-learning course material, lack of skills and the wide diversity of mobile devices. In the long term, technologies such as flexible screens will enable a wider range of portable m-learning devices.

User Advice: Despite the immaturity of m-learning, many educational institutions have experimented successfully with some form of m-learning. Educators should look for simple applications that can deliver educational material or assist staff and students with administrative tasks. Educational institutions have the opportunity to increase the accessibility of learning content that not only better supports problem-based pedagogy but also leads to better usage of "spare time" (for example, while commuting). The latter convenience is greatly appreciated by part-time learners, which tends to increase students' satisfaction and retention.

Business Impact: Companies should explore the potential of m-learning for "just in time" training. Organizations and educational institutions creating or selling training and reference material should explore the potential of mobile devices as delivery channels.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Apple; OutStart; Tribal Software

Recommended Reading: "M-Learning Opportunities and Applications"

At the Peak

Open-Source Higher Education Financials

Analysis By: Jan-Martin Lowendahl

Definition: Open-source higher education financial applications are developed via open-source or community source models.

Position and Adoption Speed Justification: Open-source solution financial projects have the potential to be part of a nonproprietary and highly customizable higher education administrative application suite or a best-of-breed financial solution. Process, integration and support issues are still largely undefined and unproven in practice, but management of community source software keeps maturing. The commercial support ecosystem is not as developed as it is with, for example, Moodle and Sakai, which probably impedes a higher speed of adoption. However, high interest in open-source software (OSS), in general, and successful marketing from the Kuali Foundation, in particular, continue to draw interest and result even in resources from foundations like the Andrew W. Mellon Foundation. The latest example of the resource-focusing effect of a community source foundation such as Kuali is the inclusion of the MIT-run consortia grant management system Coeus into the Kuali road map. Not only will development resources be pooled, but also the Mellon Foundation has supported the effort with \$1.5 million. The Kuali project has a predominantly North American focus, with some notable exceptions such as Strathmore University in Kenya, which had the first live implementation of the Kuali Financial System in 2007. An important step was Indiana University's change from its homegrown system to the official release of Kuali Financial System r.3 on 5 February 2009, even if the homegrown system was a big part of the code foundation for Kuali to begin with. Altogether, this results in a relative leap on the Hype Cycle for "OSS financial systems," relative to "OSS student information systems (SISs)" this year.

User Advice: Open-source solutions for financials are at an early stage, and they should be monitored as a possible fit only for institutions that are capable of supporting in-house application development as well as have no pressing need to change their solutions. When this is the case and the institutions have homegrown systems, they might consider joining the open-source community to see if they can contribute and prolong the life of their current system. Institutions outside the U.S. should be very observant about how national regulation and local accounting best practices affect the need for customization and maintenance. Smaller institutions and institutions outside the U.S., in particular, should watch if there are signs of a sustainable market for commercial support providers if they contemplate an OSS financial solution.

Business Impact: The area of financial administration and the areas of financial integration with other administrative applications will be affected, but as a whole, it will have a limited effect on the core mission of the institution's education and research. However, the benefit may increase if the Kuali Foundation continues to collect functionality that is highly higher-education-specific such as grant management through Coeus.

Benefit Rating: Low

Market Penetration: Less than 1 percent of target audience

Maturity: Embryonic

Sample Vendors: Quali Foundation

Recommended Reading: "Open Source in Higher Education, 2008"

Lecture Capture and Retrieval Tools

Analysis By: Jan-Martin Lowendahl

Definition: Lecture capture and retrieval tools are two sets of complementary tools often presented as a set. Lecture capture tools perform live recordings of a lecture, including voice and relevant visual material, in as complete a manner as possible. Lecture retrieval tools aid the student in retrieving the whole lecture, or the parts of the lecture relevant to their learning needs.

Position and Adoption Speed Justification: Although several proven solutions are on the market and more institutions send out requests for proposals (RFPs), the breakthrough in adoption is not yet here. Teacher push-back is likely to be the main issue in speed of adoption.

User Advice: User acceptance is key to deployment, in terms of functionality and teachers' acceptance of being recorded. Pilot implementations with thorough evaluation and stakeholder involvement are a must. Evaluation must include: (1) ease of use and convenience for teachers; and (2) ease of deployment, as well as search/indexing and "play-back" functionality for students. Beware of the social and behavioral issues with these solutions. Initially, there will most likely be some push-back from faculty not being accustomed to or not wanting to be recorded. This "people issue" has to be addressed seriously. However, it can be expected that younger generations (both teachers and students) will become increasingly accustomed to peer-created content and realize that recorded lectures should not be compared to Hollywood production standards. Expectations will then focus on the learning qualities rather than the production qualities.

Consider statistical functions helping to monitor student usage coupled to, for example, student result and student retention. Consider software as a service (SaaS) solutions to minimize storage implications.

Business Impact: Lecture capture and retrieval tools have tentatively shown to have some effect on student grades and retention, and they promise to be important pedagogical tools. The ability to index lectures and the ability to offer playback of selected passages have proven key to these positive results. However, they are just two of many tools that are needed, and they can never replace good teaching. They can only extend its reach. Additional practical benefits include a new option for students to make up planned or unplanned absence. This is particularly important in K-12.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Echo360; Panopto; Sonic Foundry; Tegrity; Winnov

Web-Based Office Productivity Suites

Analysis By: Michael Silver; Tom Austin

Definition: Office productivity suites are generally collections of basic productivity applications for tasks such as word processing, spreadsheet manipulation and presentation graphics. Traditionally, suites such as Microsoft Office, Corel WordPerfect and OpenOffice.org are fat-client applications that need to have millions of bytes of code installed and maintained on users' PCs. The Web 2.0 paradigm enables office automation services to be provided, using a rich-client experience that does not require explicit delivery and maintenance of the software by the enterprise. New features, such as real-time collaboration, may also be enabled. Real-time collaboration gives multiple people the ability to simultaneously edit the same section(s) of a single document, typically keeping track of (and almost instantly showing) changes made by every contributor in the document.

Position and Adoption Speed Justification: Here, we consider productivity functions, such as word processing and spreadsheets, although some of these products also offer hosted e-mail. Office productivity products have been available on the Web for more than three years. These applications generally do not approach the level of functionality of full-function, fat-client suites (such as Microsoft Office), but they do provide a relatively small, task-specific function set. In 2007, Google Apps Premium Edition (GAPE) made this technology more frequently recognized, although not yet adopted, by large organizations, and in 2008 Microsoft announced that it would have a Web-based entry as part of the Office 2010 wave, which is expected to arrive in the first half of 2010, although details have been scant.

Individual users have been using free, consumer-grade versions to augment, rather than replace, functionality in traditional office suites (such as for real-time collaboration). Offline functionality and other features continue to be added by all vendors. There are at least 20 vendors offering some type of Web-based productivity suite today, with Zoho and Adobe's Buzzword as additional examples. As functionality improves, Web-based office productivity applications will make the traditional versions of Microsoft Office relatively less important, as users rely on it for less time each week.

Web-based office productivity suites will likely reach the peak on the Hype Cycle in 2010, once Microsoft's offerings are available.

User Advice: Don't plan to replace Microsoft Office with Google's offerings anytime soon. Google will not supplant Microsoft as the dominant enterprise office suite provider during the next four years, at least. However, it will challenge Microsoft and gain ground in specific situations.

Audit the degree to which other applications (such as CRM and ERP) provide Office macros to facilitate interacting or integrating with those applications via an Office tool. Determine what Office application user segments do not require use of those macros.

End-user experimentation with these tools is taking place. Give your users guidelines on practicing safe experimentation (whether at work or not), and encourage them to share their findings with you, including their best and worst practices.

Appoint a champion of freeware (and software as a service) to track these trends and ensure that the enterprise experiments with and implements such software where appropriate.

Business Impact: A new generation of productivity applications could significantly change how users collaborate on projects, and how organizations pay for, deploy and manage office productivity services.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Adobe; Google; Zoho

Recommended Reading: "Considering Alternatives to Microsoft Office"

"The State of Google Apps"

Virtual Environments/Virtual Worlds — Higher Education

Analysis By: Marti Harris

Definition: Virtual environments are online platforms in which participants are immersed in a three-dimensional representation of a virtual space.

Position and Adoption Speed Justification: The current limitations of virtual environments — such as network and grid scalability; English-only language for the end-user interface; and relatively high-cost hardware components, such as processors, graphical boards and network access bandwidth to meet good performance — restrict the adoption to a niche audience. However, as the price of entry for those prerequisites decreases, the technology matures, and global-class consumers and enterprises access and realize the value of using them, the pace of adoption will accelerate, and the number of initiatives on those virtual environments will rapidly increase. Inhibitors to adoption, specifically for institutions, are related to the lack of collaboration tools, 3-D modeling tools and integration with real-world educational applications. While commercial interest is rapidly going into the Trough of Disillusionment, higher education interest is just past the peak.

User Advice: Evaluate the alignment between virtual environments; consumerization of IT; and your institution's research, teaching and learning goals. Identify the early adopters and easily attainable objectives, such as increasing faculty and student communication, collaboration, and learning activities, because they've been the focus of short-term benefits for a long time. Use the "try before buying" strategy, experimenting with proven virtual environment platforms such as Entropia Universe, Second Life and There. Emerging integration developments between e-learning platforms and virtual-world environments continue, such as Second Life with Moodle and Angel Learning. Case Western Reserve University has deployed a stand-alone version of Second Life, which will be worth watching by institutions that desire a stand-alone deployment.

Business Impact: There will be effects on analysis, student performance, productivity and agility for knowledge transfer processes, teaching/learning and research support, decision support, training, R&D, intellectual capital management, and innovation.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Croquet Consortium; Entropia Universe; Linden Lab; There

Hosted Virtual Desktops

Analysis By: Brian Gammage; Mark Margevicius; Ronni Colville

Definition: A hosted virtual desktop (HVD) is a full, "thick-client" user environment, which is run as a virtual machine (VM) on a server and accessed remotely. HVD implementations comprise server virtualization software to host desktop software (as a server workload), brokering/session management software to connect users to their desktop environment, and tools for managing the provisioning and maintenance (e.g., updates and patches) of the virtual desktop software stack.

Position and Adoption Speed Justification: An HVD involves the use of server virtualization to support the disaggregation of a thick-client desktop stack that can be accessed remotely by its user. By combining server virtualization software with a brokering/session manager that connects users to their desktop instances (that is, the operating system, applications and data), enterprises can centralize user data and applications, and manage each desktop instance centrally. Because only the presentation layer is sent to the accessing device, a thin-client terminal can be used. For most early adopters, the appeal of HVDs has been the ability to "thin" the accessing device without significant re-engineering at the application level (as is usually required for server-based computing).

Issues surrounding the licensing compliance of the Windows client operating system were solved in 2006 through Microsoft's Vista Enterprise Centralized Desktop program; however, other technical issues must still be resolved before mainstream viability is reached. Improvements in the complexity of brokering software and remote-access protocols will continue through 2010, extending the range of desktop users and applications that HVDs can address.

Through 2011, broader manageability of hosted desktop VMs will improve, as techniques to reduce HVD storage volumes (introduced in late 2008) lead to new mechanisms for provisioning and managing HVD images by segmenting them into more-isolated components (including operating systems, applications, "persistent personalization" and data). These subsequent manageability improvements will extend the viability of HVD deployments to mobile/offline users.

Since late 2007, HVD deployments have grown steadily, and they will continue to do so through 2010. General deployments should begin shortly thereafter. Inhibitors to the general adoption involve the cost of the data center infrastructure that is required to host the desktop images (servers and storage in particular). Because of the constraints previously discussed, broad applicability of this technology has been limited to specific scenarios, primarily structured task workers in call centers and kiosks, trading floors and secure remote access.

User Advice: Unless your organization has an urgent requirement to deploy HVDs immediately, wait until late 2009 or 2010 before initiating deployments for mainstream desktop users and assess the user types to which this technology is best suited. You will need to balance the benefits of centralized management with the additional overhead of the infrastructure and resource costs. Customers should recognize that HVDs may resolve some management issues, but they will not become panaceas for unmanaged desktops. In most cases, promised reductions in total cost of ownership will not be significant and will require initial capital expenditures to achieve.

Organizations must optimize desktop processes, IT staff responsibilities and best practices to fit HVDs, just as organizations did with traditional PCs. Leverage desktop management processes for lessons learned. The range of users and applications that can be viably addressed through HVDs will grow steadily through 2011. Although the user population is narrow, it will eventually include mobile/offline users as well. Organizations that deploy HVDs should plan for growing viability across their user populations, but they should be wary of rolling out deployments too quickly. Diligence should be employed in testing to ensure a good fit of HVD capabilities with management infrastructure and processes. Visibility into future product road maps from suppliers is essential.

Business Impact: HVDs provide mechanisms for centralizing a thick-client desktop PC without re-engineering each application for centralized execution. This appeals to enterprises on the basis of manageability and data security.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Adolescent

Sample Vendors: Citrix; NEC; Parallels; Red Hat; Virtual Iron; VMware

Unified Communications and Collaboration

Analysis By: Jeffrey Mann

Definition: Unified communications and collaboration (UCC) describes the addition of communications capabilities to collaboration technologies, generally from the perspective of collaboration practitioners. Until fairly recently, the technologies and vendors for communications and collaboration were fairly distinct, with telephony and network products and vendors comprising the former and software companies like Microsoft and IBM dominating the latter. That cozy distinction has eroded dramatically because Microsoft and IBM offer voice and telephony features and vendors like Cisco are moving aggressively into the collaboration market. In most organizations, those IT staff responsible for managing and defining the needs of collaboration tools are different to those managing and defining the needs of communications tools. Unified communications (UC) is a closely related term, describing a similar phenomenon, where communications technologies extend into some areas of collaboration, either by integration or offering those capabilities directly.

UCC is newer and less developed than UC, but has the potential to go much further toward realizing transformational changes. Mashups, portal consoles, application programming interfaces, Web services and packaged clients, will enable communications and collaboration services to be blended into a mix that includes e-mail, Really Simple Syndication feeds, social networks, calendars, blogs, tasks, wikis, personal pages and discussion forums. These communication modalities will be consumed directly and be woven into applications where they will be used contextually.

Position and Adoption Speed Justification: As UCC represents the merging of formerly, fairly distinct marketplaces, there is a lot to work out before it can be considered well-understood or mature. The current period sees vendors jockeying for position to gain influence over end users, leading former partners increasingly to become fierce competitors. Vendors add functionality to their product suites, which overlap or compete directly with other products brought in-house for completely different reasons. For example, Microsoft's Office Communications Suite is primarily an instant messaging platform, but the latest version also includes voice, telephony and Web conferencing functionality, features, which many organizations have already acquired from other vendors. End user organizations are coming under pressure as IT sub-departments responsible for communications increasingly conflict with the people responsible for collaboration. We regularly hear customers complaining, "Why are they bringing in voice services when we already have that covered?" These tensions will have to be resolved and new market "norms" will need to be established, before it becomes clear what the balance will be between UC and UCC in the marketplace.

Collaboration vendors will have a hard time meeting the quality and robustness of traditional communications vendors as they add these capabilities to their products, just as communications vendors are finding it a challenge to understand user interface issues and how people work. For the moment, seamless UCC remains an aspiration for most suppliers. However, the potential benefits of UCC make it a worthwhile exercise. Shifting seamlessly between a variety of communications and collaboration modalities increases productivity and end user satisfaction. Consumerization is also driving user expectations in this area. Facebook, Skype and Yahoo can mix communications and collaboration, so why can't enterprise vendors?

User Advice: Ensure that the different IT sub-departments involved are aware of each of others' plans and are communicating effectively. Creating a joint task force to develop a UCC strategy

made up of communications, network and collaboration people, as well as representatives from management and lines of business, has proven to be effective in reducing inter-departmental friction.

Evaluate whether users need or even want the new capabilities. UCC capabilities often sound fascinating, but sometimes can be a "solution looking for a problem." Ensure that the organization will benefit in concrete, preferably measurable ways from the new capabilities. Resist the temptation to deploy capabilities just because they are included in the next upgrade. Introducing UCC too quickly could outstrip the ability of end users to assimilate the changes in work processes and even simple tasks. Communicating and collaborating are fundamental to most business processes. Do not mess them up for end users with unwanted complexity and unnecessary change.

Business Impact: The importance of the shift to UCC services should not be underestimated. By the end of the decade, users will routinely employ an integrated set of collaboration tools, escalating to the highest value combination of interaction services — both inside and outside the firewall and including fixed and wireless networks — for the business task at hand. Presence services will be a vital unifying tool, enabling users to "right-click" on a name and invoke a variety of collaboration mechanisms. Shared team spaces will provide temporary and persistent repositories for interactions. These capabilities will be available as a complete stack from several vendors, which currently only provide point solutions, as vendors expand their offerings. Standards-driven integration will make even more combinations possible, beyond relying on a single vendor product stack.

The value to organizations will be realized in several ways. First, will be the simplified and more effective use of the increasingly broad range of collaboration and communication options. Second, will be the improved ability of individuals and groups to accelerate reactions to market events. Third, will be the efficiency gains via the contextual embedding of communication services into applications at points where, for example, process disconnections occur and human intervention is necessary.

Identifying the value of UCC is easy. What organizations will struggle with is quantifying the benefits and calculating return on investments. Companies may need to eschew traditional return on investment mechanisms and look for alternative, less-quantifiable means to justify UCC investments, such as process cycle acceleration, faster problem remediation, increased information awareness and inclusion of more internal and external resources in planning processes.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Cisco Systems; Google; IBM (Lotus); Microsoft

Recommended Reading: "The New Market for Unified Communications and Collaboration"

"VoiceCon 2009 UCC Trends: IBM and Microsoft Emerge to Threaten Communications Titans"

"Key Issues for Unified Communications, 2009"

Global Library Digitization Projects

Analysis By: Marti Harris

Definition: Global library digitization projects are massive organizational initiatives that make research library collections globally accessible.

Position and Adoption Speed Justification: The massive size of such a project means that implementation could take a decade, and publishers are concerned that copyright interpretation of "fair use" could delay progress.

User Advice: These projects will deliver great academic value, but the projects are so large that technological changes must be expected during the span of project life cycles. Commitments to specific technologies could prove shortsighted.

Business Impact: Affected areas include instruction, research, library collection development and e-learning.

Benefit Rating: High

Market Penetration: Less than 1 percent of target audience

Maturity: Emerging

Sample Vendors: Google; Yahoo

Sliding Into the Trough

Mashups — Higher Education

Analysis By: Jan-Martin Lowendahl

Definition: Mashup software in higher education is simply that which brings functionality and/or data together from more than one source. The more formal Gartner definition is that a "mashup" is a lightweight, tactical presentation layer integration of multisourced applications or content in a single, browser-compatible offering. It is a lightweight variant of the older notion of a composite application and the heavier service-oriented architecture orchestration approach to composite applications. In the usual use of the term, mashups are composite applications that are built on enterprise platforms, are internal-facing and are not necessarily Web-based.

In contrast, the usual notion of a mashup is a Web-based application that leverages consumer-oriented sites for external-facing audiences. These original notions are being blurred as mashups move onto enterprise platforms, and composite applications swivel to face outward. Even within the enterprise, mashups partly rely on data and services from public websites, such as Google Maps, craigslist, eBay, Amazon.com and others. Because mashups leverage content and logic from other websites and Web applications, they're lightweight in implementation and are built with a minimal amount of code (which can be client-side JavaScript or server-side scripting languages, such as PHP or Python). These are not fixed requirements, but reflect the original implementation of the mashup concept in Web 2.0 startup companies, which typically do not use enterprise-oriented platforms, such as Java or .NET.

Mashups exploit lightweight mechanisms, such as representational state transfer (REST)-based application programming interfaces (APIs), to public Web services, as well as Ajax "snippets" and "widgets." Mashups aren't intended to be strategic, systematically built, industrial-strength enterprise applications; rather, they're created quickly or opportunistically to meet a focused tactical need.

Position and Adoption Speed Justification: Higher education has embraced mashups, and many institutions have some applications and/or projects that use mashups. Academic and administrative applications are likely to include mashups of some form as a normal way to link

data and functionality to the application. Faculty and students are comfortable with mashups from the public Web, including videos and shared content, and often are promoting the use of mashups. The use of social networking software has also increased interest and trials of mashups in higher education.

This latter trend especially has meant that mashups are generally leveraged for personal productivity needs rather than the requirements of a long-standing corporate role. This suits the academic culture perfectly. The context of mashups involves the confluence of many innovations: Web APIs, lightweight client-side scripting, delivery of content via Really Simple Syndication (RSS), wikis, Ajax, social networking and the explosion of Web-based communities. For a long time, the closest thing to mashup creation tools for "civilians" (users who do not write code) was an RSS feed reader or podcasting client, which enabled them to "mash" content from more than one site. That situation has improved, with recently announced, more-powerful tools (such as Yahoo Pipes, Microsoft Popfly and Google Mashup Editor). Altogether, this means a rather quick adoption in higher education.

User Advice: Higher education institutions are naturally being drawn to the use of mashups through student portals, social networking software and academic content posted from multiple sources to course management and content management systems. Institutions must regularly review policies and practices to ensure that decisions about what institutional data or content should be locked down are made at the institutional, not individual, level and that institutional digital rights management (DRM) policies are enforced. Institutions must be prepared to make changes in practices, policies and mind-sets, which may take time to change or to get people to engage in institutional discussions. It is important to note that mashups add another layer of complexity in regard to data or source validation. This is especially important to highlight when using external data sources and when using for educational purposes.

Business Impact: Mashups can be used effectively to bring content and functionality together with a low level of IT skills, thus improving flexibility and the time from idea to service.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe; Google; IBM; Microsoft; Oracle; Yahoo; YouTube

ITIL — Education

Analysis By: Jan-Martin Lowendahl

Definition: The Information Technology Infrastructure Library (ITIL) is a standard process framework for integrated IT service support and delivery processes used to manage an IT operations environment.

Position and Adoption Speed Justification: ITIL is now a well-known alternative for IT service delivery quality improvement. The interest in ITIL is well into the action phase for many institutions, at least at a basic level. Most early adopters have focused on implementing a basic level of "service desk" and "service support" capability with processes such as change, incident and problem management in the first round, and they are now planning to implement the next set of processes. In this, they have gained valuable insight and a more-realistic view of what ITIL can do for a higher education IT organization. ITIL is now seen as an established quality stamp, especially for centralized IT services. Still, full implementation of all ITIL processes in an institution is rare and expected to take time (indications are that it will take an institution three to seven years, depending on the initial maturity).

There are some regional differences in interest, based on geopolitical pressures. For example, interest seems to be higher in Australia and Northern Europe, but interest is picking up in the U.S.

User Advice: Institutions that are unfamiliar with ITIL should begin by examining the standard process framework used by ITIL. Before the institution selects process improvement frameworks and models, it must assess: (1) what the organizational scope of the improvement initiative is; and (2) whether the ultimate goal is operational process improvement or business transformation. If the goal is business transformation, then a more-strategic approach to change will be required.

It is also important to recognize that most higher education institutions do not have nor need to have the cultural prerequisites for attaining the highest levels of ITIL maturity. A proven tactical approach to ITIL implementation is to focus on the pain points (such as downtime) and to establish metrics that demonstrate tangible results of ITIL implementation. This approach builds momentum and credibility and will pay for itself through cost savings and improved productivity, if done well.

Business Impact: Large and/or complex institutions will likely find greater return on investment. ITIL has a positive impact on multisourcing where institutions and external service providers both work according to ITIL.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Recommended Reading: "Global Standards Can Reduce the Adverse Effects of 'Administrative Freedom' in Higher Education"

E-Learning Repositories

Analysis By: Marti Harris

Definition: E-learning repositories are digital repositories for institutional sharing of e-learning content.

Position and Adoption Speed Justification: Progress on standards will cause the pace of adoption to pick up, but faculty culture is still not attuned to reusable, object-level content. The e-learning repositories will give way to digital content repositories that are not for the sole purpose of holding learning content as more and various types of content will be incorporated into learning.

User Advice: Consider e-learning repositories to increase the performance of other course management system applications. Look for providers with a track record of higher education integration with course management systems.

Business Impact: Affected areas include instruction, learning space and library management.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Alfresco; Blackboard; DSpace; Giunti Labs; MERLOT; Nuventive; The Learning Edge

Hosted PC Virtualization Software

Analysis By: Brian Gammage

Definition: Hosted PC virtualization software enables a user to run multiple operating systems (OSs) simultaneously on top of a single, host PC OS.

Position and Adoption Speed Justification: Hosted PC virtualization software is primarily used in niche applications to consolidate multiple operating environments onto a single PC. The virtualization software runs as an application on top of the PC's primary (host) OS and enables the definition of one or more virtual machines (VMs). Despite market interest in using this approach to create a contained and managed environment on PCs owned by someone other than the enterprise (for example, employees and partners), adoption will be limited by restrictions in Microsoft's Windows OS licensing policies until January 2009.

Until 2006, hosted PC virtualization software was primarily employed by technical users, including software developers (to write and test code in separate environments on the same PC), academic institutions (consolidating access to multiple and disparate systems on a single terminal) and help desk personnel (to store copies of software environments for faster fault diagnosis). Since 2006, these users have been augmented by home users looking to run the Windows OS as a VM on Apple computers. Through 2011, some organizations will use hosted PC virtualization to support legacy applications during OS migrations. Microsoft is set to embrace this approach for its Windows 7 client OS (due to be released in 4Q09), by providing users of Windows 7 Professional with access to a Windows XP VM.

User Advice: Use hosted PC virtualization software to enable Windows migrations and user lockdown, but monitor licensing implications carefully and evaluate the additional overhead of managing twice as many Windows instances. Consider hosted PC virtualization software for technical users who need to consolidate multiple environments onto a single machine (thereby reducing the total number of PCs in use) and as a mechanism for creating a managed environment on the unmanageable devices that rogue knowledge workers use.

Business Impact: Hosted PC virtualization software can remove obstacles to OS migrations for some organizations, and facilitate total cost of ownership savings through image standardization, improved manageability and easier lockdown. However, these savings will be achieved only when the technology is used to take control of a previously unmanageable PC. Enterprises should be cautious about increasing overall PC management costs through the addition of logical PCs to be managed. By 2012, hosted PC virtualization software will be rendered obsolete for most of these applications by developments in PC hypervisors.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Early mainstream

Sample Vendors: Microsoft; Parallels; Sun Microsystems; VMware

Recommended Reading: "Forecast for PC Virtualization"

802.11n

Analysis By: Michael King; Timothy Zimmerman

Definition: 802.11n is the next-generation wireless LAN (WLAN) standard developed by the Institute of Electrical and Electronics Engineers (IEEE). Improvements in the technology have expanded the throughput and range that can be implemented in 2.4GHz or 5GHz. A single spatial

stream operating in a 20MHz channel width can achieve 75 Mbps, compared with the 54MHz of a similar 802.11a or 802.11g solution. Theoretically, 802.11n is expected to deliver as much as 600 Mbps of networking performance using four spatial streams and expanded channels, but actual performance will depend on each vendor's implementation of functionality, such as frame aggregation, which is not covered by the standard. 802.11n uses multiple-input multiple-output (MIMO) antenna technology to create separate spatial streams that turn multipath conditions in the environment to an advantage where previously it diminished 802.11a/b/g performance.

Like previous standards, 802.11n provides for a 20MHz channel width to enable backward-compatibility with 802.11a, 802.11b and 802.11g (a/b/g) standards on the market today and for the near future.

Position and Adoption Speed Justification: Approval of the standard is expected in early 2010, and a mature product should be on the market by late-2010. An interim certification by the Wi-Fi Alliance, based on draft 2.0, was released in mid-2007, and has seen significant adoption by the market, especially in the education and healthcare markets. Wi-Fi Alliance certification ensures enterprises that draft 2.0 products will be forward-compatible with the final specification.

User Advice: Organizations need to understand WLAN requirements, including capacity and level of service, to determine the right technology for their situations. Enterprises that continue to deploy 802.11a/b/g solutions need to include a migration path to 802.11n as part of their communications strategies. 802.11n is a framework, not just a physical standard, which means it represents a wider set of implementation choices for manufacturers than previous 802.11 physical standards amendments (that is, for 801.11a/b/g). This will create vendor differentiation and technical competition that not only will improve wireless network performance in terms of capacity and robustness of communication, but also will create the need for use-case testing, because implementation choices will affect data, voice and video applications.

Business Impact: 802.11n will continue to address applications requiring high performance, but also will address wireless scenarios with a high density of users (such as "hot spots" or classrooms/lecture halls) or the need for a more robust WLAN service level. There is a surge in the integration of 802.11n with laptops that will fuel the WLAN foothold in enterprise conference rooms and reception areas as the de facto guest access connectivity. We believe that 802.11n will enable sufficient bandwidth and required capability, such as quality of service, for enterprises to consider moving not only data, but also voice and video for many enterprise applications to the WLAN.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Aruba Networks; Belden/Trapeze Networks; Cisco; HP ProCurve; Meru Networks; Motorola

Recommended Reading: "Magic Quadrant for Wireless LAN Infrastructure"

"The Many Faces of 802.11n"

"Toolkit: Checklist for Building a Solid WLAN Access Layer"

"WLAN Microenvironments Address Different Application Needs in Enterprises"

Organization-Centric IAM — Education

Analysis By: Jan-Martin Lowendahl

Definition: Organization-centric identity and access management (IAM) technologies enable institutions to manage user accounts and privileges that are under the direct control of the institution. We changed the name relative to last year's definition to separate this technology profile from those on federated IAM and user-centric IAM and also to be able to more accurately position all three profiles. On the higher education Hype Cycle, organization-centric IAM represents one general education view of a number of technologies that are described in more depth in "Hype Cycle for Identity and Access Management Technologies, 2009."

Position and Adoption Speed Justification: IAM overall is necessary to enable personalized, secure and auditable access to networks, systems and data, which has become a top priority in higher education. Although recognized as a strategic infrastructure capability, implementations have been hampered by the difficulties of finding a clear-cut financial return on investment (ROI). This has now been overcome by enlightened institutional leadership, or more likely, peer pressure and implementation projects have been taking off on a large scale. The hurdle now is the inherent complexity in comprehensive organization-centric IAM solutions, especially in a demanding environment such as higher education, where at least 20% new user IDs are needed each year and where changes of roles are frequent. It also explains why organization-centric IAM as a whole in higher education lags the more mature area of federated IAM. Federated IAM solves a simpler process and technical problem where IDs and attributes are already assigned (by the organization-centric IAM), using well-established technological standards such as SAML, as well as metadata standards such as eduPerson to allow for interinstitutional sharing of services. The challenge in federated IAM is instead interorganizational trust.

K-12 institutions have less of a hurdle in implementing organization-centric IAM due to their general centralized natures.

User Advice: IAM should be considered as part of the institutional strategy for personal interaction with its stakeholders, and it should be included in the security plan. It is imperative that institutions obtain an IAM solution as quickly as possible. An organization-centric IAM solution, including well-designed user provisioning and deprovisioning processes, is also a prerequisite for the full exploitation of federated services. Due to the nature of the global academic community, there already exists today many federated services, and many more can be envisioned if sufficient access control can be implemented. For institutions that have significant student/faculty mobility, a federated approach using federated IAM technology can provide a significant collaborative advantage. Furthermore, since higher education institutions are such a large part of society, with many individuals passing through, user-centric IAM (see the technology profile on "user-centric identity frameworks") is also emerging as a future option and as an identity layer off the Internet with a potentially high impact. These initiatives should be closely watched.

Business Impact: Identity and identity-related attributes used for personalized e-interaction with all the institution's stakeholders are a strategic asset. A wide community, including parents, students, faculty, staff and alumni, benefits from personalized communication with the institution. Well-designed IAM solutions that reach well outside the institution through standards-enabled interoperability promise returns in the form of more-effective and efficient core activities, such as recruitment, grant application and fundraising. Furthermore, it has direct implications on the cost of user provisioning and deprovisioning, as well as security and auditability. Additionally, IAM is a core capability in a service-oriented architecture (SOA) strategy. It is especially important to be able to benefit from the quickly increasing internal and external sourcing options such as Web services for administrative applications and "cloud" e-mail.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Cisco Systems; e-Security; EMC; IBM; Microsoft; netForensics; NetIQ; Novell; OpenID; Oracle; Sun Microsystems; Sxip

Recommended Reading: "Gartner Higher Education Security Survey, 2008: Progress in Identity and Access Management"

"Hype Cycle for Identity and Access Management Technologies, 2008"

Emergency Notification/Mass Notification Software

Analysis By: Roberta Witty; Jeff Vining

Definition: Emergency or mass notification is defined as the automated callout to notify groups or individuals — disaster recovery teams, employees, citizens, residents, students/parents, customers, suppliers or government officials — and is critical for crisis/incident management. In other words, these tools automate the manual call tree. Not everyone is on duty when the incident occurs, but they must be notified to take action. Emergency notification system (ENS) or mass notification (MN) offerings are sets of tools focused on the electronic activation and management of notification messages, thus streamlining an organization's mass communications capability. The software can be used to organize contacts into an unlimited number of groups or subgroups, to send emergency messages (for example, announcing fires, power outages, natural disasters, severe weather conditions, terrorist attacks, hostage crises, bridge collapses, child abductions or criminal activity) and then track receipts or responses for message delivery confirmation.

Activation can be accomplished by logging onto a Web portal or accessing the system by a telephone and then securely sending a custom or previously crafted voice or text message to multiple endpoint devices, such as phones, PDAs, desktops, e-mail systems, fax machines, physical security systems or public announcement systems. ENS/MN software can send thousands of messages to endpoint devices simultaneously. However, there is no guarantee that the person to whom the endpoint device belongs actually receives the message due to the telecommunications infrastructure being used, as well as recipient issues — for example, not being properly trained to use the service, information overload during an event, not wanting to participate in the service and so forth.

Position and Adoption Speed Justification: Critical incidents were once thought of as localized storms or man-made accidents, such as utility crews severing a power line or a shooting on a college campus. Although these continue to be threats, events such as Hurricane Katrina, the threat of pandemic or a terrorist attack demonstrate that these human-driven or natural disasters may not be localized or short-lived. As a result, organizations are increasingly implementing ENS/MN, thereby building a stronger crisis management program.

As the market grows, organizations will realize that they can use ENS/MN for more than emergency/mass purposes — such as for community notification by government agencies (for example, Wayne County, Michigan), IT operations and routine business operations (for example, callouts to parents for absent students, special event announcements, weekly cafeteria menus, important meeting reminders and so forth). Organizations will expand their use of these offerings, thereby driving down the cost, making these offerings feasible for the smallest of organizations.

As usage increases, so will message delivery degradation, due to the inability of the vendors' telecommunications infrastructures, as well as that of the regional or national telecommunications infrastructure, to handle the increased volume of messages. Competition with government agencies may further degrade message delivery when nongovernment entities are relegated to Tier 2 (that is, nonemergency) status when using a national alerting system, such as the commercial global alert system proposed by the U.S. Federal Communications Commission.

During the past year, there has been a large increase in the number of implementations of ENS/MN offerings, hence the large shift in adoption from our 2008 position. This shift acknowledges the market uptake, but we continue to hear about implementation issues that will mean changes in both technology and process for these offerings in the future.

User Advice: Organizations prefer a subscription-based or hosted solution, which entails that all the software and hardware necessary to operate the ENS/MN system be located off-site and be accessed via a Web portal, desktop application programming interface or handheld device. As a result of mass mobility demand, examine vendors that have message formats and delivery domain expertise, such as Telecommunication Device for the Deaf/teletype (TDD/TTY); text-to-speech capability, so that written messages can be sent as audio to phones; and multichannel formats (e-mail, true/native Short Message Service [SMS], SMS via e-mail, Multimedia Messaging Service, interactive voice response, faxing and cellular). Find out if the vendors offer logical groupings, auditing of message delivery status, and updating or canceling due to changed conditions.

There are four main markets that vendors focus on: higher education, elementary education, healthcare and government, and general corporate use. Choosing a vendor who has experience in your market will mean a more-aligned offering to your operating environment.

Examine whether a particular vendor has application integration expertise. Contact data management may be a problem, and the requirement to update records or integrate with government, student or HR directories, as well as e-mail programs, such as Microsoft Outlook, or 911 systems, can be a challenge.

Review and examine the types of potential uses you likely will encounter, and select the most important themes (or chain of events) in which ENS/MN systems and procedures are required.

Government organizations should not, for the sake of redundancy, opt to use multiple ENS/MN vendor technologies, because, when activated in unison, they have the potential to overload servers. Some of these systems can be linked to a geographic information system map interface to develop a more-targeted approach, such as a certain ZIP code or a neighborhood within a certain radius of a chemical spill.

Carefully plan your enrollment procedure to ensure that all people needing to be contacted are included in the service and that their contact information is current and complete.

Carefully plan the types, number and content of notification messages because:

- Recipients of notification messages may ignore notices if too many are sent about the same event.
- Carrier-based character restrictions on text messaging make the formation of a meaningful message a challenge.

During a regional disaster, don't overload the telecommunications infrastructure with needless messages.

Business Impact: The interest in and need for ENS/MN tools continue to grow among governments, private enterprises — regulated or not — educational institutions and operators of critical infrastructures. The use of ENS/MN reduces overall costs by consolidation of functions and improves the capability to deliver and update uniform message delivery to targeted and mass groups. The business benefits of using an ENS/MN tool include:

- Many key personnel can be notified in minutes.

- Management can focus on critical decision making and exception handling, instead of message delivery.
- Human error, misinformation, rumors, emotion and distraction, so often found during a crisis, are eliminated from automated ENS/MN communications.
- A documented notification audit log can be provided for real-time and post-event management.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Twenty First Century Communications; Amcom Software; Amtelco; AtHoc; Blackboard; Cooper Industries; Dell; Dialogic Communications; Enera; Everbridge; Federal Signal; FirstCall; Global Alertlink; MIR3; Omnilert; Rave Wireless; ReadyAlert Services; Send Word Now; SpectraRep; SunGard Availability Services; Varolii

Recommended Reading: "How to Understand and Select Business Continuity Management Software"

"Toolkit: Requirements for Crisis Command and Emergency Operations Centers"

"New York Projects Show Critical Need for Unified Emergency Management"

"Q&A: How Universities Can Notify Students of a Crisis"

"Case Study: City of Chicago and ChicagoFIRST Public-Private Partnership"

"Automated Emergency Notification Will Speed Disaster Recovery"

Open-Source Higher Education Portals

Analysis By: David Gootzit

Definition: Open-source horizontal portal frameworks have experienced significant adoption among higher education organizations.

Position and Adoption Speed Justification: More than 250 higher education enterprises have, at some point, used Java Architectures Special Interest Group (Jasig) uPortal, or a solution based on uPortal. During the past 18 months, Gartner has seen larger numbers of higher education organizations expressing greater interest in other open-source portals and commercial-portal options.

Some higher education institutions are moving away from Java-based open-source portals to more lightweight Linux-Apache-MySQL-PHP (LAMP)-based platforms, such as Drupal. Other examples of LAMP-based portals include Joomla and Mambo.

User Advice: Higher education enterprises implementing a portal should closely consider open-source portal alternatives, but should carefully evaluate their long-term requirements against what is available from this open-source portal framework or one of the solutions built on top of it. Frequently, solutions targeted at the higher education market and based on uPortal are highly customized. Organizations should carefully evaluate the capabilities of open-source packages described as "portals," because many of these open-source alternatives are really lightweight Web content management or community publishing tools.

Business Impact: Relying on an open-source horizontal portal framework reduces the initial acquisition costs traditionally associated with a portal product, but the trade-off may be less-than-leading-edge functionality in some areas, and an increased reliance on internal staff and peer organizations for technical support.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Drupal; Jasig uPortal; Liferay Portal; Red Hat JBoss

SaaS Administration Applications for Education

Analysis By: Bill Rust IV

Definition: Software as a service (SaaS) for administration applications in education is software that is owned, delivered and managed remotely by one or more providers. It's based on a single set of common code and data definitions that are consumed in a one-to-many model by all contracted customers anytime, on a pay-for-use basis, or as a subscription based on use metrics. Application service provider (ASP) models differ from SaaS in that solutions are outsourced to the customer but licensed as if they are hosted and supported by customers themselves.

Educational administrative applications that may be delivered through SaaS include major solutions such as student information systems, finance and HR software, as well as point solutions such as substitute teacher notification and assignment systems.

Position and Adoption Speed Justification: SaaS is a relatively foreign solution strategy for education at all levels, but primary and secondary school agencies are attracted to the model by the economies of scale and speed of deployment, as well as increasing recognition that the business requirements schools once thought unique to their particular organization can be met without a custom (or customized) solution. This is a general insight among higher education institutions as levels of interest in SaaS are high, especially in the community college sector. However, research-intensive institutions still seem to consider the business requirements and their capacity to meet them to be unproven. In either case, actual SaaS deployment in its truest form has been slowed to some degree by consumer agencies and vendors by confusing SaaS with ASP opportunities and by existing shared-service strategies. So, for example, a local education agency looking to meet ERP requirements through SaaS may find that the responding providers come back with an ASP proposal that is configured or customized for the customer and licensed as if hosted by the school agency.

Adoption should be expected to accelerate, especially in primary and secondary education where common business requirements will be driven by accountability mandates from federal levels of government.

User Advice: Best practices in considering administrative suite requirements are re-examining needs and considering process change as well as technology change to meet business requirements. Build business cases for satisfying those business requirements that include the ongoing total cost of ownership for the range of solution models, including SaaS. The key decision will often be reduced to balancing calls for customized, highly enterprise-specific requirements — and the costs that accompany them — versus the opportunities that may be offered through SaaS or other shared deployment models.

Business Impact: SaaS offers school organizations the opportunity to identify and concentrate on analyzing and using key and essential data without saddling them with all the hardware,

software and staffing requirements that accompany enterprise-hosted solutions. Educational agencies and institutions that view their data requirements as not unique will adopt SaaS; those that do not see a common solution — and are willing to pay for the perceived critical differences between themselves and similar organizations — will not adopt SaaS.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: TopSchool

Cloud E-Mail for Higher Education

Analysis By: Matthew Cain; Marti Harris

Definition: Cloud e-mail for higher education refers to no-fee e-mail services made available to educational institutions by Google, Microsoft and Yahoo.

Position and Adoption Speed Justification: The Google and Microsoft services are approximately four years old. Yahoo Zimbra became available in April 2008. There is significant interest in these services, and colleges and universities have begun to sign up in numbers. But despite great enthusiasm, many institutions struggled with contracting, directory, portal and single-sign-on problems in 2008. None of these problems proved insurmountable, however, and the vendors gained experience in handling the institutions' more complex needs. Cloud e-mail for higher education has advanced rapidly through the Trough of Disillusionment as the vendors, spurred partly by intense competition, have worked hard to make these services work.

User Advice: Organizations using older, functionally poor or unstable e-mail systems should consider using these no-fee services. Their first decision should be whether a premises-based or a cloud-based provisioning model is more appropriate. They also need to decide which constituencies — students, alumni, staff and parents — should be served by which systems. They often choose a cloud-based system for their students, but a premises-based system for their staff.

Business Impact: Many colleges and universities could save money by using a no-fee cloud e-mail service, compared with running their own premises-based system. But no-fee does not mean free — institutions will still need to manage their supplier, integrate identity and access mechanisms (increasingly important for hybrid premises-and-cloud-based systems), expose services via the portal and manage the directory. Side benefits include access to much greater e-mail storage capacity and to collaboration and (in some cases) personal productivity applications.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Google; Microsoft; Yahoo

Recommended Reading: "Yahoo Jumps Into .edu E-Mail Market Competition"

"ACU Adopts Gmail for Students and Staff"

"Q&A: Hosted Exchange Services for the Education Market"

IT Infrastructure Utility

Analysis By: Claudio Da Rold; Frank Ridder

Definition: An IT infrastructure utility (IU) is a shared IT infrastructure architecture provided through on-demand services. Pricing is based on service use and proven, ongoing reductions in the fixed baseline (or subscription fees) and unit costs. The IU is open, flexible, predesigned and standardized, as well as virtualized, highly automated, secure and reliable.

Position and Adoption Speed Justification: The industrialization of the IT services industry continues within a range of alternative delivery models. Cloud computing is driving increased innovation, investment and hype at different service layers, including infrastructure services. Most service providers have already incorporated IU solutions into their portfolios. If not, they often deliver infrastructure services, such as utility, in a usage-based model. Most of these providers are positioning IU and cloud computing as two sequential or parallel steps toward industrialized, off-premises services (see "Comparing Cloud Computing and Infrastructure Utility").

Seven attributes define an IU, creating unique value for organizations of all sizes. IUs are outcome-focused, ready-to-use and charged on a usage basis. Enterprises can scale their IU use up or down. IUs are also highly virtualized and shared, automated, lean, and standardized (see "The Seven Golden Rules for Industrialized IU Services").

The most basic IU style is utility hosting, which has evolved from traditional dedicated hosting. Providers added service elements, such as virtual servers and virtual storage, to traditional hosting to support flexible provisioning, which often still requires manual intervention to execute. Most vendors and traditional outsourcers have already added these virtualized utility services to their portfolios.

From a management content perspective, the most-developed IU offerings build on these basic IU services, adding elements designed to support a specific application landscape, such as ERP, e-mail and CRM. The client is still in full control of the customized applications, while the service provider controls and manages the operating platform. The provider tailors the architecture/performance/price of the service to the application requirements — for example, billing on a per-user or per SAP Application Performance Standard (SAPS) basis. IUs for specific applications include Capgemini's SAP Run, IBM Applications on Demand for SAP, HP Utility Sourcing Services for SAP, T-Systems Dynamic Services for SAP, and Logica SAP ODIS (see the Recommended Reading section).

Amazon.com (ECC and S3 offerings); smaller providers GoGrid, Joyent and Linode; and virtual data center hosting companies deliver IU services that leverage a cloud computing approach. Virtual data center hosting companies enable the implementation of complex virtual architectures in their hosting data centers. Traditional outsourcers and small startups, such as ThinkGrid, are also introducing virtualized desktop utility services in the market.

Most infrastructure service providers have delivered some financial flexibility to their clients — even in dedicated environments in the past. However, under the competitive pressure of virtualized and shared IU offerings, service providers must move ahead with real IT service industrialization to deliver standardized, virtualized and shared environments that also enable additional layers of automation.

From a maturity perspective, we map the advancement of IU against our Infrastructure Utility Maturity Model (IUMM; see "Gartner Introduces the Infrastructure Utility Maturity Model"). Leading IU providers are delivering at Level 3 (virtualized) of the IUMM and are progressively implementing Level 4, which is all about automation. A recent research series on IUs for SAP — where automation is in addition to a virtualized and standardized infrastructure — demonstrates

that these IUs enable better quality of services, reduced cost and fast reactivity/flexibility. Client case studies also confirm that these services have a compelling value proposition compared with traditional in-house and outsourced approaches.

Although IUs for SAP are quite mature, and more than 400 clients leverage this solution from different service providers, more-complete IU architectures are emerging within leading IU providers. These architectures offer basic IU services (virtual server and virtual storage) that are modular. Providers can group and combine these services to support complex client requirements. At the application infrastructure layer, for example, providers offer an IU for SAP and a CRM IU. In the messaging and collaboration space, they add IU for Microsoft Exchange, Lotus Notes or Microsoft SharePoint. Providers offer these IU services with standard terms and conditions (T&Cs), different categories of standard service levels to choose from, and options to combine services with each other.

The contribution that IU solutions make to a client's ability to control and increase flexibility is the key factor accelerating these solutions in the market:

- **Price:** Providers can spread costs across multiple clients because of the high use of virtualization technologies, standardization, and their investment in technology and tools. Process standardization and the use of automation also help to reduce cost. There is limited costly customization, and pricing for IUs decreased by 5% to 10% from 2008 to 2009, which is a great efficiency gain.
- **Flexibility:** Companies that grow through acquisitions or shrink due to restructuring and other firms with dynamic resource needs can benefit significantly from an IU solution. Scaling the service up or down is easy, because providers offer usage flexibility of up to 50%, which helps reduce costs quickly (by reducing volume).

IUs are increasingly accepted on the market, and more organizations include them in their IT services value chain. Especially during tough economic times, organizations consider IUs as a fast way to achieve benefits. Almost half of client organizations use outsourced services in North America, 35% in Europe already use utility services, and more than 25% of these organizations plan to implement IUs within 24 months (see "Market Trends: IT Infrastructure Utility, Worldwide, 2008"). This confirms that the IU has crossed the Trough of Disillusionment, and started the path toward maturity and broad adoption.

Traditional providers must continue to invest and industrialize their IT infrastructure service delivery, because new and disruptive approaches — especially those based on cloud computing — will progressively threaten the status quo of every insourced or outsourced solution. In the medium to long term, IUs will drive consolidation, and large providers will end up winning the market share battle, growing organically or by acquisition.

User Advice: IU is an emerging alternative delivery and acquisition model for infrastructure management services.

All clients should:

- Gain awareness and understanding of this emerging offering to leverage its value for their enterprises.
- Investigate critical areas, including pricing mechanisms and demand management, architectural specifications and limits, transition in and out, contract T&Cs, security, compliance, auditing, and risk management.
- Include IUs in the set of service options under evaluation as part of their sourcing strategy and enterprise architecture.

- Use the Gartner IUMM as a road map to follow the evolution of infrastructure toward the real-time infrastructure concept. This evolution will affect most organizations, regardless of their decision to transform and run their infrastructure internally (insourced delivery) or externally (outsourced delivery or IU).

Organizations delivering their IT infrastructure services in-house should:

- Regularly check how IU offerings are advancing in the market. Increasingly, these offerings will become the external benchmark for price, efficiency and flexibility. Examples include an SAP production managed platform (excluding SAP licenses) at \$20 per user per month (PUPM) or a Microsoft Exchange IU service at \$8 PUPM.

Organizations considering outsourcing deals or utility offerings should:

- Concentrate on pricing units and pricing schema — and on the related tools for service requests, metering, billing, and financial and service reporting — to understand the maturity of offerings. The degree of flexibility must align to client requirements and the maturity of the offerings.
- Request references from other clients using these offerings and pricing units, and exercise due diligence in actively checking those references.
- Ask the provider to carefully describe the processes, automation tools and service-level agreements underpinning service delivery quality and efficiency, because a focus on unit definition and pricing alone is insufficient to achieve the best value for money.
- Request that providers communicate their service/architecture road map to understand how their offerings evolve over time and to judge the potential for lock-in into their specific architecture.

Business Impact: IT IU can optimize the cost-efficiency and service effectiveness of the IT infrastructure; increase flexibility in response to business requirements; and deliver an open, predefined, automated platform for innovation. To benefit, clients must overcome significant cultural, financial and technical issues, such as standardization acceptance, independent software vendor pricing strategies, application portability, virtualization and policy-driven management on heterogeneous environments. The uncertain economy and the rise of cloud computing will accelerate the evolution toward industrialized IT services.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon.com; Atos Origin; AT&T; BT Global Services; Capgemini; CSC; HCL Technologies; HP; IBM; Logica; Rackspace; Savvis; Siemens IT Solutions and Services; T-Systems; Terremark; Unisys

Recommended Reading: "Keiper: Adopting an Infrastructure Utility for Flexibility and Efficiency"

"Case Study: Areva Gains IT Flexibility Through an Infrastructure Utility"

"Oxea Shows How Infrastructure Utility Can Deliver Speed and Efficiency"

"Case Study: How IT Utilities Support Rio Tinto's IT Dynamics and Company Moves"

"Case Study: Nampac Adopts the IBM Infrastructure Utility for SAP Applications"

"Comparing Cloud Computing and Infrastructure Utility"

"IT Infrastructure Utility Services Reach 5% of Data Center Outsourcing Revenue"

"Infrastructure Utility in Practice: Offerings Description"

"Q&A on IT Services Industrialization"

"Dataquest Insight: A Service Provider Road Map to the Cloud Infrastructure Transformation"

E-Portfolios

Analysis By: Jan-Martin Lowendahl

Definition: E-portfolios are Web-accessible repositories for student work, both graded and ungraded, which may be shared with authorized parties.

Position and Adoption Speed Justification: E-portfolios have begun to move toward the mainstream as standards and security issues are resolved by institutional policies and improved technologies. E-portfolios in their current incarnation have a place in many institutions, but adoption is still hampered somewhat by interoperability issues. Besides the "standard" issue about what metadata standards to apply, there is also the more deep-rooted problem of who owns and supports the portfolio, especially in the context of lifelong learning, multiple institutions and multiple employers. Until megavendors such as Microsoft and Google (or even Facebook) enter the market and offer lifelong services in the form of cloud e-portfolios (similar to their healthcare initiatives, but far less contentious), this issue is not likely to be solved, and e-portfolios will experience a limited uptake relative to the grand vision that started the movement.

User Advice: E-portfolios are moving from limited-access projects to institutionwide applications. Security and reliability, as well as the validity of student-entered data, are still concerns. However, policies and flags are being established to define content that is certified by the institution as valid. In order to prepare for a future of greater interoperability and extended use cases of e-portfolios through either federated or cloud solutions, institutions need to evaluate the standards supported, especially from an import/export perspective.

Business Impact: Affected areas inside the institution include instruction, collaboration, assessment and student services. Areas outside the institution are potentially many and affect student and faculty mobility, employee skill scouting, etc.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: ePortaro; McGraw-Hill; Nuventive; Open Source Portfolio Initiative (OSPI); TrueOutcomes

Podcasting Learning Content

Analysis By: Marti Harris

Definition: Podcasting learning content involves the prerecorded, radiolike format delivery of content via Really Simple Syndication across a varied set of content themes.

Position and Adoption Speed Justification: Podcasts are quietly being incorporated in other technologies, including social software tools, learning management tools, and other broadcasting

tools that also incorporate video and whiteboard technologies, such as iTunes and YouTube University.

User Advice: While podcasting is a relatively easy way to deliver lectures for distance learning, as well as for follow-up study access, other tools that include video, audio and whiteboard technologies are quietly incorporating or replacing podcasts on some campuses. Social networks are also being used for posting of audio and video and are a growing preference for students. Event podcasting will be part of a larger learning ecosystem to bring digital content to the users.

Business Impact: Podcasting is an extremely efficient method for delivering audio and spoken-word content to students, and it can be an important institutional communications tool.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Apple; NotePage; Softease

Climbing the Slope

Social Networking in Education

Analysis By: Marti Harris

Definition: Social networks represent Web environments where individual information is aggregated, presented and shared. Typically, applications are provided to document and filter connections between individuals, present content on profiles, support various multimedia, and facilitate communications between people. Social network sites attract a critical mass of students to provide healthy communities and opportunities for people who are connected by events, products or demographics to develop contacts based on personal, professional and educational backgrounds or interests.

Within the context of education, the rise of social networks in the student Internet marketplace has stimulated ideas on exploiting such capabilities for formal student groups.

Position and Adoption Speed Justification: Student and alumni membership in social networks such as Facebook and MySpace are well-established as meeting places. These types of networks continue to grow without any formal connection to higher education institutions. This informal use within student groups is far advanced, compared with any formal institutional uses, and provides institutions with a window to future student user expectations of community and collaborative tools. Official university Facebook uses include communication for social purposes, academic announcements, marketing and emergency messages.

User Advice: Although it does not pay to chase after students in their social communities, it is essential that higher education IT decision makers monitor student expectations with regard to communicating and collaborating within networking environments. This information can be used for institutional strategic planning for user collaboration, communications and the future of e-learning platforms.

Business Impact: Social networks may provide additional useful tools for recruiting, teaching, collaborating and marketing.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Facebook; LinkedIn; MySpace

Tablet PC

Analysis By: Leslie Fiering; Mark Margevicius; Stephen Kleynhans

Definition: Tablet PCs meet all criteria for a notebook PC, and are equipped with a pen and an on-screen digitizer. Tablet PCs run Windows XP Pro Tablet Edition, Windows Vista and, eventually, Windows 7. There are two form factors: slates, which don't have a keyboard; and convertibles, which have attached keyboards and swivel screens that lie flat on the keyboard when in the tablet mode. Slate adoption tends to be restricted to vertical applications with walking workers and "clipboard replacement."

Position and Adoption Speed Justification: Tablet PCs have overcome all barriers to adoption, except for the \$250 price premium that results from the single-supplier monopoly on screen digitizers. Although tablet PCs have been a staple technology for certain vertical applications (and education), the price barrier and lack of tablet-optimized applications have prevented broader mainstream adoption.

User Advice: The tablet PC is solid and mature for vertical applications in which it solves a specific problem. Sales — which Gartner considers a "semivertical" market — is showing a strong return on investment from the use of tablet PCs, because it's possible to collect customer information while maintaining eye contact and customer intimacy. Smaller-form-factor tablets are especially attractive to this segment. The ability to do nontext entries (such as diagrams and formulas) is making tablet PCs attractive for higher education students; however, we still don't recommend tablet PCs for broad mainstream deployment because of the price premium.

Business Impact: Tablet PCs are useful in vertical applications for clipboard replacement. There is growing payback for note-taking in social settings or where nontext entry is required.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Early mainstream

Sample Vendors: Acer; Dell; Fujitsu; HP; Lenovo; Toshiba

Recommended Reading: "Dataquest Insight: Tablet PCs Are Slowly Gaining Momentum"

"Tablet PC-Based Detailing for Biopharmas: Lots of Vendor Options and Approaches"

Digital Rights Management — Higher Education

Analysis By: Jan-Martin Lowendahl

Definition: The term "digital rights management" (DRM) covers a variety of ways of preventing the unauthorized use of electronic objects. DRM can restrict the viewing, copying, editing, altering, printing and e-mailing of business documents, messages and other intellectual property, in order to protect privacy, confidentiality and financial value.

Position and Adoption Speed Justification: While DRM has been on the list of IT issues facing education for some time, and DRM is immature in some markets, educational institutions have been involved in setting standards and developing a federated approach to DRM. DRM is now a part of the larger discussions on the academic use of information and research. While DRM

technologies are still evolving, we expect higher education to continue to move forward in deployments of DRM technology, and DRM will continue to move toward maturity during the next five years.

User Advice: Consider DRM primarily as a general-purpose protection mechanism to control access, printing and e-mailing of content within your institution. External distribution of information requiring protection demands the strongest forms of embedded protection technology, particularly if the content is highly valued and not owned by the institution.

Business Impact: DRM offers higher education institutions a degree of protection against the loss of intellectual property, as well as inappropriate or unintended disclosure of proprietary or confidential information.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; EMC; Liquid Machines; Microsoft; Oracle

Wikis

Analysis By: Nikos Drakos; Whit Andrews

Definition: A "wiki" is a simple collaborative system for creating and maintaining hyperlinked collections of Web pages. A wiki usually enables users to add or change pages "in context" without having to worry about where and how the content is physically stored. A wiki is, by design, an information synthesis tool that simplifies the modification and reorganization of existing information and encourages what is often referred to as "wiki gardening." This is the process of incrementally editing a wiki space to preserve continuity, make additional connections and links, and generally to clean it up. Key enabling functions are:

- User-friendly "click to edit" features for any wiki page that invites users to create, link, edit or reorganize the information they see on the screen, without having to understand the physical file organization.
- The ability to track changes, to compare different versions and to revert to a previous version makes it easier to make changes in the knowledge that any mistakes can be reversed easily.

Static Web addresses to any wiki page or even to any component of a wiki page (such as a paragraph). This means it is easier to organize related ideas using Web links, not only inside a wiki but also between a wiki and other, Web-addressable sources of information (for example, other wikis, the intranet or the public Internet).

Position and Adoption Speed Justification: Wikis are now available from commercial vendors, in addition to many open-source products and are becoming available from established enterprise vendors. Wikipedia is the best-known publicly available wiki and it has raised awareness to the point where users often demand wiki-style collaboration support from their IT departments. Although the wiki functionality is still at the core of many products, it is beginning to defy clean categorization as it expands into adjacent areas either through plug-ins and extensions or by enhancements to the core product that typically includes blogs, discussions, user profiles and tagging. Wikis are also increasingly being offered by content management vendors and archived/stored in content management repositories.

User Advice: Understand that there are advantages to using a wiki over a conventional repository-style collaboration system, and be receptive to users who will argue that a wiki will improve team collaboration. Now is the time to move from pilots to more systematic deployments, as appropriate, and to evaluate the suitability of wikis in different collaboration scenarios, if this has not been done already. Caution is required when setting up stand-alone wikis which may help to solve short term problems but which may create additional content silos. Also, where wikis are used to create or maintain formal content (for example, client communication, product descriptions, technical documentation and so on) it may be necessary to introduce additional policies and management control to ensure appropriate quality control and governance.

Business Impact: Wiki-style information creation and sharing has significant advantages over traditional collaboration environments in terms of improved transparency, usability and information reuse. Like the public Web, it encourages the creation of a "Web of interrelated information," where it is just as easy to create internal cross-references as it is to reference external resources. Within businesses, wikis are used as informal repositories for maintaining technical documentation, client communication, issue tracking, e-learning and training, general information sharing and knowledge management. They are also used to support communities of practice or communities of interest, product development and idea exploration.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Atlassian; IBM; Jive Software; MediaWiki; Microsoft; MindTouch; Socialtext; TWiki

Recommended Reading: "Magic Quadrant for Social Software"

"Moving Social Software Deployments Beyond Experimentation Project Overview 2009"

CRM for Enrollment Management

Analysis By: Marti Harris

Definition: The importance of customer relationship management (CRM) in addressing institutional, market and constituent needs is now widely recognized in higher education. Successful CRM strategies include multichannel communications, business analytics, and strong and agile reporting and management tools, which together allows for the establishment and maintenance of student/prospect relationships. CRM in higher education is also referred to as "constituent relationship management."

The purpose and scope of CRM are necessarily unique to every institution of higher education, as are the meaning and uses of CRM analysis. Enrollment management analysis can be clearly and consistently identified as an integral part of any institution's CRM strategy. CRM for enrollment management involves systems that are verticalized for higher education student and prospect recruiting, as well as for enrollment management functionality.

Position and Adoption Speed Justification: A key obstacle is showing the value of overcoming politically inspired constituent data stovepiping.

User Advice: CRM for enrollment management should be considered as a business unit strategy and as part of an institutional CRM strategy. Even when implemented first in a single unit or department, an institutionwide CRM strategy should be considered for any future expansion and in view of the potential savings in license, time and training. Not all enrollment and recruiting

applications are CRM-based, and institutions should determine if they seek a single-purpose enrollment management solution or enrollment management that is CRM-based.

Business Impact: Affected areas include recruiting and enrollment community relations.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Intelliworks; Jenzabar; Oracle; RightNow Technologies; SunGard Higher Education; Talisma

Federated Identity Management

Analysis By: Gregg Kreizman; Ray Wagner

Definition: Federated identity management enables identity information to be shared among several entities and across trust domains. Tools and standards permit identity and information to be transferred from one trusted identifying and authenticating entity to another for authentication, authorization and other purposes.

Position and Adoption Speed Justification: Interest is growing in Security Assertion Markup Language (SAML) options and Active Directory Federation Services (ADFS). Many enterprises have become interested in acting as identity providers to third-party business partners and/or application service providers (ASPs), while ASPs and software-as-a-service (SaaS) providers have begun providing federation support, primarily to enable single sign-on for their customers. Market adoption had been slower than we expected in years past, mostly due to lack of partner readiness to federate and business cases; however, adoption has been accelerating recently.

User Advice: If an enterprise is managing access to its systems for a large number of external users managed by other organizations, or these users regularly authenticate to a third party (for example, if the enterprise has outsourced the service offering), then a strong case for federation can be made. The ideal arrangement, which provides the greatest value to both parties, is what's sometimes called "federation in both directions," in which each partner manages access to its resources for the other's users, so that both act as identity provider (IDP) and service provider (SP or "relying party").

Federation also offers benefits when deployed internally by enterprises made up of multiple units that have historically managed their own users, and for which centralized user management hasn't been feasible — technically or politically. One common example is where government agencies must deliver a service to higher educational institutions. The higher education community has invested heavily in federation for providing access to shared academic resources within and external to their institutions. In these cases, the government agencies and universities can continue to manage their own users and infrastructures while using federation for two-way access to each other's resources.

For effective federation identity management, greatest attention should be given to partner readiness, governance agreements and federation metadata management to ensure fastest time to value. Federation startups can take longer when federation is new to one or both partners. Governance agreements stipulate requirements for each side — for example, time expectations for deprovisioning a user when that user leaves the organization, and who is liable for fraudulent authentications. Metadata management has to do with agreeing to the data types that will be transmitted across trust boundaries, performing the operational steps to map data syntax and format between federation partners, and managing that operation moving forward.

Business Impact: Federated identity management is positioned to provide a foundation for consumer and business identification, authentication and authorization across trust boundaries. The primary benefits are reduced identity administration for service providers, reduced authentication failures for users and user convenience through single sign-on.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: CA; EMC; IBM; Liberty Alliance; Microsoft; Novell; Oracle; Ping Identity; Sun Microsystems; TriCipher

Recommended Reading: "Frequently Asked Questions About Federated Identity"

"Identity 2.0: Tomorrow's Promise and Today's Reality"

Open-Source E-Learning Applications

Analysis By: Jan-Martin Lowendahl

Definition: Open-source e-learning applications are education e-learning systems developed via open-source or community source models.

Position and Adoption Speed Justification: Open-source e-learning platforms such as Moodle and Sakai have had somewhat of a breakthrough in the past year. Maturing community source management in the case of Sakai, and an increasing commercial support ecosystem for both Sakai and Moodle (see www.moodle.org for a listing of vendors), together with turbulence in the commercial e-learning platform market, have continued to increase the open-source software (OSS) "market share." OSS e-learning platforms now represent 31% of all installed platforms and are in 20% of institutions — the platform used for the delivery of most courses, according to Gartner's latest e-learning survey for higher education. Looking forward, we believe Sakai's developing road map toward version 3, commercially supported integration such as that of Moodle and Google Apps by Moodlerooms and Google, and turbulence around the recent acquisition of Angel Learning by Blackboard are only likely to enhance the OSS trend.

User Advice: Open-source solutions for e-learning are a particularly good fit for institutions capable of supporting in-house application development. However, the continued development of viable commercial ecosystems enables more institutions to adopt OSS e-learning platforms without internal development capabilities. CIOs need to be practical and not parochial when assessing OSS options. They need to consider all the standard factors such as the full life cycle total cost of ownership (TCO), as well as available skills, flexibility for the future, community and commercial support for successful deployment of e-learning projects.

Business Impact: The benefit of OSS e-learning platforms is potentially high because it directly affects the core process of education in the institution. Flexibility in changing the functionality and speed of change are potentially crucial factors for some institutions.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Claroline; ILIAS; Moodle; Sakai

Recommended Reading: "Open Source in Higher Education, 2008"

"Gartner Higher Education E-Learning Survey 2007 Highlights: Maturity, OSS, Infrastructure and Sourcing"

"Gartner Higher Education E-Learning Survey 2007: Clear Movements in the Market"

Grid Computing — Higher Education

Analysis By: Jan-Martin Lowendahl

Definition: Grid computing in higher education refers to using computers owned by more than one organization to collectively accomplish large tasks, such as derivative risk analysis, candidate drug screening or complex simulations.

Position and Adoption Speed Justification: While grid computing in higher education is largely a research university activity, regional grids and research-related grids have become common, and they are quietly becoming a norm for research-intensive universities.

User Advice: Grid computing provides a way to bring more computing and storage resources to the institution and researcher than could be afforded by each institution or individual research project. It offers opportunities for service, support, software, and storage from universities, as well as national, regional, and corporate laboratories and computing centers, to be shared in a common grid. In addition, grid computing can help universities meet changing demands, as well as provide a means for archiving and recovery. A crucial skill to get full advantage of grid computing is parallel programming skills.

Business Impact: Grid computing provides increased computing power and greater opportunities for collaboration across different geographies and needs. It also provides a cost-effective way for universities to manage changing computing and research requirements. A potentially disrupting trend is the emergence of "cloud-computing," where computing power can be bought "on demand."

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Appistry; DataSynapse; Digipede; HP; IBM; Platform Computing; Sun Microsystems; United Devices; Univa UD

Web and Application Hosting

Analysis By: Ted Chamberlin

Definition: Web hosting, which includes application hosting, is the outsourcing of some or all the infrastructure management associated with Web-based content and applications. Customers are provided with Internet data center facilities, bandwidth, computing capacity and storage, as well as associated managed services. This infrastructure may be shared, dedicated, virtualized or provisioned on a utility basis. Typically, the Web hoster is responsible for the day-to-day operation of the infrastructure. The transfer of technical and staff assets is relatively rare, with customers tending to provide their own software licenses and hardware.

Position and Adoption Speed Justification: Web and application hosters have mastered the basics of network, infrastructure and operational support in dedicated environments, and now must look to extend this level of competence to virtualized environments. Although hosting providers have improved customer support processes, this area still continues to be problematic for some. This movement toward "hybrid" hosting environments, where applications are hosted

on a combination of dedicated and virtualized platforms, will start to separate the leading providers from those that offer only partial solutions. The increased interest in cloud-computing and software-as-a-service (SaaS) models has pushed traditional hosting providers to develop services that can be purchased on a consumption-based model where assets can rapidly be provisioned from a pool of shared resources to their portfolios. These usage-based services, commonly referred to as "utility of cloud hosting," focus heavily on server, storage and file-sharing capabilities; commercial enterprise application hosting continues to thrive on dedicated enterprise server platforms. As hybrid hosting offerings become more user friendly, enterprises will start to move more test and development computing to the cloud-based models.

User Advice: Most enterprises should consider external hosting in their tactical and strategic sourcing decisions, because the services and products have become standardized and mature. Not every service provider can deliver all levels of support (especially enterprise application management and utility/cloud services), so we recommend engaging in a competitive bid situation to ensure that the provider has the requisite processes, facilities, networks and service levels.

Business Impact: Web and application hosting provides greater reliability, scalability and technology expertise than in-house hosting for all but a few enterprises that have complex application integration needs, or whose IT operations that are large enough to match the scale of a Web hoster. Web hosters typically also have higher-quality facilities, diverse carrier networks and deeper system-support personnel than enterprises. However, the customer is restricted to the technologies supported by the Web hoster, and as with all outsourcing, there may be some loss of control.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Sample Vendors: AT&T; Corinex Communications; CSC; HP/EDS; IBM; Interoute; KDDI; Logicworks; NaviSite; NTT Communications; Orange Business Services; Quality Technology Services; Rackspace; Savvis; ServePath; Singapore Telecom; SunGard Availability Services; Terremark; Verizon Business

Entering the Plateau

Web Services for Administrative Applications

Analysis By: Jan-Martin Lowendahl

Definition: Web services for education administrative applications facilitate the internal integration and extra institutional collaborative commerce needed to carry out education-specific administrative functions.

Position and Adoption Speed Justification: Web services have become deeply embedded in mainstream administrative application suites in higher education. They are no longer considered nice to have, but are a requirement for academic and administrative applications. Web services are increasingly considered as an interoperability strategy for administrative suites in K-12 education, challenging SIF (Schools Interoperability Framework) and other integration strategies.

User Advice: Although education administration and academic application providers have embedded Web services in their latest releases, institutions must continue to stay up on releases.

Business Impact: Affected areas include student administration and procurement, as well as enterprisewide academic applications, including course management systems.

Benefit Rating: Moderate

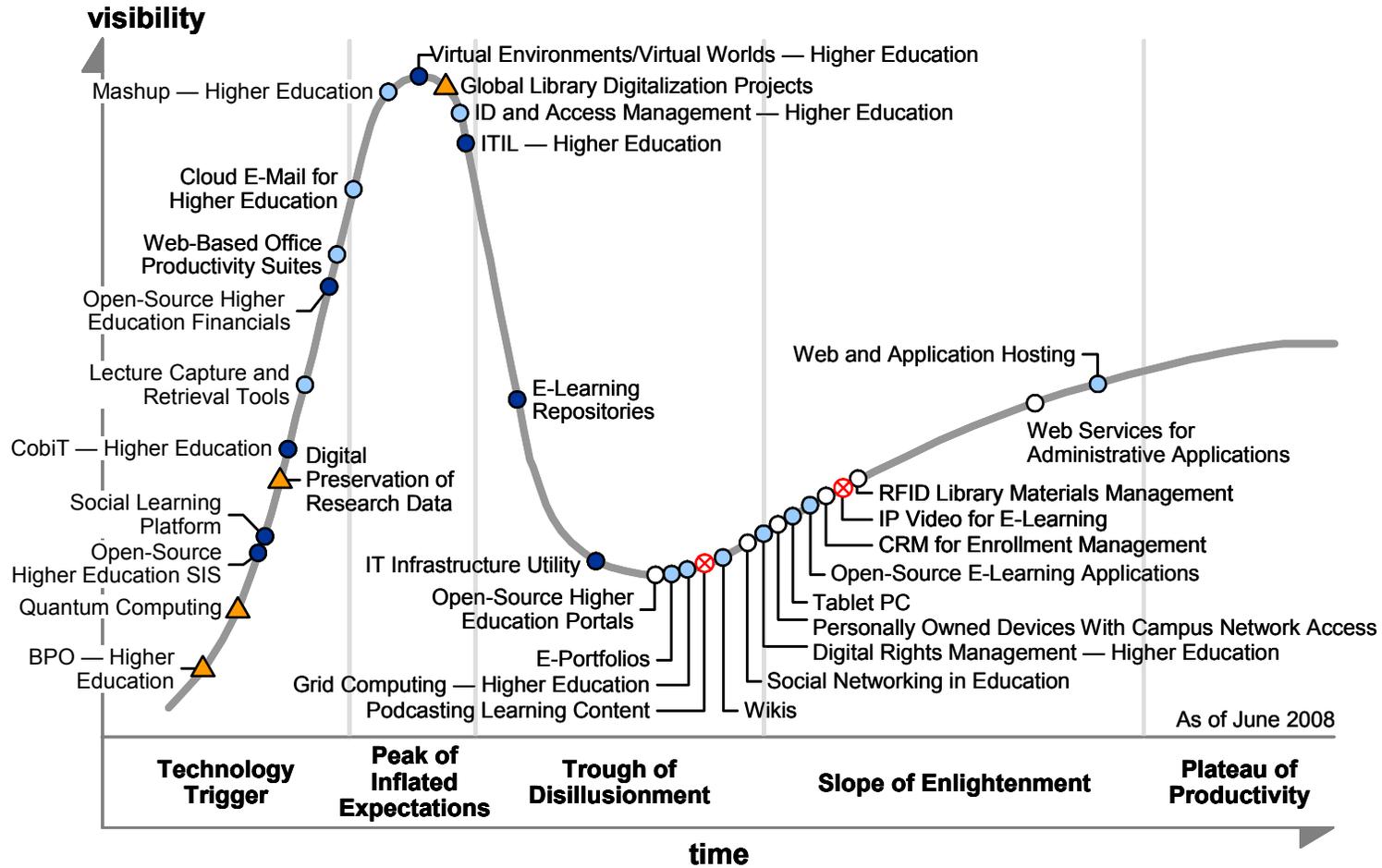
Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Blackboard; Campus Management; Datatel; Desire2Learn; Jenzabar; Oracle; SAP; SunGard SCT

Appendixes

Figure 3. Hype Cycle for Higher Education, 2008



Years to mainstream adoption:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

Source: Gartner (June 2008)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
<i>Technology Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
<i>Trough of Disillusionment</i>	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2009)

Table 2. Benefit Ratings

Benefit Rating	Definition
<i>Transformational</i>	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
<i>High</i>	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
<i>Moderate</i>	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise

Benefit Rating	Definition
<i>Low</i>	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2009)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
<i>Embryonic</i>	<ul style="list-style-type: none"> • In labs 	<ul style="list-style-type: none"> • None
<i>Emerging</i>	<ul style="list-style-type: none"> • Commercialization by vendors • Pilots and deployments by industry leaders 	<ul style="list-style-type: none"> • First generation • High price • Much customization
<i>Adolescent</i>	<ul style="list-style-type: none"> • Maturing technology capabilities and process understanding • Uptake beyond early adopters 	<ul style="list-style-type: none"> • Second generation • Less customization
<i>Early mainstream</i>	<ul style="list-style-type: none"> • Proven technology • Vendors, technology and adoption rapidly evolving 	<ul style="list-style-type: none"> • Third generation • More out of box • Methodologies
<i>Mature mainstream</i>	<ul style="list-style-type: none"> • Robust technology • Not much evolution in vendors or technology 	<ul style="list-style-type: none"> • Several dominant vendors
<i>Legacy</i>	<ul style="list-style-type: none"> • Not appropriate for new developments • Cost of migration constrains replacement 	<ul style="list-style-type: none"> • Maintenance revenue focus
<i>Obsolete</i>	<ul style="list-style-type: none"> • Rarely used 	<ul style="list-style-type: none"> • Used/resale market only

Source: Gartner (July 2009)

RECOMMENDED READING

"Understanding Gartner's Hype Cycles, 2009"

"Technology Adoption in Higher Education: Know Your Businesses"

"A Proven Simple Visual Tool to Aid the Service Portfolio Dialogue Between Higher Education Stakeholders"

"Financial Slowdown Emphasizes Budget-Planning Effectiveness in Higher Education: But It's About Yield, Not Cost"

"The 2009 Higher Education CIO's Agenda: Building Opportunities in a Financially Challenging Environment"

"Scenario Planning: Exploring Possible Futures for Education"

"Toolkit: Building a Higher Education IT Strategy"

"Case Study: Is Norway's FEIDE a Step Toward a National IAM Solution?"

"Lessons Learned From Higher Education and Public-Sector Identity Federations"

"The Higher Education CIO: From the Era of ERP to the Era of Consumerization"

This research is part of a set of related research pieces. See "Gartner's Hype Cycle Special Report for 2009" for an overview.

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