Over the past fifteen years, the technology choices and issues facing higher education have changed dramatically. This white paper maps these changes and establishes the foundation for the Common Systems Review Group in its Strategic Planning Retreat to consider future technology needs.

Strategic Initiatives first developed this framework three years ago for the University of Wisconsin Common Systems Review Group, developing the key elements of the graphics set displayed at the end of this paper. These graphics have been updated to reflect events up to the present and have been expanded to incorporate new topics such as analytics, service-oriented architecture, and enterprise performance dashboards. Readers should scan and cross reference these figures while reading the text descriptions below.

I. The Emergence of Strategic Institutional Management and Performance Enhancement

Figure 1 portrays the changes in administrative systems, academic systems, technology issues and developments, and leadership/management challenges over the period ranging from the early 1990s to today. Dramatic changes have occurred in the higher education technology scene, particularly since 1999-2000.

In the early 1990s, technology decision makers in higher education were confronted with a relatively basic set of technologies and issues. At that time, administrative systems consisted of stand-alone, legacy systems, and the concept of enterprise resource planning (ERP) systems had not made its debut on the higher education scene. Administrative systems, academic systems, and computing were treated as highly separate elements. Library automation was a primary focus of academic systems during this time period. Technology issues were largely hardware-driven; the competition between mainframe and mini-computers provoked serious debate. As for leadership and management matters, institutions focused on departmental and functional performance. Leadership struggled to overcome the limitations caused by fragmented business operations and information silos.

Advances in Administrative Systems

Advances in administrative systems were crafted to overcome these limitations and more. Vendor providers touted new approaches like “Strategic Enrollment Management,” which enabled institutions to use purchased software to link activities in recruitment, admissions, financial aid, retention, advising, and related functions. The efforts used the term “enterprise” to describe this collection of enrollment services-related functions. Around 1997, the concept of ERP arrived in higher education to great fanfare,
symbolized by PeopleSoft introducing its flagship Human Resources and Financial Systems. Subsequently, and in collaboration with institutions of higher education, PeopleSoft introduced its Student Information System module, offering a set of tools that institutions could use to create their own integrated suite of administrative software. The adoption of ERP was given a great boost by institutional concerns about the impact of Y2K.

The leadership and management issues addressed by early ERP emphasized achieving greater transactional efficiency, information integration, reporting and business analytics, business intelligence, and recruiting and retention. At this stage of development, institutional leaders assumed that customizing ERP systems to memorialize the current practices of each institution was not only a good idea, but an imperative. While institutional executive leaders were instrumental in the decision to upgrade technology, they delegated responsibility to end users to decide how applications should be customized. During this period, the term “enterprise” was used by technology vendors and institutional users to describe the collection of administrative functions of the institution included in ERP – Human Resources, Financial, Student, and Development. Academic applications were not part of the “enterprise” suite of applications. Technology issues during 1995-1999 focused on database considerations (i.e. relational vs. non-relational), migration to ERP client server environments, graphical user interface (GUI), multi-platform, and the unknown challenges of Y2K. Vendors and institutional leaders alike debated the benefits of “best of breed” vs. “fully integrated solutions.”

**Toward Learning Management Systems and Academic Enterprise Systems**

Academic systems were slower to develop, but eventually course information systems (CIS), course management systems (CMS), and learning management systems (LMS) arrived on the scene. These systems automated the providing of course materials and management of course-based learning experiences. While they could be interfaced with other administrative systems, these first generation offerings were essentially stand-alone course systems.

Prior to the emergence of the Internet, networked computing had become an important issue on campus. But then the Internet struck like a bolt of lightning and changed campus academic and administrative systems forever. It opened the door to pervasive communication, free-range information access, and significant knowledge sharing between individuals all over the world. During the period 1999-2000, campus users, technology thought leaders, and technology vendors came to appreciate the importance of the Internet and Web-based applications for their products and services. From 2001 onward, networking issues became pre-eminent and developing standards and Web-native applications drew greater attention. The pervasive use and sharing of information and identity management emerged as the top issues of this era.

These Internet-initiated developments stimulated the convergence of administrative and academic systems offered by technology vendors and the emergence of new meanings of the term “enterprise.” Blackboard was at the forefront of developing an e-education platform, capitalizing on the transformation of the Internet as a powerful environment for the education experience. Emerging portal capabilities enabled the blending of learning systems, content, and community building into a more cohesive system solution. In 2002, SCT began promoting the concept of “e-education infrastructure” to describe an
integrated set of administrative/academic systems and services that would encompass portal, administrative and academic applications, communications, data management, network, and hardware. In these unified solutions, services were equally as important as software and hardware, if not more so. WebCT used the term “academic enterprise systems” (AES) to refer to its next generation of LMS offerings, which merged academic enterprise applications together, including knowledge management capabilities.

Leadership/management issues during the 2001-2003 time frame reflected the transformative influence of the Internet. They focused on the “Webification” of products, services, experiences, and knowledge. The conventional wisdom about customized ERP took a 180 degree turn. Many institutions began to focus on the desirability of implementing non-customized ERP (what Gartner called the “plain vanilla” vendor solution) and accepting the best practices embedded in established ERP solutions. Institutional thought leaders discovered process reinvention as a means to leverage new systems applications. Portalization (using enterprise portals to access and integrate ERP, LMS, and knowledge assets) became a newly “hyped” practice. Using enterprise portals to encourage self-service for students, faculty, and staff became a new frontier practice on many leading-edge campuses.

**Economic Downturn**

Beginning in 2001, the impact of the national economic downturn began to significantly impact institutional technology initiatives, especially at public institutions. Several years of progressive budget cutbacks led to tuition hikes, reductions in services, and severe scrutiny of technology initiatives across higher education. These economic exigencies have had a profound impact on technology initiatives, increasing the demand for accountability for outcomes and results from IT investments.

Since 2004/2005, the improved economic conditions in the American economy have trickled down to state funding for higher education, leading to growth in state appropriations for higher education in many states.

**New Realities Create the Need for New Perspectives**

By 2004, the intersection of the aforementioned developments had created a new reality for leaders in higher education:

- Institutional leaders began to see the value of ICT in linking all of the resources and activities of the institution to achieve the unification of academic and administrative applications, research, teaching and learning, public service, outreach, and other activities. To describe this unification, one must move beyond the term “enterprise,” which has been corrupted through earlier, narrow usage. Many institutional leaders today are using variations on the enterprise theme. They see the need to move beyond ERP, LMS, and portal technologies to a phenomenon characterized by the education community as “strategic institutional management.”
• Information and communications technology emerged as the instrument through which institutions could leverage and manage all of their institutional resources, potentially enhancing productivity and value propositions for stakeholders. The emerging principle was that aggressively leveraging technology is essential to deliver the “value on investment” necessary to justify continuing investment in information and communications technology. The resulting theme/message: If IT is not leveraged to create strategic differentiation, it may not be worth the investment.

• The new vision of tomorrow’s technology infrastructure became the seamless fusion of networking, portal, ERP, AES, and vast digital resources. By 2004, this model had become self evident (patently obvious) to most thought leaders.

• In higher education, the potential for open source applications software took a quantum leap between 2003 and 2004. During this period, the technology issues focused on security, open source, Web services, and Internet2.

• For the past 15 years, the emphasis on IT has been the development of technology infrastructure. Today’s institutional leadership must raise the ante beyond infrastructure to include business processes and strategic alignment. In order to leverage IT to deliver value, institutional and system leadership will need to combine these three elements of the pyramid, reinventing business processes and realigning academic and administrative programs to deliver new value propositions. This is a tall order.

The capacity of institutional leadership to leverage technology and business process reinvention in support of strategic realignment has recently received a substantial boost by the exertion of external pressure enhanced performance and accountability in higher education.

Enhancing Performance and Demonstrating Value

By 2007, the evolution of strategic institutional management had been influenced by a series of developments: 1) open source/open architecture developments, 2) weaving together the “stack” and the “cloud,” and 3) political and corporate pressure for greater accountability.

Open Source/Open Architecture Developments. Open source/open architecture initiatives gained momentum after 2004 as leaders looked for ways to overcome limitations in administrative and academic ERP applications and to better control costs and leverage new development activity.

While today’s generation of ERP applications (the “stack”) are Web-based, they are built on a tightly integrated core of application modules whose basic functionalities are difficult, expensive, and time consuming to enhance. For these reasons, the functionalities of ERP-stack-based applications are seldom “best-of-breed” since they take the common denominator approach to developing new features and functionality. Only top priority applications and functionality that appeal to a broad body of users make it into ERP products. Many practitioners believe that ERP solutions address about 70-80% of the sophisticated, nuanced, flexible and evolving applications they would prefer. These users realize that the remaining 20-30% of their functional requirements either will remain in the ERP providers’ development queues forever or will not even make it onto product development road maps in the foreseeable future.
The institutional response then is to further develop, customize and/or acquire their own brand of additional features and functionality.

**Leveraging the Stack and the Cloud.** The emerging solution to the ERP dilemma is to extend the existing tightly integrated ERP “stack” with a loosely coupled “cloud” of Service Oriented Architecture (SOA)-based applications. This emerging solution is illustrated in Figure 2 in the graphics set, and Figure 3 contrasts the characteristics of tightly and loosely coupled applications.

SOA describes the architecture of the new generation of Web services that is being characterized as “Web 2.0.” The “cloud” applications are based on interoperability standards (crafted over the years by groups like the IMS Global Learning Consortium) that enable easy, seamless integration/interoperation with other applications. Using this approach, users are creating “mash-ups” that combine special-purpose Web applications like Google maps, campus events planning, and student information sources. These Web 2.0 applications/services can be widely shared and repurposed by other users, expanding the capacity of the institution to meet its own unique information/knowledge needs.

Other software vendors are using SOA to create special purpose, “best of breed” applications and services that address the 20-30% of special purpose functionality not covered by ERP. For example, SA LINK is an open architecture solution that enables institutions to manage student organizations’ finances and activities. SA LINK documents students’ activities in organizations, leadership development programs, and service learning. The solution can create a co-curricular transcript that can be incorporated into existing student portfolios; the combined portfolio then offers a more complete view of students’ learning outcomes and successes.

On many campuses, various “middleware” applications are being deployed to weave together robust legacy systems, ERP-based applications, and other “best-of-breed” SOA-based applications. In addition, some of the major ERP vendors are migrating their modules to SOA, looking to “loosen up” the ERP stack and appeal to institutions that may be considering open source solutions. These developments promise to become a highly significant movement over the next few years.

The truly transformative breakthrough enabled by the “cloud” of loosely coupled Web services-based applications is their capacity to facilitate the sharing of knowledge in ways that have previously eluded enterprise information systems. The next generation of executive dashboards, performance management, and accountability tools will reside in the “cloud,” drawing on resources from the ERP and Web 2.0 applications.

Using these tools, institutions will be able to break down the information silos that currently bedevil strategic institutional management, seamlessly linking strategic planning, accreditation, resource allocation, program review, and performance evaluation. Institutional portals/portfolios will be able to portray flexible, multi-faceted balanced scorecards that draw information from academic and administrative ERPs, qualitative assessment, and sources of insight on institutional context. The first generation of student/institutional portfolios, executive dashboards, and assessment/performance management systems is suggesting how new levels of knowledge sharing and performance measurement can be achieved by loosely coupling the ERP “stack” with the SOA “cloud.” This is the ultimate payoff from open architecture approaches.
Political and Corporate Pressure for Greater Accountability. Today, institutional leaders are being pressured to improve productivity and are being held more accountable than ever before, including performance funding measures for some states’ public institutions. Many corporate and political leaders are demanding greater emphasis on student success and linkage of competencies to employment. The Spellings Commission has raised the specter of federal intervention to mandate accountability and to establish national standards if higher education and their accrediting bodies do not exercise more leadership at a faster rate of change. Educational organizations like ACE, NASULGC, and AASCU have issued manifestos for higher education to take responsibility for its own accountability.

In this environment, the new challenge facing institutional leadership is to “Enhance Performance and Demonstrate the Value” of higher education to its stakeholders, both public and private.

Put simply, the leadership/management issues and vantage point for today’s administrators are dramatically different than they have been over the past 15-20 years. This requires fresh perspectives and insights from institutional leadership on how to leverage ICT to deliver on its promise to the stakeholders of higher education. The following table summarizes the four distinct eras we have faced over the past 15-20 years and the challenges for the future.
II. Economic Conditions, Technology Providers, and Seminal Publications

Figure 4 in the graphics set elaborates on the trends highlighted in the preceding section and examines the impact of economic conditions, changes in technology providers, and the seminal publications that have influenced thought leaders over the years.

Technology Providers

Over the past 15-20 years, the portfolio of technology vendors serving higher education has changed dramatically. Look at the mix of companies in the Pre-ERP/ERP space and compare it with the mix in subsequent years. Early leading vendors such as SCT and Datatel focused exclusively or primarily on higher education. Major ERP vendors (PeopleSoft, SAP, and Oracle) came to the higher education market from the commercial world. Innovative new companies came and went (The Robinson Group and Buzzeo, to name two). Consolidation of higher education vendors has (and continues to be) a significant challenge for higher education. For example, in the early 1990s, SCT acquired Information Associates (IA), then several Microsoft-based student system solutions. Campus Pipeline, once a student portal pioneer, was acquired by SCT and became Luminis, an enterprise portal and content management solution. Jenzabar, another early student portal application, acquired a collection of small companies to become a competing ERP while Oracle acquired PeopleSoft and now rivals SunGard Higher Education in terms of market penetration. Datatel acquired LiquidMatrix, yet another early campus portal/fund-raising solution that was incorporated into Datatel’s ActiveCampus solution. This market consolidation will likely continue as ERP vendors work to offer more complete end-to-end, fully integrated systems. At the same time, however, open source solutions for some software application elements of ERP are being developed by the Sakai and Kuali Projects and other like-minded initiatives. Competition from open source and Web service providers will further complicate the picture for ERP and AES vendors.

Both LMS and enterprise portals have been affected by consolidation and/or incorporation into broader product lines (SCT acquiring Campus Pipeline, Microsoft investing in Blackboard, Blackboard acquiring WebCT). Portals have essentially become part of a broader product suite or become open source (uPortal). LMS have broadened their scope of functionalities to include more advanced knowledge management and sharing capabilities, as exemplified by the new competitor Desire2Learn, while at the same time, open source solutions such as Angel and Moodle have emerged as viable alternatives to tightly integrated L/CMS. The rising costs and increasing complexity of learning management and knowledge sharing solutions have encouraged many campus leaders to seek solutions that are more affordable and more flexible. Open source LMS, knowledge repositories, and e-portfolio initiatives through organizations like Sakai and Kuali are likely to have a highly significant impact in the higher education marketplace.

In competitive practice two major, competing ERP camps have emerged. SunGard Higher Education, Oracle/PeopleSoft, Datatel, Jenzabar, and Campus Management comprise an “administrative ERP” perspective that is attempting to dominate the market with the “integrated campus solution” approach. Blackboard is attempting to dominate the market from the “academic ERP” perspective. Both camps are working hard to extend their infrastructure of tightly integrated products with additional features/functions,
including analytics and tools layered onto their existing stacks. In some cases, the build-out drives up the costs for new versions that include features/functionalities that may or may not be of value to their customers.

In 2007, the biggest news so far is the “patent wars” involving Blackboard on one side, and virtually the entire higher education community on the other side (including corporate providers such as IBM, a major champion of SOA-based solutions). Blackboard’s efforts to patent the basic functional elements of CMS (and also assessment and assessment management systems) threaten the capacity of higher education communities to evolve to the next generation of loosely coupled solutions that holds so much promise.

What People Were Reading

The perspectives on using technology in higher education have been reflected in a number of seminal publications over the past 15 years. In the mid-1990s, Datatel sponsored the booklet, *Strategic Enrollment Management*, which touted the use of enterprise technology systems to manage the recruitment, admissions, and retention efforts in institutions. In 1996, Norris and Dolence wrote *Transforming Higher Education: A Vision for Learning in the 21st Century*, which described how information and communications technology could be used to fuse academic and administrative processes and transform learning experiences. In the same year, Hamel’s book, *Strategy as Revolution*, highlighted how leading enterprises were using strategy to revolutionize and transform themselves to establish competitive advantage in the emerging Knowledge Economy.

Throughout the remainder of the 1990s, these themes were extended as higher education grappled with the implications of digitizing learning resources and experiences. Two books, Downes and Mui’s *Unleashing the Killer App: Digital Strategies for Market Dominance*, and Evans and Wurster’s *Blown to Bits: How the New Economics of Information Technology Transforms Strategy*, illuminated the potential of technology to challenge existing strategies and business models for learning. *E-Business in Education* by Norris and Olson explored the potential of e-business practices to change business processes in education.

Between 2002 and 2004, a number of seminal publications appeared that influenced the emergence of the new thinking incorporated in the concept of strategic institutional management. In 2002, ECAR published “The Promise and Performance of Enterprise Systems for Higher Education,” which chronicled the disappointing track record of ERP implementations in higher education. In plain language, most ERP implementations preserved existing processes and practices, excessively customizing the vendor’s products, and focused on achieving transactional efficiency. Relatively few had leveraged ERP and other applications to substantially change business practices and discover new value propositions. The combination of portal technology with ERP opened the door to discovering how to reinvent processes, policies, and procedures, creating new value propositions for students, faculty, and staff.

A second bombshell was Nicholas Carr’s article in *The Harvard Business Review* on “Does IT Matter?” Carr asserted that most enterprises had failed to achieve strategic differentiation from their investment in IT. He contended that unless IT was leveraged so that it delivered such differentiation, enterprises should reduce their IT investments, treating IT as a source of efficiency but not competitive advantage. His article and subsequent book provoked a firestorm of push back and cascading cycles of debate on this issue. However, his point was clear: IT investment could not count on the iconic status it had enjoyed for many years.
At the same time, other publications identified new opportunities from the shrewd deployment of information technology. Transforming e-Knowledge: A Revolution in Knowledge Sharing highlighted the potential benefits to learning enterprises from digital asset management, knowledge repositories, and new ways of experiencing knowledge. The Business Value Web introduced new techniques for maximizing the value from an institution’s resources, leveraging IT to create new resourcing opportunities.

In 2005, ECAR published “IT Investment and Business Process Performance,” which assessed the state of process reinvention in the same manner that its report on ERP implementation gauged the generally poor record of leveraging ERP to create new value propositions for higher education. The 2005 ECAR Report studied 48 business processes and found most business process performance to be “adequate” or “satisfactory.” Relatively few respondents report innovative or exemplary performance for business processes, while several report that at least some processes were at risk.

The ECAR Report found that higher education leaders manage their portfolio of institutional processes by merely “satisficing” low impact processes and investing time and resources to develop processes that improve the institution in a positive way, such as student services. Process performance in higher education is shaped by two forces: 1) the breadth of political engagement in the process, and 2) the strategic impact of the process. Institutions that report high-performing processes also report having strong executive leadership, a proven method for soliciting improvement ideas from employees, and a strong technology foundation.

Taken together, the ECAR Reports on ERP Implementation and Process Performance paint a desultory picture of missed opportunities, modest ambitions, and a “good enough” mentality. But the history of most institutions is not destiny for particular institutions for which “good enough” is unsatisfactory. Figures 1 and 2 portray the emerging consensus among technology and educational leaders that new opportunities await institutions that leverage technology, process reinvention, and human resources development to achieve a new plane of strategic institutional management.

Another seminal work memorialized in Figure 4 is William H. Graves’ research paper, “Improving Institutional Performance: The Necessary Role of IT-Enabled Innovation.” This research report is posted on the SunGard Higher Education Website. Graves’ work conveys the emerging viewpoint that higher education must rise above the “good enough” philosophy of past ERP and process improvement efforts to achieve significant performance improvement and cost reduction in both academic and administrative processes, services, and experiences. To do so, institutions must explicitly pursue performance enhancement as a matter of institutional strategy, building four interconnected elements of organizational capacity – technology, information, analytics, and innovation, as portrayed in Figure 5 in the graphics set.

Leveraging Technology to Achieve Performance Enhancement and Smart Change

In summary, the leading edge of thought and practice in higher education suggests the following conclusions:

- **Leveraging information and communications technology can enable institutions to achieve substantially enhanced levels of performance and cost reduction/productivity gains.** These can be achieved through reinventing processes and practices, creating genuinely new experiences, and focusing on fulfilling value propositions for learners and other stakeholders. In this context, value is a combination of outcomes, the experiences in which they are embedded, and cost. Value =
Positive outcomes + embedded experiences + acceptable price/costs.

- **To achieve truly transformative change, institutions must enhance their capacity to engage in systemic, enterprise-wide change initiatives.** This requires an enhanced set of capacities/capabilities/competencies. These capacities include technology, information, analytics, and innovation (as reflected in Figure 3). Successful institutional change efforts must integrate institutional initiatives to aggressively enhance all four elements of institutional capacity, on the way to achieving new levels of performance.

- **“Smart change” is the aggressive application of change management principles and practices to create systemic, enterprise-wide change in colleges and universities.** Change management is an iterative process for providing a strategic context for the institution’s ongoing process improvement, capacity building, and value-enhancing initiatives. Chance management weaves these initiatives together so they focus on and develop enterprise-wide capacity and outcomes.

- **Effective change management processes begin by articulating the performance leaps necessary to meet the institution’s future vision.** This is followed by assessment of institutional readiness, capacity for change, and higher levels of performance. The change management plan describes how the change management process will weave together institutional initiatives, navigate the challenges of change, mobilize leadership, develop institutional capacity, and engage stakeholders at all levels. **Management of enterprise-wide change will be a new core competency of successful institutions in the future.**

Special challenges and opportunities exist for multi-campus systems leveraging technology to achieve economies of scale and scope and enhanced performance across the system. In earlier eras, systems of public institutions aimed to increase geographical access and provide economies of scale in certain administrative and academic services. Today, systems of institutions are discovering new value propositions for learners by sharing resources across the system, enabling learners to access “the best of the best” from across the system, and providing seamless policies and practices and consistent outcomes for learners.

**Making Knowledge Services Work in Higher Education**

In 2006/2007, some of the most important work has been reflected in the reports of the Spellings Commission and in responses by the educational community. The multi-dimensional membership of this commission debated in plain view the often conflicting perspectives of government policy makers, corporate leaders, accrediting bodies, student advocates, and institutional leadership on the need for greater accountability and demonstration of performance. These deliberations have provoked many initiatives by educational associations and individual institutions to take leadership on these issues and to expand existing linkages with K-12 education and employers.
Changing Perspectives on Technology

SOA Tools, Analytics, and Services. In this environment, recent advances in using SOA applications to create advanced knowledge services promises to open a new frontier of analytics that could prove invaluable to enhancing performance and demonstrating value. Several recent articles in the EDUCAUSE Review, including “Making Knowledge Services Work in Higher Education” have suggested how loosely coupled applications could draw together information and insight from academic and administrative ERP, qualitative assessment resources, and portrayals of institutional context to create new portal/portfolio-based resources that could create previously unattainable capabilities:

- Aligning strategies, actions, and outcomes at institutional, college, departmental, and program levels;
- Aligning strategic planning, accreditation, resource allocation, program review, and performance assessment;
- Increasing access to learning, improving learning outcomes, and reducing the cost of learning;
- Significantly enhancing student advising and support services, increasing student retention, and success;
- Creating student portfolios for life that could be seamlessly linked with state/national employment systems and corporate human resources systems; and
- Retrofitting campus facilities planning in the face of wireless technology and changing patterns of interactivity among students, faculty, mentors, and others.

These features are likely to emerge and figure prominently in development of the next generation of ICT-based applications in higher education.

Enterprise Performance Dashboards. For the past several years, institutions have been developing prototypes of data marts, executive dashboards, balanced scorecards, and portfolios that display snapshots of institutional, college, department, and program data. Analytics and business intelligence tools are on the upswing. These first generation applications are merely the first wave of advanced analytics that will emerge over the next few years in a confluence of advances in knowledge services and external pressures for accountability.

Figures 6 and 7 portray the dimensions of the next generation of enterprise performance dashboards. To meet all the needs of accountability, these dashboards must have the capacity to draw from three distinct “buckets” of institutional data: 1) Administrative ERP, 2) Academic ERP, and 3) Assessment data. As Figure 6 illustrates, however, it is not sufficient merely to draw these data into data marts and from there into dashboards. A layer of “context management and alignment” middleware is needed to make sense of the context of these data and align them with institutional goals, strategies, and actions. This “sense making” layer can then feed portfolios/portals that can present the data in institutional, colleges, department, program, or other snapshots.

Over time, this combination of data manipulation, sense making, and presentation software will be combined with improved visualization and analytics tools to create the next generation of the enterprise...
performance dashboard, as portrayed in Figure 7. Users will be able to select different views, including: 1) Executive Dashboard, 2) Balanced Scorecard, 3) Strategic Planning, 4) Accreditation and Program Review, 5) Performance and Value Added, and 6) Quality Rankings. In selecting these tabs, users will initially encounter a first-level visualization of results, but will then be able to drill down to more detailed views. The Strategic Planning, Accreditation, and Program Review views will all be consistent with none another, drawn from the sense making tools that enable these processes to be seamlessly managed and transparently made available to authorized users. The Performance/Value Added and Quality Ranking views will also be consistent, but will provide different views of institutional/program standing.

The tools needed to develop these new enterprise performance dashboards are largely available today and promise to be broadly deployed over the next several years.

In summary, this new generation of knowledge services promises to enable analytical practices that far exceed anything previously available to leaders, faculty, and staff in higher education. These practices will not only illuminate performance, but enable practitioners to continuously improve learner access, affordability, and success.
III. Key Decision Points, UW Common Systems

Figure 8 memorializes some of the major decision points that the UW System faced over the past ten years.

Economic Conditions

Wisconsin’s economic recovery and the state of public finance lagged behind many other states. But by the late 1990s, the economy and state financial resources had improved. The development and funding of Common Systems by the UW System was facilitated by a positive period in state financial support that lasted from roughly 1998 through 2001. After 2001, budget constraints have progressively squeezed academic and administrative programs at the UW System. In this context of financial exigency, Common System initiatives have come under great scrutiny. In the past few years, economic conditions have improved, but the level of scrutiny has intensified. This condition has been exacerbated after the UW System did not complete the implementation of the appointment, payroll, and benefit system (APBS).

Student Administration Systems (SAS)

In the early to mid 1990s, a number of UW System campuses were considering new student system solutions. Legacy systems were developed in Eau Claire, La Crosse, and Stevens Point in the early 1990s. In 1996, UW Stout chose Datatel for student, financial, and human resources applications and the OWL consortium considered student system solutions. In 1997, four UW campuses (Madison, Oshkosh, Whitewater, and Platteville) announced their intention to purchase PeopleSoft SAS. In 1998, the UW System selected the PeopleSoft SAS and in 1999, contracted to develop MILER to facilitate implementation. Campuses were not required to participate in the SAS and even those that implemented SAS were able to utilize their own definitions. Over time, a number of additional campuses have opted to migrate to PS SAS. Today, Eau Claire, La Crosse, Stevens Point, Stout, and Extension have elected not to use PeopleSoft SAS though La Crosse and Stout are in the initial stages of planning PeopleSoft SAS implementation.

Shared Financial Systems (SFS)

In 1996-1997, a series of controllers/business officers teams considered the needs of the UW System for shared financial systems. In 1998, a plan was prepared by the Financial Information Systems Team (FIST) and presented to the UW System Chancellors. The UW System opened negotiations with PeopleSoft and Oracle. In 1999, Core Teams began working on implementation. Campuses were not required to be full participants in the initial SFS implementation and five campuses (Eau Claire, La Crosse, Madison, Stevens Point, and Stout) chose an interfaced solution between their campus systems and SFS. As of July 2007, Eau Claire, La Crosse, Stevens Point, and Stout will have implemented SFS and migration from Madison’s Legacy Accounting System is underway.

Appointment, Payroll and Benefit Systems (APBS)

The decision to pursue APBS began in earnest with a set of recommendations from the Best Business Practices Subcommittee in 1997. In 1998, a final report was approved by the Chancellors and in 1999, the RFP process was completed. Lawson was selected over PeopleSoft and SAP. Core Teams were designated in 2000 and implementation proceeded. All campuses and entities were participating in APBS at this time.

In 2006, however, the decision was made not to complete the implementation of the Lawson System. At the same time, the UW System took advantage of the selection of Oracle/PeopleSoft by the state’s Department of Administration (DOA) for its Integrated Business Information System (IBIS) suite of IT implementations (procurement, financials, and human resources). The UW will move to parallel, but
separate, implementations of e-procurement with DOA, and has begun planning efforts to a similar implementation with DOA for its HR-payroll-benefits system in the future.

**Academic Systems**

The UW System developed a Web-based Learning Support System (WBLSS) utility model in 1998. For the next several years, the UW System supported four learning system platforms: Lotus LearningSpace, WebCT, Web Course in a Box, and Blackboard. In 2002, a Working Group developed an RFP for an e-Learning System. In spring 2003, the contract was awarded to Desire2Learn and during that Spring/Summer the Learning@UW utility was created to provide hosting for D2L. The system was in full production by fall 2004. All campuses and entities are participating in D2L.

The sharing of library resources at the UW (“One System, One Library”) has been one of the signal collaborative accomplishments. While this has not been directed by the Common Systems Review Group, it should be included in the overview.

**Common Systems Review Group**

The Common Systems Review Group (CSRG) evolved through a variety of organizational forms in the late 1990s. By 2002, the CSRG had taken its current form, with additional representation from CIOs, Provosts, and CBOs from the campuses. In 2004, CSRG staged a successful retreat in which it crafted strategic principles for the future. A comparably successful outcome is planned for another CSRG meeting in March 2007.

The sequence of decision processes for Common Systems constituted a learning curve for the UW System. Looking over the time span portrayed by these graphics, one can easily discern the changes, decision drivers, and options available to institutions.

**Unexpected Outcomes from Common Systems**

The Common Systems process at the University of Wisconsin System has created not only a mechanism for collaborating on common enterprise architecture and application systems, but a collaborative ecology for sharing know-how, best practices, and resources that do not need to be duplicated on individual campuses. FASTAR and Miler have facilitated the sharing of system implementation know-how. UW Madison has shared many of its world-class technology resources and applications and served as the foundation for many Common System developments. These contributions need to be factored in any evaluation of the outcomes of Common Systems.

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Figure 1

CHANGING PERSPECTIVES ON TECHNOLOGY

The Emergence of Strategic Institutional Management


Administrative Systems
- Standalone Legacy Systems (Pre-ERP)
- Strategic Enrollment Management
- Best of Breed vs. Integration
- Beginning of ERP in Higher Education
- Y2K concerns

Academic Systems
- Library Automation
- Course Info Systems (CIS)
- Course Mgmt Systems (CMS)

Technology Issues and Developments
- Hardware-driven (mainframe vs. mini)
- Database issues (relational vs. non-relational)
- ERP Client Server
- 3-Tier vs. 2-Tier
- GUI
- Y2K
- Multi-platform
- Networks become preeminent
- Standards
- Webinar
- Pervasive information
- Identity management
- Security
- Open Source
- Web Services
- Internet II

Leadership/Management Issues
- Departmental/functional performance
- Fragmented business operations
- Information silos
- Transactional efficiency
- Enterprise information integration
- Customization of ERP
- Reporting & business analytics
- Business intelligence
- Recruiting/retention
- Webify products, services, experiences, and knowledge
- Non-customized ERP
- Reinvent processes
- Self-service/portal
- Student centered
- Budget constraints

INTERNET
- Strategic Institutional Management
- Fuse academic/admin/research/teaching & learning
- Leverage resources through use of IT
- Value on investment
- Leveraging loosely coupled apps with the tightly integrated ERP stack
- "Loosening up" the Stack
- Administrative "mashups"

IMPACT
- Assessment
- Outcomes & Competencies
- Academic "mashups"
- Service Oriented Architecture (SOA)
- Open Source
- Portfolios
- Dashboards
- Assessment & Performance Management Systems
- Accountability
- Linkage to Employment
- Enhancing Performance & Demonstrating Value

Change Management to Achieve:
- Strategic Alignment
- Business Processes
- Technology Infrastructure
- Improve institutional performance
The Challenge for Higher Education: Leveraging “The Stack” and “The Cloud”

THE ENTERPRISE TODAY: Tightly-Coupled Core

THE FUTURE: Loosely-Coupled Service-Oriented Architecture complementing “The Stack”

“The Stack”
of Enterprise Applications

“The Cloud”
of Loosely-Coupled Applications
### Contrasting Tightly and Loosely Coupled Applications

<table>
<thead>
<tr>
<th>Providers and Business Processes</th>
<th>&quot;The Stack&quot; of Tightly Coupled Applications</th>
<th>&quot;The Cloud&quot; of Loosely Coupled Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>System Integrator/Controller</td>
<td>Orchestrator of Applications and Business Processes</td>
</tr>
<tr>
<td></td>
<td>Limited, all-purpose service providers: Administrative ERP, Academic ERP</td>
<td>Specialized service providers</td>
</tr>
<tr>
<td></td>
<td>Infrequent Benchmarking and Process Reinvention</td>
<td>Continuous benchmarking, dynamic reconfiguration</td>
</tr>
<tr>
<td></td>
<td>The size of the tightly integrated Stack progressively shrinks as portions are migrated to SOA</td>
<td>The size of the loosely-coupled Cloud progressively grows</td>
</tr>
</tbody>
</table>

**The "Long-Tail"**

<table>
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</thead>
<tbody>
<tr>
<td></td>
<td>Focus on mainstream applications</td>
<td>Focus on specialized, niche applications</td>
</tr>
<tr>
<td></td>
<td>Slow queue</td>
<td>Fast queue</td>
</tr>
<tr>
<td></td>
<td>Developer-focused</td>
<td>User-focused, user participation</td>
</tr>
<tr>
<td></td>
<td>Address 70-80% functional needs</td>
<td>Address 100% of traditional functional and new performance analytics</td>
</tr>
</tbody>
</table>

Adapted from
- Ronald Schmelzer, "Service-Oriented Architecture: Enabling the Long Tail of IT." ZAPFLASH, September 6, 2006
Changing Perspectives on Technology

Figure 4

CHANGING PERSPECTIVES ON TECHNOLOGY

Economic Conditions, Technology Providers, and Seminal Publications

Economic Conditions
- National Economic Boom
- National Recession in State Financial Support
- Rebound in State Financial Support

Technology Providers
- Pre-ERP Legacy Systems/ERP
  - IA, SCT, Datatel, AMS, CMDS, POISE, ABT, CARS
    - Major competition: SCT vs. Datatel
    - PeopleSoft, Oracle, SCT, Datatel, TRG, Buzzeo, SAP, small players
  - PeopleSoft, SCT, Oracle, Datatel, SAP, small players
  - Sungard SCT, PeopleSoft, Oracle, Datatel, Jenzabar
  - Oracle acquires PeopleSoft, Kuaili Financial Open Source

- Course Management Systems/Learning Management Systems/Academic Enterprise Systems
  - WebCT, Blackboard, eCollege
  - WebCT, Blackboard, eCollege, Desire2Learn, Sakai
  - Blackboard/WebCT acquisition - patent wars, Sakai CMS Open Source
  - Blending of Portals & Portfolios

- Portal
  - Campus Pipeline
  - Blackboard, Campus Pipeline, Campus Cruiser, Mascot
  - uPortal, embedded portal offerings from Sungard SCT, PeopleSoft, Oracle

- Seminal Publications – what people were reading
  - Strategic Enrollment Management
  - Transforming Higher Education
  - Strategy as Revolution
  - Unleashing the Killer App
  - Blown to Bits
  - ECAR ERP Report
  - ECAR IT Investment and Business Process Performance
    - Gaskin and Marcy
    - “Does IT Matter?” HBR Case
    - Transforming e-Knowledge
    - The Business Value Web
  - Out of the Box
  - ECAR IT Investment and Business Process Performance
  - Graves, Improving Institutional Performance
  - Making Knowledge Services Work in Higher Education
  - Spellings Commission
Figure 5

Elements of Institutional Capacity to Enhance Performance

Innovation Capacity
- Capacity to collaborate/innovate to enhance performance
- Fuse together academic, academic support, and administrative innovation
- Weave innovations and process improvement together to achieve systemic, enterprise-wide performance enhancement
- Practice shared leadership and smart change
- Leverage innovations in facilities, programs, and processes

Technology Capacity
- Basic enterprise systems: networks, security, ERP, CMS, etc
  - 24 x 7 x 365 support for all users
- New technologies – eportfolio, knowledge repositories, Web Services
- Move from technology infrastructure to technology ecology

Analytics Capacity
- Capacity to move from data to analysis to action
- Capacity to prioritize performance initiatives
- Capacity to contextualize assessment and measurement
- Nimble decision-making and governance
- Track performance enhancement and calculate value on investment

Information Capacity
- Unified data
- Single login authentication
- Self-service web portal
- Data Warehousing, Information Management and Stewardship
- Collect information on performance

Adapted from William Graves, “Improving Institutional Performance: The Necessary Role of IT-enabled Innovation” – SunGard Collegis
Figure 6

Creating Enterprise Performance Dashboards

• INSTITUTIONAL/ENTERPRISE • COLLEGE/DEPARTMENT • PROGRAMMATIC • SPECIALIZED

Portfolio/Portal Presentation

Context Management/Alignment

Data Marts

Administrative ERP
• Student Info Systems
• Human Resources
• Financial Applications
• Financial Aid
• Alumni
• Fundraising

Data Marts

Academic ERP
• Learning Management Systems
• Research
• Library Services

Data Marts

Assessment
• Qualitative and Quantitative Assessment
• Outcomes
• Quality Enhancement Plans (QEP)
Figure 7

Creating Enterprise Performance Dashboards

Executive Dashboard
- Executive Summaries:
  - Administrative
  - Academic
  - Assessment

Balanced Scorecard
- Balanced Scorecard Portrayal

Strategic Planning
- Institutional Summary
  - Other Summaries:
    - College
    - Department
    - Program

Accreditation & Program Review
- Institutional Summary
  - Program Summaries

Performance & Value Added
- Institutional Summary
  - College Summaries
  - Department Summaries

Quality Rankings
- Institutional
  - College
  - Department
  - Program

- Factbook
- Data Warehouse
- Administrative ERP
- Academic ERP
- Assessment
- Contextual Mapping
## Figure 8

### Key Decision Points

**UW Common Systems**

### Student Information Systems
- **1995**: OWL Consortium
- **1998**: UW Systems announces decisions to purchase PeopleSoft – Madison, Oshkosh, Whitewater, Platteville
- **1999**: UW Systems selects PeopleSoft SIS
- **2004**: UW Systems contracts to develop MILER. CSRG receives FASTAR proposal.

### Shared Financial Systems
- **1996**: UW System Controllers initial plan
- **1997**: Best Business Practices Team
- **1998**: Financial Information Systems Team (FIST)
- **1999**: Plan presented to UW System Chancellors. Negotiate with Oracle/PeopleSoft
- **2000**: CTP & SF Core Team, Test General Ledgers, etc.

### Appointment, Payroll & Benefit Systems – Changed to Human Resources
- **1999**: Best Business Practices Subcommittee Recommendations
- **2000**: Final Report approved by Chancellors
- **2000**: RFP developed – Fall 1999
- **2001**: Proposals received, evaluated. Lawson selected
- **2003**: Core Team – April 2000
- **2004**: APBS Development/halted

### Academic Systems
- **1999**: Web-based Learning Support System (WBLSS) utility model
- **2000**: Full production WBLSS – Lotus LearningSpace, WebCT, Web Course in a box, Blackboard
- **2000**: Working Group for e-Learning System RFP, RFP in August 2002
- **2001**: Contract awarded to D2L, Spr 2003
- **2002**: Spr/3a – formation of Learn@UW Utility Hosting for D2L
- **2003**: Core Team
- **2004**: Full production, fall 2004

### Common Systems Review Group
- **2000**: Deliberations
- **2004**: CSRG Retreat and Plan
- **2004**: CSRG Retreat