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Above-Campus Services: Shaping the Promise of Cloud Computing for Higher Education

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Cloud computing has arisen as the in-vogue description for the massive aggregation of a wide variety of IT services delivered via fast digital networks—much like power generation and the electrical grid of a public utility. The idea is not new. In fact, the concept of today's cloud computing may date back to 1961, when John McCarthy, retired Stanford professor and Turing Award winner, delivered a speech at MIT's Centennial. In that speech, he predicted that in the future, computing would become a "public utility."¹

Yet for colleges and universities, the recent growth of pervasive, very high speed digital networks offers not simply access to more efficient computing but rather a new capability and an opportunity to rethink approaches for delivering IT services. These networks are catalysts that point toward an evolving discontinuity in the point of origin for essential IT services. Many institutions are particularly well positioned—principally from their collective investments in Internet2, National LambdaRail, and various Regional Optical Networks²—to garner the anticipated economic benefits of cloud computing models, and such efficiencies are especially welcome in these extremely difficult economic times. Beyond cost-per-IT-unit benefits, however, these networks and cloud computing models renew important questions regarding the role of a particular

institution among the community of scholars and students that compose higher education.

Above-Campus IT Services

Just as atmospheric clouds can obscure the sun, the current discussion of cloud computing by the IT industry and the media may be obscuring a far more strategic conversation for colleges and universities. In a 2006 *EDUCAUSE Review* article, Charles Vest, president emeritus of MIT, asserted: “We are seeing the early emergence of a meta-university – a transcendent, accessible, empowering, dynamic, communally constructed framework of *open materials* and *platforms* on which much of higher education worldwide can be constructed or enhanced.”³ There are similarities between McCarthy’s vision of a generalized, public computing utility for all and Vest’s meta-university utility of content and platforms for higher education.

Notably, the public Internet was a catalyst for a new way to efficiently share educational materials and knowledge among institutions.⁴ This sharing had long been pursued through many means including expensive, formal student- and faculty-exchange programs, but the increasingly pervasive Internet yielded a relatively low cost way to leverage the cooperative, sharing culture of higher education. Although institutions do continue to compete for the best faculty, students, and research grants, at the core they are also remarkably collaborative. Sharing knowledge and resources is a millennium-refined value of the academy, and from a purely economic view, it is often in institutions’ self-interest to do so.

To what extent, then, should models for aggregating IT services embrace and extend this unique culture? Could the broad adoption of cloud computing be a critical multi-institution step toward Vest’s meta-university? Vest noted: “The meta-university will enable, not replace, residential campuses, especially in wealthier regions. It will bring cost-efficiencies to institutions through the shared development of educational materials. It will be adaptive, not prescriptive.”⁵

Although Vest’s primary focus was on open-course materials, platforms for standards-based IT services are clearly an essential element of his vision. In many ways, this idea of sharing by the institution is simply catching up to the activity already evident in many scholarly disciplines and among students. Collaboration among researchers, students, degree programs, and even administrative services is both an economic necessity and a driver for real innovation. Collaboration is the new normal.

For example, multi-institutional partnerships already extend from joint investments in ever more costly research efforts to expansion of the pedagogical approaches demanded by today’s digital natives. For research-intensive institutions, the need to collaborate nationally and globally is both a research imperative and an economic necessity – particularly in the sciences, where large-scale instrumentation is now the norm. Scientists from multiple institutions share supercomputers, librarians share digital humanities repositories, astronomers share galactic images, network

engineers share strands of fiber in the same physical cable, and treasurers share check-disbursement services. These partnerships also extend to teaching and learning, where joint degree or exchange programs are being augmented by shared online curriculum. For example, the Michigan Community College Association has undertaken such an effort and now has the “v-campus” (<http://vcampus.mccvlc.org/>), a joint offering enabling Michigan community college students to take courses from various member colleges while still receiving face-to-face, local support services at a convenient "home" college.

These few examples are illustrative of the myriad multi-institutional activities that pervade the academy. These activities are not new; rather, they represent technology-enabled extensions of the embedded culture of sharing. All of these service aggregations – beyond any single campus – share the trait of efficiency while enabling, rather than undermining, the healthy “coopetition” among institutions with the core missions of education and research.

Thus, when colleges and universities consider this next era of IT services in a larger strategic context, the term *above-campus services* may frame institutional objectives for IT service aggregation better than the common, all-industries notion of *clouds*. *Above-campus* means that for a particular IT service, a sufficient level of aggregation for efficiency cannot be achieved within one campus but, rather, must be achieved at a higher level of aggregation, beyond a single institution. Efficiencies may be realized in aggregating personnel, expertise, licensing, business continuity, and other benefits far beyond simply joining computer hardware.

Specific services that will benefit from aggregation will evolve over time and will be closely linked with advances in technology. However, operating models are needed for the partnerships that will take advantage of these advances. Two questions, then, are essential for colleges and universities as they consider the economic benefits of cloud computing and the potential strategic possibilities for above-campus services:

1. To what extent should specific IT services be aggregated and why?
2. Through what models should IT services be aggregated and governed?

Three models for aggregating IT above-campus services are particularly suited to higher education: *Commercial Sourcing*, *Institutional Sourcing*, and *Consortium Sourcing*. These models seek efficiencies through *economies of scale in IT service provision* and *on-demand IT capacity as needed* and seek improvement through *a vibrant ecology of innovation* – none of which would be accessible within a single institution. The three models do not ignore the very real necessity of institutional policy compliance and risk assessment, and they presume some disparity of choice and strategy among different institutions.⁶

Commercial Sourcing

Commercial Sourcing is the best-understood aggregation model, because of its long history. It is an aspect of traditional outsourcing represented, in small form, by the

“Service Bureaus” of the 1970s or, in large form, by the big IT outsourcing deals that began with Kodak in 1989. The mantra is: “Pay someone else to do something you need done, and then hold them accountable by contract.”

In the early 1990s, Mike Zucchini, formerly the CIO of Fleet/Norstar, saw four possible reasons for outsourcing information technology. He explained these reasons in his “4-S” model: *Scale*—the desire to access economies of scale and efficiency that an institution could not achieve alone; *Specialty*—the desire to access specialized expertise that is too expensive to staff; *Sale*—the desire to turn nonproductive assets of capital facilities and IT equipment into cash to improve a balance sheet and reduce headcount; and *Surrender*—the desire to simplify the IT agenda by essentially giving up and hoping that a contract for service yields the outcomes an executive desires.⁷ Zucchini argued that Scale and Specialty are functional reasons for outsourcing and that Sale and Surrender are ultimately dysfunctional. History supports his insights: the big Sale/Surrender outsourcing deals of Kodak, American Express, GM, and Xerox all proved transient as the complexities of managing by contract and service-level agreements led to the eventual re-creation of internal IT service capabilities.

Over the years, new methods for provisioning commercially aggregated IT services have developed. *Infrastructure as a Service* (IaaS), *Platform as a Service* (PaaS), and *Software as a Service* (SaaS) provide a much richer continuum of commercial services than in the past. SaaS commercial sourcing has demonstrated effective uses of the Scale and Specialty approaches while provisioning policy-compliant IT services via institutional contracts with a cloud provider. For example, Google offers various versions of its GoogleApps platform, including the Education Edition, which is tailored to the needs of academic institutions and can be contracted via an institutional agreement. Likewise, Microsoft and Google both offer institutional e-mail services that can be procured as a purchased or an advertising-based service. Apple offers iTunesU for distribution of podcasts in an institutionally branded channel.

Each of these solutions takes an offering that was designed initially as a consumer experience and turns it into a commercial-grade SaaS offering that is branded with an institution’s identity and delivered via the Internet. Likewise, commercial sourcing is already pervasive for software that is unique to higher education. Course management systems are not a typical consumer experience, but many institutions contract for them as PaaS or SaaS from service providers including Desire2Learn, the Longsight Group, and rSmart.

Provisioning Above-Campus IT Services

The Commercial Sourcing, Institutional Sourcing, and Consortium Sourcing models provision their aggregated IT services via three types of offers:

IaaS: Infrastructure as a Service

PaaS: Platform as a Service

SaaS: Software as a Service

For more on these offers, see Brad Wheeler and Shelton Waggener, "Provisioning Above-Campus IT Services: Supply and Demand," in the online version of this issue of *EDUCAUSE Review* (<http://www.educause.edu/library/erm0964>).

Commercial Sourcing can be an agile, efficient means to support an academic department or campus in creating its own solutions, with little need for large up-front technology investments. The possibilities are intriguing but beg the questions: What happens when these one-off agreements with cloud providers proliferate within an institution? What are the implications when a department decides to use (or suddenly finds itself using) ten different cloud services from ten different vendors to mash-up a "solution"? What does the end user's experience look like? Will each faculty member and student need ten different IDs to conduct campus business? What if one of the vendors goes out of business with no warning and institutional data perish with it? More commonly, what happens when a PaaS provider (like many of the social networking sites, such as Facebook and Twitter) modifies or changes its platform, which may break interfaces written to access the data? Alternatively, what if a campus wants to exit a relationship with a commercial cloud service provider? Is that simple, or are commercial cloud computing models a guise, as noted by *The Economist*, for a new form of vendor lock-in through very high switching costs?⁸

Institutional Sourcing

Institutional Sourcing is a model of aggregation that draws on the cooperative, cultural uniqueness of higher education. In this model, one or more institutions become a direct service provider to other institutions on a cost-recovery basis. For institutions that are formally members of university or college systems, this model is very common, with services often provided by the largest member to other campuses of the system. Externally, this may be as simple as a bilateral no-cost agreement between two institutions for a particular service need. For example, Stanford University and Duke University have a bilateral agreement to provide backup DNS services should either experience a sustained outage. Indiana University operates the Global Research

Network Operations Center (GRNOC, <http://globalnoc.iu.edu/>), which provides for-fee services to Internet2, National LambdaRail, and many state Regional Optical Networks. The Coeus Consortium (<http://coeus.org/>), based at MIT, creates research administration software for institutions and provides technical support. It is a member-funded activity, but MIT is the institutional home. In these arrangements, there is no profit premium or motive other than achieving scale to cover all operating costs.

In other industries, this model most closely aligns with the *core competency* model for global and multinational firms. For example, a multinational corporation may create a competency center for accounts payable in Hamburg, a process-engineering center in Mumbai, and an innovation center in Silicon Valley. Other divisions of the firm use networks and shared systems to make use of these centers, which aggregate expertise and scale of operations for greater efficiency. The National Science Foundation already demonstrates the applicability of this competency model when it sources the operation of big supercomputers or research centers at an institution to operate on behalf of researchers at many institutions.

Consortium Sourcing

The Consortium Sourcing model is a not-for-profit means of aggregating demand for above-campus IT services and then matching that demand with supply. A Consortium Sourcing model can then operate IT services itself through its own staff and systems or can choose to contract with an institution or a commercial provider. This model provides resiliency for sustaining aggregated demand and participant collaboration while varying the sourcing of operations as situations change over time.

For example, HathiTrust (<http://www.hathitrust.org>) was created by the Committee on Institutional Cooperation (CIC) as a shared digital repository for the institutional copy that resulted from the Google Book Project. By the time of the launch, the CIC was joined by the ten libraries of the University of California system, the California Digital Library, and the University of Virginia Library as co-founders. Each of the founding members was pursuing solutions independently when the consortium opportunity became clear; each institution had a very similar challenge, and developing a wholly unique solution would not offer any substantial benefit. HathiTrust was created with a series of lightweight contracts to the CIC to aggregate demand among its members, and then an operational agreement for HathiTrust was granted to the University of Michigan and Indiana University as the initial repository operators.

Similarly, ETUDES (<http://www.etudes.org>) operates as a not-for-profit membership consortium among twenty-three California community colleges. Its provision of course management services is a closed or private SaaS offering for its members, and it contracts with commercial IaaS providers for servers. Internet2 provides another example of a consortium that has thrived for over a dozen years as a member-created entity that owns and operates millions of dollars of assets for higher education. It provides a form of IaaS cost efficiencies over independent efforts and also performs a function that could not have been accomplished without the consortium model to aggregate demand and then operate services for members.

Consortium Sourcing models can also evolve with the wishes of their members. For example, ETUDES was incubated at Foothill College with support from the William and Flora Hewlett Foundation and the California Community College System. It now operates as an independent 501(c)(3) not-for-profit legal entity with board oversight selected from participating members. The Coeus Consortium has set its roadmap to operate as part of the Kuali Foundation (<http://kuali.org>), as the MIT-based version of Coeus became the baseline design for a new open-source research administration system called Kuali Coeus (KC). Yale University created the Central Authentication Service (CAS) for single sign-on and ultimately migrated its community-development activities to the Jasig (<http://jasig.org>) consortium.

To be fair, we should note that even the best-aligned and well-intended consortia have a rather checkered history in higher education. Some consortia have flourished, providing services over a sustained number of years, but other grand efforts have failed to achieve the original goals or have been turbulent at best. In recent years, however, higher education is demonstrating a growing capability to execute and provision services through relatively lightweight consortia governance. The availability of additional lightweight services via cloud offerings may lead to the creation of more Consortium Sourcing models.

Coordinating Institutional Resources

The distinguishing difference among the Commercial Sourcing, Institutional Sourcing, and Consortium Sourcing models is the coordinating mechanism used to aggregate supply, aggregate demand, and institute governance to make the inevitable values-based trade-offs for resource use. Each model involves a flow of resources – cash or tendered personnel time – from institutions to an aggregation point for service provision. Each model makes trade-offs in allocating resources based on its core values. For example, the Commercial Sourcing model uses sales and marketing to garner contracts to aggregate cash sales and then to leverage the cost of operations over many customers and products. Real competition should drive innovation. Access to software and services is provided in exchange for cash, and firms make pricing and resource use choices to maximize profits to owners over the lifecycle of product offerings.⁹ By contrast, the Consortium Sourcing model works in an ecosystem in which institutions are both the means of supply and the source of demand. For some digital goods – for example, Sakai’s software (<http://sakaiproject.org>) or HathiTrust’s digital books – a consortium may make all or part of a service freely available to the world, since doing so aligns with institutions’ missions and has little marginal cost. But to sustain themselves over the longer term, consortia must create agile governance mechanisms to ensure efficient resource use, innovation, and provision of services to members.

Differences among these three primary sourcing models merit institutional scrutiny: history affirms that each model has its own risk-and-reward profile. No one model is a magic bullet for the larger organizational challenges of IT services, and there may also be varying levels of fit between an aggregation model and an IaaS, PaaS, or SaaS cloud service offering.¹⁰

Above-Campus Service/Model Matrix

As favorable economics trends toward above-campus aggregation, how should an institution develop a holistic, above-campus IT services strategy that can purposefully evolve over time? In the absence of an explicit campus strategy, the potential benefits of cloud computing models may be elusive. There is no universal strategy, since institutions will vary in their current state of IT services, adaptive capabilities, history, and objectives. For some institutions, above-campus services are strictly about containing costs and adopting the least-expensive IT service models. Others will value efficiency but may also see consortia or leading-edge commercial relationships as pushing frontiers that align with an institution's mission for education and research.

The Service/Model Matrix is a useful tool that institutions can use as they consider the *types of IT services* and the *models for provisioning (aggregating)* each service. IT services are not monolithic. An institution might readily choose a Commercial Sourcing model for student e-mail while providing administrative e-mail in-house or via an Institutional Sourcing model. Likewise, it seems unlikely in the near term that complex, research-intensive institutions will choose to operate their financial systems in an above-campus model, since the disparity and the specialization among institutions remain large. Less complex institutions, however, may find considerable efficiency for financial services in a Commercial or Consortium Sourcing model using SaaS to support (or create) common business processes.

The first step in using the Service/Model Matrix is to list specific IT services. Which services will continue? One option, of course, is that an institution may choose to quit offering a service. It could direct individuals to use the public service of their choice through their own means (e.g., personal e-mail, Amazon S3, Flickr). There may be very strong merit in choosing this option for transient needs that have little to do with coordinated, institutional activities. But for IT services that are to continue, the next step in using the Service/Model Matrix is to list the current baseline condition plus the three above-campus aggregation models as potential options.

Service / Model Matrix

IT SERVICE	UNAGGREGATED LOCAL MODEL	AGGREGATED ABOVE-CAMPUS MODELS		
	Current Baseline	Commercial Sourcing	Institutional Sourcing	Consortium Sourcing
Business Continuity/ Disaster Recovery Planning	Local			In Development
Classroom Videos	Pilot	Option		Desired
Clinical Research Data	Local			In Development
DNS Backup	Local		Planned	
E-Mail (faculty/staff)	Local			
E-Mail (student)		Current		

Institutions will vary in their interest in local and above-campus models for various IT services. These interests will also shift over time as the risk and the reality of the services and the models mature. Indeed, various forms of cloud computing and above-campus aggregation models presage a rapid pace of change leading to both opportunity and risk for any IT services strategy.

Some large institutions may already have sufficient size and scale to hit favorable economics for a particular IT service, and some institutions can aggregate across multiple campuses to achieve favorable economics. For other institutions, simple two- or three-way partnerships may produce scale at very low coordinating cost – especially if a Consortium Sourcing model provisions a service using IaaS/PaaS from an efficient commercial provider. Timing is an issue as the models and offers evolve; during this process, institutions can simply respond to whatever happens, or they can use their choices to help shape the future of essential IT services.

Toward the Meta-University

The aspirations of Vest's meta-university can best be achieved over the longer term through the Consortium Sourcing model. This model aligns well with the collaborative, open values of higher education, it can selectively draw on the strengths of the Commercial Sourcing and Institutional Sourcing models when necessary, and it can provide an adaptive resiliency as the needs of members and the world evolve. There can be no single consortium for the myriad needs in higher education. Rather, the Consortium Sourcing model will provide a generalized template for like-minded interests to opt-in to efficiently aggregate demand and coordinate resources to serve the missions of research and education. This is already happening with faculty and students through many formal and informal affiliations. It is already happening with many forms of educational software and content and library resources. Above-campus models for IT services will enable institutions to further align with these trends.

The Commercial Sourcing model will rapidly evolve with refined IaaS, PaaS, and SaaS offers that are suited to many different industries. Individual institutions and aggregated demand via consortia should make skillful use of these large-scale, efficient commercial offers. Likewise, the Institutional Sourcing model will develop in time, as some institutions choose to expand expertise in a specific area and offer related services to partner schools.

Localized and Scaled

Institutional participation in the meta-university will be a voluntary, loosely coupled endeavor of open materials and platforms. This model requires scale in sharing for efficiency, but it also necessitates localized institutional identity for sustained participation. In the past, IT outsourcing focused on homogenization, standardization, and pure efficiencies, with the tension between standardization and localized needs breaking many good intentions. Today's above-campus cloud models are different: they create opportunities to harness economies of scale, on-demand capacity, and ecology of innovation while still enabling localized offerings. These advances, combined with the inherently cooperative nature of higher education, uniquely enable colleges and universities to develop effective Consortium Sourcing arrangements.

From an efficiency standpoint, these Consortium Sourcing arrangements may be particularly applicable to non-core, back-office types of activities where automation, self-service, and scale can unlock vast savings. Yet the collaboration of the evolving meta-university will best enable and enhance those IT services that are critical to research and education – for example, research data sets, the scholarly record, and course materials (particularly in evolving fields). For such services, institutions seek efficiency, but they must also nurture innovation and skills in these areas. The domain for consuming these IT services – or, more properly, these IT-enabled services for scholarship – can no longer be maintained or contained within a single institution. For example, physicists and geneticists around the world compete and collaborate on data, models, and publications that advance collective knowledge. Global warming and

climate change research requires real-time and historical data analysis across institutions, continents, and thousands of automated sensors. Instructional materials are shared via for-fee and open models. In short, the attributes of the Consortium Sourcing model may provide the best long-term fit for higher education institutions' research and teaching needs and their public service missions. For colleges and universities, this model represents a step toward realizing not only Vest's meta-university but also McCarthy's public utility model. Consortia can provision services that are uncompromising in their value for institutional requirements yet flexible enough to meet the breadth of heterogeneity across the academy.

Consortium Sourcing Attributes

For CIOs and campus leaders, three attributes of the Consortium Sourcing model are particularly appealing: (1) efficiency, (2) direction, and (3) leverage. First is *efficiency*: aggregating demand and converting a traditional technology problem into IT service can result in an attractive cost of service. In many cases, the efforts are already under way and governance mechanisms are already in place for existing consortia to add new cloud services. DuraSpace, ETUDES, HathiTrust, JSTOR, Kualu, Moodle, and Sakai are all early exemplars of the *potential* of the Consortium Sourcing model.¹¹

For example, the Kualu Foundation plans to offer a derivative version of the business continuity / disaster recovery software from the University of California, Berkeley as "Kualu Ready" via a SaaS cloud service. The foundation will source initial operations with Berkeley, Indiana University, and the University of British Columbia, but the sourcing could be moved to a commercial provider or other institutions in time. Likewise, HathiTrust was launched with the University of Michigan and Indiana University as the repository operators with full redundancy. In time, it could be provisioned by Amazon or the California Digital Library without having to renegotiate all the upfront work that aggregates member demand, defines the service, and governs its evolution in the HathiTrust consortium. By the end of 2009, HathiTrust will contain more than six million digitized books that are managed within the rules of copyright for each member while also making available, electronically to everyone in the world, almost one million books that are in the public domain. Individually, each institution could have worked on a local, yet fundamentally similar service offering, which ultimately would have duplicated investment – with little unique benefit. The success of HathiTrust illustrates that a consortium may achieve both economic efficiency and the institutions' mission to advance education without compromising the local campus presentation of the services.

The second attribute is *direction*: governance decisions regarding specific investment options will be steered by the values of consortium members. As a relatively small market, higher education has often been challenged by its limited ability to influence offers from a diminishing set of competitors. The academy has a better chance of steering service evolution to reflect the deep values of higher education when it has the means and sufficient influence to do so. Aggregating demand via an opt-in consortium provides a means to ensure that the values of the academy will steer

resource-allocation choices. More important, the Consortium Sourcing model still enables market efficiencies by provisioning services via economically efficient and motivated providers over time.

The third attribute is *leverage*: higher education is developing the skills and know-how to manage at scale by leveraging the combined skills of experts across campuses to solve common problems. Again using HathiTrust as an example, the community is sharing best practices while learning about long-term digital preservation. In Kuali, the community is learning how to build and adapt portable, enterprise-scale systems that are essential to the research and teaching missions. In the absence of combined effort and leveraged skills, higher education leaves itself vulnerable to what economists call “monopolist rents,” which essentially rob the academic treasury in the form of transfer payments made to others in excess of real value.

Speaking personally as CIOs of large, diverse, complex research institutions, the two of us have been involved in many iterations of consortia efforts during the past decade, and we well understand the substantial challenges of sustaining multi-institutional aggregations of effort. However, *it is those very experiences* that give us confidence that the Consortium Sourcing model is both viable and desirable for higher education. Our advocacy of the Consortium Sourcing model for core IT services still affirms that other models may be a better fit for some types of services or even for some core IT services at certain points in time. Likewise, for some IT services, even seemingly pedestrian ones, the Commercial Sourcing model will be more efficient for higher education.

It is our belief that if the Consortium Sourcing model is not developed during the next few years of the early stages of moving to above-campus models, it will be very difficult to develop later. Institutions could find themselves in a position of watching their own internal resources atrophy while paying substantially more for, and potentially locking themselves into, suboptimal solutions designed primarily for the needs of other industries. The ultimate result could very well be limited options and less efficiency for higher education. We believe that broad adoption of this model, which enables a robust platform of IT services (and ultimately content), is the best way to judiciously frame the opportunity for above-campus services. As Vest argued, the emergence of a meta-university of open content and common platforms will “enable, not replace, residential campuses” and will empower the academic missions of education and research.

The Path Forward

As institutions look to a future of above-campus IT services, institutional leaders need an immediate agenda. For 2010, we propose the following actions:

1. *Federated Identity.* High-performance networks, such as Internet2, have connected higher education institutions for collaboration across distance. The immediate next step is for institutions, vendors, consortia, and everyone interacting with higher education to work, with all deliberate speed, to support federated identity and an education trust fabric. Ease of adoption as well as improved integration of above-campus services will benefit greatly from a common means of authentication and authorization to appropriate services. Although there are several meritorious efforts within and beyond higher education, we advocate for swift action in full support of InCommon (<http://incommonfederation.org>). In practical terms, this means that faculty can focus on developing degree programs or course offerings that span multiple institutions without having to worry about the complexities of institutional logins and passwords for each IT service. Local investment to support federated identity will greatly ease opting in (or out) of all above-campus sourcing models.¹²

2. *Consortium Maker.* Institutions differ in the timing of their need to solve campus challenges using information technology. Thus, for IT services that may be best provisioned in the Consortium Sourcing model, higher education needs a simple, lightweight way for like-minded institutions – coalitions of the committed – to come together and create an expansible consortium for a specific IT service issue. It is entirely appropriate to balance risk and reward in these arrangements, so those who take early initiative and larger risks will play a greater role in shaping services and governance. Institutions do not need to – and could not possibly – participate in each and every anticipated consortium. A collective of these partnerships, however, could develop a fabric of services for higher education. Each one would stand on its own economic merits to sustain or adapt over time, but together they would be able to extend, expand upon, and leverage consortium efforts with great efficiency.

What is needed for higher education is something like the Amazon Marketplace (formerly zShops), in which Amazon provides the legal and IT infrastructure for various types of online shops. For higher education, this approach avoids the expensive overhead of creating new legal entities as not-for-profit corporations and of seeking 501(c)(3) tax-exempt status with the IRS. An existing organization – possibly EDUCAUSE, Internet2, Jasig, or Quali – could provide a means for quick-start member collaborations and could serve as the market-maker for like-minded colleges and universities that want to develop a consortium offering. Our view is that fewer legal entities are better than more and that sooner is better than later. Likewise, standardized, template legal agreements for participating in consortia or institutional sourcing of services are needed in order to minimize endless negotiating with each institution.

3. *Staff Development:* Institutional leaders should also rigorously engage in education and work to steer investments to above-campus services when local

resources are insufficient or financial investments cannot achieve economic efficiencies in operation or innovation. This will involve considerable effort and changes in approach with personnel, policy, and strategy as IT services evolve. It is critical that institutions assert a process of career development for their valuable technical staff to aid staff in the transition from exclusively technical experts to solution providers. Technical staff who are comfortable working quickly on local, isolated projects may have trouble adapting to the shared consortia approach. Setting clear direction through training programs to encourage the development of solutions with cloud components will help, as will updating job descriptions to appropriately reflect above-campus IT service skills.

4. *Policy Evolution:* Finally, institutional policies will need to be modified to support the adoption of above-campus solutions. Institutional leaders should work with their technology-transfer offices early to support the adoption of the appropriate licenses for any local web services code that is developed.¹³ Those services could ultimately end up being contributed to a consortium effort, so reducing this burden in advance will allow for faster adoption and partnership later. Institutions will need to streamline procurement processes to more readily assess consortium offerings. This includes modifying RFP processes and decision matrices to balance between legacy purchase models and new service-based solutions.

Conclusion

With the incredible momentum shifting toward information technology being delivered as a service and with the inherent efficiencies in IT aggregation, a discontinuity is coming for campus IT organizations. The development of new models for aggregating above-campus IT services—models driven by sound economics and high-speed digital networks—seems quite certain. Campus leaders can ignore the signs, or they can embrace the opportunity presented by the perfect storm of severe economic challenge, rapid innovation in cloud computing models, and higher education’s unending aspirations toward the greater possibilities envisioned by Vest’s meta-university.

Those of us in higher education have proven, through the many collaborations noted in this article and elsewhere, that we can pool our efforts to create and sustain achievements beyond the reach of any one campus alone. These new solutions represent a step toward the empowering vision of the meta-university. Above-campus IT service offerings will ultimately empower faculty and students to customize, remix, and reuse information for their local needs and will provide staff with access to the latest tools and services developed by the best and the brightest that higher education has to offer. Assertive leadership today can shape the promise of cloud computing using the above-campus service models that will serve higher education now and into the future.

Notes

1. "Future Men and Machines: A Report on the Centennial Talks at M.I.T.," *Technology Review*, vol. 63 (July 1961), pp. 46–48.
2. For more on research and education networks, see Internet2 (<http://internet2.edu>), National LambdaRail (<http://nlr.net>), and Regional Optical Networks (<http://thequilt.net>).
3. Charles M. Vest, "Open Content and the Emerging Global Meta-University," *EDUCAUSE Review*, vol. 41, no. 3 (May/June 2006), p. 30, <<http://www.educause.edu/library/erm0630>>.
4. Toru Iiyoshi and M. S. Vijay Kumar, eds., *Opening Up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge* (Cambridge: MIT Press, 2008), <http://mitpress.mit.edu/opening_up_education>.
5. Vest, "Open Content and the Emerging Global Meta-University," p. 30.
6. For more on institutional IT security and policy, see Brian D. Voss and Peter M. Siegel, "Keeping the Guard Up in a Down Economy: Investing in IT Security in Hard Times," *EDUCAUSE Review*, vol. 44, no. 5 (September/October 2009), pp. 10–23, <<http://www.educause.edu/library/erm0950>>.
7. Lynda M. Applegate, "Eastman Kodak Co.: Managing Information Systems through Strategic Alliances," Harvard Business School, Teaching Note 193-037 (1992; revised, October 9, 1995).
8. "Unlocking the Cloud," *The Economist*, May 28, 2009, <http://www.economist.com/opinion/displaystory.cfm?story_id=13740181>.
9. Milton Friedman, "The Social Responsibility of Business Is to Increase Its Profits," *New York Times Magazine*, September 13, 1970.
10. M. Lynne Markus and Robert I. Benjamin, "The Magic Bullet Theory in IT-Enabled Transformation," *MIT Sloan Management Review*, January 15, 1997, pp. 55–68.
11. Brad Wheeler, "Open Source 2010: Reflections on 2007," *EDUCAUSE Review*, vol. 42, no. 1 (January/February 2007), pp. 48–67.
12. For more on federated identity and InCommon, see Jack Suess and Kevin Morooney, "Identity Management and Trust Services: Foundations for Cloud Computing,"

EDUCAUSE Review, vol. 44, no. 5 (September/October 2009), pp. 24–42,
<<http://www.educause.edu/library/erm0951>>.

13. For more on software licensing and institutional sharing, see Brad Wheeler and Daniel Greenstein, “Open Source Collaboration in Higher Education: Guidelines and Report of the Licensing and Policy Framework Summit for Software Sharing in Higher Education,” March 2007, <<http://hdl.handle.net/2022/3076>>.