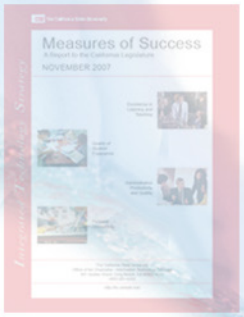
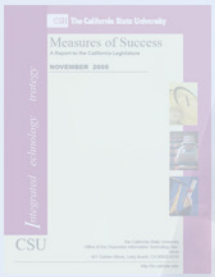
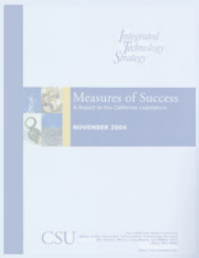
CSU The California State University

Integrated Technology Strategy







Measures of Success

Final Report to the California Legislature

November 2008

Riding the Wave of Technology

Information Technology Services
CSU Office of the Chancellor
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CATEGORY NAME **TAB**

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EXECUTIVE SUMMARY

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This *Measures of Success* annual report is the final edition in a ten-part series based on an accountability agreement between the California State University (CSU) system and the California Department of Finance. The series reports to the legislature on the progress of the Integrated Technology Strategy. This final report presents no new quantitative data; however new interviews are included. It is a summary of the previous studies and an overall assessment of the role of information technology in the CSU from the standpoints of strategic planning and outcomes measurement.

This summary report is therefore an opportunity to look both back and forward. It is a statement of successes and of lessons learned from a multi-year system commitment to information technology planning, implementation, and measurement.

This report does the following:

1. Provides a brief background statement on the importance of the Integrated Technology Strategy (ITS), as well as the strategies underlying the Measures of Success (MOS) report series and its methodology.

2. Outlines policy and technical shifts in information technology for the past decade from a national, statewide, and CSU institutional perspective. The national perspective includes a trend analysis of EDUCAUSE top ten issues from 2000 to 2008. The statewide view addresses student access, workforce preparation, and institutional efficiencies. A decade-by-decade overview of changing technologies and IT policies portrays the institutional environment.

3. Identifies the major CSU trends in academic, administrative, and networking technology at the institutional level, and changes in user behavior and attitudes documented in MOS data. Some of the issues discussed are: progress towards campus baseline capability; the stability and generally positive nature of the findings; technology and policy changes; campus and user variations; and national comparisons.

4. Describes findings from qualitative interviews with CSU presidents and Chief Information Officers (CIOs) on the impact of the ITS, and IT generally, and from systemwide conferences designed to assess IT goals and challenges. Part of that process traces the evolution of the systemwide ITS before and during the MOS reporting, and the concomitant patterns in IT organization, governance, and campus strategic planning.

5. Points to some of the unresolved issues from the MOS research (campus size and resources, IT governance, online learning) and unmet needs from a fiscal perspective, both of which suggest areas for potential study in the future.

6. Examines options governing the future state of IT accountability reporting in the CSU in terms of moving from input to outcome measures while institutionalizing a “culture of evidence” across the system. There are six recommendations for campus CIOs and one major recommendation for the systemwide Technology Steering Committee (TSC).

    - Participate in the annual Campus Computing Survey, conducted by the Campus Computing Project and the EDUCAUSE Core Data Services Survey.

    - Continue to collect a subset of the annual MOS survey data and other information deemed important by ITAC. The vehicle for collection will likely be an addendum to the national Campus Computing Survey, if the cost can be negotiated.

    - Conduct user surveys of faculty, staff and students every three to five years using a subset of CSU campuses for each survey. Campuses should be selected with the proper mix so the costs can be mitigated and results can be extrapolated to the system.

    - Develop IT metrics for the eight commitments in the California State University Access to Excellence accountability report (these data probably will be collected by departments of institutional research).

- Review the Academic Technology Baseline Plan when it is published, including metrics. CIOs should be actively engaged in the data collection for this baseline and be required to approve all submissions as part of his/her Information Technology Advisory Committee (ITAC) designee role.

- Insure that all IT initiatives, whether campus-based or systemwide, contain metrics for success in the pilot or proof of concept phase. Metrics should be well established prior to widespread implementation of the initiative.

- ITAC should make a formal recommendation to the TSC that a structure and process be established and resources appropriated to satisfy the data collection needs for a policy agenda, as articulated by the TSC presidents and Vice Chancellors. These include, but are not be limited to: using IT to resolve lower-division bottleneck courses; expanding online courses and degree programs; increasing student remediation using IT; improving e-learning outcomes; providing faculty, staff and student IT training and support services; responding to state manpower needs; standardizing best business practices; tracking total cost of ownership in IT expenditures; and improving space management through IT.

INTRODUCTION

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It should be noted that the MOS served two purposes, external and internal. The former fulfilled the reporting requirements to the state legislature. The latter provided the CSU campuses and Chancellor’s Office with information useful for strategic planning and for operational management of initiatives within the ITS. There was not always a perfect fit between these functions, so the data collection process was adjusted over the years to reflect the changing needs of both.

Integrated Technology Strategy (ITS)

Since the mid 1990s, CSU leaders, particularly campus presidents, saw the emergence of digital technologies and increased student and faculty demand for them, as an opportunity to use information technology as a strategic resource within the CSU. They recognized that to seize this opportunity, a way must be found to update the system and campus technology infrastructures at a rate more in keeping with the pace of technological change than was possible under prevailing processes. They concluded this could only be accomplished by adopting a collaborative approach.

Planning for the ITS began in 1994 as an iterative process involving all major CSU stakeholders. Constituent input made clear that without a minimum baseline technology infrastructure on every campus, the benefits of the ITS initiatives could not accrue to all students, faculty, and staff. In March 1996, the CSU Board of Trustees approved the ITS framework for leveraging technology as a tool to achieve CSU academic and administrative goals.

The four outcomes of the ITS are depicted in Figure 1 as the apex of the pyramid. They have remained constant from 1996 to the present and result from the strategic application of information technologies in support of the core programs and operations of the university. The infrastructure prerequisites for using technologies effectively are shown as the broad component at the base of the figure (the Technology Infrastructure Initiative, or TII). These have evolved to make more explicit the need for middleware tools for managing access to and interaction between hardware and software.

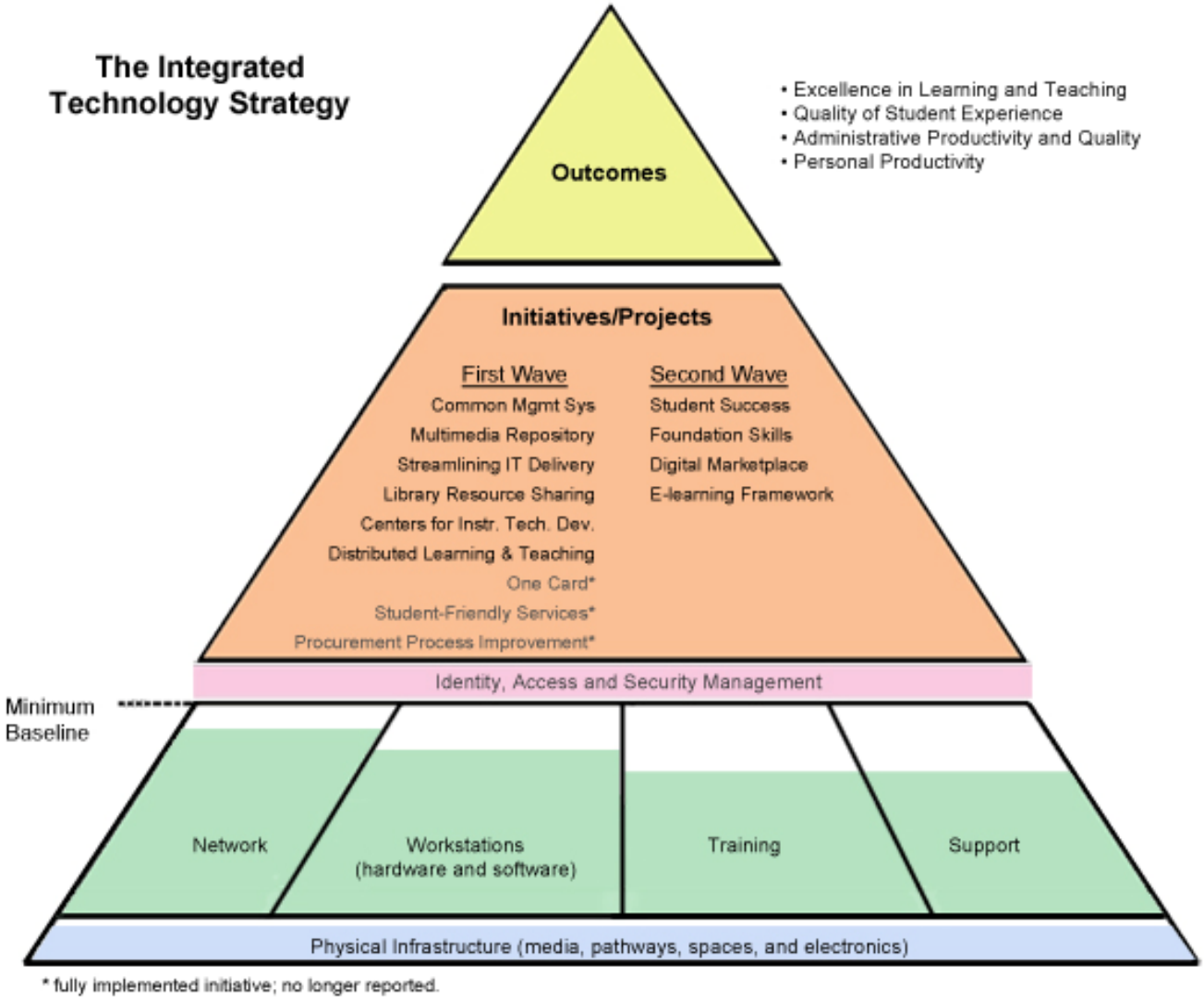

Figure 1

Specific initiatives, shown in the center of the pyramid, were designed to achieve improvements in academic and administrative areas of priority concern. They have changed and will continue to change as they mature. For example, two of the first-wave initiatives were institutionalized prior to the inception of the Measures of Success. These included a student One Card initiative for simplifying admissions, financial aid, purchasing, and other administrative functions, and a centralized procurement process for large, systemwide needs. Reporting about a third initiative, Student Friendly Services, was discontinued in the 2004 MOS because the number of applications had far exceeded the 2008 goal of having 50 percent of applications to CSU received electronically. By June 30, 2003, over 68 percent of applications were so submitted, rendering further tracking unnecessary. Today, 98% of all CSU applications are received online.

In March 2001, the CSU presented a five-year progress report to the Board of Trustees, noting that the first-wave initiatives were well underway. A follow-up ten-year report was delivered in March 2006.

The ITS never was a specific detailed plan but more a dynamic strategic planning framework. As such, it has continued to guide the CSU's investments in technology for more than a decade and will do so well into the foreseeable future. For example, the administrative initiatives to implement common human resources, financial and student administration systems are almost complete; and a centralized data center supporting those systems is fully implemented. Subsequently, with the technical and administrative enabling infrastructures in place, CSU leaders have made academic technology a major policy priority of the system. The goals of the original academic initiatives have largely been achieved, and the efficiencies mainstreamed.

For more than a decade, the pyramid has been the iconic representation of the ITS. An additional pyramid for academic technology has been developed to illustrate the evolving nature of the ITS. This new pyramid (Figure 2 in Appendix A) shows the outcomes specific to academic technology, the initiatives in progress, and the infrastructure required to support them. Some first wave initiatives from the ITS, such as Common Management System (CMS) and those focused on Excellence in Teaching and Learning, have become institutionalized and now form part of the infrastructure for the new academic efforts.

Measures Of Success (MOS)

The MOS is the vehicle through which CSU has informed the legislature about progress and benefits of the ITS. Annual reports were submitted each November, beginning in 1999. The 1999 report outlined the plan for the series, the 2000 report provided baseline data descriptions and measurement, and the next seven year's reports 2001 – 2007)chronicled changes to the baseline data. This is the tenth and final report in the series.

The reports measured progress in achieving the benefits associated with specific ITS initiatives in the following outcome categories:

- Excellence in Learning and Teaching
- Quality of the Student Experience
- Administrative Productivity and Quality
- Personal Productivity

The intent of the *Measures of Success* process was to yield information about:

- Extensiveness, or the amount of usage of IT services
- Effectiveness, or the degree to which the ITS objectives have been met
- Efficiency, or the cost of the services provided
- Quality, or the currency and capacity of IT resources and the satisfaction of users

The benefits of ITS depend on a robust technology infrastructure. Therefore, executive management determined that this infrastructure should be given priority—often above new buildings. Voter-approved bonds provided the source of funding to build the technology infrastructure. Before approving CSU plans to use capital dollars on technology infrastructure, the state legislature required assurances that having this capability would produce the benefits identified in the ITS.

The MOS is the result of negotiations between the CSU and the California Department of Finance. Agreement was reached on a framework and metrics for measuring and reporting on the progress and results of ITS implementation. The ten-year time frame of the reporting requirement showed that as the infrastructure is extended to a growing number of campuses over time, there is commensurate improvement in ITS goal attainment.

Methodology

The CSU conducted a wide range of data collection efforts to support the MOS process. Both institutional surveys and individual surveys of students, faculty, and staff were administered from the baseline year of 2000 through 2007. These included:

Annual Systemwide Technology Surveys: Certain types of campus data often are mandated by law and are collected, synthesized, and published by systemwide offices. These data include official demographic and quantitative records

on students, faculty, staff, space and facilities, course enrollments, administrative budgets, and so forth. Where appropriate, these official databases and reporting sources were used in preparation of the MOS reports. Other aggregate statistics are routinely collected at the program or department level to monitor and evaluate major systemwide ITS initiatives, and these were included in the reports as well.

Annual Campus Technology Survey: This institutional survey was initiated for the explicit purpose of collecting information identified in the original MOS report and to provide additional technology-related data for internal CSU uses. The survey was coordinated by campus chief technology officers, and addressed every important facet of the ITS—academic, administrative, and network infrastructure—and was a major part of the MOS reports.

Biennial Student, Faculty, and Staff Technology Surveys: In addition to institutional data and broad aggregate indicators, CSU gathered individual information about student, faculty, and staff experiences with technology. Some of the questions in these telephone surveys for all three groups were modified or deleted over time due to evolving technologies and absence of significant change in the findings from previous surveys. The surveys also sought to address emerging policy concerns of the campuses and system office.

A total of 12 telephone surveys were conducted over the MOS period. Each was based on representative samples of the CSU student, faculty, and staff populations using stratified random techniques. About 3,000 students and faculty, and roughly 2,000 staff were included in the biennial surveys. These provided user data on the importance of information technology; perceptions of the availability of computing and network technologies and services; use of those resources; and satisfaction with the quantity and quality of the technology and support available.

Annual National Surveys: Since 1990, the annual Campus Computing Project has been the largest continuing study on the role of computers and information technology in American higher education. All 23 campuses were mandated to participate in the projects annual survey as part of the MOS data collection effort. Each year, the CSU contracted with the survey provider for customized data comparing the CSU findings to roughly 100 Carnegie Masters I institutions nationally. Responses to this survey provided the CSU with a policy and budgetary context within which the MOS metrics could be considered.

-EDUCAUSE is the leading professional organization on information technology in higher education in the nation, and sponsors a Core Data Services survey each year. CSU campuses were strongly encouraged to participate because of the web-based, interactive comparisons that could be made with national norms. This survey focuses heavily on organizational and fiscal issues in IT, and between 15 and 20 CSU campuses usually participated.

THE BIG PICTURE

Following is a brief discussion of the role of IT prior to and during the MOS process from a national, statewide, and institutional perspective. Dramatic changes have occurred in both IT policies and technologies, even since the advent of the MOS in 1999-2000. In general, the trends and priorities within the CSU tended to mirror those of other higher education institutions in the nation and the state.

The National View

Network and digital technologies are changing the culture and character of higher education much as they are changing the face of everyday life and the operations of almost every industry in the economy. The MOS was conducted in this dynamic environment where the university was only part of broader IT forces sweeping the social and economic landscapes.

Each year since 2000, the EDUCAUSE Current Issues Committee has conducted a survey on the most pressing higher education IT challenges facing executives and CIOs of member institutions. Nearly 600 institutions typically respond to this annual survey. From a list of approximately 30 potential issues, adapted from the changing landscape, IT leaders identified the top ten from four different perspectives:

- Most important for your campus to resolve for its strategic success
- Potential to become much more significant in the coming year
- Spending most of your time as an IT leader addressing
- Costing the most human and/or financial resources

Each year there were distinct differences within the top ten items for each of the four questions. What IT leaders were spending their time on was not necessarily where their institution as a whole was spending the most human and/or fiscal resources. In addition, the issues that are most important to resolve today may not be those that have the greatest potential for future challenges.

The table below shows the top ten issues in 2000 and 2008 based on their current strategic value to the institution (question one). Perhaps the most striking feature about the change over time was the rise in network security issues and the decline in academic technology that has always been the victim of funding shortfalls. Trends in the CSU were not markedly different. In general, the dominant pattern has been the rise in network technologies and all of the changes in individual and institutional behavior that stem from it. Directly or indirectly, the MOS was witness to those changes.

2000	**2008**
1. Funding IT	1. Security
2. Faculty development, support, and training	2. Administrative/ERP Information Systems
3. Distance education	3. Funding IT
4. Electronic learning environments	4. Infrastructure
5. Enterprise administrative systems (ERP)	5. Identity/Access Management
6. IT staffing and human resources management	6. Disaster Recovery/Business Continuity
7. IT strategic planning	7. Governance, Organization, and Leadership
8. Online student services	8. Change Management
9. Advanced networking	9. E-learning/Distributed Teaching and Learning
10. Support services demands	10. Staffing/HR Management/Training

The national Campus Computing Project is a second major source on the most important IT issues facing higher education institutions. When the findings for 2000 and 2007 are examined, a similar pattern emerges. Instructional integration, user support, and funding IT were the top three issues in 2000, while network and data security, upgrading or replacing ERP systems, and hiring or retaining IT staff were the top three issues in 2007. In fact, no other issue made it into the top three over the period.

The Statewide View

State lawmakers are less concerned with the internal preoccupations of IT than with practical matters of budgets and the economy. Therefore, their priorities tend to revolve around three interrelated issues: student access, workforce preparation, and institutional efficiencies. Technology is a subset, albeit an important one, of these concerns.

Access: Expanding access to higher education has been a cardinal principle of California state government since adoption of the Master Plan for Higher Education in 1960 and the dramatic expansion of CSU and community college campuses during that decade and beyond. For many years, the California Department of Finance (DOF) published official projections of higher education enrollments, and public infrastructure investments (for both physical plants and information technology) relied heavily on them. More recently, the DOF discontinued the projections because of their budget and political implications as ten-year census data became more problematic. Still, the basic building blocks of such projections (population changes, demographic shifts in age and ethnicity, and high school graduation rates) suggest that the current mix of CSU campuses may not be sufficient to accommodate anticipated enrollment increases, especially in geographic areas of high growth.

Many CSU campuses in areas of high population growth have reached or exceeded their master plan limits for the physical plant. Those limits traditionally were set at 25,000 FTES, but they can be waived upon petition to the Board of Trustees, and have been. All of this implies new buildings or new campuses and off-campus centers, or all three. Greater use of information technology, especially online instruction, has represented the best hope for both expanding access while realizing efficiencies in space construction and maintenance. Those hopes have not yet been satisfied to a significant extent, so the access/space dilemma remains.

The latest systemwide academic strategic plan for the CSU is titled *Access To Excellence*, an accountability plan that includes eight "commitments" for access and degree attainment together with a "menu of possible indicators" to demonstrate progress toward them. The technology infrastructure of the CSU is identified as one of the enabling tools for achieving these commitments to students and the state.

Workforce Preparation: Both students and faculty accorded workforce preparation a high priority in the MOS user surveys. Knowledge of, and skills in the use of technology figure prominently in the information age economy of the state. Much of the state support for the ITS was predicated on the long-term benefits to students and the state of a technologically-literate citizenry.

Many CSU campuses and the Chancellor's Office conduct periodic studies of the community and statewide economic impact of a college education, respectively. The most recent study of statewide impact shows that the CSU's direct economic effect on the state was $7.6 billion annually. This total in turn generates a "multiplier" impact of $13.6 billion in direct spending for the state's economy, sustaining more than 200,000 jobs and producing more than $760 million annually in state and local taxes. The system's campuses graduate 82,000 students each year, and the 1.7 million CSU alumni working in California earned an estimated $89 billion in income, of which an estimated $25 billion was attributable to their CSU degrees. In general, every dollar of state investment in the CSU returns $4.41 to the economy. Information technology permeates every industry in California, and the CSU produces 40 percent of the state's IT graduates, including more than half in computer and electronic engineering.

Efficiency: Campus collaboration and system centralization are hallmarks of several ITS initiatives, and the MOS was able to document the levels of cost savings and cost avoidance for them. Chief among these have been the data center consolidation for CMS; library resource sharing in the purchase of an electronic core collection; workstation hardware and software purchasing; and purchase and installation of network electronics.

Personal productivity, on the other hand, is usually harder to document but nonetheless real. User satisfaction surveys for faculty, staff, and students were good indicators of the time savings and productivity gains realized from implementation of the student friendly services initiative; remote, high-speed network access; current generation hardware and software; and the student administration and human resource modules within CMS. Beyond institutional efficiencies, training for a knowledge-age workforce was an added imperative for implementing the ITS initiatives.

The Institutional View

Table 1 in Appendix A provides an historical overview of IT development in the CSU, by decade, along six crucial dimensions: IT organization; strategic planning; academic technology and libraries; administrative systems; computing environments; and telecommunications and networking. Together, these dimensions offer a road map to the formation of the ITS, the need for a systemwide MOS, and potentially some form of long-term, systematic data collection. In sum, they highlight the evolving nature of IT over the past several decades:

1960s: era of large mainframe computers run by technical specialists; formation of the first central administrative data center in the CSU.

1970s: era of distributed data processing and related terminal-based computing, central timesharing and mini-computers for instructional and administrative applications; the beginning of library automation and microwave and satellite network systems.

1980s: era of telecommunications and statewide networking for remote access to information resources, formation of the systemwide CSUNet (wide area network), and linkages to networks outside the CSU; convergence of computers and telephony, desktop work processing and personal computers, and client-server environments; mandated annual campus strategic plans along with standardized resource inventories; the first comprehensive, systemwide strategic plan for IT issued in 1983 (a forerunner to the ITS calling for universal access to computers and networks, and integration of voice, video, and data information); formation of the first systemwide commission on instructional technology.

1990s: era of dramatic increases in computer speed, power, and storage together with lower costs; emergence of the World Wide Web, technology convergence and multimedia applications, browsers, search engines, and the commercial Internet; decentralization of computing resources to the campuses; in 1990, the second major strategic plan launches 21 IT initiatives, followed in 1996 by formal adoption of the ITS; formation of four systemwide commissions on instructional technology and libraries, administrative systems, networking, and extended education and the oversight Technology Steering Committee led by campus presidents; comprehensive library and network strategic plans are developed; CSUNet is expanded to include community colleges and some K-12 schools (4CNet), and later merged with a statewide telecommunications network consortium; the CSU becomes a major national player in Internet2, the National Learning Infrastructure Initiative, and the information competence project; planning for the Common Management Systems (CMS) and Technology Infrastructure Initiative (TII) are informed through a Systemwide Internal Partnership and negotiations with external business partners leading to the statewide bond proposition for a baseline infrastructure buildout.

2000s: era of accelerated migration to a networked environment, including wireless technologies and ubiquitous, personal mobile devices; emergence of learning management systems, middleware, and new network security protocols; agreement on a MOS reporting regimen to support the infrastructure buildout; and launch of a second wave of ITS initiatives addressing academic technology.

Summary: Several things are evident from this brief historical overview. First, systemwide strategic planning has been a major focus of the CSU for at least 25 years, including instructional technology, libraries, administrative systems, and telecommunications and networking. Second, presidential involvement and leadership has been a hallmark of the process for almost two decades, exploring avenues for greater collaboration, integration, and cost sharing in IT. Third, the CSU has often been at the forefront of new and emerging technologies and organizational structures, particularly in networking. Fourth, with the exception of the late 1980s and early 1990s (the campus-based program on Computing and Information Resources Project), the CSU did not have a centralized data collection effort in IT. In 2000, the MOS introduced a new culture of evidence and accountability, but more needs to be done in the future as the next two sections of this report indicate.

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JUST THE FACTS

Some MOS metrics have remained consistent over the period while others have been introduced as new policies and new technologies emerged. Tables 2 and 3 in Appendix A offer a high-level summary (from the 2000 baseline year to 2007) of the major trends in academic and administrative technology and in networking at the institutional level, and of changes in user behavior and attitudes.

Positive Findings: The indices shown in those tables were selected from the full range of available data based on their significance for ITS success. Of 45 selected institutional metrics in the MOS report, fully 89 percent showed positive longitudinal gains. Of the 61 user metrics for students, faculty and staff, 80 percent showed positive longitudinal change.

Some of the most significant institutional achievements were in: library resource sharing; multimedia repositories for online instructional resources; Internet use; course management systems that improve student learning and faculty administration; electronic student services; common management systems for campus financial, human resource, and student administration functions; workstation access and quality; networking and wireless technologies; and campus telecommunications infrastructure buildout.

User surveys show that student computer access and home-based broadband access are virtually ubiquitous by 2007. The greatest increases in the use of technologies over the period occurred in administrative systems for registration, grades, financial aid, and degree progress; instructional technologies, and campus-based wireless networking. Students gave extremely high importance ratings to IT literacy for future employment, and were generally satisfied with campus technology resources, services, and skill preparation.

Increasingly, faculty employ a wide range of online technologies in instruction such as multimedia and electronic databases, presentation graphics, specialized software applications, websites, and team-based activities. They reported greater use of campus administrative systems and campus wireless networks, and consistently gave positive evaluations to technology support services. Staff too gave very high importance and satisfaction ratings to campus technology resources and services, and their use of the new PeopleSoft common administrative systems increased dramatically during its implementation across the system.

Campus Baseline Capability: Quantity and quality standards in five categories define a minimum level of technology infrastructure for each campus: the telecommunications infrastructure (backbone network and electronics that provide broadband connectivity); workstation standards (hardware and software currency); high speed network access (from individual workstations); technical support services; and user training. The state bond investment of $250 million was used to support the technology infrastructure buildout to a minimum baseline capability on CSU campuses. By 2008, fully 22 of the 23 campuses had met the standards for the telecommunications infrastructure and workstation network access. Campuses have also made significant progress toward meeting baseline standards for workstation quantity and quality. Achievement of baseline capability in the areas of support and training has been uneven. All five categories, however, remain prerequisites for achieving progress in the academic, administrative, and networking goals of the ITS as measured in the MOS.

The telecommunications infrastructure buildout had two major components: network electronics (switches and routers) and cable plant construction (remodeling, trenching, cabling, and wiring). Funding, purchasing, and control of the former (approximately $80 million) were highly centralized. With the exception of overall standards, operational management of the latter was decentralized to the campuses in order to accommodate their individual needs. Technical and legal issues sometimes slowed progress, but in the end, many campuses added their own funds and resources to complete the work, again with oversight by the central office on standards.

Stability: The dominant pattern at both the institutional and individual levels has been one of relative stability; change occurred slowly and in predictable directions. In some areas, there was very little change over the period on matters that historically had few resources devoted to them (e.g., user training and support services). In others, technology soon attained the status of a commodity, a daily appliance that almost everyone had and used (e.g., personal computers, high speed network access). In still other areas, technology use and satisfaction were relatively high to begin with and remained so.

Technology Changes: Information technology is one of the most volatile of an institution's assets. Learning management systems, wireless networks, smart classrooms, and a host of other issues assumed prominence quickly after they appeared. MOS data collection procedures moved stable items out of the process as it added new ones. As a result, it was not feasible to conduct longitudinal tracking of all data points for the entire period.

Policy Changes: In addition to new technologies, the MOS served as a barometer of evolving policy priorities over the past decade. Chief among these were security and identity management, online instruction, adaptive technologies, and cost recovery and avoidance. In general, changes in CSU policy concerns matched those expressed by institutions nationally.

Campus Variations: CSU campuses are characterized by enormous diversity in size, programs, history, culture, organization, leadership, and resources. Only system findings were reported in the MOS so most of the campus variations in the data were not discussed. However, even a cursory glance at the detailed data tables reveals a great deal of campus variation around mean scores and system norms. Yet the ITS goal of achieving a baseline capability for all campuses on most IT resources did produce a steady if not dramatic closing of the gap and movement toward greater uniformity (especially in the areas of telecommunications infrastructure and administrative information systems).

User Variations: Each of the three user groups (students, faculty, and staff) occasionally showed statistically significant sub-group differences that paralleled sample stratification (e.g., discipline and rank for faculty, and class level and ethnicity for students). One area that differentiated staff was satisfaction toward the common management system implementation; more experienced users became more satisfied over time. However, differences among groups of students, faculty, and staff were usually greater than those within them on the three dimensions surveyed—i.e., technology access, use, and satisfaction.

National Comparisons: On the vast majority of IT issues, CSU campuses are more like comparison institutions nationally than different from them. This was especially true in fiscal expenditures, policy priorities, new technologies, and academic technology. Given its emphasis in recent years on administrative systems and networking, the CSU was usually ahead of national norms in these areas.

IT IMPACT: STATUS IN 2008

Preparation of this report represented an opportunity to get an overall assessment of the ITS, and of IT generally, over the past 15 years from the two groups most responsible for guiding CSU technology policy: the presidential Technology Steering Committee (TSC) and the CIO Information Technology Advisory Committee (ITAC). Accordingly, interviews were held in spring and summer 2008 with members of both groups. In addition, information was gathered from: the presidential Executive Council retreat in 2008; a CIO 2008 goals and challenges survey and leadership conference on system collaboration; the fall 2007 CIO retreat on budget and fiscal issues; and a 2005 systemwide study of IT strategic planning among executives on a sample of 11 CSU campuses. Together, these sources speak to the broader impact of the ITS and the MOS over the years, particularly in terms of cultivating structures and processes for IT governance and strategic planning.

The TSC Perspective

One of the most impressive features of the ITS has been the involvement of CSU campus presidents in its planning and execution. The TSC, comprised of between six and eleven presidents and two system executive vice chancellors, has met almost every month since its inception in 1993 to guide the ITS process. This degree of collaborative presidential leadership in IT is a rare occurrence in higher education, and has placed technology near the center of the policy agenda in the CSU system. More recently, an academic technology steering committee of campus provosts, augmented with CIOs, was formed to complement the TSC.

In the early 1990s, CSU presidents recognized the potential threat to the system posed by a growing technology gap. The exponential growth in digital and network technologies was far outstripping the ability of campuses to provide them to faculty, students and staff. In addition, these trends exacerbated existing technological gaps among CSU campuses. The policy solution chosen was to leverage the size and resources of the system through collaboration, and the vehicle for doing so was the ITS. Since then, the initiatives within the ITS have nurtured an unprecedented culture of collaboration among CSU campuses, which have adopted a greater system and statewide perspective as a result.

When asked about their top policy priorities, each TSC member had a very clear idea of the questions he/she would like answered through additional research into IT, although most overlap with academic and institutional research as well. These included:

Academic Priorities

Bottleneck Courses: demonstrate the efficacy of IT for improving student retention and graduation rates in high-volume, lower-division courses and for courses addressing the English Placement Test and the Entry Level Math requirements.

Online Courses and Degree Programs: improve student access and time to degree through online and hybrid course delivery; share courses across the system as a means of reducing costs per FTES with attention to faculty workload considerations; measure the effects of changing faculty incentive and reward systems, especially in the Retention Tenure and Promotion (RTP) process.

Remediation: overcome the quality deficits in K-12, especially for minority and historically underserved students; evaluating the software already available; focus on math and English.

E-Learning Outcomes: expand faculty use of Internet-based learning objects by discipline, and document their relationship to student success; use WASC and disciplinary guidelines along with the CSU Access to Excellence standards to develop IT outcome measures; assess the academic implications of social networking applications and of new cognitive learning styles among students; transform course design to both increase student success and lower instructional costs.

Faculty, Staff, and Student Training and Support Services: consider the role of mandates along with the development of a reliable funding stream to support them; identify baseline metrics in key academic technology areas with special attention to instructional design staffing and IT professional development.

State Manpower Needs: conduct community and state impact studies and expand the models of CalStateTEACH and the statewide nursing program.

Administrative Priorities

Standardization of Business Practices: use standardization and mandates to achieve efficiencies; in student services, administrative processes, and strategic planning; provide real-time, interactive, Web-based, dashboard data for decision-making and continuous improvement of best practices.

Total Cost of Ownership: demonstrate efficiencies attained through the use of technology on both the academic and administrative sides; test the long-term efficacy and cost of new technologies prior to system adoption; find common ways to measure and track costs over time, and make desktop, server, classroom, and other forms of refresh cycles part of this equation.

Space Management: investigate the effects of setting aside a percentage of the capital outlay budget for IT projects; reconsider space design and allocation formulas for a technological age (e.g., smart classrooms), and study the potential for replacing and expanding physical space through online instruction.

The CIO Perspective

An informal survey of CIOs in spring 2008 indicated that the following IT issues and concerns were among their top priorities:

- *Refresh Funding*: upgrade and maintain workstation hardware and software for faculty and staff, and smart classroom environments.
- *Minimum Baseline*: manage the ITS minimum baseline infrastructure, with emphasis on user training and support services and identity management.

Unfunded Mandates: In addition to the CSUs mission to provide equality of educational opportunity to all its students, federal and state requirements mandate a variety of important yet unfunded services such as adaptive technologies for the disabled or network security and privacy. These items must be funded from already constrained resources.

- *CMS*: keep abreast of upgrades, improve performance, and adopt best practices.
- *Integrating IT into the Curriculum*: operationalize and implement academic transformation and support for online learning.
- *Reduction in Services*: mitigate funding shortages, especially for support services such as help desk.
- *Staffing*: retain existing staff, fill critical vacant positions, and avoid lay-offs.

In fall 2007 and spring 2008, CIOs met to address areas for potential collaboration in the future, including: a LMS collaborative; off site disaster recovery and business continuity; common, outsourced email systems; process management; CMS modifications and upgrades; green data center; identity management; IT professional development; and academic technology governance. Some of these priorities may lead to strategic initiatives for the system as a whole while others may remain as operational concerns of individual campuses.

Organization And Governance

IT organizational models and views about strategic planning vary greatly in the CSU. The results of a recent presidential IT organization survey found that nine CIOs report to the president, five to the provost, and six to the administrative vice president. Among the 20 campuses with CIOs, 17 are sitting members of the president's cabinet, and two join the cabinet as needed.

Beyond personalities and campus culture and history, the 2005 strategic planning study found that sheer size may be the single most important factor in IT organization. Smaller campuses rarely need elaborate planning committees and larger ones often are too decentralized to make them effective. It is probably no accident, then, that some of the most integrated planning structures and processes were found on medium-size campuses. No matter the topic, the issue

of "breaking down silos" (both organizational and cultural) came up repeatedly in campus interviews with CIOs. Balkanization among academic colleges and departments and the failure of IT and libraries to work more closely together were recurring themes.

On balance, campus interviews suggested that: success in IT *organization* depends on a formal structure and systematic processes; success in IT *governance* depends more on having effective processes, e.g., stakeholder consultation, than any given structure;. however, that a prerequisite for *both* is an institutional strategic plan widely disseminated and understood by campus stakeholders.

IT Strategic Planning

Evolution Of The ITS

The ITS was both similar to previous strategic planning efforts at the system level, and yet different from them. The two closest examples were the strategic plans released in 1983 and 1990. Like the ITS, the former had a long list of specific initiatives for academic, administrative, and network efficiencies using technology. Also like the ITS, the latter relied heavily on presidential leadership to drive the IT agenda. However, unlike these examples, the ITS was more of a bottom-up approach where campus stakeholders determined priorities and shaped the programmatic agenda to address them.

However, the ITS was never designed to be a static planning document, and indeed has changed over the years. The first phase focused heavily on the telecommunications infrastructure buildout, implementation of the common management system modules for finance, human resources, and student records, and data center consolidation. The academic initiatives were less sweeping in scope or expense, but yielded important institutional efficiencies in library resource sharing and electronic student application and registration procedures.

Phase two ushered in the Measures of Success reporting series. It tracked progress in campus movement toward minimum baseline standards in workstation availability, network connectivity, and user training and support services, and provided the first systematic evidence of user IT behavior and attitudes.

Phase three witnessed completion of the infrastructure buildout and the common management system implementation, together with the emergence of ambitious new initiatives in academic technology (such as transforming course design, e-learning, and foundational skills), and in wireless technologies, information security, and learning management systems. Currently, work groups are developing a set of baseline standards for the more "nuanced" and complex environment of academic technology.

Campus Strategic Planning

The spring 2008 survey of presidents showed that 19 campuses currently have an institutional IT strategic plan and three are currently developing such plans. One campus had strategic plans at the divisional level.

Institutional strategic planning in the CSU can be thought of as a continuum, ranging from relatively simple mission and goals statements posted to the Web, to full-scale public relations campaigns that permeate the campus, to detailed "no-nonsense, by-the-book" technical exercises. Campuses tend to develop IT planning that mirror their culture of institutional strategic planning.

In general, technology seems to be better integrated into campus strategic plans when a formal planning structure, process, and methodology are used to develop them. "Thematic" campus strategic plans often provide a compelling vision but the operational underpinnings, such as technology, may receive little or no mention. IT advisory committees are indispensable in bridging the gap between strategic vision and practical application.

According to a recent EDUCAUSE study, campuses nationally with a high degree of IT alignment:

- had a clearly articulated campus vision and/or priorities;
- considered planning important and closely linked to the institutional budget;

- had published an institutional plan or campus IT plan or engaged in planning activities continuously;
- reported dynamic or stable environmental climates (as opposed to turbulent or volatile ones);
- perceived both their IT governance process and their IT strategic planning process to be effective;
- had greater communication with and involvement of key constituents, especially faculty and deans; and where objectives are clearly documented at the time IT initiatives are approved.

A 2007 study by the-EDUCAUSE Center for Applied Research, found that the degree of IT alignment in the CSU was very similar to levels nationally. The 11 case studies in the 2005 study of campus strategic planning identified these emerging patterns of IT alignment in the CSU:

Academic Alignment:

- Campus IT strategic planning must take into account the movement towards a new institutional culture and ethic that points to fundamental changes in the traditional teaching and learning paradigm, such as greater use of online technologies and less reliance on "seat-time" in the instructional process.
- Digital technologies, lifestyles of the "net generation," and the expansion of online learning will drive this potential "transformation" by forcing pedagogical changes that increase convenience, collaboration, and individual control.
- Traditional functions such as academic libraries and student services are similarly being transformed by the proliferation of virtual environments. Automation and self-service applications will allow staff to devote more time to personal interaction with students.

Infrastructure Alignment:

- A robust network infrastructure, "smart" learning spaces such as electronic classrooms and libraries, and the active involvement of IT in the design, construction, and renovation of the campus physical plant are central to infrastructure alignment.
- Flexibility and modular design together with opportunities for social interaction are two of the primary factors that should drive building and space decisions in a technological era.

Fiscal Alignment:

- There is a lack of stable, predictable and adequate funding sources for IT in the CSU and elsewhere, especially in the area of academic technology. This is crucial because all evidence indicates that IT strategic plans will not be implemented in the absence of direct linkages to the overall institutional budget.
- In order to make the IT business case, both CIOs and CFOs must recognize and articulate the operational, tactical and strategic value of IT to the institution.
- There must be a "culture of evidence" surrounding IT investments, including a formal accountability process, well-defined success indicators, and appropriate metrics.

UNRESOLVED ISSUES, UNMET NEEDS

Despite the elaborate detail contained in the annual campus surveys and biennial user surveys conducted for eight years, in some cases the data raised as many questions as they answered. This is typical of almost any such study. Additional or different research is almost always needed to resolve conflicts and anomalies among campuses and user groups. Moreover, resource constraints virtually guarantee that some issues are overlooked in the research process because the funds are not available to make them an immediate policy priority.

Unresolved Issues

There were many details in the aggregate MOS data, both in the institutional and user surveys, that time and resources did not permit investigating, or that simply were outside the scope of the MOS reporting process. At least three deserve attention here.

1. *Campus Size And Resources:* The goal of a minimum baseline is probably the most important feature of the ITS. Its intent is to overcome campus disadvantages due to history, size, demography, and resources. By design, the MOS focused on overall system findings; individual campus variations in the data were profiled in graphic form for campus and system metrics but without campus identification. No analysis was undertaken to discover possible explanations of those variations. Conventional wisdom suggests that large campuses have certain built-in advantages due to economies of scale, greater flexibility in resource allocations, and potentially greater depth in technical expertise, but these matters await more detailed study.

2. *IT Governance:* Discussions about IT governance, both nationally and in the CSU, generally focus on two major dimensions: centralization versus decentralization, and academic versus administrative technology.

Campus CIOs have devoted a great deal of attention to the advantages and disadvantages of a centralized versus decentralized IT organization. Almost everyone believes that organization matters, but few know for sure on what issues, under what circumstances, and to what extent. Fortunately, there is a large professional literature on this subject that may offer clues on where to look for governance effects among CSU campuses.

Similarly, the familiar distinction between academic and administrative technology and the reporting lines that often accompany them are constant concerns of CIOs, provosts, presidents, and executive management generally. Breaking down silos (both organizational and cultural) and the increasing balkanization among academic colleges and departments are recurring themes of IT management and operations. The questions usually are these: does it matter if the CIO reports to the president, the provost, the CFO, or sits on the president's cabinet; is IT a university-wide resource where distinctions between academic and administrative technology are artificial; and how can a greater integration of academic, administrative, and networking technologies be achieved in an environment of increasing decentralization and specialization of IT resources, both hardware and software? Again, these are topics for research and debate among national professional audiences, but their implications for CSU campuses have not been tested in any systematic way.

The bottom line is that these two issues (centralization/decentralization and academic/administrative technology) could be candidates for case studies within the CSU where qualitative variables can be addressed more directly than in raw quantitative surveys. As always, the problem is one of introducing experimental or statistical controls to test the independent effects of governance and organization versus a host of other influences on IT outcomes, such as campus history, culture, size, leadership, resources, etc. However important these organizational "fault lines" are to CIOs and others, they were beyond the scope or intent of the MOS reports and await further study.

3. *Online Learning:* Almost nothing goes to the heart of infrastructure buildout and its relationship to student access more than online teaching and learning. Fiscal and political constraints limit the physical expansion of current campuses or the building of new campuses and off-campus centers.

There is both good news and bad news associated with online learning in the instructional process. The good news is that information technology has been infused into the curriculum of virtually every academic discipline and degree program in the CSU, ranging from student and faculty use of electronic library resources to the World Wide Web to course management systems. Computers, network access, "smart" classrooms, specialized software, and the like are integral parts of the teaching and learning process throughout the system. This was not always the case when

the ITS was launched 15 years ago, but today all forms of technology are as ubiquitous as books and blackboards. The policy goal of making information resources available on an anytime, anywhere basis has largely been achieved. This would not have been possible without the technology infrastructure buildout across the CSU system.

The bad news is that transforming entire courses into either online or hybrid (combination of online and face-to-face instruction) modes has been slow to develop. While it is true that some disciplines and some courses lend themselves more easily to online instruction than others, there are strong cultural and technical forces in higher education that have worked against its widespread adoption by faculty and students. Faculty usually prefer the type of face-to-face instruction that characterized their own careers in the university, and national studies show that students like the social interaction and peer group relationships that have always been part of traditional education.

Dramatic increases in off-campus instruction have been the "holy grail" of campus planners since the days of satellites, television, and distance education generally decades ago. Today, significant expansion of online learning has the potential to reduce the need for additional classroom buildings or even additional campuses. Yet, in a world of ubiquitous communications tools and network information resources, the MOS findings are not encouraging and beg the question "why?" For example:

- Enrollment in all forms of distributed learning modes (online, hybrid, off-campus) in AY 2006-2007 totaled 13,772 FTES, an amount equivalent to only 4.1 percent of total main-campus FTES for the system. Still, eleven CSU campuses have smaller FTES enrollments than the aggregated total for distributed learning, which alone points out the physical plant implications of distributed and online learning.

- A 2006 study showed that 15 CSU campuses offered 44 online degree programs, but two-thirds of these were self-supporting (i.e., offered through extension to non-matriculated students) rather than state supported.

- Availability of online instruction ranked second in importance only to technology preparation for future employment in all four student survey administrations. However, students consistently rated "satisfaction with online courses compared to regular classroom instruction" the lowest of any similar question in the surveys.

- By contrast, faculty consistently assigned a very low priority to online instruction and very few have taught online classes. When asked how important it was to "provide students with electronic online course instruction at anytime, in any place," faculty responded with the lowest mean rating of any item in all four faculty surveys.

The MOS did not address motivational issues underlying student and faculty attitudes and behavior. These are difficult to assess through simple survey questions. More detailed, qualitative interviews and use of focus groups are usually better methods for probing the reasons that lead to certain patterns of attitudes and behavior, but also more costly to administer. These remain other studies for other days.

Aside from pedagogical, social, or institutional considerations, there is one important technical barrier to online instruction that deserves mention, known as the "last mile" problem. Ubiquitous, high-speed network access to the home is a relatively recent phenomenon. While students usually had such access on campus, faculty could not assume that it would be available to all students off campus. Online instruction may expand more rapidly as broadband resources become more mobile and reliable.

Once again, the professional research literature is awash in opinion articles and statistical surveys on impediments to various forms of distance learning and online instruction. There have been sporadic studies in the CSU as well. In some instances, faculty culture, the retention, tenure and promotion process, and workload issues are prime targets of "blame." In others, outdated FTES formulas and expensive start-up costs are cited. Until the underlying causes for the slow adoption of online instruction are identified and resolved, the twin dilemmas of student access and space management will continue to be critical concerns of the CSU. This may be the most urgent and important item in any post-MOS research agenda given its direct implications for expanding student access while mitigating the effects of expensive physical plant construction, renovation, and maintenance.

Unmet Needs

In addition to unresolved issues in the research process, the MOS did not address all of the emerging technologies or changing IT fiscal and policy needs of CSU campuses (despite attempts to modify the campus and user surveys each year). Some IT issues are "perennials" because they never seem to command the time, attention, and resources they deserve. Perhaps the best examples are IT user training and support services for students, faculty, and staff. Others fly beneath the radar because they are new or occupy a niche position in the historical priorities of IT staffing, workstations, administrative systems, network expansion, and the like. In 2005, a study was conducted among a sample of six CSU campuses to identify some of these unmet needs, and to calculate the gaps between current funding levels and those needed to meet minimum baselines. In 2008 and beyond, these and many other areas may benefit from a greater policy and research emphasis revolving around costs and budgets.

The 2005 ITAC Funding Gap study offers a model for conducting such research. It identified four major categories of IT unmet needs (i.e., where campuses were not achieving the minimum baseline standards for access and quality) that were largely missing from the ITS initiatives and the MOS metrics over the period. These categories included: four baseline needs within the existing ITS framework (workstations, servers, technical support, and security); three new or emerging baseline needs (middleware, wireless networks, and disabled access compliance); four core academic technology needs on the campuses today (learning management systems, instructional design staff, smart classrooms, and electronic content); and four emerging academic technology needs stemming from the new systemwide ITS initiatives (student success, e-learning framework, professional development, and digital marketplace).

For each of these 15 unmet needs, the study team then developed baseline definitions together with operational metrics; collected data on the one-time costs and ongoing costs to bring these assets to and maintain them at baseline levels; and then calculated the gap between baseline costs and current expenditures in each category. The sample data were then extrapolated to the system as a whole.

This research model, incorporating the key concepts of sample campuses, core needs, emerging needs, baseline, metrics, one-time costs, ongoing costs, expenditure "gaps," and system extrapolation could be expanded to cover other areas as new technologies or new policies warrant. That kind of research would place the CSU in a strong position for prioritizing and defending future budget requests at the campus and system levels.

Finally, the list of principles and recommendations in the next section of this report offer still more avenues for IT research to support campus and system planning and initiatives. The ones noted above should be considered in that broader context of overall research principles and recommendations.

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THE WAY FORWARD: FROM INPUTS TO OUTCOMES

The CSU has a long and rich history of institutional research and systemwide data collection and reporting, particularly in the areas of student enrollments, academic programs, space management, and financial records. Research on IT resources and practices was more modest until the inception of the MOS in 1999-2000. Perhaps the ultimate question for a report of this nature is how successful the CSU will be in institutionalizing a long-term commitment to a "culture of evidence" in IT planning, at both the campus and system levels, particularly in light of budget cuts and fiscal constraints.

It is fair to say that the MOS focused heavily on "inputs" to academic, administrative, and network systems, such as asset inventories and student, faculty, and staff use of those technologies. There is no doubt that inventory and user activity data are essential to both operational management and strategic planning. However, such data rarely inform broader policy concerns that require outcome-based measures. While input data on technology will continue to be collected in the CSU, the emerging need is for a greater focus on policy questions and outcome goals of student learning, personal productivity, and institutional efficiency.

One of the major decision points for future systemwide data collection is whether the primary intent is to inform system initiatives (such as those contained in the ITS and MOS) or campus operational needs and strategic planning, or both. It should be noted that many individual campuses conduct assessments and studies of IT programs on their own, and perform many surveys of students, faculty, and staff with their own resources.

In spring 2008, several campus CIOs or their representatives agreed to be interviewed about the principles and options that should guide future data collection. This ad hoc data team then met to review the findings and their implications, and their recommendations are scheduled to be presented to the full Information Technology Advisory Committee (ITAC). Following are the major items for the ITAC discussion and eventual transmission to the presidential Technology Steering Committee (TSC) in early 2009. In effect, these principles and recommendations represent the agenda for institutionalizing a culture of evidence in a post-MOS environment, with the ultimate decision resting with the TSC.

Principles of IT Data Collection

- Gather data once and only once; coordinate with external data collection, especially if it is required (e.g., WASC).
- Institutionalize a regular process for campus surveys; avoid ad hoc institutional surveys.
- Where possible, use and participate in national surveys that permit institutional comparisons.
- Relate any data collection effort to the concept of minimum baseline.
- Use the expertise of individual campuses to define baselines and develop metrics.
- To the extent possible, gather evaluation and outcomes data as opposed to inventory and activity data while recognizing that a balance is necessary.
- Collect data on issues that involve systemwide collaboration and common needs and priorities.
- Develop metrics that show trends over time, especially cost and life cycle data.
- Metrics should be closely related to system and campus goals and be publicly shared.
- Measure only what is going to be used for policy or operational decision-making, but with an eye toward future campus and system needs.
- For user surveys, consider drawing limited samples to answer a targeted range of questions on an ad hoc basis. However, be attentive to individual campus needs for making comparisons that in turn require larger sample sizes.
- Where possible, make data available in accessible and interactive formats for real-time decision-making, perhaps using email and web-based formats.
- Rely on and participate in national surveys for organizational, governance, and opinion data.

Recommendations for Campus IT Data Collection

CSU campuses should:

1. Participate in the annual Campus Computing Survey and the EDUCAUSE Core Data Services Survey.

2. Continue to collect a subset of the annual MOS survey data and other information deemed important by ITAC. The vehicle for collection will likely be an addendum to the national Campus Computing Survey, if the cost can be negotiated.

3. Conduct user surveys of faculty, staff and students every three to five years using a subset of CSU campuses for each survey. Campuses should be selected with the proper mix so the costs can be shared and results can be extrapolated to the system.

4. Develop IT metrics for the eight commitments in the Access to Excellence accountability report (these data probably will be collected by departments of institutional research).

5. Review the Academic Technology Baseline Plan when it is published, including metrics. CIOs should be actively engaged in the data collection for this baseline and be required to approve all submissions as part of his/her ITAC designee role.

6. Insure that all IT initiatives, whether campus-based or systemwide, contain metrics for success in the pilot or proof of concept phase. Metrics should be well established prior to widespread implementation of the initiative.

Recommendation for System IT Data Collection

ITAC should make a formal recommendation to the TSC that a structure and process be established and resources appropriated to satisfy the data collection needs for a policy agenda which may include, but not be limited to: using IT to resolve lower-division bottleneck courses; expanding online courses and degree programs; increasing student remediation using IT; improving e-learning outcomes; providing faculty, staff and student IT training and support services; responding to state manpower needs; standardizing best business practices; tracking total cost of ownership in IT expenditures; and improving space management through IT.

The implications of this final recommendation are far-reaching and therefore deserve further comment. In recent years, research on the role of information technology in higher education has expanded rapidly on the national scene. It includes the EDUCAUSE Center for Applied Research, the Campus Computing Survey, and theEDUCAUSE Core Data Services survey. Within the CSU, the MOS project has produced eight years of institutional and user survey data on academic technology, administrative systems, and technology infrastructure. Although a solid base of scholarship has been established at both levels, several problems are evident.

The MOS approach provided information on "who has what and who uses it," but did not adequately address broader policy issues of cause and effect, or the outcomes of technology in terms of learning effectiveness and institutional and user efficiency. Doing the latter requires a much more ambitious and costly research agenda than simple surveys alone can provide. A new approach is needed to perform comprehensive research that informs executive decision-making, one that is policy-focused and centered on outcomes rather than on technology inventories alone.

The policy questions posed by the TSC will require, at a minimum, a coordinated effort on the part of IT, academic affairs, and institutional research divisions. While some of the required information may already exist, it usually is spread across several academic and administrative units. The missing link is a central organizational unit charged with designing, integrating, and analyzing the pieces of a very large puzzle. The most pressing issues confronting the CSU tend to be pedagogical in nature, and technology is an enabling tool in that broader process.

Basically, the CSU has a “design problem” in data needs and collection procedures for information technology. A great deal of relevant information is available, but it tends to be scattered among several divisions such as academic affairs, student services, administrative offices, institutional research, as well as the technology organizations themselves. In some cases, national research data could be better integrated with system data, and campus

research data could be better integrated with both. Very often, it may be less a matter of collecting new data (although that may still be needed) than of better managing the data and information already available from a variety of sources.

The basic questions confronting a post-MOS data collection environment are therefore: what information is required; what metrics can provide that information and from what sources; how often should it be collected; and who is responsible for data base management and reporting? A new policy research agenda would bring the centralizing power of the network to bear on these questions for the entire system, and use the collaborative efficiencies and expertise of individual campuses to answer them.

"Business as usual" will seldom resolve the kinds of overarching, strategic questions that state lawmakers, trustees, and presidents have to ask. While sporadic or even regular institutional and user surveys can be helpful, they rarely enjoy the scope and sustained support that genuine outcomes-based research requires. In addition, much of the operational data needed for routine management of networking, workstations, libraries, CMS, MERLOT, degree audits, remediation, online degree programs, and the like already are collected at the system level.

The TSC policy concerns listed previously are "constants" because, to date, the system has not committed the resources to resolving them. Still, the 23 campuses of the CSU are laboratories in waiting. The telecommunications infrastructure buildout and the common administrative system implementation are good examples of what can be achieved through coordinated planning, resource allocation, and presidential leadership. A high-level policy research agenda will require similar levels of commitment.

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CONCLUSION

In 1996, the California State University Board of Trustees approved the Integrated Technology Strategy (ITS) as the framework under which CSU would make its information technology investments. This framework has successfully guided the CSU's efforts in technology since then, resulting in a world-class baseline infrastructure that undergirds academic and administrative initiatives. These initiatives all support one or more of the outcomes of the ITS: Excellence in Learning and Teaching; Administrative Quality and Productivity; Quality of the Student Experience; and, Personal Productivity.

The Measures of Success series of accountability reports to the legislature has tracked the success of these initiatives since 2000. They have shown how the state's investment in a minimum baseline infrastructure for each CSU campus has expanded the benefits of the academic, administrative and productivity initiatives to increasing numbers of faculty, students and staff.

The 2007 Measures of Success provided an overview of individual initiatives and the progress achieved at the institutional level since the baseline year of 2000. It also documented the generally positive improvements in access to, use of and satisfaction with the CSU IT environment on the part of students, faculty and staff as the infrastructure evolved.

This final document provided an opportunity to look back at the successes and to address the challenges of maintaining and improving upon the culture of evidence that the Integrated Technology Strategy and Measures of Success efforts have brought to CSU. This report looked at ways that CSU can continue to build accountability into new information technology initiatives through adherence to a set of common sense principles of data collection. In addition, it offered a potential approach to answering broader policy questions on the minds of higher education leaders (not only in the CSU, but nationwide) about the learning and productivity outcomes associated with investments in information technology.

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APPENDIX A: FIGURES AND TABLES

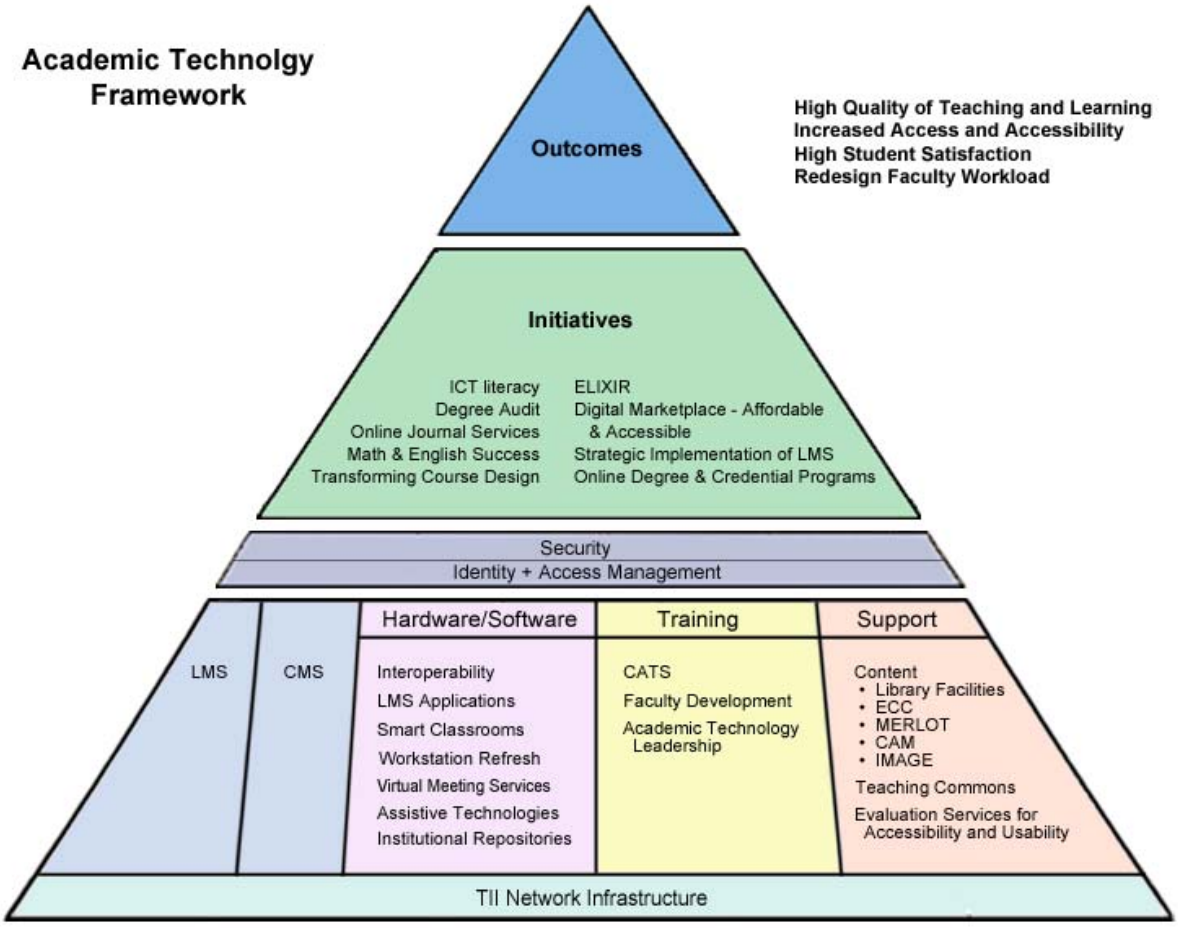

Figure 2

Information Technology Matrix of Major CSU Technology Initiatives

DECADE	CSU SYSTEMIT ORGANIZATION	STRATEGIC PLANNING	ACADEMIC TECHNOLOGIES/ LIBRARIES	ADMINSTRATIVE SYSTEMS	CSU COMPUTING ENVIRONMENT	TELECOMMUNICATIONS AND NETWORKING
1960s Mainframes	• Division of Information Systems mandated by state legislation • No formal campus computing organizations	• Feasibility Study Reports (DOF) in response to state regulations		• Used state agency financial systems • Campus based student systems established	Northern and southern data centers: mainframe computers at San Jose and Los Angeles	
1970s Timesharing	• Division of Information Systems (CO) • Embryonic computing organizations on campus	• Feasibility Study Reports (DOF) in response to state regulations	• Creation of audio-visual and media centers on campus	• SIMS • ERSS • APDB	• Creation of State Data Center • DEC academic timesharing computers for every campus	• Regulated telephony environment • Statewide ATSS network • Microwave and satellite capabilities established
1980s Personal Computing	• Computing and Communications Resources (CO) • Full scale computing organizations on campus • Beginning of integration of computing, networking and telecommunications organizations at system and campus levels • Commission on Instructional Technology • Commission on Extended Education	• Campus Information Resource Plans (CIRP) • 1984 – CSU received exemption from state procurement oversight	• Library Automation Project • EAR/ECC • AIRC/Specialty Centers • Library Strategic Planning • Expansion of campus media centers	• IBS • Financial Aid System • AIMS • OASIS • EASE	• Cyber mainframes for each campus • Desktop word processors • Personal computers • IBM mainframes begin replacing Cybers • Discontinuance of Statewide Data Center • Campus-based Academic Computing Specialty Centers	• CSUNet established • Telecommunications upgrades (Centrex to PBX) • Expanded microwave and satellite course delivery • ITFS licenses for 14 campuses
1990s Internet/WWW/ Multi-media	• Information Resources & Technology (CO); late in 90's becoming Information Technology Services (CO) o TSC o CLIRIT o CIMIT o CTI	• Integrated Technology Strategy • Systemwide Internal Partnership	• Library Strategic Planning • Project DELTA • NLII Projects • Information Competence • ITS • CDL • MERLOT • CETUS Partnership • BATS	• IBS transitioned to FRS (Financial Reporting System) • Discontinued SIMS • CMS/PeopleSoft (1998)	• Explosion of personal computer use by student, faculty and staff • Client-Server environments • Disappearance of timesharing • Continuation of Cyber replacement with IBM mainframes • Organized efforts to create student computing labs	• 4CNet • CODEC video-conferencing • ITS-TII (SIP/CETI)
2000s Mobile and Converged Technologies (Voice, Video, Data)	• Information Technology Services (CO)	• Measures of Success (evaluation of ITS strategic plan)	• Library Strategic Planning • ICT Literacy Project • Academic Technology Initiatives (Digital Marketplace, E-Learning Framework, Student Success)	• FRS phased out with CMS • CMS – Consolidated Data Center		• CENIC/CALREN • SECURITY/SPAM/ VIRUSES

Table 1

Progress of ITS Initiatives: Institutional Indicators 2000-2007

TECHNOLOGY INFRASTRUCTURE INITIATIVES		
Survey Item	*2000/01*	*2006/07*
Campus Baseline Capability		
	# campuses	# campuses
Percent network outlets meeting CSU connectivity standards:		
75-89 percent	1	3
90-100 percent	0	14
Percent campus workstations meeting current generation hardware and software standards:		
75-89 percent	1	0
90-100 percent	3	10
Percent campus workstations with high speed network access:		
75-89 percent	2	1
90-100 percent	3	19
Percent of technical support services meeting CSU policy standards:		
75-89 percent	5	4
90-100 percent	3	4
Percent of IT training services meeting CSU policy standards:		
75-89 percent	5	4
90-100 percent	0	1
Access Infrastructure		
Campus workstations meeting CSU hardware standards for:		
Full-time faculty	74%	88%
Part-time faculty	61%	76%
Staff	66%	88%
Students	69%	85%
Campus workstations meeting CSU software standards for:		
Full-time faculty	81%	95%
Part-time faculty	77%	84%
Staff	66%	88%
Students	69%	85%
# "smart" classrooms systemwide with multimedia equipment and network connectivity	792	2,437

ACADEMIC INITIATIVES		
Survey Item	*2000/01*	*2006/07*
Library Resource Sharing		
# of times Electronic Core Collection (ECC) resources were accessed	2.5M	21.3M
Cost per use of ECC resources	$.33	$.16
Estimated cost avoidance through collaborative purchase of ECC	$374K	$1.2M

Multimedia Repository		
Survey Item	*2000/01*	*2006/07*
# CSU MERLOT members	149	1,473
Total # MERLOT members	3,922	47,541
# MERLOT peer reviews	35	2,281
# MERLOT website visits	188K	4.8M
# MERLOT learning objects	3,033	17,133
Distributed Learning and Teaching		
Course sections supported by learning management systems	3%	34%
Total FTES enrollments in non-state venues	8,070	13,772
FTES enrollments in non-state venues as percent of total FTES	2.8%	4.1%
Centers for Instructional Technology Development		
# campuses with central instructional technology centers	5	20
# faculty participations in campus instructional technology centers	4,205	9,945
Total campus expenditures for instructional technology centers	$7.4M	$14M
STUDENT FRIENDLY SERVICES		
Survey Item	*2000/01*	*2002/03*
# using student planner	259K	382K
Electronic applications as percent of total	41	69
ADMINISTRATIVE INITIATIVES		
Survey Item	*2000/01*	*2006/07*
# campuses implemented Common Management System:		
Financial system	0	22
Human resources system	0	23
Student administration system	0	13
# campuses using consolidated data center	11	23
Consolidated data center cost avoidance	$-5.7M	$16.76M

Table 2

Technology Use And Satisfaction: Student, Faculty, and Staff Surveys 2000-2007

STUDENTS		
Survey Item	*2001*	*2007*
Satisfaction with campus computing/technology resources	7.5	7.9
Rating of importance of having electronic access to instruction any time/any place	8.5	8.6
Rating of importance of computer literacy for future employment	9.1	9.3
Rating of campus preparation with technology skills	6.6	7.0
Classes taken in last two years requiring Internet use	44%	67%
# classes taken completely online in last two years:	0.3 (‘03)	0.5
Uses campus online administrative system for registration information	67%	96%
Uses the campus administrative system for grade information	71%	96%
Uses the campus online administrative system for financial aid information	29%	60%
Uses the campus online administrative system for billing information	20%	66%
Uses the campus online administrative system for degree progress information	22%	62%
Owns a computer	94%	95% (‘03)
Owns a *laptop* computer	36% (‘03)	74%
Has broadband access at home	80% (‘05)	93%
Uses campus wireless network	27% (‘05)	51%
FACULTY		
Survey Item	***2000***	***2006***
Importance of any time/place electronic access to instruction	5.8	5.5
How well does dept./university prepare students for technology skills in field	6.5	6.8
Required students to use spreadsheet programs	36%	50%
Required students to use database programs	24%	34%
Required students to use presentation programs	41%	69%
Required students to use electronic data repositories	30%	33%
Required students to use electronic library resources	60%	75%
Required students to use computer-based instruction/tutorials	28%	36%
Required students to use computer-based simulations and/or animations	24%	29%
Required students to use information websites	60%	74%
Required students to use streaming video presentations	11%	23%
Required students to use specialized software applications	38%	42%
Required students to use project-/team-based activities employing IT	27%	49%
Uses campus online information system to get student records	54%	66%
Uses online HR Info System to access personal HR information	12% (‘04)	20%
Uses campus wireless network	31% (‘04)	49%
Satisfaction with campus wireless network	6.3 (‘04)	6.9
Received technical help (last 2 years)	94% (‘02)	92%
Satisfaction with time it took to resolve problem	7.1 (‘02)	7.7

STAFF		
Survey Item	***2000***	***2006***
Importance rating of computing/network resources for own work	9.1	9.4
Satisfaction rating with computing & technology resources	7.5	7.7
Knowledge of computer hardware/software important to job (rating)	7.7 (‘05)	7.9
Uses CMS PeopleSoft Financial Information System	50% (‘02)	68%
Uses CMS PeopleSoft Human Resources Information System	58% (‘02)	83%
Uses CMS PeopleSoft Student Administration Information System	18% (‘02)	44%
Satisfaction with university-provided computer workstation	8.2 (‘02)	8.5
Satisfaction with university-provided computer software	8.5 (‘02)	8.3
Satisfaction with quality of work: set up, maintenance, hardware	7.8 (‘02)	8.3
Satisfaction with frequency of workstation upgrade/replacement	7.6 (‘04)	7.6
Uses remote access to campus network	50%	66%
Satisfaction with remote access to campus network	6.7 (‘04)	7.4
Uses campus wireless network	24% (‘04)	24%
Level of reliance on tech. support to solve computer problems	7.1 (‘04)	7.1
Received technical help to solve problem with university-provided computer (last 2 years)	94% (‘02)	94%
Satisfaction with time to resolve problem with university-provided computer (last 2 years)	7.9 (‘04)	8.0
Importance for campus to offer training	7.6 (‘04)	9.1
Uses training workshops	68%	63%

Note: Importance and satisfaction ratings were based on a scale of 0 to 10.

Table 3

APPENDIX B: REFERENCES

For further reading on the Integrated Technology Strategy, see:

http://its.calstate.edu/systemwide_it_resources/its_initiatives.shtml
and
http://its.calstate.edu/systemwide_it_resources/its_planning_documents.shtml

For further reading on the Biennial User Surveys, see:

http://its.calstate.edu/documents/Data_Collection/III_Biennial_Surveys/III_Biennial_Surveys.shtml

For further reading on the Annual Campus Technology Survey, see:

http://its.calstate.edu/documents/Data_Collection/II_Annual_Tech_Surveys/II_Annual_Tech_Surveys.shtml

For further reading on the Measures of Success Reports, see:

http://its.calstate.edu/documents/Data_Collection/I_Reports_MOS/Measure_of_Success.shtml

The following hardcopy documents are important for historical reference:

Mission, Challenge and Opportunity: The California State University in the Information Age, January 1990

The Student, the Faculty and the Information Age: The Power of Technology, January 1990

Current Status and Proposed Actions or Implementation of the Initiatives from "The Student, the Faculty, and the Information Age: The Power of Technology", December, 1991 (Staff Report to the Commission on Learning Resources and Instructional Technologies)

Project Delta: Planning Phase, 1st Half, 1992

ITS Baseline Hardware/Software Access, Training and User Support (BATS): 1997/98 Progress Report, November 1998

The Plan for Telecommunications in the CSU: 1992-95, December 1991

Telecommunications Infrastructure Planning Guidelines, September 1993

Leveraging the Future: The Telecommunications Plan for the CSU, (Academic Communications Network Committee of the Academic Information Resources Council) March 1994

Knowledge and Information for the 21st Century: 1993

Transforming CSU Libraries for the 21st Century, September 23, 1994

Information Technology Funding Gap Study, (A Report From the Information Technology Advisory Committee, California State University), 2005.

IT Strategic Planning in the CSU: Case Studies of Best Practices, (Information Technology Services, CSU Office of the Chancellor), 2006.

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