UNIVERSITY OF MINNESOTA
BOARD OF REGENTS
Audit Committee
Thursday, December 8, 2011
8:00 - 9:30 a.m.
600 McNamara Alumni Center, East Committee Room

Committee Members
Richard Beeson, Chair
David Larson, Vice Chair
Clyde Allen
Laura Brod
John Frobenius
Maureen Ramirez

Student Representatives
Terrance Paape
James Rook

AGENDA

1. External Auditor Report - M. Volna/K. Vosen/K. Knudtson (pp. 2-26)

2. Compliance Officer Report - L. Zentner (pp. 27-36)

3. Cloud Computing: Realizing its Opportunities Responsibly - B. Gulachek/
   B. Cohen/A. Anders (pp. 37-71)

   Waldemar (pp. 72-75)

5. Information Items - G. Klatt (pp. 76-80)
Audit Committee

December 8, 2011

Agenda Item: External Auditor Report

☐ review  ☐ review/action  ☐ action  ☒ discussion

Presenters: Associate Vice President Michael Volna
            Kirsten Vosen, Audit Partner, Deloitte
            Katie Knudtson, Audit Partner, Deloitte

Purpose:

☐ policy  ☐ background/context  ☒ oversight  ☐ strategic positioning

To present the External Auditor’s opinion on the University of Minnesota’s fiscal year 2011 financial statements and other required audit communications.

Outline of Key Points/Policy Issues:

Discussion of the audit results for the 2011 financial statements, including:

- Auditor’s opinion
- Significant accounting policies
- Accounting estimates
- Audit adjustments
- Other required communications

Background Information:

The Audit Committee oversees external audit engagements on behalf of the Board of Regents. A copy of the 2011 financial statements is available in the Board office.
University of Minnesota
Presentation to the Audit Committee of the Board of Regents
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary financial information</td>
<td>2</td>
</tr>
<tr>
<td>Strengths, challenges and accomplishments of the University</td>
<td>6</td>
</tr>
<tr>
<td>Required communications with the Audit Committee</td>
<td>7</td>
</tr>
<tr>
<td>Communication of peer review results</td>
<td>12</td>
</tr>
<tr>
<td>Information technology control procedures</td>
<td>13</td>
</tr>
<tr>
<td>Summary of other 2011 audit services</td>
<td>14</td>
</tr>
<tr>
<td>Other material written communications</td>
<td>15</td>
</tr>
<tr>
<td>Appendix A</td>
<td>16</td>
</tr>
</tbody>
</table>
Our professional standards require that we communicate with you concerning financial, accounting, and auditing matters that may be of interest to you in fulfilling your oversight fiduciary responsibilities. We have prepared the following comments to assist you in that regard.
Summary financial information

Statements of Net Assets
(In thousands)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current assets</td>
<td>$ 590,555</td>
<td>$ 598,999</td>
<td>$ 611,540</td>
</tr>
<tr>
<td>Noncurrent assets</td>
<td>1,842,770</td>
<td>1,449,016</td>
<td>1,297,454</td>
</tr>
<tr>
<td>Capital assets, net</td>
<td>2,605,072</td>
<td>2,531,864</td>
<td>2,471,421</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>5,038,397</strong></td>
<td><strong>4,579,879</strong></td>
<td><strong>4,380,415</strong></td>
</tr>
<tr>
<td><strong>LIABILITIES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td>$ 428,407</td>
<td>$ 488,549</td>
<td>$ 480,678</td>
</tr>
<tr>
<td>Noncurrent liabilities</td>
<td>148,710</td>
<td>131,617</td>
<td>114,544</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>1,145,419</td>
<td>956,364</td>
<td>953,372</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td><strong>$ 1,722,536</strong></td>
<td><strong>$ 1,576,530</strong></td>
<td><strong>$ 1,548,594</strong></td>
</tr>
<tr>
<td><strong>NET ASSETS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unrestricted</td>
<td>$ 619,983</td>
<td>$ 626,307</td>
<td>$ 562,994</td>
</tr>
<tr>
<td>Restricted-expandable</td>
<td>802,858</td>
<td>512,126</td>
<td>434,643</td>
</tr>
<tr>
<td>Restricted-nonexpendable</td>
<td>253,609</td>
<td>242,541</td>
<td>242,606</td>
</tr>
<tr>
<td>Invested in capital assets, net of related debt</td>
<td><strong>1,639,411</strong></td>
<td><strong>1,622,375</strong></td>
<td><strong>1,691,578</strong></td>
</tr>
<tr>
<td><strong>Total net assets</strong></td>
<td><strong>$ 3,315,861</strong></td>
<td><strong>$ 3,003,349</strong></td>
<td><strong>$ 2,831,821</strong></td>
</tr>
<tr>
<td><strong>Total liabilities and net assets</strong></td>
<td><strong>$ 5,038,397</strong></td>
<td><strong>$ 4,579,879</strong></td>
<td><strong>$ 4,380,415</strong></td>
</tr>
</tbody>
</table>
### Statements of Changes in Net Assets

(In thousands)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating revenues</td>
<td>$ 1,919,060</td>
<td>$ 1,850,356</td>
<td>$ 1,743,287</td>
</tr>
<tr>
<td>Operating expenses</td>
<td>2,886,024</td>
<td>2,900,389</td>
<td>2,902,268</td>
</tr>
<tr>
<td>Operating loss</td>
<td>(966,964)</td>
<td>(1,050,033)</td>
<td>(1,158,961)</td>
</tr>
<tr>
<td>State and federal appropriation</td>
<td>692,716</td>
<td>716,298</td>
<td>730,215</td>
</tr>
<tr>
<td>Net investment income (loss)</td>
<td>160,865</td>
<td>54,801</td>
<td>(285,507)</td>
</tr>
<tr>
<td>Capital appropriations</td>
<td>75,801</td>
<td>96,555</td>
<td>65,913</td>
</tr>
</tbody>
</table>

**INCREASE (DECREASE) IN NET ASSETS**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ 312,512</td>
<td>$ 171,528</td>
<td>(342,059)</td>
</tr>
</tbody>
</table>

### Statements of Cash Flows

(In thousands)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net cash used in operating activities</td>
<td>(847,949)</td>
<td>(850,405)</td>
<td>(964,481)</td>
</tr>
<tr>
<td>Net cash provided by non-capital financing activities</td>
<td>1,027,484</td>
<td>1,066,517</td>
<td>997,089</td>
</tr>
<tr>
<td>Net cash provided by (used in) capital and related financing activities</td>
<td>45,972</td>
<td>(148,008)</td>
<td>(142,439)</td>
</tr>
<tr>
<td>Net cash (used in) provided by investing activities</td>
<td>(97,055)</td>
<td>(103,844)</td>
<td>96,713</td>
</tr>
<tr>
<td>Net increase (decrease) in cash</td>
<td>128,452</td>
<td>(35,740)</td>
<td>(13,118)</td>
</tr>
<tr>
<td>CASH — beginning of the year</td>
<td>290,580</td>
<td>326,320</td>
<td>339,438</td>
</tr>
<tr>
<td>CASH — end of the year</td>
<td>$ 419,032</td>
<td>$ 290,580</td>
<td>$ 326,320</td>
</tr>
</tbody>
</table>

### Enrollment Statistics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate student enrollment</td>
<td>69,000</td>
<td>68,000</td>
<td>67,000</td>
</tr>
</tbody>
</table>
Total revenues

June 30, 2011
- Grants, gifts, and other nonoperating, net, 10%
- Federal and state appropriations, 22%
- Education activities, 4%
- Auxiliary enterprises, net, 11%
- Grants and contracts, 26%
- Student tuition and fees, net, 20%
- Net investment gain, 6%

June 30, 2010
- Grants, gifts, and other nonoperating, net, 11%
- Federal and state appropriations, 24%
- Education activities, 7%
- Auxiliary enterprises, net, 11%
- Grants and contracts, 25%
- Student tuition and fees, net, 20%
- Net investment gain, 2%

June 30, 2009
- Grants, gifts, and other nonoperating, net, 12%
- Federal and state appropriations, 30%
- Education activities, 8%
- Auxiliary enterprises, net, 12%
- Grants and contracts, 27%
- Student tuition and fees, net, 24%
- Net investment (loss), -12%
Strengths, challenges and accomplishments of the University

Strengths of the University
- Ability and commitment to respond to changes, including new accounting pronouncements
- Strong accounting and finance functions
- Strong internal audit function with experienced professionals
- Growth of federal grants and contracts revenue as well as non-governmental grants and contracts revenue to $71.2 million or 10.4%
- Research spending of $625.7 million benefits the entire state of Minnesota
- Diverse revenue base from tuition, state appropriations, federal grants, private gifts, grants, and contracts
- Strong net asset position
- Continued strong bond ratings (ability to generate additional funding)
- Long range capital planning
- Quality – ability to raise tuition and still have enrollment growth and higher academic standards

Challenges faced by the University
- Erosion of public funding
- Rising costs
- Need to continue to support infrastructure (annual depreciation of $163.7 million)
- Retention of key faculty members to maintain national top tier rankings
- Need for continued recruitment and retention of high-quality individuals within the finance, accounting, and IT departments
- Capacity issues are forcing the University to limit the students who can attend the University
- Decentralization
- Systems upgrade

Accomplishments of the University
- Ability to respond to state funding shortfall while increasing graduation rates, increasing retention rates and affecting first year students with increased ACT scores
- Limited litigation exposure
- Minimal unrecorded audit adjustments
- Accounting Services met all significant audit deadlines and appears to have a strong desire to do what is right
- Successful bonding activity, solid bond ratings in the excellent category
- Risk Tolerance working group, including the Audit Committee’s support
Required communications with the Audit Committee

Our Responsibility under Generally Accepted Auditing Standards and Government Auditing Standards

Our engagement letter dated June 6, 2011, described our responsibility under generally accepted auditing standards (GAAS) and Government Auditing Standards (GAS) including:

- To report whether, in our opinion, financial statements are fairly stated in accordance with accounting principles generally accepted in United States of America (GAAP) in all material respects
- That our procedures are not designed specifically to detect fraud
- To consider internal controls and assess control risk to the extent necessary to plan and perform audit procedures rather than to provide assurance on internal controls

We have completed our audit of the consolidated financial statements of the University of Minnesota (the "University") as of and for the year ended June 30, 2011. We have issued an unqualified opinion on the consolidated financial statements of the University.

We believe our audit fulfilled the objectives set forth in our engagement letter.

Internal controls and the management letter

As described in our engagement letter, GAAS requires, among other things, that we obtain a sufficient understanding of the University’s internal controls to enable us to properly plan our audit and to determine the nature, timing, and extent of our audit procedures to be performed.

- We will issue a separate report to you containing our comments on internal controls and certain observations and recommendations on other accounting, administrative, and operating matters. No observations or recommendations represent significant deficiencies or material weaknesses in internal controls.

Significant accounting policies

The University’s significant accounting policies are set forth in Note 1 to the 2011 consolidated financial statements. During the year ended June 30, 2011, there were no significant changes in previously adopted policies or their applications.

Accounting and disclosure requirements for any significant, unusual transactions, and effect of significant accounting policies in controversial or emerging areas

There were no significant accounting and disclosure requirements for any significant, unusual transactions, or effect of significant accounting policies in controversial or emerging areas during the year ended June 30, 2011.
Management judgments, accounting estimates, and key risks

Accounting estimates are an integral part of the consolidated financial statements prepared by management and are based on management’s judgments. Those judgments are normally based on knowledge and experience about past and current events and assumptions about future events.

Our conclusions as to the reasonableness of estimates, as expressed in our auditors’ report, are based upon the testing of management’s estimates and/or the development of an independent expectation of the estimates to corroborate management’s estimates. Significant accounting estimates and key risks reflected in the 2011 consolidated financial statements include the following areas:

**Summary of Accounting Estimates and Key Risks**

- Valuation of investments and cash and cash equivalents
- Interest rate swaps
- Recognition of revenue in the appropriate period
- Information management and communication
- Federal grant compliance

<table>
<thead>
<tr>
<th>Financial Statement Account and 2011 $’s</th>
<th>Audit Procedures</th>
<th>Management’s Assertions</th>
</tr>
</thead>
</table>
| Valuation of investments and cash and cash equivalents (Investments of $1.66 billion ($1.03 billion considered alternative investments) and cash and cash equivalents of $419 million) | • Read the valuations provided by external investment managers and management’s year-end analysis to evaluate how positions are marked to market for a selected sample. Assessed the underlying assumptions used to determine fair value for alternative investment vehicles.  
• Updated our understanding of the University’s investment portfolio and considered investment strategies or products that pose control or financial reporting risks.  
• Understood and documented the oversight and monitoring procedures performed by management when investing in new funds, quarterly and annually.  
• Obtained an understanding of the internal controls over the monitoring of and reporting on ongoing invested funds.  
• Reviewed transactions at or near the balance sheet date which support the valuation of the investment.  
• Independently tested pricing of readily marketable investments.  
• Confirmed directly with external investment managers and requested related audited financial statements as required by American Institute of Certified Public Accountants guidance to verify underlying value of alternative investments for a selected sample. Performed rollforward procedures from audited financial statement date to June 30, 2011 for a selected sample.  
• Compared investment fund returns to standard industry benchmark for a selected sample. | Management has represented that the assumptions used are reflective of management’s intent and ability to carry out specific courses of action and are consistent with the University’s plan and past experiences. Also, management has represented these assumptions and methods used result in a fair value measure appropriate for financial statement disclosure purposes in accordance with GAAP. |
<table>
<thead>
<tr>
<th>Financial Statement Account and 2011 $'s</th>
<th>Audit Procedures</th>
<th>Management's Assertions</th>
</tr>
</thead>
</table>
| Interest rate swaps and long-term debt (Interest rate swaps notional amounts of $145 million and fair value of ($16.9) million) (Long-term debt of $1.15 billion) | • Obtained an understanding of all interest rate swap agreements.  
• Reviewed management's analysis and conclusion on accounting for interest rate swap agreements.  
• Utilized specialists to review the fair value balances of the interest rate swap agreements.  
• Assessed the financial condition of the interest rate swap counterparties.  
• Confirmed long-term debt.  
• Assessed the University's compliance with debt covenants. | Management has represented they have properly accounted for interest rate swap agreements, and that there are no negative financial conditions with any of the interest rate swap counterparties. Further, management has represented that the University is in compliance with all debt covenants as of June 30, 2011. |
| Recognition of revenue in the appropriate period (Student tuition and fees revenue of $634.0 million, net of allowance of $239.1 million) (Grant and contract revenue of $817.0 million) (Other operating revenue of $468.0 million, net of allowance of $12.7 million) | • Reviewed student tuition and fees and other revenue recognition accounting policies and procedures through our testing of internal controls  
• Audited student tuition and fees and other revenues recorded through substantive analytical procedures as well as testing completed within the federal grant compliance audit  
• Reconciled federal grant and contracts revenue with the federal grant compliance audit. | Management has represented that revenues have been recorded at the appropriate amounts and within the appropriate periods. Management has also represented that amounts recorded as federal grant and contracts revenue reconciles to revenues recorded within the federal grant compliance audit. |
| Information management and communication | • Utilized internal IT specialists to test and evaluate the computer-related controls within the business cycles, including revenue, expenditures, and payroll and personnel.  
• Performed internal control procedures around the University's ability to accumulate accurate and reliable information. | Management has represented that they have appropriate IT controls in place to produce accurate and reliable information to generate the consolidated financial statements. |
| Federal grant compliance (Federal and state grants of $1.18 billion) | • Understood compliance regulations applicable to the University's major federal programs as described in the U.S. Office of Management and Budget Circular A-133.  
• Held discussions with management, research leaders, and principal investigators and updated our understanding of procedures in place to comply with federal regulations.  
• Evaluated effort reporting costs charged to government grants in accordance with federal regulations.  
• Coordinated our tests for financial reporting purposes with our tests of compliance with government regulations.  
• Reviewed methodology and calculation used to determine new indirect cost rate used by the University during the current fiscal year. | Management has represented that they have identified the requirements of laws, regulations, and the provisions of contracts and grant agreements that are considered to have a direct and material effect on each federal program as identified in Part 3 of the Compliance Supplement dated March 2011. Also, management has represented that they have made available all information related to federal financial reports and claims for advances and reimbursements, which are supported by the books and records from which the consolidated financial statements have been prepared and are prepared on a basis consistent with that presented in the Schedule of Expenditures of Federal Awards. |
Significant audit adjustments

Our audit was designed to obtain reasonable, rather than absolute, assurance about whether the financial statements are free of material misstatement, whether caused by error or fraud. In addition, we are obligated by GAAS to inform you of any adjustments arising from the audit that could, in our judgment, either individually or in the aggregate, have a significant effect on the University's financial reporting process. A summary of unrecorded audit adjustments was attached as Appendix A to the management representation letter.

There was one unrecorded audit adjustment for the year ended June 30, 2011 included in Appendix A to the management representation letter. This unrecorded audit adjustment is to correct an overstatement of gifts of $5.3M, an overstatement to operating expenses of $5.2M, and an overstatement to cash of $.1M as of June 30, 2011 due to Arboretum agency fund reversal entry impacting revenue and expenses in the incorrect fiscal year. The unrecorded audit adjustments would have resulted in a net decrease in net assets of $.1 million if management had recorded the adjustments.

Capital asset additions were tested using statistical or other sampling techniques and certain errors in recording the capital assets additions as of June 30, 2011 were found in the sample items selected. The mathematical projection of the likely error which results in a potential overstatement of $5.3 million of capital assets as of June 30, 2011, is not included in Appendix A of the management representation letter. Only additional testing and verification would produce a more accurate estimate of the errors within trade receivables and investments. Based on the materiality of the likely error, no additional testing was deemed necessary.

Disagreements with management

There were no disagreements with management during the 2011 audit.

Consultations with other accountants

We are not aware of any consultations that management may have had with other accountants about auditing and accounting matters during the 2011 audit.

Major issues discussed with management prior to retention

There were no financial reporting or accounting issues discussed with management prior to Deloitte & Touche, LLP retention for the 2011 audit.

Difficulties encountered in performing the audit

There were no unusual difficulties encountered in performing the 2011 audit.

Alternative accounting treatments

We had no discussions with the University's management regarding alternative accounting treatments within GAAP for policies and practices, including recognition, measurement, and disclosure considerations related to the accounting for specific transactions, as well as general accounting policies, related to the year ended June 30, 2011.

Other matters

There are no additional matters encountered in performing the 2011 audit.
Other information in documents containing audited financial statements

The audited financial statements are included in the University’s 2011 Annual Report. We read the other information in the University’s 2011 Annual Report and inquired as to the methods and presentation of such information. We did not note any material inconsistencies or material misstatement of fact in the other information.
Communication of peer review results

Under Government Auditing Standards, issued by the Comptroller General of the United States, paragraph 3.62 we are required to provide you with a copy of our most recent peer review. See Appendix A for this review.
Information technology control procedures

- We deployed information technology controls specialists as part of our financial statement audit procedures to test general information technology controls related to the following critical systems:
  - PeopleSoft Campus Solutions
  - PeopleSoft Human Resource Management System
  - PeopleSoft Enterprise Financial Systems

- We performed procedures to gain a detailed understanding of Information Technology (IT) controls related to core areas considered part of the financial audit framework of controls over financial reporting. The areas reviewed were Information Security, Data Center Operations, and System Change Control.

As a result of these procedures:

- We have communicated opportunities for improvement to IT management and will include formal observations and recommendations within those observations and recommendations from the financial statement audit. No observations or recommendations represent significant deficiencies or material weaknesses in internal controls.
Summary of other 2011 audit services

Single audit reports on federal funds

- Testing is focused on Research and Development and Student Financial Assistant, the major federal programs at the University.
- Five additional programs were tested as major programs for the year ended June 30, 2011.
- Audit testing complete. Report issuance planned for December 2011.
  - Passed disclosure item noted related to the omission of required disclosures of sub-recipients in the Scheduled of Expenditures of Federal Awards in accordance with Part 3 of OMB Circular A-133, Subrecipient Monitoring
  - No additional findings noted.
- Federal expenditures for the year ended June 30, 2011 (in thousands):

<table>
<thead>
<tr>
<th>Program</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Development programs</td>
<td>$ 531,000</td>
</tr>
<tr>
<td>Student Financial Assistance programs</td>
<td>492,000</td>
</tr>
<tr>
<td>Other programs</td>
<td>161,000</td>
</tr>
<tr>
<td><strong>Total Federal Expenditures</strong></td>
<td><strong>$ 1,184,000</strong></td>
</tr>
</tbody>
</table>

Minnesota Office of Higher Education examination

In connection with our procedures around the student financial assistance programs within the federal compliance audit, we performed procedures around the examination of the University's compliance with the Minnesota Office of Higher Education Financial Aid Programs requirements. We anticipate issuing our examination report in December 2011.

Student fees agreed-upon procedures

Agreed-upon procedures for fourteen student organizations, accepted and agreed to by the Fees Committee and Office of Student Affairs, to assist in review of financial affairs and accounting records of student organizations. Procedures were performed by Deloitte in November 2011, with anticipated issuance of agreed-upon procedures reports for each student organization in December 2011.

NCAA agreed-upon procedures

Agreed-upon procedures of the accounting records of the University of Minnesota Athletic Department in accordance with the NCAA Constitution. Procedures were performed in August and September 2011, with anticipated issuance of agreed-upon procedures report in December 2011.
Other material written communications

- Written communications that we believe constitute other material written communications between management and us related to the audit for the year ended June 30, 2011, include:
  - Audit engagement letter — previously provided
  - Management representation letter (available upon request)
  - Management letter of recommendation (to be provided at a later date).
Appendix A
Commitment to quality and integrity
2008 Report on Peer Review
To the people, clients, and business associates of Deloitte:

Deloitte’s commitment to quality and integrity is a shared value fundamental to our obligation to serve the public interest and to achieving our vision of being the standard of excellence. Our client service standards, quality control policies and procedures, and ethical principles are designed and implemented to assure that we meet our own performance standards and those of our profession and deliver our services in a professional manner with independence, integrity, objectivity and the highest quality.

Every third year, as part of the profession’s self-regulatory program, we engage another CPA firm to evaluate the quality control system for our accounting and auditing practice as it applies to non-SEC issuers, and to assess our adherence to that system and the quality control standards of the profession. In 2008, Ernst & Young LLP conducted this "peer review" and issued a report with a peer review rating of pass. Ernst & Young’s report is included herein, along with the letter of acceptance from the Center for Public Company Audit Firms Peer Review Committee.

To attain the goal of being the standard of excellence, we live our shared values in the vigilant pursuit of quality. We are committed to a process of continuous improvement so that we may retain and enhance the trust and confidence of our clients and the public.

Sincerely,

Nick Tommasino
Chairman & CEO, Deloitte & Touche LLP
System Review Report

To the Partners of Deloitte & Touche LLP
and the AICPA Center for Public Company Audit Firms Peer Review Committee

We have reviewed the system of quality control for the accounting and auditing practice of Deloitte & Touche LLP (the Firm) applicable to non-SEC issuers in effect for the year ended March 31, 2008. Our peer review was conducted in accordance with the Standards for Performing and Reporting on Peer Reviews established by the Peer Review Board of the American Institute of Certified Public Accountants. The Firm is responsible for designing a system of quality control and complying with it to provide the Firm with reasonable assurance of performing and reporting in conformity with applicable professional standards in all material respects. Our responsibility is to express an opinion on the design of the system of quality control and the Firm’s compliance therewith based on our review. The nature, objectives, scope, limitations of, and the procedures performed in a System Review are described in the standards at www.aicpa.org/prsummary.

As required by the standards, engagements selected for review included engagements performed under the Government Auditing Standards, audits of employee benefit plans, and audits performed under FDICIA.

In our opinion, the system of quality control for the accounting and auditing practice applicable to non-SEC issuers of Deloitte & Touche LLP in effect for the year ended March 31, 2008 has been suitably designed and complied with to provide the Firm with reasonable assurance of performing and reporting in conformity with applicable professional standards in all material respects. Firms can receive a rating of pass, pass with deficiency(ies) or fail. Deloitte & Touche LLP has received a peer review rating of pass.

Ernst & Young LLP

December 3, 2008
December 11, 2008

Nick Tommasino, CPA
Deloitte & Touche LLP
1633 Broadway, 38th Floor
New York, NY 10019

Dear Mr. Tommasino:

It is my pleasure to notify you that on December 11, 2008, the Center for Public Company Audit Firms Peer Review Committee accepted the report on the most recent system review of your firm. The due date for your next review is September 30, 2011. This is the date by which all review documents should be completed and submitted to the administering entity.

As you know, the report had a peer review rating of pass. The Committee asked me to convey its congratulations to the firm.

Sincerely,

[Signature]

James W. Brackens, Jr.
Vice President -
Firm Quality & Practice Monitoring

cc: Robert Michael Rohweder, CPA

Firm Number: 10016352

Review Number: 264503
Ethical Principles: Guiding Our People

These principles are a result of close collaboration between DTT's global ethics and compliance officer, DTT's global independence leader, and senior partners from member firms around the world. They offer guidance to our professionals on the global and local levels and address matters of professional conduct, including confidentiality, competence, and leadership. Our ethical principles include:

Honesty and integrity — We act with honesty and integrity.
- We are straightforward and honest in our professional and business relationships.
- We are truthful about the services we provide, the knowledge we possess, and the experience we have gained.

Professional behavior — We operate within the letter and the spirit of applicable laws.
- We comply with professional standards and applicable laws and regulations.
- We avoid any action that may discredit our firms or our professions.
- We strive not only to do what is legal, but also what is right.

Competence — We bring appropriate skills and capabilities to every client assignment.
- We understand that the public and our clients expect our work to meet high professional standards.
- We use due care to ensure that client needs are matched with Deloitte personnel who have the competence required for their assignments.

Objectivity — We are objective in forming our professional opinions and the advice we give.
- We do not allow bias, conflict of interest, or undue influence of others to override our professional judgments.
- We address differences of opinion and handle them constructively and professionally.

Confidentiality — We respect the confidentiality of information.
- We prohibit disclosure of information to anyone inside or outside our firms without the legal or professional right to know.
- We do not misuse information of our clients, our firms, or our people for personal advantage or for the benefit of third parties.

Fair business practices — We are committed to fair business practices.
- We receive fees that reflect the value of services provided and responsibilities assumed, and are considered fair and reasonable by our clients.
- We respect our competitors and do not compete unfairly.

Responsibility to society — We recognize and respect the impact we have on the world around us.
- We take our role in society seriously and do not cause intentional harm.
- We support contributions to the communities where we operate.

Respect and fair treatment — We treat all our colleagues with respect, courtesy, and fairness.
- We understand the impact that our individual behavior has on our firms, our colleagues, and society, and always work to take responsible action.
- We encourage and value the diverse mix of people, viewpoints, talents, and experiences found at Deloitte.
- We are fair in our behavior and our policies promote equal opportunity for all.

Accountability and decision-making — We lead by example, using our shared values as our foundation.
- We recognize that we are role models and that we set behavioral standards for our professions and each other.
- We make decisions based on our shared values and expect our leaders and colleagues to do the same.
- Integrity
- Outstanding value to markets and clients
- Commitment to each other
- Strength from cultural diversity
Audit Committee
December 8, 2011

**Agenda Item:** Compliance Officer Report

☐ review  ☐ review/action  ☐ action  ☒ discussion

**Presenters:** Lynn Zentner, Director
Office of Institutional Compliance

**Purpose:**

☐ policy  ☐ background/context  ☒ oversight  ☐ strategic positioning

This presentation provides the Audit Committee with information on the activities of the Office of Institutional Compliance to help the Committee carry out its oversight responsibilities for the University's compliance program.

**Outline of Key Points/Policy Issues:**

The Institutional Compliance Officer will provide the Committee with a summary of the most significant compliance-related risks identified since her June 2011 report to the Audit Committee, and current compliance-related initiatives, focusing on the following issues: evaluation of the institutional compliance program, regulatory changes affecting the conflict of interest program, addressing compliance challenges associated with University activities abroad, and UReport.

**Background Information:**

The Institutional Compliance officer regularly reports on the institutional compliance program at least twice each year.
INTRODUCTION
This report provides: (1) a summary of the efforts currently being undertaken to evaluate the University’s Compliance Program; (2) a summary of the significant provisions of the revised conflict of interest regulation issued by the Public Health Service (PHS) in August; and (3) an update on the efforts undertaken to identify a vendor which has the capability of providing a range of compliance-related services to the University in connection with research and other academic initiatives conducted outside the United States.

Information regarding the University’s Compliance Program is available at http://www.compliance.umn.edu/complianceHome.htm.

THE COMPLIANCE FOCUS DURING THE PAST SIX MONTHS

I. Evaluation of the Compliance Program

Recently, during a meeting of the Executive Oversight Compliance Committee (EOCC), a group of seven senior executives who oversee the implementation of Compliance Program initiatives, a decision was made to evaluate the University’s Compliance Program. When the Compliance Program was launched in the Office of Institutional Compliance (OIC) in 2002, the work of OIC was entirely focused on developing the infrastructure for and implementing a University-wide compliance program. Today, OIC operates four programs: the University-wide Compliance Program, the University-wide Conflict of Interest Program, the University Policy Program, and the Delegations Program.

At the time the Compliance Program was created, former University President Mark Yudof and several senior executives examined the Federal Sentencing Guidelines (the Guidelines) as a potential model for the Program’s infrastructure. It may seem unusual that an institution of higher education would adopt a compliance infrastructure informed by guidelines used for federal sentencing purposes. However, at the time OIC was created, there was relatively little formal guidance for corporations and institutions of higher education interested in developing compliance programs. Although the University is not required to comply with the Guidelines, those involved with the development of the Program several years ago incorporated a number of key aspects of the Guidelines in establishing its infrastructure. Those key features include the following:

• Risk identification and assessment
• Identification of responsible parties
• Standards and procedures
• Program oversight
• Awareness, education and training
• Lines of communication
• Monitoring and auditing
• Enforcement
• Corrective action

In addition to reviewing and considering information regarding the appropriate model(s) to adopt going forward, the EOCC has reviewed the following:

• The Director’s Position Description;
• A slide presentation former Director Tom Schumacher made to this Committee in 2003;
• A slide presentation former Director Tom Schumacher made to senior executives in 2004;
• A summary of current OIC activities and the Director’s participation on several University compliance-related committees; and
• Information obtained from telephone interviews of Compliance Officers at the University of Texas at Austin, the University of California at Berkley, the University of California System, and New York University.

Among the issues to be addressed during this evaluation process are the following:

• Should the Compliance Program’s infrastructure continue to be premised on a number of key aspects of the Guidelines or are there other models to consider?

• Are there other compliance infrastructure models that ought to be considered? If so, what are they and what value might they bring?

• Are there other models that, while not providing a program infrastructure, might supplement the current features of the University’s Program? An example might be the Enterprise Risk Management system which involves a process of identifying risks
inherent in a particular type of organization and determining the likelihood of occurrence and the magnitude of impact.

- Has there been value in adding other programs to OIC? Do the three additional programs (the University-wide Conflict of Interest Program, the University Policy Program, and the Delegations Program) complement the overall compliance initiative and, if so, in what way? Do any of the three add challenges that need to be considered?

- What are other institutions of higher education doing with respect to the implementation of their compliance programs that might have value for the University?

The EOCC will meet again in December and January to examine other compliance model(s) or compliance-related supplementary systems, the role of the compliance program, and the role of the Director that best meet the needs of the University going forward. The EOCC will forward its recommendations to President Kaler.

II. Conflicts of Interest Program

   A. The Revised Conflict of Interest Rule Adopted by the Public Health Service

The Public Health Service (PHS) issued regulations in 1995 to govern financial conflicts of interest and promote objectivity in research. Concluding that the landscape involving relationships among research institutions and the private section have become increasingly complex, PHS recently issued amended regulations. The final rule was issued on August 25, 2011 and its provisions become effective no later than August 24, 2012. The revised regulations apply to all institutions and investigators that apply for or receive PHS-funded grants with a Notice of Award issue date after August 24, 2012.

The Rule has 18 provisions that require incorporation into the University’s current policies and approaches to conflict of interest identification, review and management. The significant question to be addressed is whether to apply the new provisions University-wide or limit the application to those who are involved in PHS Sponsored Research. It is estimated that approximately 1600 University faculty and staff are currently engaged in PHS sponsored research, either in connection with prime contracts or subcontracts. These individuals are impacted by the new rule. Some of the new provisions can easily be incorporated into current University policies and practices but others will add burden to our current system of conflict of interest review. It is anticipated that the National Science Foundation will also issue a conflict of interest rule.
PHS agencies include:

- Administration for Children & Families
- Administration on Aging
- Agency for Healthcare Research & Quality
- Centers for Disease Control and Prevention
- Center for Medicare & Medicaid Services
- Federal Occupational Health
- Food and Drug Administration
- Health Resources & Services Administration
- Indian Health Service
- NIH
- Substance Abuse and Mental Health Services Administration

The most significant provisions of the revised rule are described below:

1. Financial interests (remuneration and equity) that equal or exceed $5,000 are deemed to be “significant financial interests” that require disclosure to the institution. The previous threshold was $10,000.

2. The financial interests that do not need to be disclosed are significantly narrower than the University’s approach to this issue. The new rule excludes:
   a. Income from seminars, lectures or teaching engagements and service on review panels for a federal, state, or local government agency, an institution of higher education, an academic teaching hospital, a medical center, or a research institute affiliated with an institution of higher education.
   b. Income from investment funds and retirement accounts as long as the investigator doesn’t control investment decisions.

3. Investigators are required to report reimbursed travel or sponsored travel. Interestingly, there is no requirement to report the dollar value of the reimbursed or sponsored travel. Rather, the individual is required to report only the purpose of the trip, the identity of the sponsor/organizer, the destination, and duration of the trip.
PHS leaves to the institution the determination regarding how to apply this information to a conflict of interest review, if at all. This information need not be reported, however, if sponsored or reimbursed travel is provided under the excluded circumstances described in paragraph 2 above.

4. The rule imposes expanded reporting requirements on institutions of higher education when a determination has been made that a conflict of interest exists. In the past, an institution was required to provide the PHS agency with the name of the individual, the name of the research project, and confirmation that the conflict is being managed. The new rule requires substantial detail regarding the nature of the conflict and how the conflict will be managed. The University’s approach to preparing conflict management plans contains all of the detail the new rule requires. It is anticipated that our management plans or a shortened version of them will now be submitted to PHS whenever a determination has been made that a conflict of interest exists involving an individual involved in PHS sponsored research.

5. The rule requires institutions to submit mitigation plans to the appropriate PHS agency whenever a financial conflict of interest is not timely identified or managed either because an investigator did not disclose his or her financial interests or the institution failed to identify a conflict. When these circumstances occur, PHS requires the institution to:

   a. conduct a retrospective review within 120 days of the date on which the circumstances are identified,

   b. determine whether there was bias in the design, conduct, or reporting of the research,

   c. prepare a report of its findings, and

   d. if bias is found, submit a mitigation report to PHS.

6. The institution must take reasonable steps to ensure that any subrecipient investigator complies with the PHS rule. A written agreement must be entered into between the prime institution and the subrecipient institution which reflects whether the conflict of interest policies of the prime institution or the subrecipient institution will apply to the subrecipient. A subrecipient’s policy will apply only if the subrecipient certifies that its conflict of interest policy complies with the PHS rule.

7. The institution must make information regarding identified financial conflicts of interest publicly accessible via either a public website or by a written response to
any requestor within five business days of a request. The information to be disclosed includes:

a. the investigator’s name, title and role on the research,
b. the name of the entity in which the significant financial interest is held,
c. the nature of the significant financing interest, and
d. the approximate value of the significant financial interest in dollar ranges or a statement that the value cannot be readily determined.

8. The revised rule also sets forth several remedies that may be imposed for investigator non-compliance.

The Executive Oversight Compliance Committee met on November 17 and reviewed the several provisions of the revised rule. It was the consensus of this Committee that a recommendation be made to President Kaler that the revised rule apply only to investigators involved in PHS funded research and that it not have University-wide application.

B. Compliance With the Mandatory Conflict of Interest Training Requirement

When the University adopted revised individual conflicts of interest policies in October 2010 and June 2011, it included a mandatory training requirement and an on-line training module was created. All individuals required to file a REPA were notified at the time the REPA season began in February 2011 that they must also complete conflict of interest training. Despite multiple follow-up efforts by Conflict of Interest Program staff, only 60% of those individuals who are required to file a REPA have completed the training. In comparison, the University has achieved 99% compliance with REPA filing. Further efforts will need to be undertaken to achieve a substantially higher level of compliance with this policy requirement.

III. Conducting Research and Other University-related Activities Abroad

The Director has previously reported on efforts undertaken over the past few years by Global Programs and Strategy Alliance (GPS Alliance) (formerly the Office of International Programs) and the Employment Outside the United States Working Group convened by the Office of Human Resources in an effort to address the business-related challenges that arise when the University conducts research and other academic initiatives outside the United States. Some of those challenges include:

• Hiring, compensating, and providing benefits to individuals working outside the United States;
• Determining the foreign legal requirements that apply to overseas activities and the options available for complying with those requirements;
• Addressing tax implications for both the University and individuals in connection with foreign and U.S. tax laws;
• Responding to insurance needs and requirements;
• Leasing real property and vehicles; and
• Accessing banking services.

In June of this year, the Director reported that a decision had been made to develop an RFP to identify prospective vendors capable of providing a variety of compliance-related services in an international context. The RFP was issued during the summer by GPS Alliance and an RFP Committee has been convened. Six vendors submitted bids and three finalists have been invited to campus in December. Assuming at least one of the vendors offers an effective program that will meet the University’s needs and, at the same time, be cost effective, it is anticipated that a vendor will be selected early in 2012. The funding source for this initiative has not yet been defined.

I. UREPORT

Ureport is the University’s confidential web-based reporting service. This reporting service is provided by EthicsPoint, an independent company that provides similar services for hundreds of companies and universities. Ureport is intended to be used to report violations of local, state and federal law as well as violations of University policy. This reporting system is not intended to be used for employment concerns that do not involve legal or policy violations or that involve purely student concerns, or issues for which the University is not responsible. Reporters may submit reports either via a hotline or the web. Reports may also be submitted anonymously. Those who submit reports are expected to report good faith concerns and are expected to be truthful and cooperative in the University's investigation of allegations.

Ureport has been in existence at the University since 2005. Since its inception, a total of 810 reports have been submitted. To date, in 2011, 120 reports have been submitted. Ninety percent of the reports submitted during this calendar year have been anonymous. Ninety-one percent of the reports are received via the internet. Only 53% of anonymous reporters checked back to determine the status of the follow up conducted regarding the concerns they have described. The graphs below illustrate these figures.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Running Total</th>
<th>Year to date (11/21/2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Reports</td>
<td>810</td>
<td>120</td>
</tr>
<tr>
<td>Report Sources:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>86%</td>
<td>91%</td>
</tr>
<tr>
<td>Call Center</td>
<td>13%</td>
<td>9%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>% Anonymous</td>
<td>74%</td>
<td>80%</td>
</tr>
<tr>
<td>Reporter “check back rate” for anonymous reports</td>
<td>49%</td>
<td>53%</td>
</tr>
</tbody>
</table>

It is interesting to note that the year-over-year trends for these statistics have been remarkably stable. As the total number of reports rises or falls, so do the characteristic statistics for the reporters. These data are displayed in the graph below.

Employment allegations continue to be the largest category of reports submitted. In the past six years, the percentage of reports received in the employment category has ranged from 29% to 46%. The chart below shows that 2007 registered the greatest number of employment allegations as well as total reports due to the AFSCME strike.
Hotline Reports 1/1/2006 - 11/21/2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Reports</th>
<th>Employment Allegations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>130</td>
<td>28%</td>
</tr>
<tr>
<td>2007</td>
<td>140</td>
<td>46%</td>
</tr>
<tr>
<td>2008</td>
<td>130</td>
<td>37%</td>
</tr>
<tr>
<td>2009</td>
<td>130</td>
<td>41%</td>
</tr>
<tr>
<td>2010</td>
<td>140</td>
<td>38%</td>
</tr>
<tr>
<td>2011 (not a full year)</td>
<td>140</td>
<td>41%</td>
</tr>
</tbody>
</table>
Audit Committee

December 8, 2011

Agenda Item: Cloud Computing: Realizing Its Opportunities Responsibly

☐ review  ☐ review/action  ☐ action  ☒ discussion

Presenters: Bernard Gulachek, Senior Director, Strategy Management, Office of Information Technology
Bradley A. Cohen, Director, Collaborative for Academic Technology Innovation, Office of Information Technology
Abram Anders, Assistant Professor of Business Communications, University of Minnesota Duluth

Purpose:

☐ policy  ☒ background/context  ☒ oversight  ☐ strategic positioning

Cloud computing has matured dramatically in recent years, and the University of Minnesota’s engagement with cloud services is rapidly expanding. This session will provide an opportunity for members of the Audit Committee to become acquainted with current practice and emerging trends and issues around the use of cloud resources.

Outline of Key Points/Policy Issues:

The discussion will:
Raise awareness of cloud use, trends and opportunities regarding academic and research environments;
Note policy concerns and risk management needs around data management, purchasing, and legal implications;
Identify connections between the cloud, mobile computing and social networking.
Background Information:

The following material is provided to further inform Committee members on cloud technology and its import to higher education.

1. **Seven Things You Should Know About Cloud Computing** (EduCause, 2009) offers a nice and very brief high level introduction to the cloud and implications for higher education.


3. **Colleges Unite to Drive Down Costs of Cloud Computing** (The Chronicle of Higher Education, October 2011) offers a snapshot of where some of the major action is right now in higher education and some of the choices we, as an institution and as individual practitioners, need to make.

4. **Seven Things You Should Know About Personal Learning Environments**, (EduCause, 2009) and

5. **Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems** (EduCause Center for Applied Research, 2008) focus on personal learning environments. With respect to teaching and learning, and increasingly, research and engagement, the cloud offers alternatives to, and augmentations for, existing common good applications that are available directly to individuals to mix and match in whatever ways best suit them. This raises complex questions for us as an institution regarding policies, services, and more.
THINGS YOU SHOULD KNOW ABOUT...
CLOUD COMPUTING

Scenario
William is the CIO at a medium-sized liberal arts college. Like the rest of the institution, the IT department is a relatively lean operation, with a modest budget that in large part is devoted to covering operational costs. When the time comes to replace an aging e-mail system, the college conducts a careful evaluation of several external providers of e-mail services and pilots one of the options. Despite his concerns about issues including security and privacy, in the end William supports sourcing student e-mail from “the cloud,” knowing that the new service will be operational quickly and that the support and reliability that the provider offers exceed what his budget would allow for a system developed—or at least maintained—in-house.

When the physics department requests a suite of expensive, complex software, William knows he needs to investigate his options. The costs are considerable, and William does not have the expertise on his staff to adequately maintain the software, which requires specialized knowledge and frequent updates. A large university in another state is a recognized leader in the subfield for which this application is used, and William negotiates an arrangement in which that university hosts and maintains the software, which is accessed over the Internet. William’s college only pays for actual usage, saving costs overall and allowing William to accurately track IT budget dollars and the IT staff to focus on activities that better match their skills.

For the spring semester, the chair of the economics department organizes an international summit, which will bring hundreds of attendees to the campus for four days of high-profile meetings. For conference sessions, the presenters need reliable connectivity and access to remote resources, and most of the event will be webcast for those unable to attend. The summit’s IT needs exceed the college’s capacity, and William understands that the consequences of an IT failure in such a public venue would be considerable, for the faculty member who organized it and for the college as well. In the weeks leading up to the event, William and his staff purchase IT infrastructure from the cloud. The arrangement calls for specified levels of service, even through the spikes and troughs of demand during the summit. Without having to invest scarce capital dollars in campus IT services, William is able to provide robust, reliable IT functions for the event, and after the summit ends, the college reduces its capacity for IT services to a more typical level.

1 What is it?
In its broadest usage, the term cloud computing refers to the delivery of scalable IT resources over the Internet, as opposed to hosting and operating those resources locally, such as on a college or university network. Those resources can include applications and services, as well as the infrastructure on which they operate. By deploying IT infrastructure and services over the network, an organization can purchase these resources on an as-needed basis and avoid the capital costs of software and hardware. With cloud computing, IT capacity can be adjusted quickly and easily to accommodate changes in demand. While remotely hosted, managed services have long been a part of the IT landscape, a heightened interest in cloud computing is being fueled by ubiquitous networks, maturing standards, the rise of hardware and software virtualization, and the push to make IT costs variable and transparent.

2 Who’s doing it?
Cloud and cloud-like solutions appear to be widespread and growing in higher education, though in relatively focused areas, such as student e-mail. E-mail notwithstanding, higher education institutions are more likely to obtain new services from the cloud than to transition established services that have long been operated by the campus. Many colleges and universities see pockets of cloud service usage in other areas, often led by individual faculty or students looking for the added flexibility and convenience that the cloud can provide. Among the drivers that are encouraging more institutions to contemplate cloud services are budget pressures, calls for increased reliability of and access to IT systems, and the need for institutions to provide timely access to the latest IT functionality.

3 How does it work?
In traditional enterprise computing, IT departments forecast demand for applications and capacity and invest time and money to develop those resources in-house or purchase them from others and operate them in-house. With cloud computing, institutions procure IT services from remote providers, and campus constituents access these resources over the Internet. E-mail, for example, long considered a staple of an institution’s IT operations, can be obtained from a range of sources, and a growing number of campuses contract with outside suppliers for this function. Software is hosted by the provider and does not need to be installed—or maintained—on individual computers around campus. In some cases, a large university or a consortium might become a provider of cloud services. Storage and processing needs can also be met by the cloud. Institutions pay only for the resources used, and users can access the applications and files they need from virtually any Internet-
connected computer. In a mature cloud computing environment, institutions would be able to add new IT services or respond to changes in capacity on the fly, saving capital costs that can be redirected to programs of strategic value to the institution.

4 Why is it significant?
Cloud computing presents IT organizations with a fundamentally different model of operation, one that takes advantage of the maturity of web applications and networks and the rising interoperability of computing systems to provide IT services. Cloud providers specialize in particular applications and services, and this expertise allows them to efficiently manage upgrades and maintenance, backups, disaster recovery, and failover functions. As a result, consumers of cloud services may see increased reliability, even as costs decline due to economies of scale and other production factors. With cloud computing, organizations can monitor current needs and make on-the-fly adjustments to increase or decrease capacity, accommodating spikes in demand without paying for unused capacity during slower times. Aside from the potential to lower costs, colleges and universities gain the flexibility of being able to respond quickly to requests for new services by purchasing them from the cloud. Cloud computing encourages IT organizations and providers to increase standardization of protocols and processes so that the many pieces of the cloud computing model can interoperate properly and efficiently. Cloud computing’s scalability is another key benefit to higher education, particularly for research projects that require vast amounts of storage or processing capacity for a limited time. Some companies have built data centers near sources of renewable energy, such as wind farms and hydroelectric facilities, and cloud computing affords access to these providers of “green IT.” Finally, cloud computing allows college and university IT providers to make IT costs transparent and thus match consumption of IT services to those who pay for such services.

5 What are the downsides?
Cloud computing introduces significant concerns about privacy, security, data integrity, intellectual property management, audit trails, and other issues. Because higher education is subject not only to institutional policies but also to a broad range of state and federal regulations, these issues are complex and become even more difficult in the context of inter-institutional cloud initiatives. Because of the control that consumers of cloud services cede to providers, successful initiatives rely on a high degree of trust between a college or university and a supplier, including confidence in the provider’s long-term viability.

6 Where is it going?
The emergence of cloud computing as a viable option for a growing number of IT services speaks to a level of Internet penetration and infrastructure maturity that did not exist just a few years ago. Analysts expect cloud computing to see mainstream adoption in 2–5 years, and some higher education IT leaders believe that cloud computing programs on campus will increase considerably in the coming years. To the extent that these efforts are successful, confidence in the model and trust in providers will grow, and institutions will be more amenable to transferring a larger number of services to the cloud. Conversely, a breach of trust by a cloud provider would likely leave institutions uneasy about cloud services.

Although the benefits of cloud computing are becoming more tangible, significant policy and technology issues must still be sorted out for it to reach its potential. Even as “public” clouds are being developed, a new class of “private” clouds is taking shape. Whereas public cloud providers offer relatively undifferentiated services, private clouds pursue similar economies of scale but do so while preserving the ability to customize applications and services for consumers. Large organizations, such as statewide offices for higher education, for instance, might invest in cloud services for all the institutions in the system. As greater numbers of campuses consider cloud computing, services that have institutional identification or integration needs are less likely to be sourced from the cloud, and a heterogeneous mix of services—some from the public cloud, others from private clouds, still others developed in-house or purchased and customized—is likely to characterize most institutional IT portfolios.

7 What are the implications for higher education?
Colleges and universities are expected to provide a wide and growing array of technology services, some of which are highly specialized or idiosyncratic to individual campuses, whereas others simply need to be available. By offering commodity services over the Internet, cloud computing offers one way for institutions to increase operational efficiency and focus scarce resources on services that are institutional differentiators. Operating in a cloud environment requires IT leaders and staff to develop different skills, such as managing contracts, overseeing integration between in-house and outsourced services, and mastering a different model of IT budgets. Cloud services might facilitate inter-institutional collaboration because they are more easily accessed by students and faculty at disparate institutions. In addition, despite the potential security risks posed by cloud services, some would argue that cloud services offer more security than on-campus solutions, given the complexity of mounting an effective IT security effort at the institutional level.

EDUCAUSE is a nonprofit membership association created to support those who lead, manage, and use information technology to benefit higher education. A comprehensive range of resources and activities is available to all EDUCAUSE members. The association’s strategic directions include focus in four areas: Teaching and Learning; Managing the Enterprise; E-Research and E-Scholarship; and the Evolving Role of IT and Leadership. For more information, visit educause.edu.
Overview

The concept of a site as we know it will change.
—Ben Rushlo, Keynote Systems

A thorough review of the burgeoning (or perhaps billowing!) literature on cloud computing leaves one simultaneously excited and confused. Excitement and confusion are common companions for information technologists who are confronted regularly with things that are new, things that promise to transform, and things with ambiguous names! Our review of this early literature does conclude that, despite the hype, cloud computing is different and is important.

This ECAR research bulletin is the first in a series of bulletins devoted to cloud computing in higher education. It summarizes insights and a framework for thinking about cloud computing, and it touches on potential emergent roles for public and private clouds. The findings draw from interviews in the spring of 2009 with industry and university information technology (IT) leaders, a review of current literature, and a synthesis of recent research from the EDUCAUSE Center for Applied Research (ECAR).

Highlights of Cloud Computing

The literature on cloud computing suffers from hype and divergent definitions and viewpoints. One report by McKinsey & Company uncovered 22 distinct definitions of cloud computing. For this research bulletin, we will use the Gartner, Inc., definition of cloud computing as “a style of computing where massively scaleable IT-enabled capabilities are delivered ‘as a service’ to external customers using Internet technologies.”\(^1\) McKinsey & Company presents a typology of software-as-a-service (SaaS) that elaborates the Gartner definition and is characterized by:

- **Delivery Platforms**
  - *Managed hosting*—contracting with hosting providers to host or manage an infrastructure (for example, IBM, OpSource)
  - *Cloud computing*—using an on-demand cloud-based infrastructure to deploy an infrastructure or applications (for example, Amazon Elastic Cloud)

- **Development Platforms**
  - *Cloud computing*—using an on-demand cloud-based development environment to provide a general purpose programming language (for example, Bungee Labs, Coghead)

- **Application-Led Platforms**
  - *SaaS applications*—using platforms of popular SaaS applications to develop and deploy application (for example, Salesforce.com, NetSuite, Cisco-WebEx)\(^2\)
In addition to being ill-defined, cloud computing is emergent. In its 2008 hype cycle, Gartner characterizes cloud computing as a technology that is moving up toward the peak of inflated expectations. That said, Gartner predicts that by 2011, early technology adopters “will forgo capital expenditures and instead purchase 40% of their IT infrastructure as a service.” Gartner analyst Daryl Plummer and his colleagues go on to conclude that “the perception of infrastructure as something that must be bought, housed, and managed has changed. Companies are now seriously considering alternatives that treat the infrastructure as a service rather than an asset and that care less where the infrastructure is located and who manages it.”

The analyst literature generally agrees with the Gartner assessment above that cloud computing will achieve mainstream adoption in a 2–5 year time frame. Again, this estimate reflects the generally inclusive definitions of cloud computing. The definitions often include things like basic web services, service-oriented business applications, SaaS, virtualization, and even managed hosting—technologies that are themselves at differing levels of maturity. Already by 2008, among commercial firms (N = 857), 35% of IT software budgets (about 10% of total IT expenditures) are spent on subscription, on-demand, transaction-based, advertisement-funded, or other nontraditional forms of software acquisition. Finally, the literature asserts that cloud computing is different and it is important.

**What Is Different About the Cloud?**

Information technologists—particularly those in higher education—are skeptical about hype. After all, haven’t we all seen, heard of, tried, used, or continued to use service bureaus, application hosts, grids, and other sourcing techniques? So what is different about the cloud?

The first key difference is technical: the maturity of standards throughout the stack, the widespread availability of high-performance network capacity, and emergence and diffusion of virtualization technologies are combining to enrich the sourcing options at our disposal. Markets are different. Consumers are different. And the economic climate has changed.

The generation raised on broadband connections, Google search, and a Facebook community is likely to embrace the idea of cloud-based services in their enterprise roles, just as they embrace them in their private lives. Such users, who are driving the rising sales of netbooks, are likely to fuel the drive toward lower-cost and lightweight computing clients and web-delivered, open-source operating systems and applications. According to Gartner, “The consumerization of IT is an ongoing process that further defines the reality that users are making consumer-oriented decisions before [they make] IT department-oriented decisions.”

The failure of the enterprise IT organization to socialize this insight might lead to the evolution of “accidental” IT architectures and to a “struggle to shut down user-introduced technologies or to accommodate them in a secure and predictable fashion.” The consumerization of IT along with the emergence of SaaS and other web-based services options will drive the movement of enterprise services both “above” the campus in the form of high-end resources able to replace traditional premises-based services, and “below” the campus in a multitude of commodity tools and environments directly available to users.
At the same time, the current financial crisis and the focus on managing IT costs and return on investment are driving commercial enterprises to move swiftly. The top-two trends identified by 56% of 857 respondents to McKinsey & Company’s 2008 enterprise software survey were SaaS and web services/SOA. Budget cuts in higher education are likely to accelerate explorations of sourcing alternatives.

Finally, recognizing these technical, generational-consumer, and enterprise economic trends, developer communities and system integrators are shifting away from established software vendors, and the established vendors are working to “cloud-enable” their products.7

**Big Switches and Permeable Walls**

McKinsey & Company suggests that “using clouds for computing tasks promises a revolution in IT similar to the birth of the web and e-commerce.”8 Burton Group concludes that “IT is finally catching up with the Internet by extending the enterprise outside of the traditional data center walls.”9 Writers like Nicholas Carr argue that a so-called “Big Switch” is ahead, wherein a great many infrastructure, application, and support tasks now operated by enterprises will be handled by very-large-scale, highly standardized counterpart activities delivered over the Internet.

The prospect of a maturing cloud of on-demand infrastructure, application, and support services is important as a possible means of

- driving down the capital and total costs of IT in higher education;
- facilitating the transparent matching of IT demand, costs, and funding;
- scaling IT;
- fostering further IT standardization;
- accelerating time to market by reducing IT supply bottlenecks;
- countering or channeling the ad hoc consumerization of enterprise IT services;
- increasing access to scarce IT talent;
- creating a pathway to a five-9s and 24 × 7 × 365 environment;10
- enabling the sourcing of cycles and storage powered by renewable energy; and
- increasing interoperability between disjointed technologies between and within institutions.

Commercial enthusiasm for cloud computing tends to cluster around agility, economics, and the size of the in-house IT organization. One interviewee we spoke with drove home the ease of deployment (agility) argument vividly: “If you are Flowers.com and your steady state business is punctuated by massive demand spikes on Valentine’s Day, Easter, and Mother’s Day, access to public cloud services represents a great opportunity to grow your IT infrastructure quickly during times of peak demand. This use of cloud services solves a very real business problem in a very cost-effective manner.”
Public Clouds and Private Clouds

Public clouds appear to be organized around site factors like those mentioned, and, not surprisingly, massive centers like those operated by Google and Amazon are located close to hydroelectric facilities or other renewable energy sources and exploit tax preferences, facility scale, access to networking, and the like. Public clouds are profit-driven and are most effective with those services that are highly commodified. If an IT service can be offered in a standardized fashion without special regard to end user variations, or to local, state, regional, or even national regulatory differences, then that service can be offered as an undifferentiated commodity service—presumably at a great price. In such a case, the dominant legal principle is likely to be *caveat emptor*—buyer beware—backed by standard contract language shielding the provider from any significant liabilities for process failures or data corruption and loss. Public clouds do offer more highly differentiated services, such as hosting e-mail applications. If, however, such a service either differentiates the institution, or is highly integrated with things that differentiate the institution, the benefits of scale or the capacity to use software as a differentiator may be blunted in a cloud context.

In cases where an IT activity adds unique value or is situated in a unique institutional or industry setting, private clouds are likely to emerge. Private clouds exploit a portion of the potential to cut IT costs by promoting asset consolidation through virtualization. Even more, private clouds make it possible in theory for enterprise IT providers to let go of more complex, risky, idiosyncratic, and value-laden IT activities. Massive organizations such as the U.S. Department of Defense are investing in private cloud technologies and deployments that have the potential to consolidate, integrate, and harmonize disparate IT operations from the Pentagon, military suppliers, military branches (and their academic academies), and so forth.

Thinking systematically about the factors of commodification and the strength and location of regulation and control might help colleges and universities navigate the evolving public and private cloudscape (see Figure 1). In the illustration below, “local” is shorthand for “folks like us” rather than simply “people down the street.” This illustration tries to communicate the idea that computing clouds over the long term will need to cover institutions that are subject to similar regulation and control. For example, all community colleges in California are subject to California law and to the policies of the California Community College System. It might be that a CCCS cloud would make sense. Computing clouds leverage scale economies, while regulatory variation tends to offset or negate scale economies.

“Regional” is used below to describe situations in which a regional service base, or a common regulatory tie, is shared by multiple institutions within a geographic region, e.g., “We serve Nebraskans!” In these instances, organizations such as CENIC, Merit, or NYSERNET might oversee cloud services for disparate institutions that share geographic commonalities.

“Public clouds” are cloud service providers, such as IBM, Amazon, or Google, that take all comers for a given service. “Private clouds” are built to serve organizations tied together by common purposes and needs. Such clouds might be governed by the organizations themselves.
The factors in the services sourcing decision are clearly more complex than represented here. That said, a discussion in higher education of these factors is important. Early sourcing decisions in higher education may be moving to public cloud offerings due to the lack of private alternatives and to the advertising-based subsidies some can provide. These factors may skew decision making in ways that will pose challenges downstream.

Finally, it is important to note that many institutions are already sourcing services above campus, if not technically in a cloud computing fashion (see Table 1), though these services are often limited in scope.

Table 1. Forms of Alternative Sourcing Currently in Use (N = 309)

<table>
<thead>
<tr>
<th>Form</th>
<th>Percentage Adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application software via the Internet (SaaS)</td>
<td>49.8%</td>
</tr>
<tr>
<td>Third-party-provided ERP project management</td>
<td>19.1%</td>
</tr>
<tr>
<td>Third-party-provided network design</td>
<td>18.8%</td>
</tr>
<tr>
<td>Third-party-operated help desk (e.g., call center)</td>
<td>14.2%</td>
</tr>
<tr>
<td>Third-party-managed network operations</td>
<td>9.4%</td>
</tr>
<tr>
<td>Internet or cloud-based servers</td>
<td>9.1%</td>
</tr>
<tr>
<td>Internet or cloud-based storage</td>
<td>7.8%</td>
</tr>
<tr>
<td>Primary data center provided by a third party</td>
<td>7.4%</td>
</tr>
<tr>
<td>Third-party-provided desktop computing support</td>
<td>7.1%</td>
</tr>
<tr>
<td>Internet or cloud-based security applications</td>
<td>4.5%</td>
</tr>
<tr>
<td>Internet or cloud-based software development environments</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

What It Means to Higher Education

The challenges and risks that will constrain higher education’s adoption of cloud computing relate to trust, confidence, and surety. As Burton Group analyst Drue Reeves points out, “Building an IT organization’s confidence in a solution requires a combination of consistent performance, verifiable results, service guarantees, transparency, and plans for contingencies.”11 Clearly most cloud services do not have the track record on which one can build the necessary trust to shift existing services without either great deliberation or a very compelling benefit. These service and provider attributes only come with time, reputation, and experience. Compounding these challenges, most IT organizations in higher education are not themselves highly skilled in managing risk and service performance in third parties. In the commercial sector, lack of confidence in the cloud stems from

- poor or nonexistent service level agreements;
- inadequate risk management;
- ROI justification, management of change orders, and vendor lock-in;
- market immaturity, and
- management issues.

In higher education, the issues tend to be the same, though the magnitude of concern is amplified by the additional burdens of public trust placed on institutions that serve in loco parentis for students and that conduct patient care, research on human subjects, and so forth. Among respondents to a November 2008 ECAR survey, two-thirds of those who outsource cited their institutional culture as a real barrier to adopting alternative sourcing approaches. Of those who outsource, nearly three-quarters (72.1%) cited concerns about IT security, and more than half (58.7%) indicated that concerns about regulatory compliance will limit their adoption of these emerging service offerings (see Figure 2). As one participant in our spring 2009 interviews expressed it, “We need to have an honest discussion of the control and privacy issues. State and federal law make these concerns real, but these policy issues can be resolved technically and architecturally. Unless we commit to study these issues, we won’t be motivated to move services to the cloud.”
At this stage in the development of cloud computing, several important conclusions for higher education can be drawn:

1. **Cloud computing shows great promise, but that promise is accompanied by tremendous hype.** This review of the literature and concurrent widespread discussions with IT leaders suggest that despite the hype, cloud computing is an important development on a par with the shift from mainframe to client-server based computing. As Michael King of IBM put it in our interviews, “We have commoditized hardware and software. The question now is how do you drive down the cost of IT? It is a fundamental shift.”

Notwithstanding the near unanimous belief that cloud computing is an important enabler of a fundamental shift in the organization and economics in enterprise IT, the (non-hyperbolic) literature and the discussion with community leaders also make clear that at present the topic is mired in hype and near-utopian optimism. While a shift to above-campus computing may be inevitable, and while planning and experimentation should begin now, it is clear that the higher education IT community needs guidance and that many pitfalls will be encountered in the road ahead. As Scott Siddall, formerly of Kenyon College, argued, “We need to take a magnifying lens to the cloud. This whole topic needs to be stripped clean of hype.” In addition to needing to see through the hype, members of higher education’s IT community will need to take care to acknowledge than not all clouds are the same. As
Internet2’s Doug Van Houweling put it, “Different clouds have different implications for the weather. We have not yet learned enough about these different clouds.”

2. **Policy and control issues will slow cloud adoption in higher education.** Among a great many issues related to adopting a cloud computing approach to delivering services, policy and control issues seem paramount. These issues run the gamut from audit to process management, to IT governance, to regulatory compliance, to IT security, and to the management of and accountability for access management, privacy, e-discovery, and protection of research results. Both the literature and discussions make clear that while the issues are substantial, improved understanding of these risks will shift the preference of many IT owners and regulators over time away from the costs and inconsistency of on-premise IT and toward the auditable and highly professional practices cloud service provides as this market matures.

3. **Above-campus services will have real costs, and an honest accounting needs to be done.** The people who participated in this discussion believe that public and private cloud services will come to market quickly but that the uptake of these services within higher education will occur relatively more slowly and unevenly. Further, the pace and evenness of adoption will depend on the length and depth of the current economic downturn. Participants also overwhelmingly agreed that the shift to above-campus computing is presently being influenced by subsidies from providers that exploit advertising or other revenue sources. The shift to above-campus services in the long term will need to be based on both a realistic assessment of the limits of alternative funding and a full and honest accounting of the costs of in-house enterprise IT activities. Services provisioned above campus will have a real financial cost, and they will be consumed (or not) in part based on a real comparison of these costs with the full accounting and opportunity costs of self-operation.

4. **Different classes of computing activity will move to the cloud at different rates of speed.** Discussants distinguished between three classes of computing capabilities: (1) services for campuses that overlap services provided commercially (like e-mail, VoIP telephone); (2) applications that campuses need to run for their institutions (ERP), and (3) research work that exhibits scale economies at the application level. The first area is very likely to grow and perhaps grow quickly. The second area has particularly strong policy, process, and control needs and is therefore likely to shift slowly, if at all. The third area is already highly virtualized (grids, remote instrumentation, supercomputing, etc.) and is likely to become increasingly virtualized.

5. **There is a good deal of consensus around which services might be candidates for sourcing above campus.** Participants in the discussion of higher education cloud services identified candidate services for delivery above campus. Entries to this list were not evaluated in terms of their degree of difficulty to source off premises. This topic deserves further treatment:

- Business availability/disaster recovery
- Computer labs for students
- Computing cycles
Cooperative (library) collection development
- Desktop support
- Data storage
- E-mail
- ERP
- Identity services
- IT help desk (Tier 1)
- Telephony

6. Many organizations and firms are exploring becoming providers of cloud services. A number of higher education organizations are engaged in discussions, plans, and actions that might position themselves as cloud service providers. These include large universities and university systems like Carnegie Mellon University, Indiana University, the University of California, North Carolina State University, and others, as well as national organizations such as EDUCAUSE, Internet2, the Kuali Foundation, the Quilt, the CampusEAI Consortium, and regional organizations such as the Regional Optical Networks.

7. New services will move above campuses before older self-operated services. The literature and higher education experts agree that the migration to cloud-based services is likely to occur more rapidly when a service is new or where demand for an existing service is new. Migrating mature services to meet existing demand will lag.

8. If the institution does not create a cloud strategy, it may inherit an “accidental strategy” formed around consumer choice. Consumer adoption of cloud services is creating a situation where the “cloudification” of institutional services will take place with or without institutional leadership. Like Gandhi, CIOs may need to run to catch up to their users if they are to remain IT’s leader in the enterprise.\textsuperscript{12}

Key Questions to Ask

- In what ways is our institution positioned to transition from self-operated to (the appropriate) cloud computing services?
- Are our processes and our data subject to considerable regulation?
- How local (institutional policy, state law or regulation, national) is that regulation?
- How institution-specific is the activity or service we want to consider performing using cloud services?
- How well does our institution tolerate risk?
Where to Learn More


- Gens, Frank. “Clouds and Beyond: Positioning for the Next 20 Years in Enterprise IT.” Presentation by Senior VP and Chief Analyst, IDC, March 5, 2009, San Jose, CA.


Acknowledgments

Thanks to the members of the NITLE Summit on Envisioning Transinstitutional Work; the Colorado Higher Education Computing Organization; John Bielec, CIO, Drexel University; Anjli Chopra, Executive Director, CampusEAI Consortium; Ted Dodds, CIO, University of British Columbia; Jim Dolgonas, President, CENIC; Deborah Elias-Smith, General Manager, SunGard Higher Education; David Ernst, CIO, University of California Office of the President; Jerry Gruchow, CIO, MIT; Michael King, General Manager, IBM; Clifford Lynch, Executive Director, Coalition for Networked Information; Scott Siddall, Managing Partner, The Longsight Group LLC; Don Spicer, CIO, University of Maryland System; Paul Strassman, Director of Defense Information, U.S. Department of Defense and Distinguished Professor, George Mason University; Doug Van Houweling, President, Internet2; and Brad Wheeler, CIO, Indiana University.

Endnotes


5. Plummer, Gartner’s Top Predictions for IT Organizations and Users, 12.


7. Interest in cloud computing has become so widespread that on September 9, 2009, Jim Lehrer devoted nine minutes of the PBS NewsHour to a segment on how cloud computing could transform the Internet. See http://www.pbs.org/newshour/video/module.html?mod=0&pkg=9072009&seg=5.


10. Five 9s and 24 × 7 × 365 are measures of IT system availability. Five 9s refers to uptime (of a computer or network) of 99.999% of the time; 24 × 7 × 365 refers to the availability of a system, a network, or a service 24 hours a day, 7 days a week, 365 days per year.


About the Authors

Richard N. Katz (rkatz@educause.edu) is Vice President of EDUCAUSE and founding Director of the EDUCAUSE Center for Applied Research. Philip J. Goldstein (philgoldstein@goldsteinassoc.com) is a Fellow of the EDUCAUSE Center for Applied Research. Ronald Yanosky (ryanosky@educause.edu) is Deputy Director and Senior Fellow of the EDUCAUSE Center for Applied Research.

Copyright

Copyright 2009 EDUCAUSE and Richard N. Katz, Philip J. Goldstein, and Ronald Yanosky. All rights reserved. This ECAR research bulletin is proprietary and intended for use only by subscribers. Reproduction, or distribution of ECAR research bulletins to those not formally affiliated with the subscribing organization, is strictly prohibited unless prior permission is granted by EDUCAUSE and the author.

Citation for This Work

Colleges Unite to Drive Down Cost of 'Cloud Computing'

As professors' demand for Web-based services grows, institutional group buying may keep them from going rogue

Meg Whitman, newly named chief of Hewlett-Packard, made a live video announcement this month that the company will join Internet2 to offer high-end computing, through the Web, to colleges.

By Jeffrey R. Young

In one of her first public appearances as chief executive of Hewlett-Packard this month, Meg Whitman beamed in by videoconference to a meeting of college technology leaders to announce the company's participation in what colleges are calling a "community cloud"—a pool of high-performance computers that researchers can tap into online, as needed, from any participating campus.

The officials who stood gazing up at Ms. Whitman, a former gubernatorial candidate in California and eBay executive, call the community cloud a new era of campus technology, and a new way to negotiate deals with tech giants like HP. The big idea: Colleges can collectively bargain with technology companies to establish more campus-friendly terms and prices than any one college could get on its own. In this case, the broker for the deal was Internet2, a nonprofit consortium with some 235 college members.

The group also announced a jointly brokered deal with a company that offers online file-stORAGE lockers, and says it is in talks with other tech companies as well.

Group bargaining for technology has been tried before, but it has sometimes faced resistance or just fizzled out. Colleges have typically asserted that each campus is unique and can't use a boilerplate contract negotiated with other institutions. At least a few colleges reportedly feel that way about the HP deal. But now many campus IT leaders say that putting computing services online seems a natural fit for group purchasing, and that the cost savings can be substantial. These "cloud services"—accessed over the Internet from outside providers far away—don't require colleges to build expensive, customized facilities on their campuses, and they can be turned on or off at the click of a mouse.

One factor putting pressure on colleges to sign such deals is a growing trend of "rogue" technology on campuses. Professors are striking out on their own and using clouds even if campuses don't approve them The academics find free or low-cost consumer services online to support their research and teaching.

They're setting up class blogs on free platforms like WordPress, storing their research data on online file systems such as Dropbox, or forwarding their official campus e-mail to a free account from Google.

That raises legal and security issues, and makes it more difficult for a college to provide central technical support. Officials at one college described a popular free file-storage system as "like Swiss cheese as far as the number of security holes." And colleges are obligated by law to protect information about students.

But some college CIO's figure that if they can't beat these professors, they should join them.

I've seen firsthand the temptation to bring a free consumer service into the classroom (more on that in a minute), and The Chronicle hosts a blog, called ProfHacker, where professors share tips on the latest technologies to become more productive.
Now that the idea of "the cloud" has shifted from buzzword to reality, the question for campus leaders is, Who should control these online services? By banding together, colleges hope to better shape how the services influence campus life.

**Few Clouds Over Campus**

Compared with other industries, colleges have been slow to adopt cloud services on an institutional level, according to Kenneth C. Green, founding director of the Campus Computing Project, an annual survey of college IT directors. Only 15 percent of campuses surveyed last year said they had a strategic plan for cloud computing, and Mr. Green does not expect a sharp rise in that percentage in this year's survey, which will be released this week.

That could change, though, with Internet2's new effort to broker deals like the one with HP. The consortium says it is in discussions with several other big technology companies as well, as part of a project it is calling Internet2 Net+ Services.

Meanwhile, the College Solutions Group, a group of college technology directors, is leading closed-door talks with major tech companies, including Microsoft, to develop a jointly negotiated contract for colleges to buy cloud e-mail services for their campuses. While hundreds of colleges have signed on with either Microsoft or Google for free or low-cost e-mail for students in recent years, most have had to bargain solo, each one reinventing the wheel (and getting different deals, depending on their size and prestige).

From a technology company's point of view, colleges can be difficult customers. It's not always clear which officials on any given campus make the final decision on expensive contracts. And colleges want to be treated differently from business customers (the "My campus is unique" issue again). Yet for a company like HP, all of higher education represents a tiny portion of its overall business.

But when it comes to cloud computing, campuses have an unusual advantage over customers in other sectors: fast local networks. Internet2 has spent the past 15 years building one of the country's zippiest data networks, which makes getting to a Web-based service seamless.

Several companies answered Internet2's call to work with the consortium to sell at once to many campuses that are easy to serve.

That was the case for Box, a company that, like HP, has signed up to offer cloud services through Internet2. It provides users with online folders to store and share files, instead of e-mailing them or passing flash drives back and forth. Colleges that buy the service through Internet2 can give everyone on their campuses a file folder, which users can access with their existing college logins and passwords. The company's service is similar to Dropbox, which is popular among professors and students. But Box's leaders say their system offers more tools to extend the service institutionwide.

The virtual folders will cost small colleges (those with up to 10,000 accounts) about $27,000 per year and the largest (up to 200,000 accounts) about $350,000 per year. Officials say that represents a discount, but it also involves contract terms, tailored to colleges, that the company does not offer through its standard sales channel.

The answer is in the fine print of the contract. Internet2 leaders say their key interest in the deal was not just the price but also the willingness of Box officials to update their service to better protect student data, as colleges are legally required to do under federal student-privacy law.

Cost is also a big factor, of course, and such bulk-negotiated deals could help reduce costs for some services that a college already offers, says Bradley C. Wheeler, chief information officer at Indiana University at Bloomington, which purchased the Box service through the Internet2-brokered contract.
"The cost footprint for operating higher education is unsustainable for this decade, period," he told me recently. "Our price points and markets are not going to sustain our cost structure as far as an industry."

As his language suggests, Mr. Wheeler is also a business professor, and he has studied cases in other industries where businesses have aggregated their buying power. He is now putting theories he has taught in the classroom into action.

The challenge for colleges, of course, is keeping up with all the new Web-based services that some professors will want to use.

Some, including Jim Groom, an instructional-technology specialist at the University of Mary Washington, have argued that free Web tools should serve as substitutes for institutionally provided tools, such as the course-management system sold by Blackboard. He even coined a term for it a few years back: "edupunk," in reference to the do-it-yourself ethos of punk rock.

I have been one of those professors who played out of bounds. I teach a journalism course at the University of Maryland at College Park as an adjunct, and I set up a class Web site using Google's free blog service, which students in the course are invited to join so they can post their multimedia assignments.

Although the university does provide a system to turn in multimedia assignments, called iTunesU, some students had found it hard to use.

But I also experienced the downside of using a free consumer service. Last semester, on the week that final projects were due, Google's blog service suffered an outage that temporarily removed some posts and prevented the addition of others. What's worse, it appeared that some assignments uploaded that week had vanished.

Frantic e-mails began pouring in from students.

After about 20 hours, Google restored the service and the posts. No real harm was done, but it amped up the stress during finals week.

Sure, a university-sanctioned service, too, could crash, but at least we could have called someone on the campus for help.

If the university had set up a deal with Box, the arrangement might have worked better as a way for students to submit assignments. But new services emerge in the consumer marketplace far faster than colleges typically negotiate deals.

Mr. Wheeler argues that group buying can help colleges move faster too. He says the deal with Box was negotiated in just 62 days.

Campus CIO's have been debating just how far they can—or should—go in collaborating on IT cloud services, via an online forum run by the education-technology group Educause, in a discussion called "our chessboard."

That exchange is scheduled to continue this week at a session at the group's annual meeting, in Philadelphia.

So stay tuned, as the strategic battle for the cloud continues.
7 things you should know about...

Personal Learning Environments

Scenario

For the fall semester, David signed up for a digital photography course, and during the first class, he was assigned to a critique group with four other students. The professor explained that students would be creating personal learning environments—exploring free applications and networking sites, sharing what they learn with each other, and submitting work for feedback from those in the critique group. Each week students were to photograph something in a public venue and upload the photos to a website where the group could view them, critique and discuss the images, and blog about what they learned. David enjoyed looking through the blogs of his fellow students and subscribed to the RSS feeds of his favorites so he would know when each was updated.

David found the feedback from his in-class critique group so useful in improving his photography that he created an open group in Flickr for his growing collection, inviting the wider photo community to comment on his work. During a zoo trip, he photographed a llama that looked oddly taken aback. Everyone smiled at the comic expression, but the image was a chance shot with hasty framing, so his in-class group suggested cropping and minor clean-up work. Then he asked his group on Flickr to suggest titles, from which he chose his favorite, “Whoa, Dude.” He later sold the photograph to a newspaper editor who had seen it on Flickr. It ran with an article about an upcoming music festival at the zoo.

The final course assignment was a joint photojournalism exercise for the class. Students were to cover the local Trout Day Parade along the riverfront, where floats and costumes took an aquatic theme and the river offered a consistent backdrop. Images would accompany a brief article or interview to be posted on student blog sites. One student compiled the articles and ran the text through Wordle, posting the resulting word collage. Two other students used the collage as a background and pasted all the class photos on top. When the completed group project was published online, several images received outside recognition. Students gathered those comments for Wordle, too, using the result as a sidebar for a page of final reflections on the course.

The following semester, when David submitted some of his work for a fine arts student fellowship, he felt confident about his submission, having integrated input from his group at Flickr, which now included several of his former classmates.

What is it?

The term personal learning environment (PLE) describes the tools, communities, and services that constitute the individual educational platforms learners use to direct their own learning and pursue educational goals. A PLE is frequently contrasted with a learning management system in that an LMS tends to be course-centric, whereas a PLE is learner-centric. At the same time, a PLE may or may not intersect with an institutional LMS, and individuals might integrate components of an LMS into the educational environments that they construct for themselves. A typical PLE, for example, might incorporate blogs where students comment on what they are learning, and their posts may reflect information drawn from across the web—on sites like YouTube or in RSS feeds from news agencies. While most discussions of PLEs focus on online environments, the term encompasses the entire set of resources that a learner uses to answer questions, provide context, and illustrate processes. As used here, the term refers not to a specific service or application but rather to an idea of how individuals approach the task of learning.

Who is doing it?

In the United Kingdom, a team at the University of Bolton developed the PLEX application to provide students with a platform for easy, coherent access to networks of people and resources. At the University of Mary Washington in Virginia, students and faculty use UMV Blogs, a WordPress multiserver publishing platform customized by the university to offer flexible web spaces where students present their work, share ideas, and collaborate on projects. The system is flexible enough to allow students to present internally developed content side by side with work they cultivate and maintain elsewhere on the web. Similar approaches have been used at Baylor University, Penn State, and the University of British Columbia. Educators who want to encourage an approach to learning in which students create PLEs might offer a site where students can house their personal reflections and digital content, return to it, share it, and repurpose it in other tools. Instructors might also invite students to explore freely available stand-alone services like StumbleUpon, Flickr, YouTube, and other venues that let users store and share information and connect to peers and their collections of resources.
How does it work?
On campuses that formally support PLEs, instructors or institutions generally provide a framework for student study. This framework might be a desktop application or a web-based service and could include links to web tools, as well as traditional research and resources to which students can add their own network of social contacts and collection of educational resources. Students are encouraged to draw upon these networks and collections of external resources, using them as tools for discovery in an effort to expand their learning experiences beyond campus boundaries. As ideas are generated, problems queried, and content created in this environment, feedback becomes the combined output of peers, colleagues, and friends as well as experts and critics. The result becomes a PLE when the integration of resources starts to include the work and voice of others as readily as a student’s own critical reflection and scholarly work.

Why is it significant?
PLEs represent a shift away from the model in which students consume information through independent channels such as the library, a textbook, or an LMS, moving instead to a model where students draw connections from a growing matrix of resources that they select and organize. In this context, the PLE functions as an extension of the historical model of individual research. Because they emphasize relationships, PLEs can promote authentic learning by incorporating expert feedback into learning activities and resources. A PLE also puts students in charge of their own learning processes, challenging them to reflect on the tools and resources that help them learn best. By design, a PLE is created from self-direction, and therefore the responsibility for organization—and thereby for learning—rests with the learner.

What are the downsides?
Personal learning environment is an evolving term, one without a single, widely accepted definition. Even as defined here, the concept remains somewhat amorphous, made up of disparate resources—including people—often beyond the boundaries of the institution or the user, that can come and go, creating a lack of continuity. For academics, a simple reference to sources may not be enough in such an environment, as data can easily disappear. As a learning platform that is by definition always evolving, a PLE requires students to engage in ongoing decision making to maintain, organize, and grow their learning environments. The process of self-directed learning requires a degree of self-awareness, and it must be given time to mature. Some students, however, may have never taken the time to think about their own metacognition or to reflect on how they learn best. These less experienced students may not be ready for the responsibility that comes with building and managing a PLE. Furthermore, despite their ability to quickly learn new online tools and computer applications, many students lack the information fluency necessary to recognize when a writer speaks from authority, for example, or when a narrative is opinion. While the PLE offers the opportunity to sharpen these skills, instructors may find it useful to discuss the hallmarks of a well-thought-out argument and to underscore caution in accepting “facts” presented by peers and anonymous posters.

Where is it going?
The PLE is a result of the evolution of Web 2.0 and its influence on the educational process. As such, the concept is likely to become a fixture in educational theory, engendering widespread acknowledgment of its value, both of its framework and of its components. Scholars might find it important to maintain web updates on their own scholarship as new findings are posted elsewhere. Students will find themselves increasingly working collaboratively and relying on their network of contacts for information. As a result, students will probably more quickly develop the skill to sort the authoritative from the noise. A few institutions may continue developing campus-specific solutions for PLEs, such as customizable portals or dashboards that help students organize their research and resources and post their reflections. Yet because so much institutional involvement conflicts with the philosophy of a PLE, many educators may prefer to use free applications like iGoogle and My Yahoo!, which offer adequate platforms for learner-centric PLEs. As increased mobile access shifts the technological landscape, the PLE may represent our acknowledgment of the need to organize and present the tools, resources, and gateways that scholars use on a regular basis so that they are available with instant access from any location.

What are the implications for teaching and learning?
The concept of the PLE marks a fundamental change in the role resources (people and media) play in teaching and learning. In an environment where information is ubiquitous and needs only to be located, there is a greater premium on skills that support fast and accurate access to information and on the ability to assess that information. In this regard, teaching is less a matter of data transmission and more a collaborative exercise in collection, orchestration, remixing, and integration of data into knowledge building. The goal for the student shifts from a need to collect information to a need to draw connections from it—to acquire it, disseminate it, and collaborate in its use. Furthermore, the use of PLEs may herald a greater emphasis on the role that metacognition plays in learning, enabling students to actively consider and reflect upon the specific tools and resources that lead to a deeper engagement with content to facilitate their learning.
Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems

Niall Sclater, Open University
Overview

There is growing awareness in higher education of student levels of engagement in Web 2.0 environments, in contrast to their engagement in the learning management systems (LMSs) hosted by their institutions. Social networking sites, blogs, and wikis offer students unprecedented opportunities to create and share content and to interact with others. These sites are used regularly by the majority of students¹ and provide possibilities for customization and a sense of ownership currently impossible in LMSs. Lecturers increasingly complain of the distractions caused by the dynamic and compelling social networking sites their students use during lectures.

By contrast, it has not gone unnoticed that even the term learning management system suggests disempowerment—an attempt to manage and control the activities of the student by the university. There are various questions at this time for faculty and university information technology staff who believe in the benefits of e-learning and need to decide whether their LMS remains an appropriate medium in which to facilitate it:

- Can we bring some of the social networking facilities that students find so appealing inside the institution?
- Should we use tools hosted elsewhere on the Internet by others?
- Should we simply allow learners to select appropriate tools for themselves?

The communication features of LMSs are poorly utilized in most institutions, the LMSs being used primarily as storage facilities for lecture notes and PowerPoint presentations. LMSs tend to restrict students to content designed for a particular course and to interactions solely with participants in that course. Stephen Powell suggested in his blog thoughts mostly about learning (http://www.stephenp.net/) on June 14, 2006, that using LMSs in this way may consequently promote a culture of dependency rather than autonomy for our students. The shortcomings of LMSs may, however, have as much to do with institutions’ lack of understanding about how to facilitate learning with them as with the inadequacies of the systems themselves.

This research bulletin details the arguments emerging in the blogosphere and elsewhere both for and against the LMS.² It examines whether the LMS is destined to continue as the primary means of organizing the online learning experience for university students. The bulletin is a companion to an earlier ECAR research bulletin that examines the factors leading to the selection of the open source learning management system at the Open University in the United Kingdom.³

Highlights of Web 2.0, Personal Learning Environments, and LMSs

Most learners are entering universities with increasing experience of the online world and competence in using social software in their leisure (or professional) activities. It has been suggested that learning providers cannot hope to compete with the developments that are happening so rapidly elsewhere on the Internet and that students will
consequently find LMSs and the tools within them inferior to those they are already using freely on the Internet—both in their look and feel and in the amount of functionality offered.

There is continual pressure on college and university computing service departments to make available familiar open source tools such as MediaWiki (the wiki system behind Wikipedia) and WordPress (a popular blogging system). These tools are feature-rich and already in use by many faculty who are often highly technically literate, visionary, influential, and prepared to make their opinions known widely in the blogosphere and elsewhere. They point out that the facilities in the LMS are more limited, and they either use these tools freely on the Internet or ask why the institution does not simply provide these systems for teaching and learning alongside the LMS. Even when the institution agrees to host such facilities, it can take a frustrating amount of time for the software to be installed, customized, and integrated with existing systems, and its use may be restricted in ways deemed unsatisfactory to teachers.

LMSs are relatively inflexible systems, with the standard organizational unit being the “course”—a term inappropriate for the hierarchy of faculties, departments, subject areas, programs, courses, modules, and other organizational concepts found in educational institutions. The Open University of the Netherlands, for example, does not have cohorts of students with fixed start and end dates and therefore has problems with a conventional LMS organized on this basis. Meanwhile, universities wishing to provide courses jointly with other institutions or businesses may find the license restrictions of commercial LMSs to be an impediment.

Rather than being minor irritations, the features of LMSs may overtly or subtly align the institutional processes with the software rather than having the systems serve the requirements of the institution. An alternative but equally damning criticism of LMSs is made by Martin Weller in his blog The Ed Techie (http://nogoodreason.typepad.co.uk/) on September 4, 2007. Weller believes that when LMSs are adapted and integrated with institutional systems they may end up embodying institutional practices, stifling the innovation encouraged by the use of more rapidly evolving Web 2.0 systems.

**Personal Learning Environments**

Much of the debate regarding the shortcomings of LMSs is taking place in the blogosphere, and a good deal of it centers around the concept of a personal learning environment (PLE). Proponents of PLEs agree that there is a need to harness the power of a range of tools, services, and content outside of the institution that learners can use during their studies. The movement diverges in three distinct directions, however, when it comes to the implementation of a PLE. The first group argues that client software can be developed to mediate between the learner and the many resources and facilities on the Internet. A second group, which includes initiatives such as Elgg (http://www.elgg.org/), is attempting to achieve this by providing sophisticated web servers and enabling participation by learners via their web browsers without additional software. Finally, some people argue that PLEs are essentially here already and that many online learners already make effective and customized use of a range of online facilities.
The PLE as Client Software

One motivation for developing tailored PLE client software is that if students are to take ownership over their learning they must own the software that manages it; the software should not sit on a server controlled by an institution. A second argument for this approach is that until we have near-ubiquitous online access, many students will sometimes find it necessary to learn from their computers or mobile devices without being connected to the Internet. The system cannot, therefore, be solely based on a web browser with assumed Internet access. One vision of the PLE comprises a piece of coordinating software seen by the learner that interacts through web services with a variety of educational tools and data sources inside a service oriented architecture.7

The client PLE group argues that open source PLEs will emerge, as will vendor products, and that learners will be able to download the PLE of their choice. To deal with the issue of how PLEs interact with institutional systems, Derek Morrison suggested in his blog on June 2, 2006, that the learner may request that his or her PLE “docks with a VLE [virtual learning environment] mother ship” every so often to refuel—that is, to bring in content and submit its own to the wider world. A student learning with more than one provider would be able to dock his or her PLE into other institutional “mother ships” as appropriate.

A PLE of Multiple Externally Hosted Systems

An argument is increasingly being voiced that institutions should no longer try to provide e-learning facilities for their students and should instead tap into free resources on the Internet. In a blog entry on October 6, 2006, (http://remoteaccess.typepad.com/remote_access/2006/10/small_pieces_ve.html), Clarence Fischer reports on the use of different systems for blogs, wikis, podcasts, instant messaging, e-mail, and photo sharing with his students. The multiple systems accessed through a web browser PLE model encourage learners to draw the best from every environment. They also arguably reduce the institutional risk of a single point-of-failure, where a crucial system such as the LMS or authentication system going down can mean that all student-facing systems are inaccessible. However, Fisher has serious concerns about this approach because his students are required to remember multiple URLs, usernames, passwords, and user interfaces. It is clearly not a robust or scalable solution for larger institutions, particularly where students are paying for services and the systems are critical in the assessment process.

Online facilities such as Elgg provide blogs, wikis, and other facilities for self-organized groups of students and avoid the problems of tools distributed across multiple sites. Elgg bears similarities, though, to the evolving LMSs that increasingly incorporate social software.

Is the PLE Already Here?

It is worth considering what tools students require to carry out their studies effectively. Many already have laptop computers that are networked at home and connect wirelessly to the Internet at their place of study. These machines have large hard disks and
hierarchical file systems allowing them to store vast amounts of learning content as well as their own work. Systems such as Google Desktop allow them to search and retrieve data on their machines using the familiar Google interface. Familiar office software includes applications for word processing, e-mail, calendar, spreadsheet, database, and presentations.

The web browser gives access to learning materials either via the institutional LMS or from the growing repository of free content. It draws administrative information from the learning provider, such as course syllabi, reading lists, times and locations of classes (online or face-to-face), examination timetables, results, and so forth. It is the window to a massive range of social software and communication facilities, some provided by the institution, most of them available elsewhere. Dictionaries, thesauri, scientific calculators, and all the other necessities of a learning environment can be found online. Another particularly effective tool is Google search, which, in a blog posting on June 1, 2006 (http://project.bazaar.org/2006/06/01/personal-learning-environments/), Graeme Atwell argues facilitates learning more than any other. Additionally, emerging e-portfolio software is set to provide a vital bridge between the content on the user’s hard disk and central storage and backup facilities hosted professionally.

Effective online learners know how to make the most of the services available and may resist further client software to mediate on their behalf. There is strong evidence that students now see the personal computer as their primary learning tool, and this can be regarded as a de facto PLE. Research demonstrates that learners are increasingly comfortable switching between a wide range of tools and sites, making simultaneous use of locally installed applications, books, and the Internet, and participating in a variety of online and face-to-face communities of practice.

Proponents of PLEs, motivated by a lifelong and informal learning agenda outside the boundaries of current institutionalized education, attempt to position PLEs as a replacement for LMSs. The whole PLE debate can indeed be seen in this light: the PLE as a concept (in the sense of the range of digital tools at a learner’s disposal rather than as a concrete system) being appropriate for—and already used extensively by—the lifelong and informal learner. Mark Van Harmelen, in Seb Schmoller’s blog Fortnightly Mailing on June 8, 2006, identifies the underlying motivation behind PLEs and their fundamental limitation, which is that they “can only be used to full advantage with a fundamental change in pedagogic practice [including] greater autonomy, diversity, openness and connectedness” (http://fm.schmoller.net/2006/07/personal_learni.html). Josie Fraser, in a comment on Stephen’s Blog on September 11, 2006, also finds the key aspect of PLEs to be the “conceptual shift/challenge the model represents to mainstream education” (http://artemis.udc.vuw.ac.nz:8000/pebble/2006/09/08/1157664630904.html). Ironically, while the PLE is portrayed as a way to reduce central control, it is itself an attempt to systematize and bound the vast, dynamic, anarchic set of tools and resources to be found on the Internet.
What It Means to Higher Education

In contrast to the client software approach, the web browser presents the most significant learning tool ever devised in terms of its ability to provide access to a vast range of tools and content and to connect learners to each other using a single interface. The browser continues to develop as the primary tool for news, entertainment, business, commerce, administration, and communication. Any attempt to devise systems that mediate between the learner and the outside world through means other than a web browser is risky. Additional client software imposes an unnecessary burden on institutions and students, and locally installed systems will have to be trivial to install, configure, and maintain if students are to use them in addition to or instead of institutionally supported LMSs. The Horizon Project Wiki in 2006 suggested that support issues could be unmanageable for institutions where students using one of a variety of proprietary or open source PLEs are required to interact with tutors and other members of a course group. While independent learning is an admirable aspiration, many learners will continue to require considerable hand-holding in the online learning world. Leaving the management of their formal learning activities entirely up to them will result in increased drop-out rates.

PLEs and Web 2.0: A Reality Check

In addition to the installation and adoption difficulties already discussed, there are two further fundamental assumptions in the client PLE approach. First, there would need to be a high degree of interoperability between the various systems. PLE open source developers and vendors would have to agree on a set of common interoperability standards, and these would also need to work with LMSs. There is, however, limited adherence to current standards by e-learning system vendors, which often have good reasons for ensuring that their systems are not interoperable. Even mainstream product vendors cannot agree on how their instant messaging systems should work together. This is mirrored in the open source arena, where widely adopted systems such as Moodle have as yet failed to integrate many key e-learning standards and specifications. PLE interoperability therefore currently seems a utopian vision.

The second assumption of the client PLE approach is that learners can be technically responsible for looking after their own learning materials. Many of them will in fact fail to back up this content on their home devices, and a large proportion of it will be lost, particularly in the lifelong learning context, where there are multiple opportunities throughout life to lose or damage hardware and data. Docking on a regular basis with some kind of “mother ship” is therefore going to be critical for the lifelong learner, whether the service is provided by the state, the current educational provider, or a commercial third party.

PLE advocates also fail to provide a solution for how PLEs can be applied in the existing institutional context of learning organized into units with specified content and learning outcomes, scheduled assessments, and classes in which a discrete group of students interacts with a teacher. These units are grouped into qualifications that increasingly
incur a financial cost to the student and years of ensuing debt theoretically mitigated by enhanced employment prospects.

The LMS Fights Back

Milligan argues that the LMS is “a conservative technology [for] managing groups, providing tools, and delivering content.” Given that formal education remains in strong demand from learners, is supported by governments throughout the world, and is unlikely therefore to disappear in the near future, there will continue to be a need for online systems that provide administrative functionality, such as allowing students to register and pay for courses, and provide information, such as course descriptors, syllabi, reading lists, class times, examination dates, and results. Centrally hosted systems are also required for the submission and marking of assignments online—and the return of marked scripts to students. LMSs can be used to restrict access to content and services for those enrolled in the course and to group learners together with the teacher allocated to them, encouraging frequent contact throughout their studies with a single set of robust communication tools. The correct list of online contacts for the course should be set up automatically for the student in the LMS. This is already a considerable challenge for institutions responding to late registrations, and it would be an unacceptable burden on students if there were no data transfer between student record systems and online learning systems.

LMSs enable institutions to ensure a consistency of service for students and backup facilities, particularly for e-portfolio content and lifelong learning records. Recent doubts about the viability of a hosted service for Elgg, expressed by commentators such as Brian Kelly in his blog UK Web Focus (http://ukwebfocus.wordpress.com/) on December 16, 2007, demonstrated the vulnerability of leaving the provision of core educational services to third-party suppliers with whom the university has no contractual agreement. LMSs also allow institutions to protect minors against unsuitable materials and permit the removal of pornographic or copyright-infringing materials and defamatory, racist, or otherwise illegal blog entries. In addition, institutions have moral and legal responsibilities for accessibility of learning content and services; it is difficult to ensure that these are met adequately unless systems are centrally hosted.

The real costs of supporting multiple “free” online learning systems, whether hosted in-house or externally (usually funded by advertising) are regularly underestimated. Most universities have built up considerable expertise in their LMSs and the ability to keep on top of the developments happening to those products. It would be a complex task for information technology and computing service departments to maintain a similar understanding of a broader range of open source products, their functionality, code base, and release cycles. There is also resistance from many of the less technically literate faculty (and some students) to being expected to use multiple systems with varying interfaces.

Offering products with widely differing user interfaces that have not been checked for accessibility and usability may be inadvisable. The integration possible in a single LMS allows a forum contribution or a blog entry to be transferred instantly to the e-portfolio, for example, or a term appearing in the glossary to be highlighted within the forum, blog,
quiz, or any other module. Achieving such integration across multiple, continually evolving systems would be a highly complex and costly software engineering task. In addition, with an LMS, there is no need to replicate user databases or access permissions across multiple systems, and the user need authenticate only once. Finally, it is far easier to track usage from the single database of an LMS than to have to trawl for data through the databases of multiple e-learning systems—and this may be impossible if the systems are externally hosted.

How LMSs Must Evolve

There are ongoing debates as to what an LMS should consist of and where the boundaries lie with content management systems, e-portfolio systems, search facilities, synchronous collaboration systems, and student portals. At the Open University (OU), these five systems, together with an electronic tutor-marked assignment system, are clearly delineated from the LMS, although the aim is to provide a unified interface for the students and give the impression that they are accessing a single system.

The e-portfolio system called MyStuff, developed at the OU for Moodle, is a good example of the debates that take place. Development of the system began shortly after the decision to implement Moodle was made. At that time, there was skepticism among some developers about whether Moodle would prove to be sufficiently robust and scalable for the OU (no longer a concern). While there was an institutional push to build the system as a Moodle module, the developers wished to build a system that could be sustained even if the institution changed its LMS at some stage in the future. MyStuff was therefore built to be fully integrated with Moodle but also able to be run as a stand-alone system, if necessary.

Meanwhile, another e-portfolio system for Moodle called Mahara was being built with funding from the New Zealand government. The architecture is similar to that of MyStuff, although the feature set is different. There is a proposal to allow both systems to be plugged into Moodle but to keep them out of the core architecture of Moodle. There are no rights and wrongs about whether such systems should be part of an LMS or left out of it, but there is a concern that Moodle may become bloated with too many features and that certain large pieces of functionality are better left as separate systems.

MyStuff draws from social software innovations elsewhere and allows learners to store and tag content and to share and discuss it with others. Any educationally useful feature of a Web 2.0 system can potentially be incorporated into an LMS, although the smaller cohort using it (based around an institution or a course rather than a global set of users) may restrict its usefulness. The key question is not whether LMSs can or should evolve into collections of the social software tools found elsewhere on the Internet but what is the most appropriate context of use for the learner at that particular time? A student in a software engineering course might use a university-provided wiki for tasks relating to that course, a proprietary wiki for collaboration with colleagues in their workplace, and Wikipedia for leisure pursuits. These systems are likely to differ at the functional and user interface levels. Effective wiki users know the basic features of a wiki, however, and should be able to master a new wiki system rapidly. Bringing these different arenas together via a mediating interface may have some value for the learner but will not
always be necessary or appropriate and may result in a lowest common denominator of functionality.

It is possible that the LMS will evolve into more of a management information system, working away in the background, with its information exportable to a variety of other systems under the control of students who wish to view it in environments they prefer. LMSs may therefore increasingly have to allow data to be exported to and imported from other systems. There is likely to be a core set of functionality, however, that the institution will have to continue to provide for the reasons described earlier, including for the many faculty and students who prefer to access learning and administrative content via consistent, simple, institutionally hosted systems.

E-Learning Standards

If data are to be transferred increasingly between the LMS and other systems, then the further development of e-learning standards by standards bodies is crucial. The implementation of interoperability standards is a key element in the checklist when an institution is selecting an LMS. One of the main drivers behind standards is so that universities will not have content stuck in proprietary formats in case they wish to change their LMSs in the future. However, the adherence to standards by most vendors is less than perfect, and there are serious problems in exporting content from most LMSs into platform-independent formats. Open source LMS communities arguably have no commercial interest in stopping institutions from moving to a different LMS that may ensure the institution’s future viability. Ironically, however, there is often little inclination in open source communities to implement learning technology standards. Why should a Moodle user, for example, care about content becoming trapped in Moodle when it is unlikely that his or her institution will switch to a commercial system after it has enjoyed the advantages of an open source product? So long as the content can be extracted from the system in some XML format, it should be relatively easy to transform it into a different format for a system with more or less the same functionality. Does it matter, therefore, whether Moodle properly adopts interoperability specifications?

Meanwhile there are encouraging efforts to develop social networking interoperability standards, such as Google’s Open Social, which promises to allow the transfer of data such as contact information freely between different sites. This will have implications for evolving LMSs where there is a desire to exchange data with other systems.

Distributed LMSs

Learning technologists—such as Martin Weller in various postings to his blog—argue that LMSs as large applications are unsustainable. Weller says that the future is a range of components built by different organizations that interact with each other over the Internet (or intranet) via web services. These components will operate as a distributed learning environment. The e-Framework for Education and Research (http://www.e-framework.org), the focus of a large amount of investment from government-funded bodies in the United Kingdom, Australia, New Zealand, and the Netherlands, is an attempt to tackle the interoperability issues and to build the underlying architecture of a distributed LMS. The development
of different applications within the framework is being funded. The concept is that if an institution wants to change the forum system it is using, for example, it can plug in a different one, and the distributed LMS will continue to appear as a single system to the user. However, there are considerable logistical issues to overcome with this approach. The e-Framework is also beginning to look like a monolithic model itself, where the implication is that institutions will still control the student experience in the way that LMSs arguably do currently.

The e-Framework is an interesting concept, and many of its building blocks are now in place, but it lacks certain key features of a successful open source community. Successful communities tend to be led by charismatic individuals such as Linus Torvalds or Martin Dougiamas who have the skills and personality to harness the efforts of others to enhance the product. Such leaders understand the entire application, insist on optimizing the performance of the product at every opportunity, can spot new requirements and ensure they are fulfilled, and are natural leaders.13 There is no such guru to follow for the e-Framework, but, even more fundamentally, the framework is composed of many unmaintained pieces of code written by different individuals using a range of languages and technologies through projects with temporary funding. Unlike the foundations of Apache or Linux, there is no common purpose that motivates developers and users continually to enhance a system of key importance to themselves or their institutions.

Moving On from Course-Based LMSs

As stated earlier, the course-based metaphor of the LMS is only appropriate in certain educational contexts. LMSs need to be able to support the concept of sub-courses, such as tutor groups, and meta-courses in which learners can be enrolled in addition to their individual courses. Students may have finished one course and not be ready to start the next one, but they still wish to be part of a subject community, retain contact with other students, and continue to have access to domain content. These groupings are very much under the control of the institution, which may not always be able to put students together in the best way or allocate the appropriate tools to them.

In an attempt to make the LMS more flexible, appealing, and useful to students, the Open University is working on a fundamental change to the architecture of Moodle from the students’ (and tutors’) points of view, allowing them to set up their own forums, wikis, blogs, and other tools and to invite others to join them in ad hoc groupings—in addition to those provided for specific course purposes.

Offline and Mobile Access

Virtually no student has the Internet available 100% of the time, and PLE advocates are right to argue that there is a need for offline access to learning services and content. As more interactive course content, administrative features, and formative assessments become available online, and as students engage more with others through forums and blogs, they will become increasingly disadvantaged if they do not have reliable Internet access. A few LMSs have offline client facilities that allow learners to continue to access critical parts of their courses at times when they are not connected. Students can then
make forum postings, carry out an online assessment, view a calendar, or play a podcast. When the student next logs in to the Internet, the client computer synchronizes with the institutional LMS system. The drawbacks of supporting client software have already been mentioned, but the LMS will increasingly need to be accessed offline and will require associated client software. In addition, students will expect access to educational content and services via devices such as mobile phones; LMSs must therefore present content acceptably on small screens, and institutions will have to design content with this in mind.

**University Use of Social Networking Sites**

Some universities are encouraging the use of the social networking site groups set up in their name, many of which are not under the direct control of the institution. There are convincing arguments for this approach: it reduces the burden on the institution for hosting the service; students are using sites such as Facebook anyway, so why not have the institution represented where the students are going; and these sites are likely to be more dynamic, up-to-date, and engaging than systems hosted in-house. However, there are dangers for institutions in giving implicit or explicit approval of such sites. A high-profile newspaper article outlined some of the drawbacks of social networking sites, and these concerns should be clearly pointed out to students where institutions are encouraging the use of groups set up in their names. These drawbacks include intrusive advertising and the fact that private information posted to these sites can potentially be used for commercial purposes. Online student profiles are being actively sought out by potential employers, who may use inappropriate content as a reason for not recruiting the students.

There are emerging attempts to integrate LMS functionality with social networking systems such as Facebook. These concentrate either on drawing information out of Facebook and into the LMS or providing LMS facilities inside Facebook. The latter is a more popular option because it is believed that if students are highly engaged in that environment, it makes sense to provide them with educational facilities in the medium where they feel most comfortable.

However successful these experiments may be, it is evident that some students do not necessarily want their education—which they may see as quite a separate part of their lives—to mix with their social environment. Moreover, while learners will continue to use the environments they find most engaging and useful, institutions need to be careful that they do not lose the opportunity to track what students are doing. If they fail to record valuable data on how students are using learning tools and content, it will be far more difficult to enhance the courses and provide remedial assistance to learners with difficulties.

**Key Questions to Ask**

- What is the appropriate blend of in-house and externally hosted online learning systems for my institution?
What are the support implications of using free software either hosted externally or on local servers?

What legal, technical, and other issues should be incorporated in an institutional strategy for the integration and use of social networking sites for our students?

Where to Learn More


Endnotes


2. Throughout this research bulletin, citations for blog postings are included when they are known. Because of the transient nature of the blogosphere, some postings may not be reliably available over the long term.


About the Author

Niall Sclater (N.L.Sclater@open.ac.uk) is Director of the Virtual Learning Environment Programme at the Open University.

Copyright

Copyright 2008 EDUCAUSE and Niall Sclater. All rights reserved. This ECAR research bulletin is proprietary and intended for use only by subscribers. Reproduction, or distribution of ECAR research bulletins to those not formally affiliated with the subscribing organization, is strictly prohibited unless prior permission is granted by EDUCAUSE and the author.

Citation for This Work

Audit Committee

December 8, 2011

Agenda Item: Recalibration of Risk in the Research Enterprise

☐ review  ☐ review/action  ☐ action  ☒ discussion

Presenters: Vice President Timothy Mulcahy
   Pamela Webb, Associate Vice President Research
   Sarah Waldemar, Director, Research, Integrity and Oversight

Purpose:

☐ policy  ☐ background/context  ☒ oversight  ☐ strategic positioning

The presentation will provide the Board of Regents with a summary of the process and representative outcomes of a strategic risk recalibration initiative in the Office of the Vice President for Research (OVPR). The presentation will also provide an opportunity to discuss best practices for application in other units.

Outline of Key Points/Policy Issues:

- Provide the Board of Regents with relevant background information leading up to OVPR’s strategic risk recalibration initiative.
- Summarize the key characteristics and expected benefits of OVPR’s risk recalibration initiative.
- Describe outcomes and lessons learned from initiative.

Background Information:

The February 11, 2011 Board endorsement of the Strategic Risk Management Work Groups’ operational strategy and risk principles provided a framework, including principles to guide the university community toward a more strategic approach to the management of risks across all aspects of its operations. It was determined that such an approach would better inform decision-making in the interest of enhancing innovation, creativity, productivity, morale and overall performance. In addition such efforts could also provide relief from some of the
financial, personnel and systems costs associated with the University’s highly regulated culture.

The Work Group defined important operational next steps and recommended that functional leaders across the University be charged with re-examining current approaches to risk management and, where appropriate, with redefining acceptable tolerances for individual risks situations within their area of responsibilities. Furthermore, it was recommended that they ensure that their employees are aware of, understand and are committed to the underlying principles of the risk recalibration initiative. In order to be successful this transformation to a strategic risk management culture will require the University to embark on a series of iterative steps along a multi-year path to completion.

Within this framework and set of principles the OVPR launched an effort to “recalibrate” and research-related risks and regulatory practices for their management. At its onset, it was envisioned that this would require an examination of the current practices, procedures, and policies for which OVPR is the responsible business process owner. It is hoped that this systematic recalibration initiative would serve as a prototype for adoption and application by other functional units at the U.
Objective
To provide operational overview and results from a project undertaken by the Office of the Vice President for Research – Strategic Risk Recalibration Initiative

This initiative was an action plan arising from the February 2011 Board endorsement of the Strategic Risk Management Work Group's strategy and risk principles. Within this framework and principles, the OVPR launched an effort to “recalibrate” research risks and regulatory practices for their portfolio of activities.

Vice President Mulcahy charged Associate Vice President Pamela Webb and Director of Research, Integrity and Oversight, Sarah Waldemar to coordinate this initiative across all OVPR units. The following summarizes the charge letter, approach utilized, and outcomes of the initiative.

Charge Letter
Excerpts from VP Mulcahy charge letter:
“...this initiative is a part of the larger institution-wide strategic effort to identify and manage our approach to risk.”

“It is anticipated that this will require an examination of the current practices, procedures and policies for which OVPR is the responsible business process owner. It is expected that some form of risk/benefit approach will be used to evaluate current business processes to achieve one or several of the following benefits:

- More innovative approaches to fulfillment of the research mission
- Removal of unnecessary oversight (the level of oversight is excessive relative to the amount of risk involved)
- Greater openness to opportunity
- Enhanced competitiveness
- Better staff engagement & empowerment; improved job satisfaction
- Increased efficiency; reduction of burden
- Cost savings
- Enhanced performance guided by responsibility and accountability”

Approach
Associate Vice President Webb and Director Waldemar created a specific program for the OVPR with guidance materials, timelines and responsibilities. The initiative required both short-term unit investment (March to December 2011) and longer-term investment (inclusion of ongoing activities into each unit’s annual work plan).
Units were provided guidance for the short-term activities to facilitate their identifying risk, exploring and assessing opportunities for change, planning and consulting about change, approving and implementing change, and evaluating impact. Each OVPR unit assumed action responsibility for its own portion of assessments and process changes, as well as responsibility for defining appropriate risk tolerance standards for activities within their portfolio of responsibilities. Units were required to submit milestone reports identifying potential initiatives (to help focus high-level discussion with the Vice President for Research on which projects were most viable to pursue with respect to criteria such as impact, resources, mission, etc.) Ultimately, 68 initiatives across the units of the OVPR were selected, and units were permitted to re-prioritize annual goals to ensure adequate time to pursue risk recalibration activities. Units were subsequently required to submit progress reports on initiatives selected for action. Templates that focused on provision of key milestones and impact parameters helped standardize reporting across OVPR units while minimizing administrative burden to units. It is important to note that within the OVPR framework units were given license to pursue the process in manners best suited to their business processes. Some units were able to assess their data collection processes, weigh the value of the information they were collecting and determine that refinements could be made.

Outcomes:
The initiative resulted (and continues to result) in substantive refinement of OVPR policies, procedures and practices. These changes better reflect a strategic approach to risk management -- balancing decisions and activities that contribute to the optimal pursuit of mission on the one hand and ethical, responsible conduct and accountability on the other. Examples of successful outcomes will be presented.

The methodology used by the OVPR is available to other units to jump start similar activities in their own areas. Other units have started to develop similar projects, for example based on requests from units and their customers, the Controller’s Office is pursuing an expedited short-form contract for certain types of external sales.

Needed refinements or enhancements to the process have been documented as the Risk Recalibration Initiative continues. Lessons learned include the need to have a methodology to prioritize projects for action and the advisability of selecting several high-priority or immediately viable projects for immediate action – allowing early “wins” to occur and recognizing the inherent need to balance special initiatives with ongoing work priorities of units.
Audit Committee  December 8, 2011

Agenda Item: Information Items

☐ review    ☐ review/action    ☐ action    ☒ discussion

Presenters: Associate Vice President Gail Klatt

Purpose:

☐ policy    ☐ background/context    ☒ oversight    ☐ strategic positioning

To report engagements with auditing firms that do not require prior approval by the Board, and to provide the Audit Committee with the Semi-Annual Controller’s Report.

Outline of Key Points/Policy Issues:

Report of Engagement with Auditing Firms:
The Tweed Museum of Art at the University of Minnesota – Duluth entered into an engagement with Charles Ziegler to prepare a statement of financial activity for fiscal year 2011 to be used as financial support for grant applications. The fees for this engagement are not to exceed $1,600. This engagement did not impair the independence of Charles Ziegler as related to the University’s external audit and was approved by the Controller’s Office in conformance with Board Policy.

The University of Minnesota - Duluth entered into an agreement with Licari Larsen & Co., LTD to provide an audit of the financial statements of KUMD radio station as of June 30, 2011. This audit is being performed as a requirement for receiving grant funding from the Corporation for Public Broadcasting. The fees for this engagement are not to exceed $4,900. This engagement does not impair the independence of Licari Larsen & Co., LTD as related to the University’s external audit and was approved by the Controller’s Office in conformance with Board Policy.

The Academic Health Center’s National Center for Food Protection and Defense (NCFPD) entered into an agreement with LarsonAllen, LLP to develop a pricing structure and cost allocation method for University vendor, DataStream Connection, for the CoreShield IT
impair the independence of LarsonAllen, LLP as related to the University’s external audit and was approved by the Controller’s Office in conformance with Board Policy.

Semi-Annual Controller’s Report
This report presents a summary of activities completed by the Controller’s Office in the last six months in the areas of financial accounting and reporting, internal controls, reducing financial or compliance risks to the University, and improving efficiencies and service.

Background Information:
Engagements with external auditors that do not require prior approval by the Board of Regents are reported after the fact to the Audit Committee as information items, in conformance with Board of Regents Policy, Audit Committee Charter. The Controller’s Report is prepared semi-annually and presented to the Regents Audit Committee in conformance with Board of Regents Policy: Board Operations and Agenda Guidelines.
This report presents a summary of activities completed by the Controller’s Office in the last six months that have improved financial reporting, enhanced internal controls, reduced financial risks, improved services to the University community, or created efficiencies in financial operations.

I. Accounting and Financial Reporting Matters

The Governmental Accounting Standards Board (GASB) has issued four new accounting and reporting standards. Management is in the process of determining if they apply to the University and if so, the impact this statement will have on the University’s accounting and reporting. These standards and the related implementation dates are explained below.

- In November 2010, the GASB issued Statement No. 60, *Accounting and Financial Reporting for Service Concession Arrangements*, which addresses the recognition, measurement, and disclosure requirements for services concession arrangements (SCA), which are a type of public-private or public-public partnership. An SCA would apply to the University in instances where it conveyed to another entity (operator) the right and related obligation to provide services through the use of infrastructure or another asset in exchange for significant consideration and the operator collects and is compensated by fees from a third party. This statement is effective for the fiscal year ending June 30, 2013, and the provisions of this statement are generally required to be applied retroactively for all fiscal years presented.

- In November 2010, the GASB issued Statement No. 61, *The Financial Reporting Entity: Omnibus—an amendment of GASB Statements No. 14 and 34*, which modifies and improves existing guidance regarding the inclusion, presentation, and disclosure requirements for component unit and equity interest transactions of a financial reporting entity. This statement is effective for the fiscal year ending June 30, 2013.

- In December 2010, the GASB issued Statement No. 62, *Codification of Accounting and Financial Reporting Guidance Contained in Pre-November 30, 1989 FASB and AICPA Pronouncements*, which bring authoritative accounting and financial reporting literature of the Financial Accounting Standards Board (FASB) and American Institute of Certified Public Accountants’ (AICPA) issued on or before November 30, 1989, and whereby does not conflict or contradict GASB pronouncements, together in one place. This statement is effective for the fiscal year ending June 30, 2013, and the provisions of this statement are generally required to be applied retroactively for all fiscal years presented.

- In June 2011, the GASB issued Statement No. 63, *Financial Reporting of Deferred Outflows of Resources, Deferred Inflows of Resources, and Net Position*, which standardizes the presentation of deferred outflows of resources and deferred inflows of resources (consumption and/or acquisition of net assets applicable to future reporting periods) and their effects on the University’s net position. This statement is effective for the fiscal year ending June 30, 2013.
II. Efforts Undertaken by Controller’s Office Departments to Enhance Service, Productivity, and Efficiency, and to Improve Internal Controls

Capital Equipment Inventories

Under federal regulations applicable to institutions receiving federal funds, the University is required to conduct a complete physical inventory of all capital assets every two years. This summer Inventory Services has concluded another two-year cycle for capital equipment asset inventories. The statistics for the most recent inventory cycle, with comparative data for the prior 3 inventory cycles, are set forth in the table below.

<table>
<thead>
<tr>
<th>Count Cycle</th>
<th>7/09-6/11</th>
<th>7/07-6/09</th>
<th>7/05-6/07</th>
<th>7/03-6/05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets Inventoried ($)</td>
<td>$674,315,903</td>
<td>$563,805,818</td>
<td>$544,909,812</td>
<td>$554,364,309</td>
</tr>
<tr>
<td>Total Assets Inventoried (#)</td>
<td>66,960</td>
<td>70,227</td>
<td>80,187</td>
<td>93,673</td>
</tr>
<tr>
<td>Total Assets Missing ($)</td>
<td>$2,409,885</td>
<td>$1,282,818</td>
<td>$641,710</td>
<td>$728,453</td>
</tr>
<tr>
<td>Missing as a % of Total $</td>
<td>0.30 %</td>
<td>0.23 %</td>
<td>0.12 %</td>
<td>0.13 %</td>
</tr>
<tr>
<td>Total Assets Missing (# items)</td>
<td>125</td>
<td>398</td>
<td>196</td>
<td>311</td>
</tr>
<tr>
<td>Missing as a % of Total #</td>
<td>0.19 %</td>
<td>0.57 %</td>
<td>0.24 %</td>
<td>0.33 %</td>
</tr>
</tbody>
</table>

The University’s compliance with these requirements is excellent. On average, our asset tracking system and procedures result in a successful tracking rate of better than 99.5%. The 07-09 reporting cycle showed a slight increase in the number of missing assets, partly attributable to isolated issues during conversion to the PeopleSoft financial system. The most recent inventory cycle shows a return to the historical patterns experienced prior to the implementation of the PeopleSoft financial system in 2008.

Non-sponsored Accounts Receivable Process Improvements

The Non-sponsored Accounts Receivable department continues to refine the new accounts receivable business processes implemented with EFS and roll out the functionality to University departments. The following departments have converted to EFS billing within the last 6-12 months:

- Medical School Affiliation Agreements
- Interlibrary Loans
- Characterization Facility
- University of Minnesota Talented Youth Mathematics Program (UMTYMP)
- UMD Children’s Place
- UMD Statesman
- UMD Intercollegiate Athletics
A new feature has also been developed and released. Customers may now pay their non-sponsored EFS invoices via an online web application. Customers visit a secure website to view a list of their open invoices and select invoices for payment. This web application is integrated with EFS resulting in fully automated payment receipt and application. This application has increased customer satisfaction and provided the ability for customers to pay 24/7/365. When this web application was released in June 2011, seven clusters were participating in the credit card payment program. Since June an additional ten clusters have opted-in for a total of 17 clusters. While this payment method represents a small portion of all AR payments, the number of credit card payments for EFS transactions has more than doubled since June and staff time required to process the transactions has been reduced by approximately 50%.

STAR METRICS Project
The STAR METRICS Project (Science and Technology for America's Reinvestment: Measuring the Effect of Research on Innovation, Competitiveness and Science) is a multi-agency venture led by the National Institutes of Health, the National Science Foundation (NSF) and the White House Office of Science and Technology Policy (OSTP). It is a voluntary partnership between science agencies and research institutions to document the outcomes of science investments to the public. The benefits of STAR METRICS are that a common empirical infrastructure will be available to all recipients of federal funding and science agencies to quickly respond to State, Congressional and OMB requests. The University of Minnesota took a leadership role (along with several other institutions) in piloting and developing the templates for the project, and continues to work closely with the STAR METRICS team to define the common definitions, better illustrate the outcomes of science investments and identify opportunities to showcase the report and underlying data. Our participation at national meetings and workshops illustrates our commitment to the effort and the long term potential impact the report and data can serve.

Automation & Standardization of Sponsored Project Invoices and Reports
Sponsored Financial Reporting (SFR) implemented a new standard procedure that not only impacts and saves time on their own process related to preparing and submitting sponsor reports and invoices but on academic units’ role of reviewing the reports and invoices as well. The staff in SFR led the initiative and collaborated with academic units to identify areas of improvement and efficiency. SFR submits 1,200 reports and invoices monthly and the new automation and standardization procedures save approximately 15 minutes of SFR accountant time per report or invoice (300 hours a month). The time saved is used to work on more reports and invoices and improve the on-time reporting and invoicing metric for the University. While the time savings at the collegiate unit level has not been quantified, the academic department units save time because the spreadsheets and materials they receive from SFR are a standard format and consistently contain the necessary information for a departmental review.