TECHNOLOGY INFRASTRUCTURE INITIATIVE

The Technology Infrastructure Initiative (TII) of the Integrated Technology Strategy (ITS) focuses on upgrading the campus telecommunications infrastructure and on improving the personal productivity of faculty, students, and staff. One goal of the TII is to ensure that *every* CSU campus has a telecommunications infrastructure capable of meeting current and anticipated information technology demands for academic programs and institutional operations. Another major goal is to ensure that all members of the university community have access to a baseline level of information technology resources and services.

To guide implementation of this initiative, ITS planners described the target environment for five components:

- the intra-campus telecommunications network
- individual workstation environment (hardware and software)
- individual network connectivity
- user training
- user support

Measures of Success reports the progress the CSU is making toward achieving these baseline infrastructure capabilities as percentages for the system as a whole and for each campus. "Baseline capability" for each component is achieved when the standards for access and quality reach 90 percent or more for members of all three constituency groups: students, faculty, and staff.

Baseline Telecommunications Infrastructure

The physical telecommunications infrastructure comprises the combination of intra- and inter-building pathways, closets, hubs and routers, and media (cables) that link individual workstations to the campus backbone, and the campus backbone to the inter-campus network and the Internet. The campus pathways, network electronics, and network media are the unseen, behind-the-faceplate prerequisites that ultimately determine when, or whether, the outcomes of the Integrated Technology Strategy can be achieved.

The benefits of access to current generation computing resources and services can be realized only if workstations are linked to each other and to campus information systems, and to the Internet, by a high-capacity, high-speed telecommunications infrastructure. Interactions over the Internet or the World Wide Web cannot be accomplished faster than the intra-campus and the inter-campus backbone networks allow, regardless of the capabilities of end-user equipment or applications. For this reason, the TII is a prerequisite for achieving the outcomes of the academic, student services, and administrative initiatives.

Intra-Campus Networks

By the early 1990s, it was clear to CSU campus and system leaders that the limitations of the telecommunications infrastructures on almost all CSU campuses constituted an impediment to maintaining and improving the quality of academic programs and the efficiency of institutional operations. Unless improvements across the system were made, the technology gap among campuses in the system, and occasionally between the CSU system and national higher education community, would very soon have a negative affect on the entire CSU. Demands for bandwidth associated with the explosive growth of multimedia and network applications, the transition from stand-alone to integrated information systems and their conversion to Web-based architecture, and the transition to electronic commerce far exceeded available resources. Upgrading campus telecommunications infrastructures to meet these demands thus became an urgent priority for the system. The TII was the solution adopted to accomplish this goal.

Baseline Telecommunications Infrastructure Standards

A common set of network performance specifications was adopted to ensure that each campus would have, at a minimum, a baseline telecommunications infrastructure capability adequate to meet the bandwidth demands of the

present and near-term future. The progress made to date in upgrading the campus telecommunications networks is shown in Figures 6A and 6B.

Figure 6A - Progress Toward Baseline Telecommunications Infrastructure

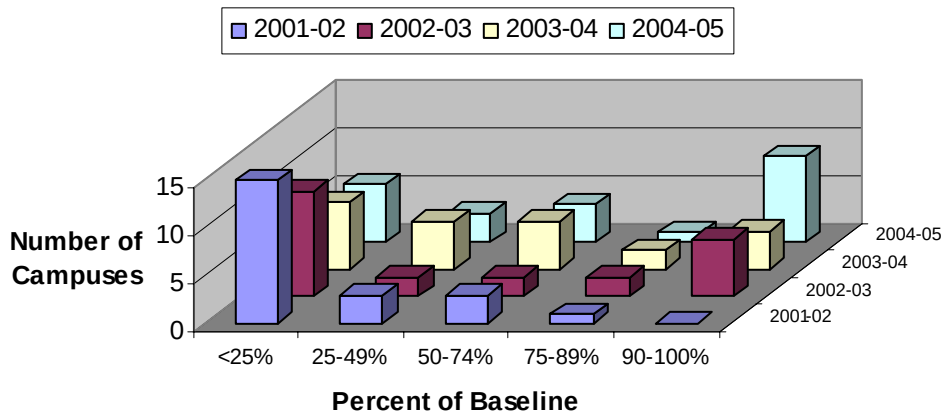
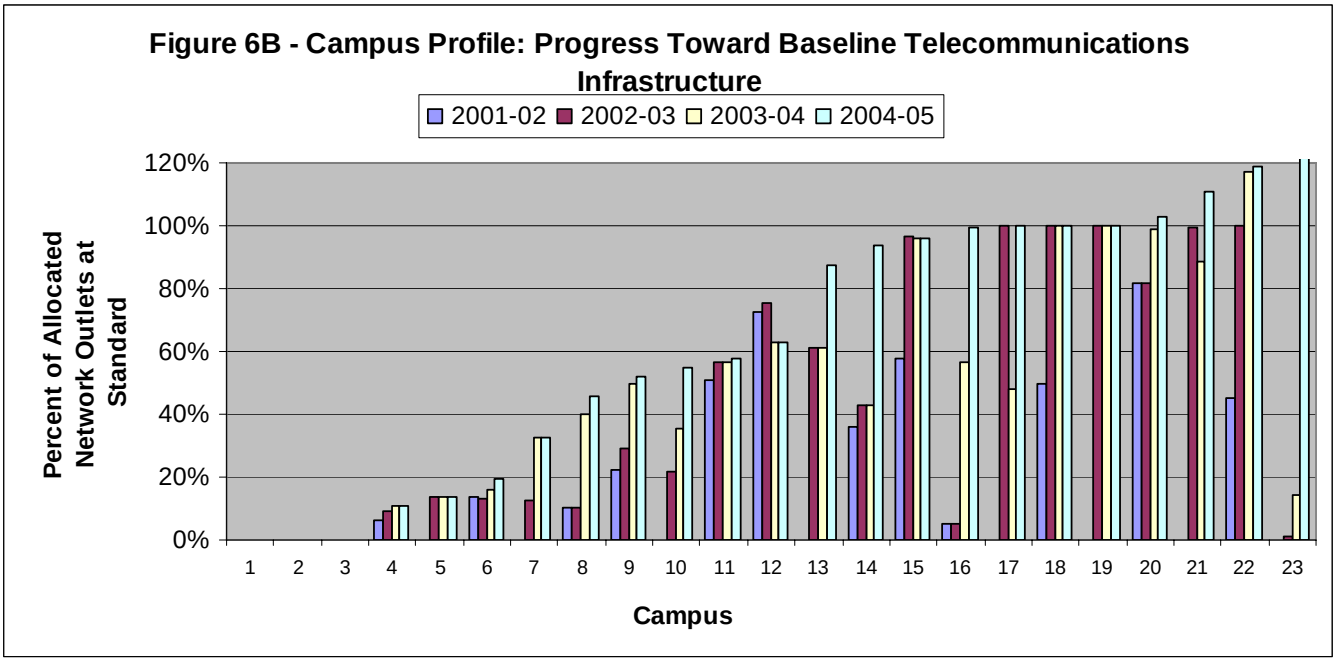


Figure 6A depicts the progress campuses have made in upgrading physical communication pathways and media to provide reliable, high-speed network connectivity from the individual network outlet (faceplate) to the campus backbone network and from the campus network to the Internet. The columns represent the number of campuses on which the percentage of network outlets meeting CSU standards (see Appendix B) falls into the range shown at the base of the chart. For example, in FY 2001–02 (front row of columns), prior to commencement of construction funded through the TII, less than a quarter of the network outlets on 13 of the campuses were up to standard. (In fact, on 10 campuses, *none* of the outlets met these criteria!) Between one-quarter and one-half of the outlets on three campuses were at standard, and between one-half and three-quarters on another three campuses. On only one campus did the number of network outlets meeting baseline expectations exceed 75 percent.

Improvements that have occurred over the four-year period since TII implementation began can be seen in the changes from the front row (2001–02) to the back row (2004–05). Variation in column height (i.e., the number of campuses at a given level of compliance) from left to right depicts the shift away from lower to higher percentages of outlets meeting baseline-level standards. As of June 30, 2005, 9 campuses were at baseline (i.e., 90 percent or higher), and one was above 75 percent of baseline. At the other extreme, the number of campuses with less than 25 percent of standards-compliant outlets fell from 13 to 6. Baseline telecommunications capability for the CSU system will have been achieved when a single column at a height of 23 appears in the rightmost column. Completion of all physical infrastructure projects is anticipated by late autumn 2006.

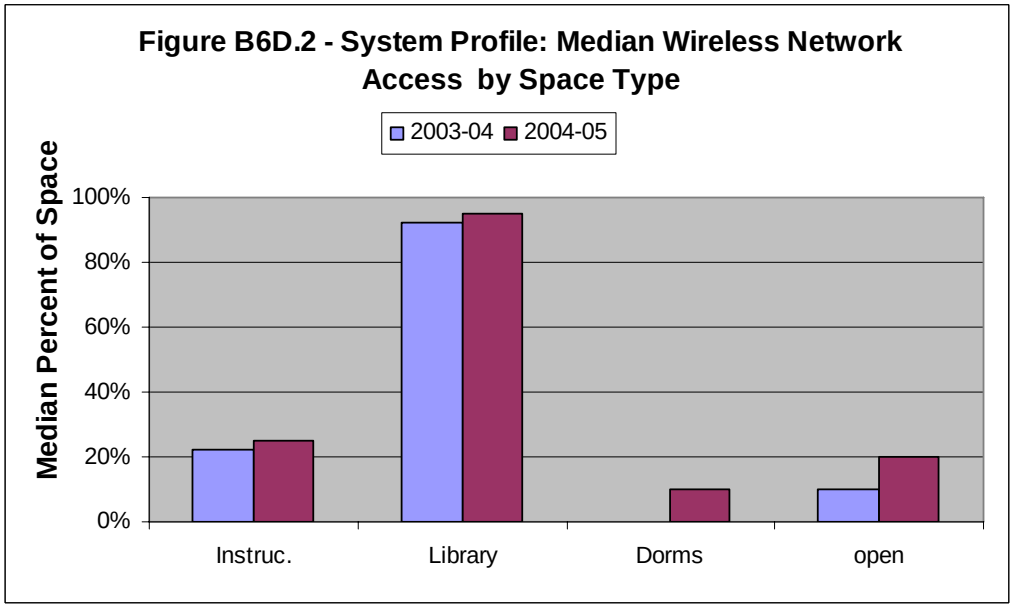
Figure 6B illustrates the progress toward baseline that has occurred on each campus. Four campuses have devoted local resources to upgrade their infrastructures beyond minimum baseline.



Wireless Network Access

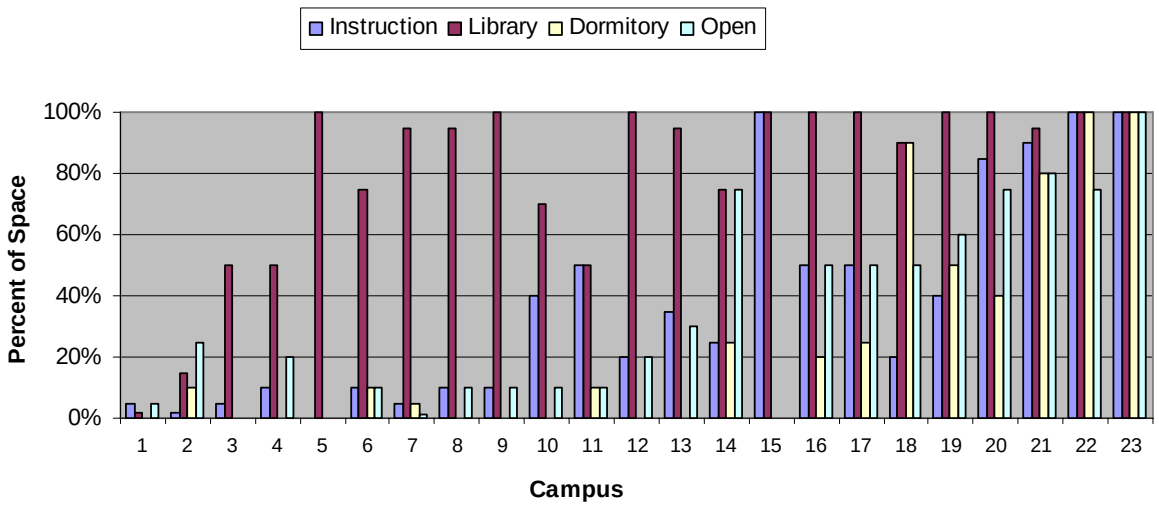
The importance of providing wireless connection to campus computing networks has increased dramatically in the six years since the *Measures of Success* report was initiated. In the spring 2005 technology survey, over a quarter of CSU students said that they regularly accessed their campus networks via wireless connections. Tracking of faculty use of wireless connection to the network began the previous year and is reported in the 2004 MOS. Only a small percentage of CSU faculty used wireless technology at the beginning of 2004. The rate of wireless use by all user groups is anticipated to increase rapidly as campuses expand wireless access and the transition to mobile computing accelerates.

Figure B6D.2 shows for the system as a whole the advances that have been made in the past two years in providing wireless connectivity from instructional sites, libraries, dormitories, and open spaces.



The current status of wireless access on CSU campuses is profiled in Figure B6D.3. A third of the campuses report full availability of wireless connectivity in their libraries. About a fourth of the campuses provide wireless access from classrooms and other instructional sites. The Campus Computing Survey showed that 65 percent of CSU campuses had a strategic plan for wireless networks versus 72 percent for comparison institutions nationally. According to the Educause CDS survey, the percentage of wireless deployment in the CSU is virtually identical to that of comparison institutions nationally.

Figure 6D.3 - Campus Profile 2004-05 - Wireless Network Access by Space Type

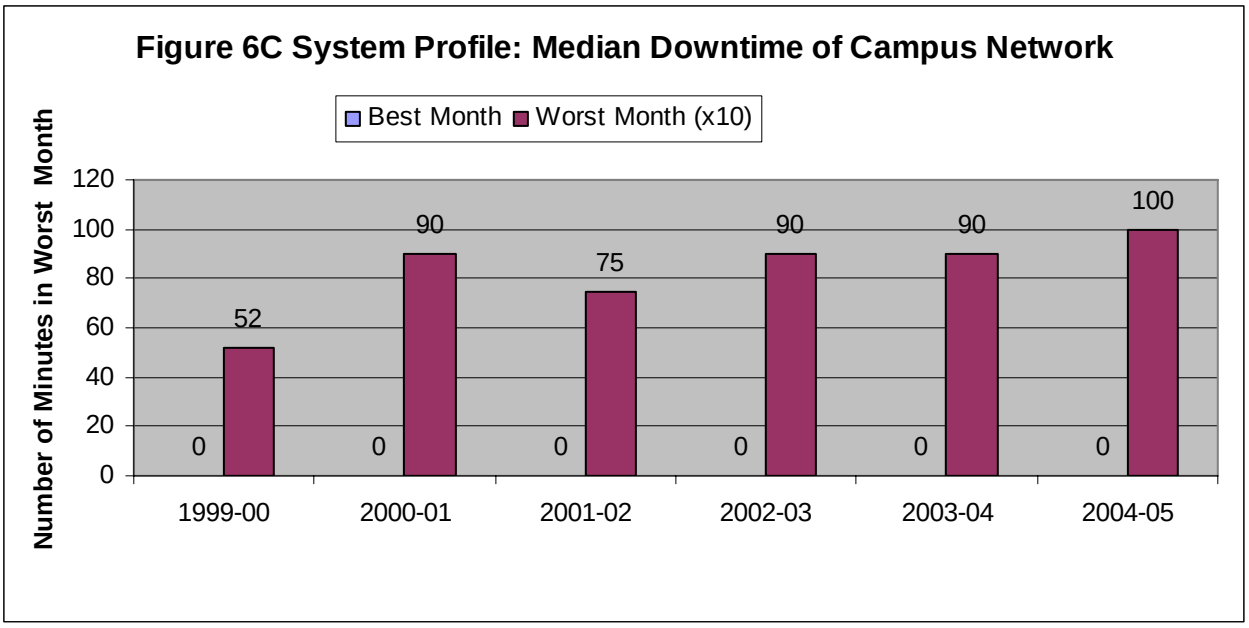


The CSU funding gap study addressed the need for baseline purchase, maintenance, and refresh of campus wireless networks, both within buildings and in open space areas. It indicated that the one-time cost to achieve baseline is $5 million and the additional annual cost is approximately $1.4 million.

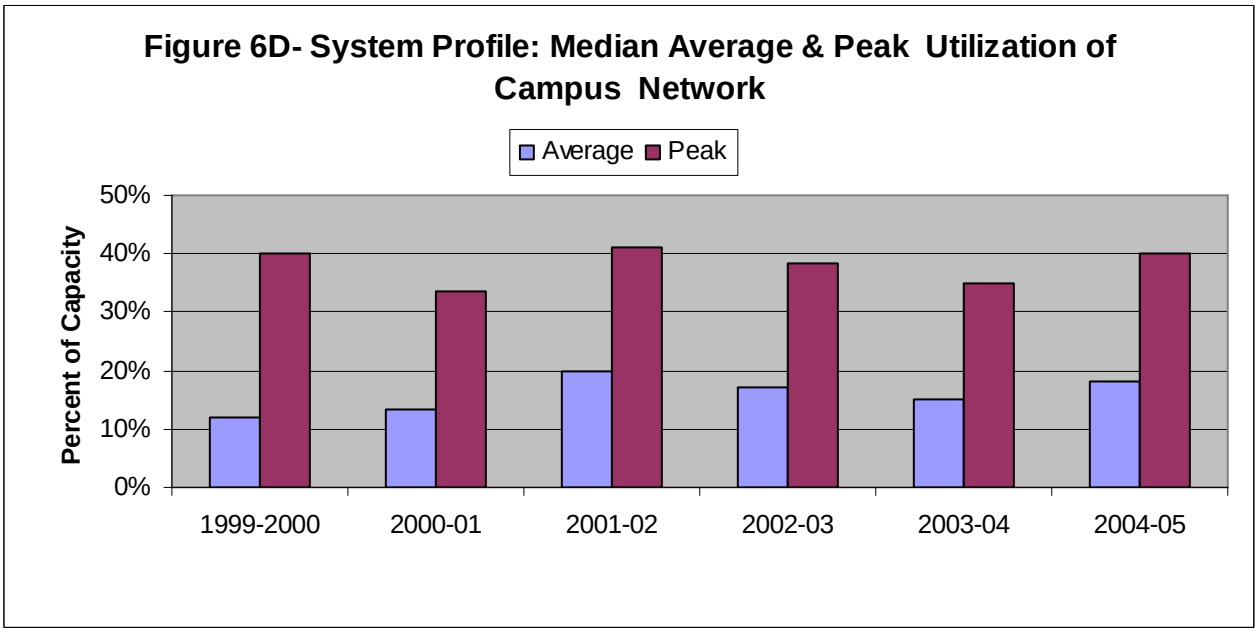
Intra-Campus Network Performance

Two measures serve as indicators of campus network performance for this report: 1) the greatest number of minutes of *downtime* for a campus network in the best and worst months during the 12-month fiscal year; and 2) the average and the highest (peak) *utilization* of the campus network capacity expressed as a percentage of total bandwidth.

"Downtime" means that a user cannot send or receive information because of a problem in the network itself, not because of problems originating within the user's desktop equipment or because of interruptions of service provided by local power and telephone utilities. For all campuses in the system, the median "best-month" downtime has remained at zero minutes since *Measures of Success* reporting began in 1999–2000; median "worst-month" downtime has not exceeded 100 minutes (Figure 6C).



The percentage of available bandwidth utilized at peak and non-peak periods is another important measure of network capability. Generally, the lower the percentage of available bandwidth required to support network uses, the better will be the performance of the network and the lower the risk of interruptions to network access.* The increases in capacity and reliability associated with network improvements have had the positive effect of providing robust and reliable capability to handle rapidly growing network traffic (Figure 6D).



Two intra-campus network issues were addressed in the CSU funding gap study: security and server refresh cycles. For the former, approximately $6 million in additional annual funds are needed to provide core services and support, and for the latter, $3.4 million in one-time expenditures and $4.2 million in additional annual funds are required.

* Individual campus methods for calculating these indicators may differ. Utilization rates are usually established by sampling network traffic on a specific day(s) and time(s) of the week associated with average usage patterns and with high usage patterns.

The EDUCAUSE CDS survey found that 65 percent of CSU campuses had undertaken an IT security-risk assessment compared to 60 percent of comparison institutions. The Campus Computing Survey showed that 68 percent of CSU campuses had a strategic plan for network security versus 76 percent for comparison institutions nationally; the percentages for disaster recovery plans were 96 and 74, respectively. When asked about security incidents during the past year, the CSU compared less favorably to institutions nationally, with the exception of virus and spyware infestations (Table 6A). However, the higher percentages of CSU institutions with incidents of "theft" and network and data file "attacks" may be attributable to the more sensitive monitoring and reporting mechanisms recently instituted in the system.

Table 6A – What security incidents did your campus experience in the past year?

	% CSU	% Public Master's I
Theft of computer(s) containing confidential data files	18.2	11.0
Hack/attack on the campus network	77.3	58.5
Hack/attack on student/personnel/alumni data files	31.8	13.4
Hack/attack on administrative/financial files	36.4	12.2
Hack/attack on research data files	18.2	3.7
Other attack on institutional data files	18.2	7.3
Identity management issues	18.2	17.1
Major computer virus infestation	31.8	31.7
Major spyware infestation	22.7	35.4

Inter-Campus Network

Funding to maintain and improve the CSU inter-campus network is outside the scope of the Technology Infrastructure Initiative. However, because inter-campus and Internet connection are vital to achieving the outcomes of the ITS, and because campus network capacity and traffic directly impact the operations of intra-campus networks, pertinent information about the inter-campus network is included in *Measures of Success*.

Prior to the 2003–04 academic year, the CSU provided inter-campus network connectivity through the operation of its internal enterprise network, 4CNet. This high-speed statewide backbone connected CSU campuses to one another and also supported connectivity among the campuses of the California Community Colleges and over 30 K–12 sites. 4CNet also provided network services for five CSU off-campus centers, the office of Government Affairs, and the Chancellor's Office. Tables 13.2 and 13.3 in Appendix A summarize the network performance of 4CNet from the baseline year (2000–02) through 2002–03.

During 2003–04, 4CNet operations were phased out, and replacement connectivity was acquired through membership in the Corporation for Education Network Initiatives in California (CENIC). The CENIC statewide backbone, known as CalREN (California Research and Education Network), provided CSU sites with reliable, high-capacity service during that transitional year. Network performance metrics and the mechanisms to monitor them put in place under 4CNet were unavailable during the migration from 4CNet to CalREN. CENIC has provided performance data for the period of January through June 2005.

During this period, there were 11 instances of service interruptions totaling 44 hours. Five of these (13 hours) were caused by campus outages and 2 (26 hours) were attributable to commercial carrier downtime. Non-maintenance hardware failures on the CalREN network accounted for the remaining five hours.

Baseline Access, Training, and Support

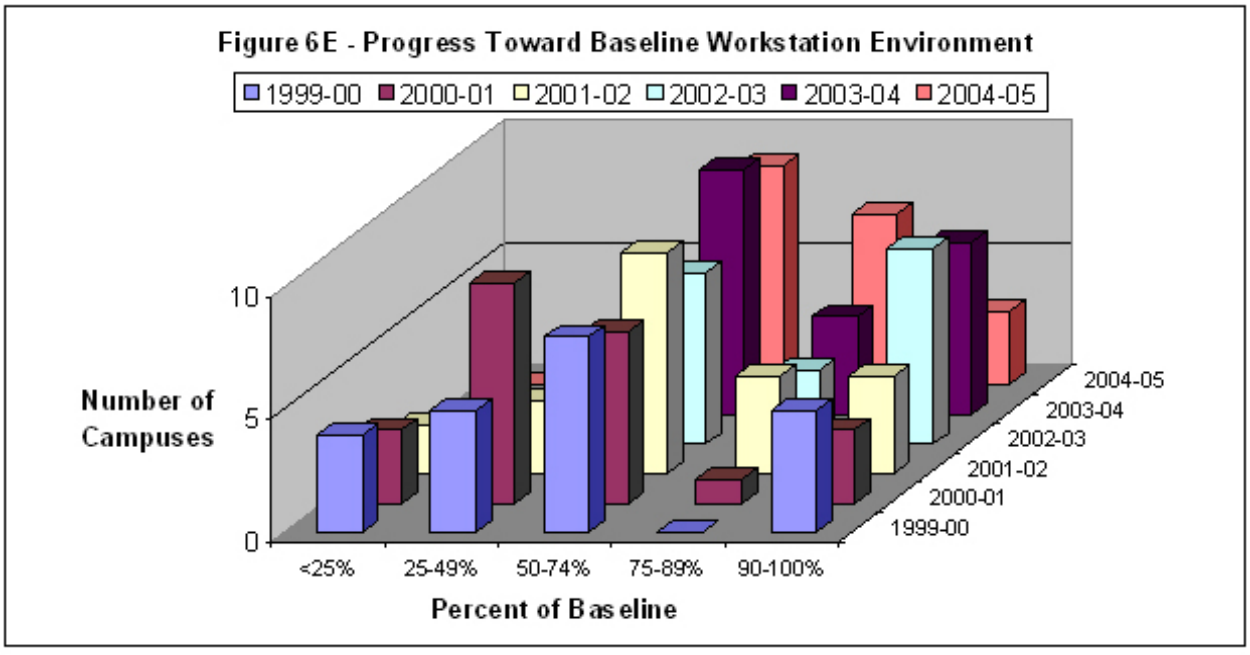
The TII seeks to improve personal productivity by providing CSU faculty, staff and administrators, and students with a baseline quantity and quality of computing and network technologies, and with related training and support services. This section of *Measures of Success* tracks progress in providing end-user access to baseline technology resources and services in four areas: workstations (hardware and software), network connectivity, technical support, and technology training.

Workstations

Access and Quality

The indicator for hardware and software *access* (quantity) is the percentage of workstations assigned to each user group. Purchase date was selected as a surrogate measure for currency: hardware and software purchased within three years of the reporting period are deemed to meet CSU *quality* standards.

Figure 6E provides an overview of the progress campuses have made toward achieving the workstation environment described in the baseline infrastructure standards (see Appendix B). Improvements in access to computer hardware and software that meet ITS standards for currency are reflected in the greater number of campuses at baseline (90–100 percent) or near baseline (75–89 percent) in 2004–05 than in the baseline year. In 1999–2000 as illustrated in the first row of bars, 4 campuses reported that less than 25 percent of the workstations provided for the use of faculty, staff, and students met the baseline standards; 5 claimed to be between 25 and 49 percent compliant; 8 between 50 and 74 percent; none between 75 and 89 percent; and only 5 were 90 percent or more. Over the years, workstation accessibility and quality have improved. As of 2004–2005 (the last row of bars) no campus reported less than 50 percent of workstations below standards, and 10 campuses said three quarters or more of their workstations were at standard. Because information technology evolves so rapidly, fluctuations occur in the number of campuses meeting the standards as hardware and software become obsolete and must be replaced at prevailing market prices.



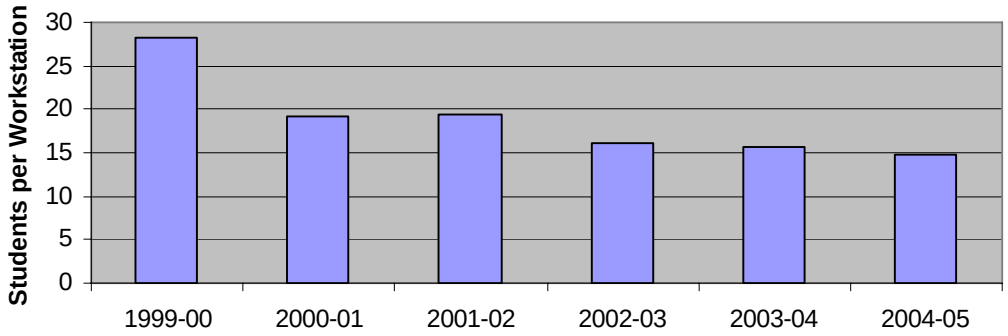
The profiles of individual campuses closely parallel the picture for the system as a whole. (See Tables 12.2–12.7 in Appendix A.) Typically, the number of workstations available to faculty, staff, and administrators equals or exceeds somewhat the total number of personnel. The number of faculty who use a laptop computer in addition to a desktop workstation continues to rise. In some disciplines (the natural sciences, for example), faculty are responsible for computing equipment used in ongoing laboratory experiments or in operation of other equipment.

To a lesser extent, the same is true for staff and administrators. The majority of non-faculty university employees use computers daily as the principal tool for performing their work. Some staff members (those responsible for monitoring and maintaining information systems for example) often have an additional, dedicated workstation. Increasingly, administrators use both a desktop and a laptop computer in connection with their work.

Overall, there have been modest increases in faculty satisfaction with computing and technology resources available to them over the past four years, and the mean satisfaction rating stood at 7.16 in the 2004 survey. Faculty satisfaction with workstation upgrades and replacements received a rating of 6.53. In surveys conducted in 2000, 2002, and 2004, CSU staff appear to be highly satisfied with the overall computing equipment, software, and network access provided to them by their campuses, with average ratings between 8 and 9. Staff satisfaction with the frequency of workstation upgrades provided by the campus is somewhat lower, with an average rating of 7.58.

Student access to university-provided workstations is generally offered in two types of computer laboratories: open-access labs and departmental labs. Students studying subjects that require specialized software applications typically use departmental or discipline-specific computer laboratories. Such laboratories are outside of the Integrated Technology Strategy framework and are not included in the annual campus technology survey. Workstations counted as available for student use in this report are those provided by the university for general use only. Figure 6F displays the median ratio of students to university-provided computer workstations available in open-access venues over the five-year MOS reporting period. On individual campuses, the ratios range from one workstation to every 4.4 students to one computer to over 40 students. Systemwide, student satisfaction with the university-provided workstations has remained consistently high since the first student technology survey was administered in 2001. (See Appendix C.)

Figure 6F - System Profile: Median Ratio of Students to Workstations



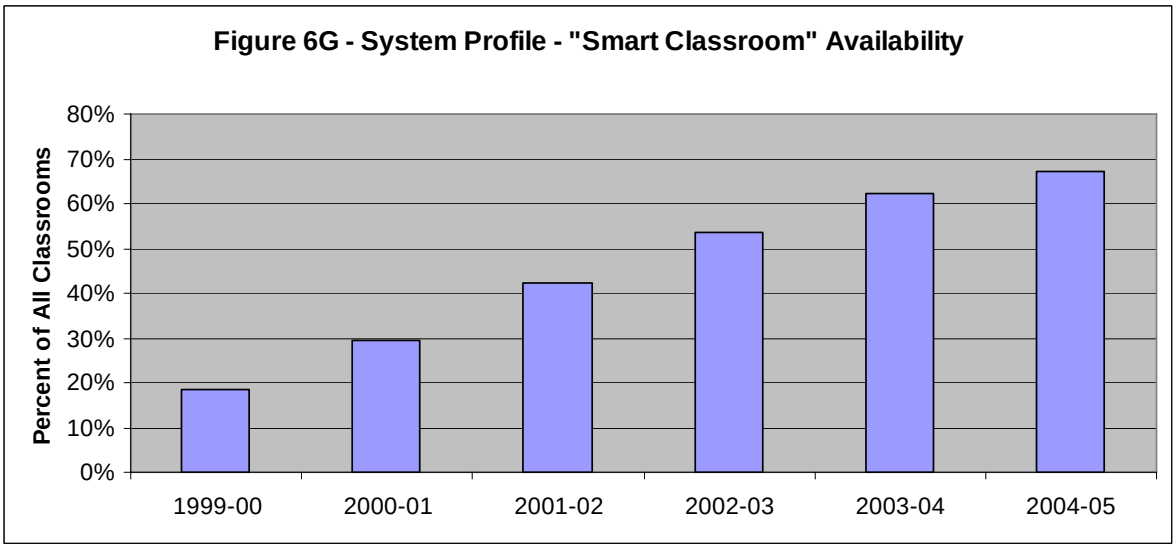
Actual student access to computers is much higher than usage of university-provided workstations suggests. The 2003 student survey revealed that more than 9 out of 10 CSU students own operational computers, three-fourths of which are less than three years old. Roughly one-third own a laptop computer, and almost half are equipped with wireless capability. Moreover, 80 percent of students in the spring 2005 survey reported having a broadband (cable or DSL) network connection from their homes, a dramatic increase from just over 50 percent who had high-speed access in 2001. These findings confirm that the intent of the CSU's policy on 24-hour student access to a computer and the network, adopted in 1995, has largely been achieved. (The policy documents can be viewed on the ITS Planning Documents website: http://its.calstate.edu/systemwide_it_resources/its_planning_documents.shtml.)

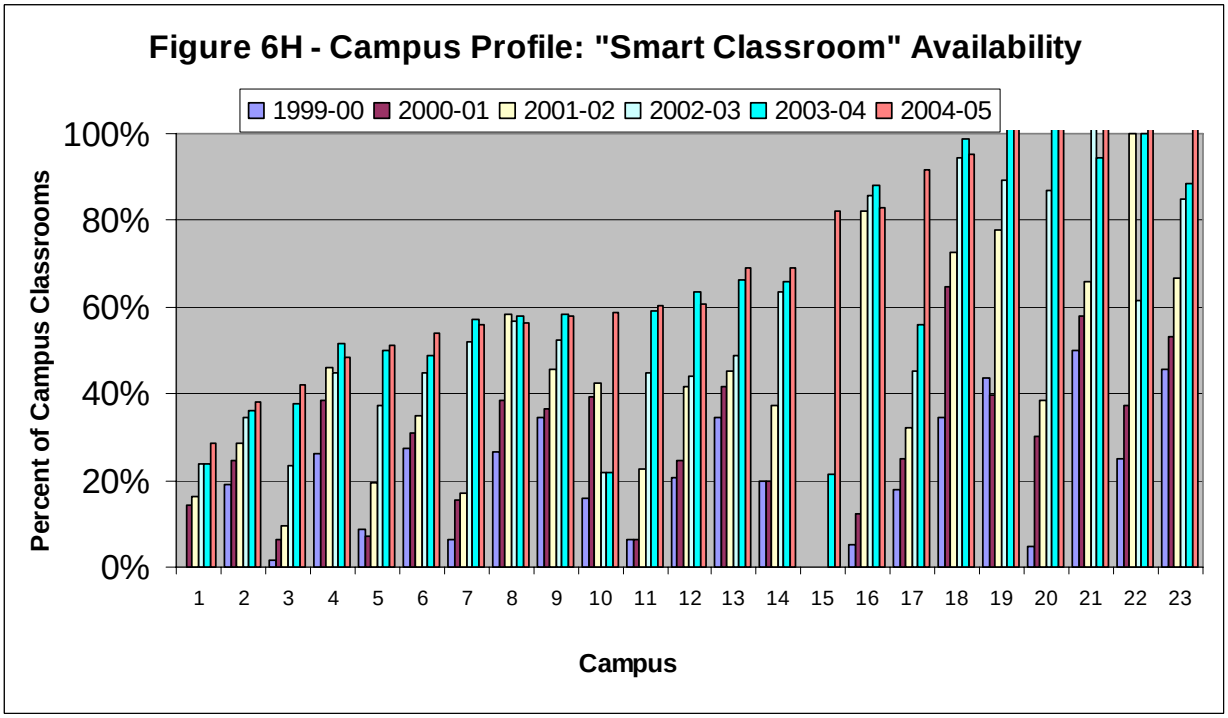
Access to workstations is only part of the equation. The quality of workstations depends on the currency of the hardware and the software, that is, their respective refresh cycles. Data from the CSU campus technology survey show that while workstation quality has increased for faculty, staff, and students from the baseline year of 1999–2000, it has declined over the past two years. (See table 12.7 in Appendix A.)

The CSU funding gap study found that the one-time cost to achieve baseline in workstation refresh for student, faculty, and staff is $11.1 million. The additional annual funding needed to maintain baseline in this category is $6.6 million. When regulatory mandates for assistive and adaptive technologies are considered, one-time costs of $11.4 million and annual support of $3.2 million are required.

"Smart Classroom" Access

At the institutional level, availability of "smart classrooms"—which are defined as classrooms permanently equipped with screen/monitor(s); projector; network connections to voice, video and data; and computer workstation(s) or provision for attachment of a laptop computer—is one indicator of progress toward baseline attainment. The need to equip classrooms for instruction that employs network resources and multimedia presentations has grown with the increased availability of technology-mediated instructional materials and with greater reliance on Web-based learning activities. Figure 6G shows the increase in the number of "smart classrooms" that has occurred for the CSU system as a whole. Approximately two-thirds of all classrooms in the CSU are now equipped to support the use of multimedia instructional resources. All of the classrooms on five of the smaller campuses are "smart;" and no campus reports that fewer than a quarter of its classrooms have such capability (Figure 6H).





Smart classrooms stand at the intersection between online and traditional teaching and learning. Equipping and maintaining such classrooms was one of the most important unmet needs in the CSU funding gap study. Construction, refresh cycles, and technical support needed to achieve baseline for smart classrooms ranked very high in unmet need costs, both one-time ($9.4 million) and $19.3 million annually. Currently, very few funds are devoted to support smart classrooms.

Workstation Network Connectivity

The baseline workstation standards established in the ITS call for network connectivity capable of supporting full-motion video (a minimum speed of 100 too 150 Mbps). Such high bandwidth enables multimedia applications routinely used in science, visual arts, and music instruction; it also meets the high data transmission demands required for the operation of administrative information systems.

Figure 6I illustrates the dramatic progress that has been achieved in providing CSU students, faculty, and staff with network connectivity at a level consistent with current and anticipated technological demands. In 2001–02, only 3 campuses were able to provide connectivity at the standard defined in the CSU baseline technology infrastructure standards (see Appendix B). As of the end of 2004–05, 16 campuses were doing so, a gain attributable largely to the campus backbone network improvements funded through the TII. As of the end of June 2005, only 7 campuses—those that have not completed or not yet begun implementation of their telecommunications infrastructure—report workstation network connectivity below baseline standards.

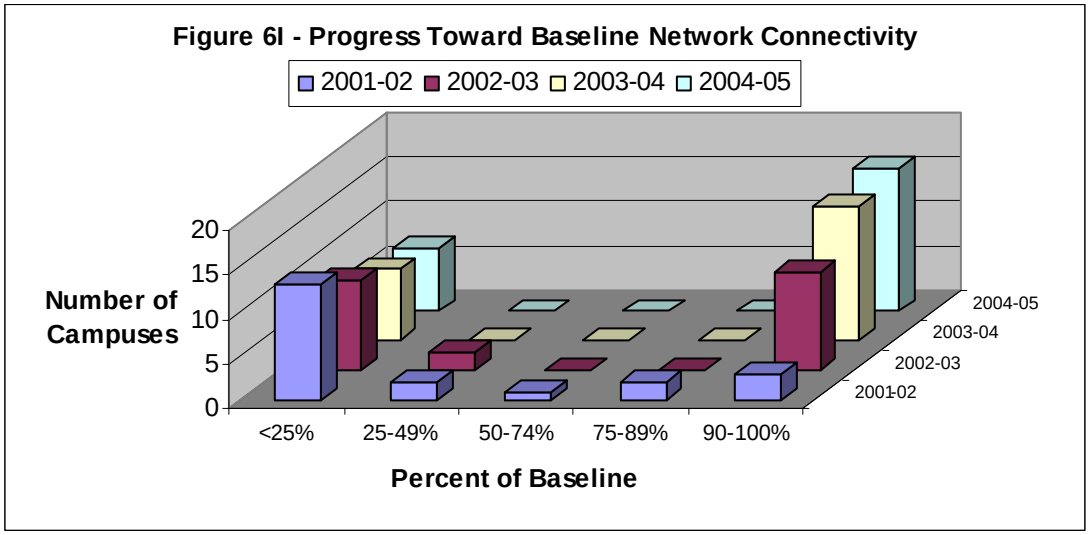
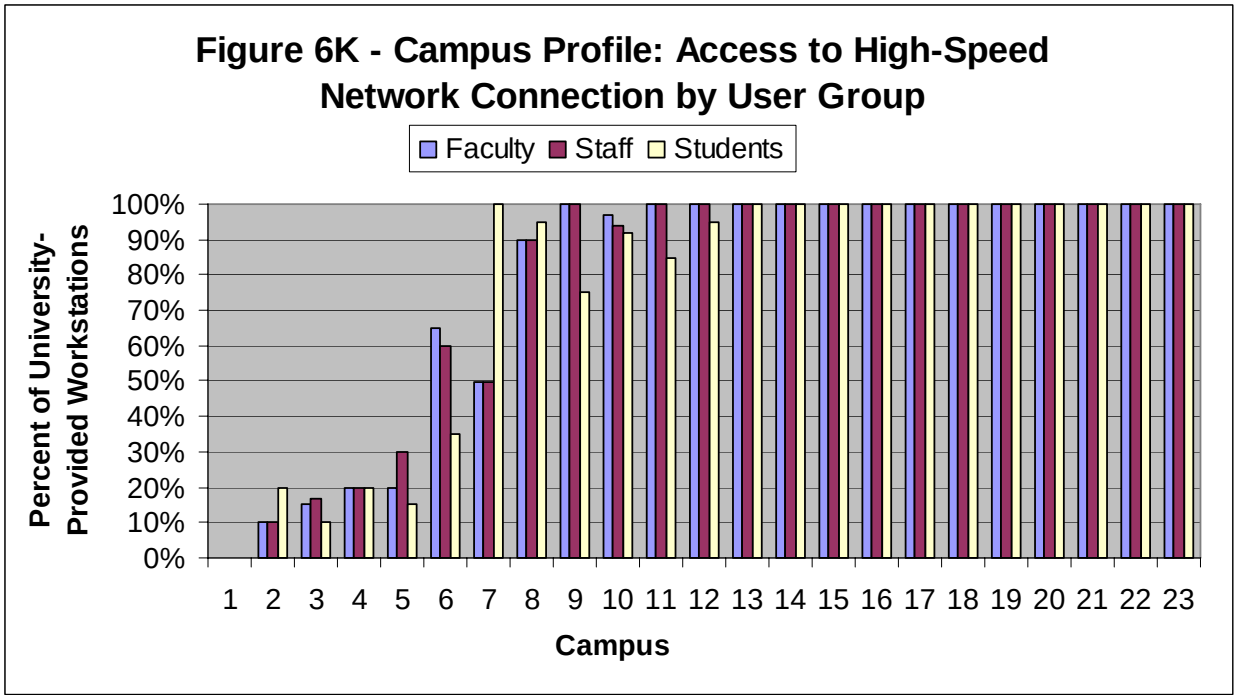


Figure 6J omitted intentionally.

As Figure 6K shows, on 15 of the campuses all or almost all of the workstations provided to faculty and staff, and the workstations available for use by students, support high-speed connection to the network. Five campuses—all pending initiation or completion of telecommunications' infrastructure upgrades—report that 25 percent or less of the workstations have such capability.



Surveys in 2001, 2003, and 2005 asked students about the ways they access the Internet (including e-mail and the Web) and their satisfaction with each option. Two-thirds of CSU students use a campus-provided e-mail account, and their satisfaction with it is also high. Eighty-seven percent of students access the campus network from off-campus, a dramatic increase from 2001 when only one-half did so. In general, satisfaction ratings tend to be higher on campuses that have made the most progress in implementing TII improvements. In 2005, 85 percent report using the campus wireless network and their satisfaction with it received a 7.5 rating.

Faculty satisfaction with campus access to the Internet declined from a mean rating of 8.50 in the 2000 survey to 7.67 in 2004. However, their satisfaction with remote access to the network has grown over the past four years. Almost 9 in 10 faculty who access the campus computer network from home have high-speed connections. Although 71 percent of faculty report having wireless network access on campus, only 41 percent had used it by 2004. Satisfaction with the wireless network was fairly low (mean rating of 6.25).

Two-thirds of staff had high-speed remote access to the campus network by 2004, and overall satisfaction with remote access has gradually increased since 2000. Only one-fourth of staff had used a campus wireless network and gave it a satisfaction rating of 7.10.

Technical Support

Technical support is an essential component of the ITS baseline information technology infrastructure. Gains in quality and efficiency cannot be expected from the acquisition of new technologies if people cannot use them effectively. Although no additional funding sources for this purpose have been found, all campuses provide at least basic technical support to user communities for university-provided equipment and software.

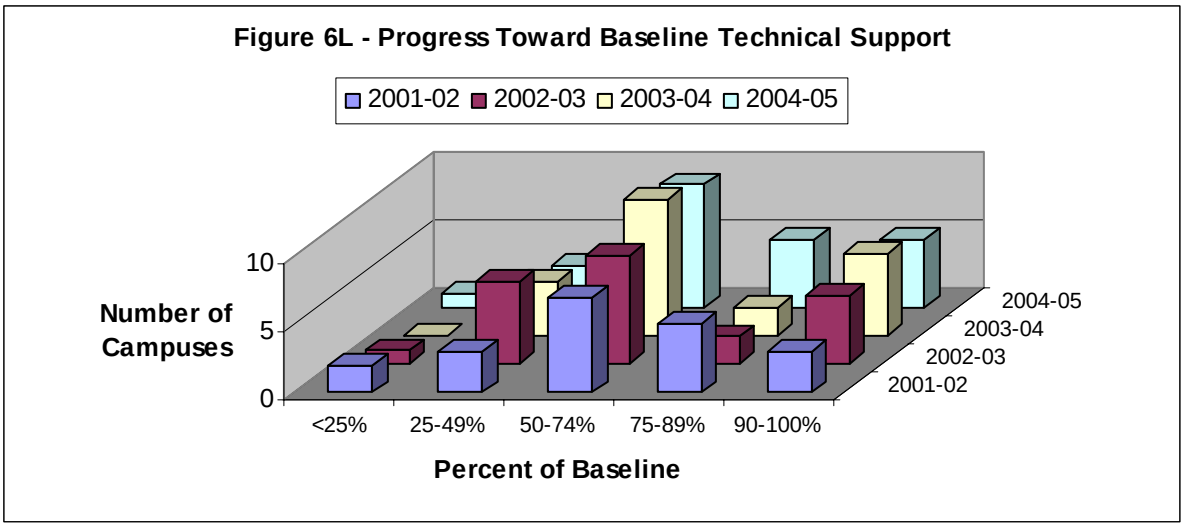
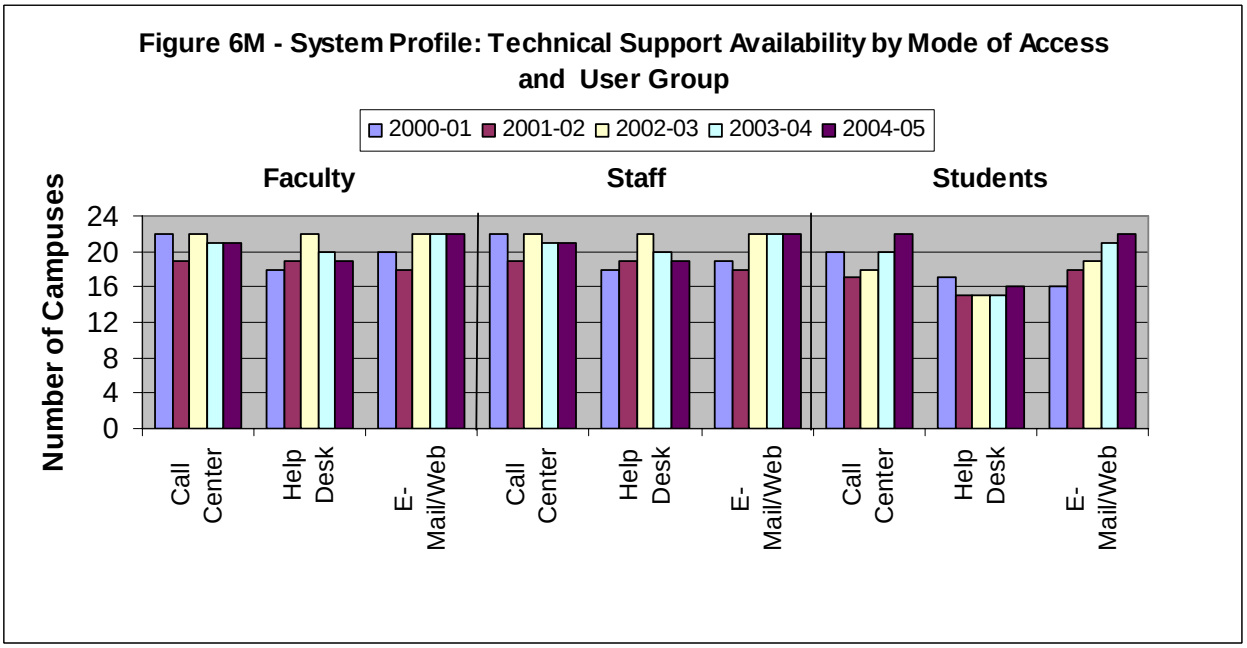


Figure 6L profiles progress toward baseline technical support for all user groups since 2001–02. The general uplift of the columns from left to right and from front to back mirrors the growth in availability of support services over the past three years. Whereas in 2001–02 the number of campuses able to provide technical support at the baseline level resembled the classic bell curve, the distribution pattern for 2003–04 and 2004–05 is clearly skewed toward the upper range.

Access

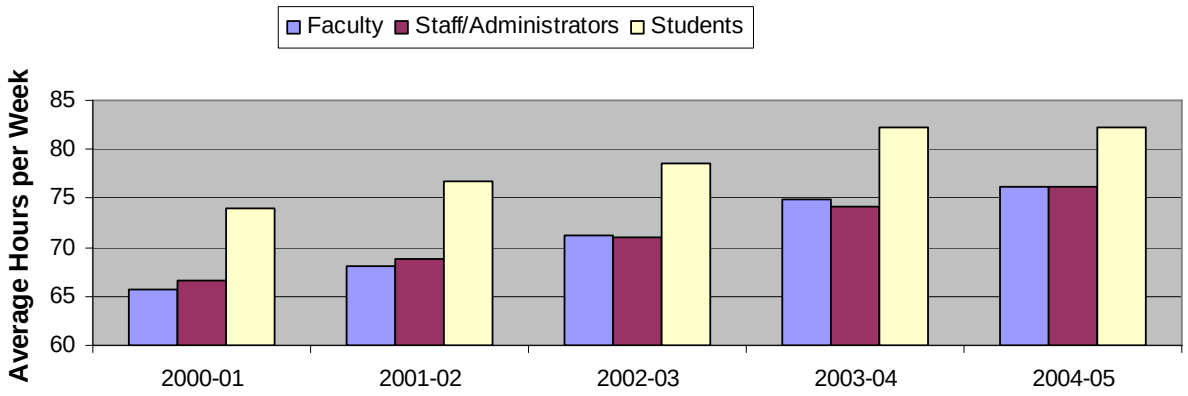
On most campuses, faculty, staff/administrators, and students have a choice in the way they request help. Figure 6M depicts the options available to each principal user group over the past five years. These include telephoning a central campus call center, visiting a central or a divisional help desk, or using e-mail/Web.



In addition to the modes or sources of assistance listed above, students often receive help from staff in computer laboratories or the library. Faculty, staff, and administrators on some campuses can receive support from technicians in their own divisions or departments.

Call centers are a widely available means of dealing with computing and network problems. There has been a steady increase in the average hours per week that call-center help is available to faculty, staff/administrators, and students (Figure 6N). With one exception, all campuses report providing at least 40 hours per week of access to call-center support for all user groups. Two campuses continue to make online support accessible 24 x 7.

Figure 6N - System Profile: Online Technical Support Availability



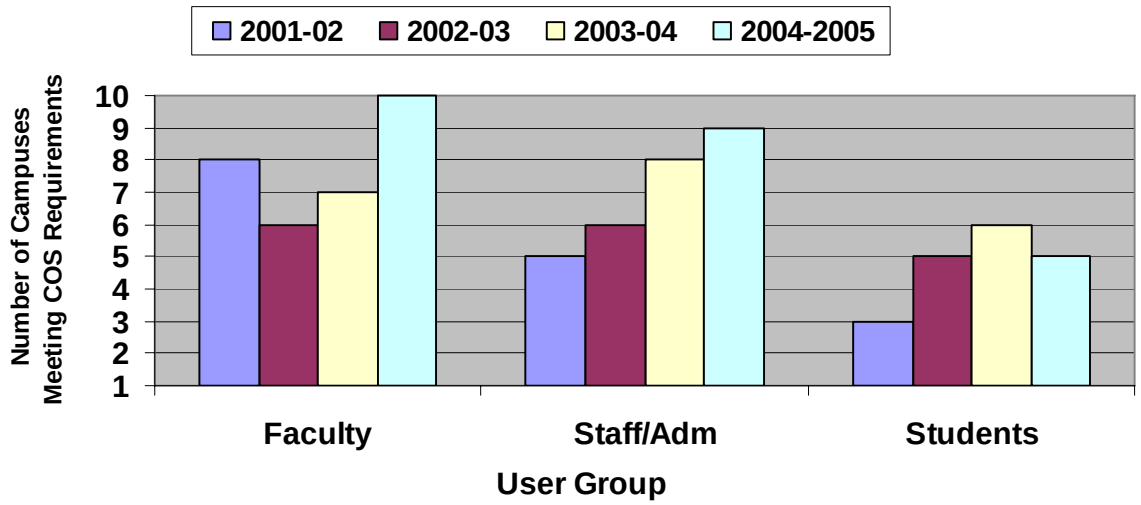
Quality of Service

In 2001–02, metrics for gauging the quality of support services were incorporated into *Measures of Success.* These metrics are a set of institutional policies and practices that, when adhered to in total, suggest the campus is providing support services of the quality envisioned in the Integrated Technology Strategy.* Baseline capability in the area of end-user technical support is attained when a campus meets all five policy/practice standards for all three user groups.

Figure 6O profiles the progress campuses have made toward meeting quality-of-service goals for the three user groups in the area of technical support. Despite greater competition for available resources, overall, the number of campuses that have adopted the set of policies and practices associated with the baseline standards has increased since the standards were adopted.

* The five support standards are:
1. The campus has policy or guidelines defining the kind and level of end-user technical support to which members of each user group are entitled.
2. The campus has, and periodically employs, a mechanism for assessing the baseline technical support needs of faculty, staff/administrators, and students.
3. The campus communicates effectively to members of each user group comprehensive information about the technical support services available to them.
4. The campus has, and periodically employs, a mechanism for measuring the satisfaction of user group members with the technical support they receive from the campus.
5. The campus tracks the use of technical support services by members of each user group.

Figure 6O - System & Campus Profile: Baseline Technical Support by User Group



In all three surveys, students were asked about several types of technical support available to them. In general, they gave very positive satisfaction ratings to all of the support services, although their levels of use varied considerably. The most striking trend is the obvious preference for immediate personal assistance. Use of telephone call centers among students rose from 26 percent to 31 percent, and requests for computer lab staff assistance rose from 14 percent in 2001 to 47 percent in 2005.

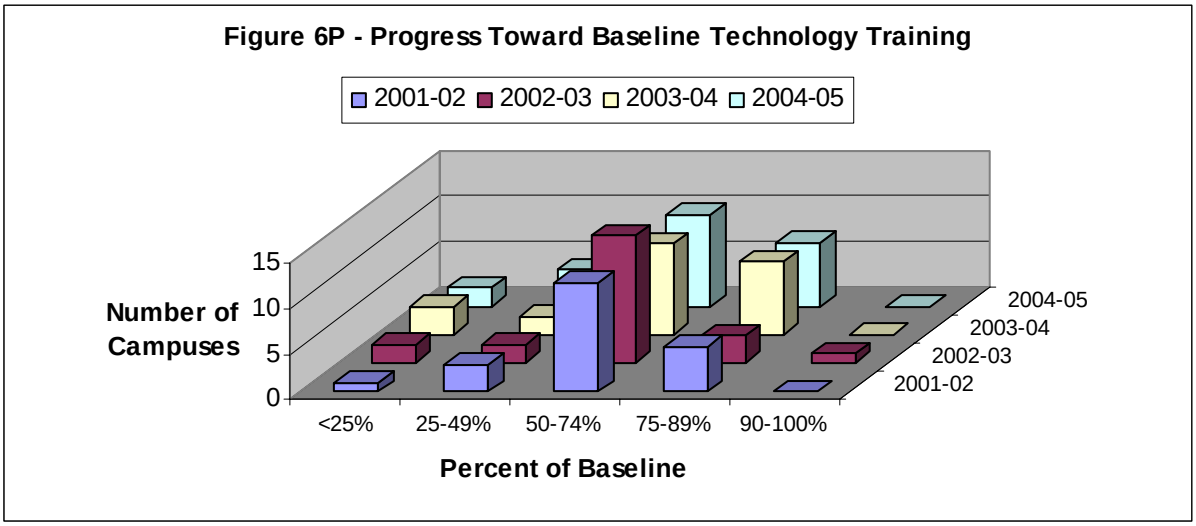
Almost all faculty and staff report having access to technical support for resolving problems with university-provided computers or software, and roughly 9 out of 10 in both groups say that the problems were resolved all or most of the time. Almost 90 percent of faculty reports access to technical support from their academic department, while only 60 percent of staff receives technical help directly from their work unit.

The CSU funding gap study showed that the shortfall in annual funding for technical support is $7.2 million for all three user groups combined.

Technology Training

Availability of end-user training in the use of computer workstations, common personal productivity software, and basic network applications is an integral component of the ITS baseline technology infrastructure. Included in the scope of the initiative is training to upgrade and maintain the knowledge and skills currency needed by the information technology staff who support end users.

Figure 6P represents the status of end-user technology training in terms of the technology infrastructure baseline standards. As of 2004–05, no campus is at baseline due to changing campus priorities and resource availability.



Access

Figure 6Q shows that there has been only modest change in the training opportunities available to all of the user groups.

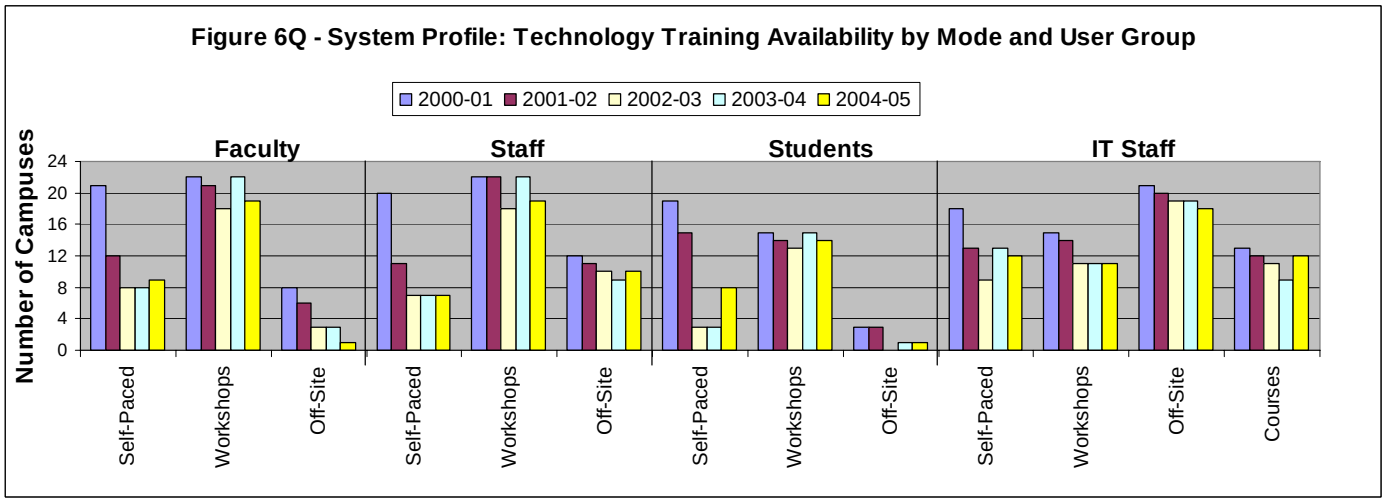
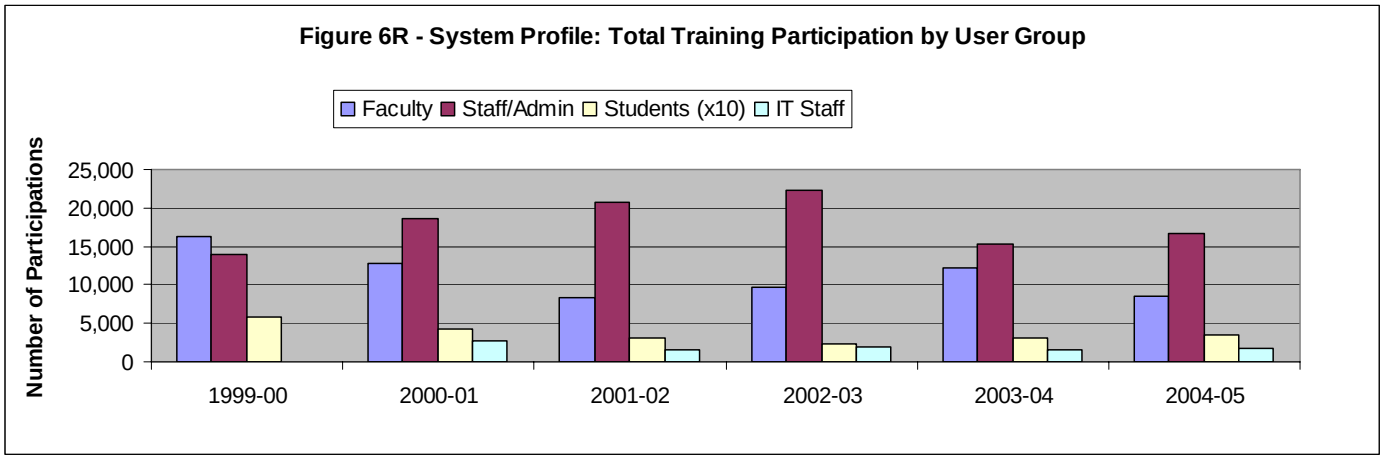


Figure 6R traces changes in the number of participations in technology training activities by members of the three user groups and IT staff over the past five years. (Because an individual may take part in more than one training program or activity, the number of participations does not necessarily equate to the number of participants.) Demand for technology training varies based on the changing needs of each constituency group, and on campuses' ability to provide support. For faculty, the initial focus on basic personal productivity and Internet applications has been displaced by interest in learning to use Web-based learning management systems. Staff training on many campuses has centered on CMS PeopleSoft training as their campuses gear up to implement new modules. Training for IT staff shifts according to changes in the equipment and software used to provide baseline technology infrastructure services. Training for students is largely dependent on the availability of resources.



Campuses support technology training in two principal ways: through the allocation of personnel positions and through the direct purchase of materials and services. Average campus spending to provide training declined for all three user groups and for IT staff for the third year in a row. Personnel positions assigned to support training also fell, but less steeply than in the previous year, with the exception of support for staff training where the drop in positions exceeded 25 percent.

Figures 6S1 summarizes the trends in direct support and personnel positions described above. The bar graphs trace total annual training expenditures for all campuses; system average expenditures appear as lines. Note that the actual dollar amounts in Figure 6S1 have been adjusted for purposes of display: total expenditures are 1,000 times the values on the chart; average expenditures are 10 times the graphed values.

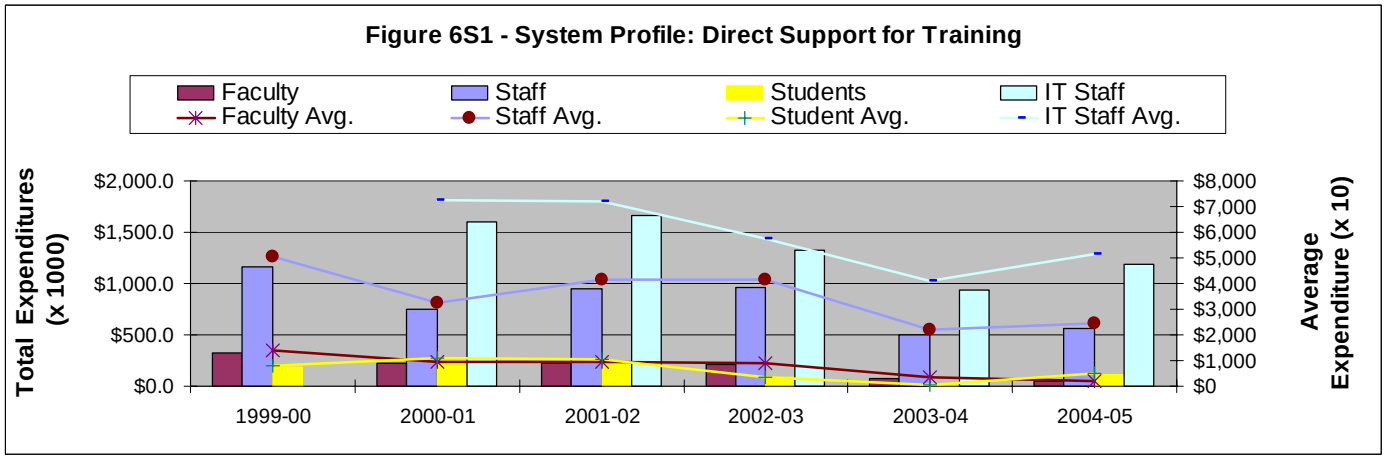
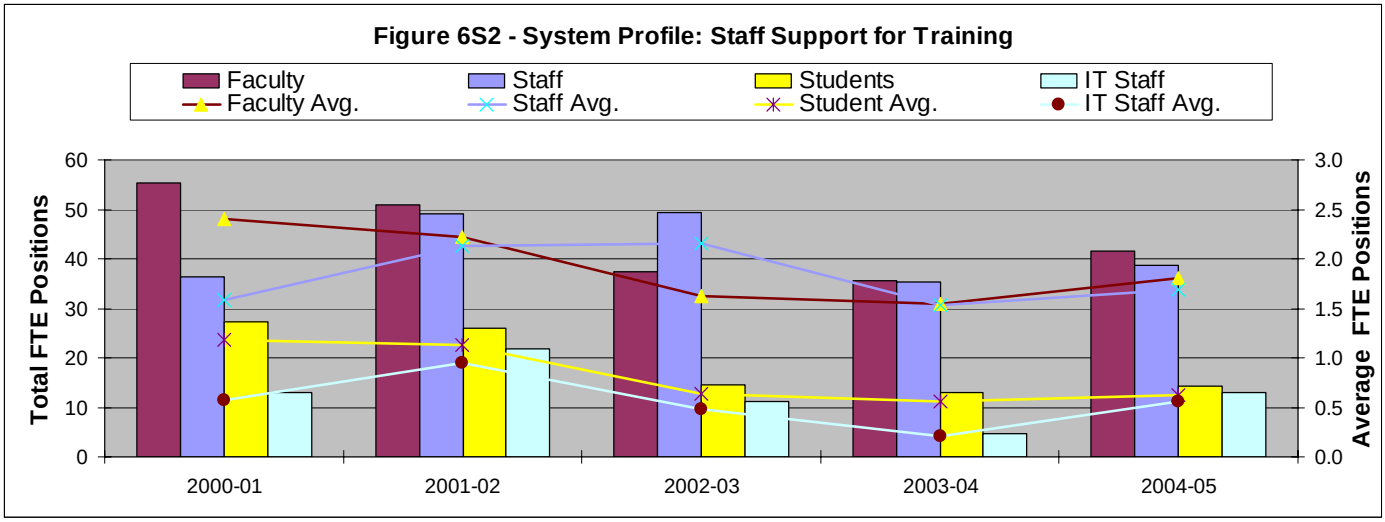


Figure 6S2 outlines changes in the level of staff support for training. The bar graphs show the total number of full-time equivalency positions allocated to support training for each constituency. The lines show the average allocations.

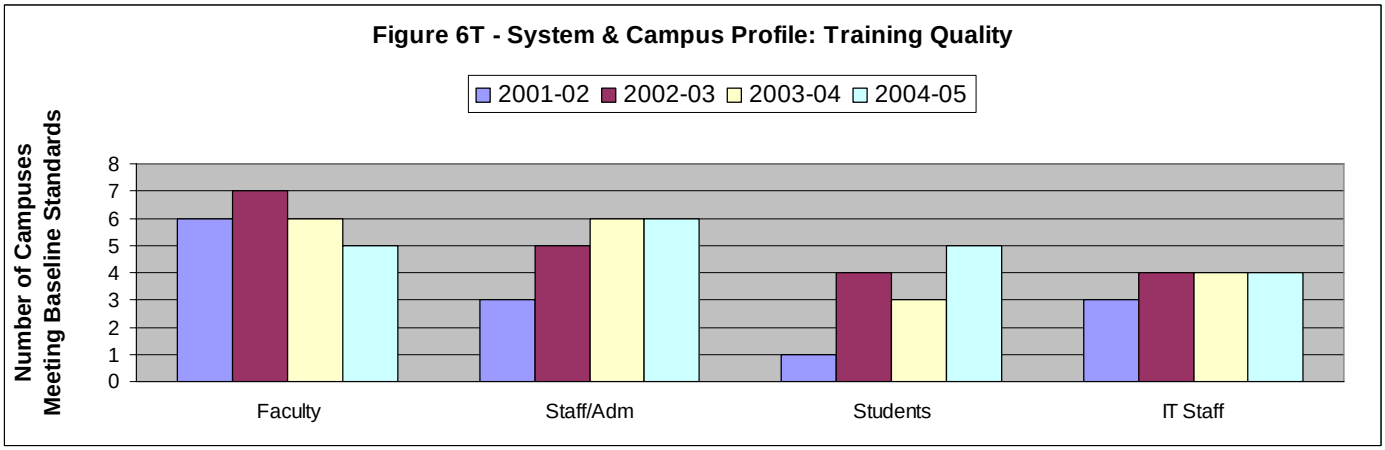


Disparities among campuses are greater in the area of training than in any other component of the technology infrastructure. Large differences exist between the kinds and quantity of training opportunities available to members of the principal user groups on individual campuses and between like user groups across campuses.

Quality of Service

In 2001–02, metrics for gauging the quality of technology training were incorporated into *Measures of Success.* These metrics are a set of institutional policies and practices that, when adhered to in total, suggest the campus is providing end-user training services of the quality envisioned in the Integrated Technology Strategy.* Baseline capability in end-user training is attained when a campus meets all five policy/practice standards for all groups.

Figure 6T depicts the uneven progress that has been made toward meeting the quality-of-service goals for faculty, students, and IT staff, and the modest gains for other staff.



* The five training standards are:

1. The campus has policy or guidelines defining "baseline" end-user technology training for faculty, staff/administrators, students, and IT professionals who provide end-user technical support.
2. The campus has, and periodically employs, a mechanism for assessing the baseline technology training needs for each user group.
3. The campus communicates effectively to members of each user group comprehensive information about technology training opportunities available to them.
4. The campus has, and periodically employs, a mechanism for measuring user satisfaction with the baseline technology training programs and activities provided by the campus.
5. The campus tracks participation by members of each user group in baseline technology training programs and activities.

In all three surveys, students gave high ratings to the importance of training opportunities, although only a small percentage (13 percent) said that they had participated in campus-based training programs. Those who did participate were very satisfied.

Similarly, faculty give very high ratings to the importance of campus-based training programs (mean rating of 8.02 in 2004), and the percentages that have used either a computer training resource or attended a training workshop stood at 52 percent and 68 percent, respectively. They also gave these training activities or programs a mean satisfaction rating of 7.46 in the same survey.

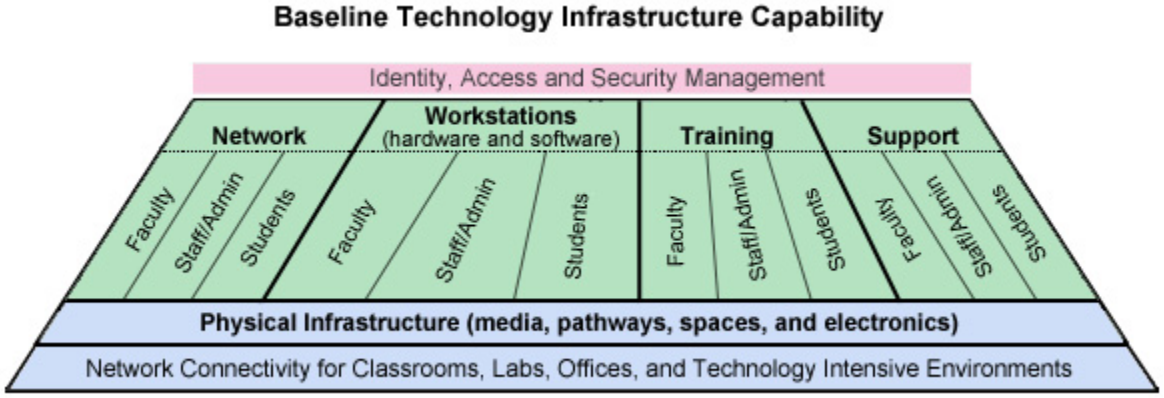
Among staff, there was a significant increase in the importance rating accorded campus training resources and programs between 2002 and 2004; the rating increased from a mean score of 7.61 to 9.07, although overall satisfaction with training remained at 7.63. In terms of training modes, 63 percent of staff had attended training workshops, and 56 percent had used computer-based training resources. Very small percentages of staff (under three percent) had used other forms such as online or self-paced training.

Institutional Progress Toward Baseline Capability

Baseline Information Technology Infrastructure Capability

The baseline technology infrastructure is the prerequisite for achieving all of the outcomes of the ITS. The system's overall progress in achieving that baseline on each campus is, therefore, an important benchmark for measuring success.

The essential components of the baseline technology infrastructure are the physical telecommunications infrastructure (pathways, spaces, media, outlets, and network electronics), workstations (hardware and software), network access, training, and support, *all* of which must meet established baseline standards for access and quality. These components are represented by bolded sections in the base of the following ITS pyramid. (Pictured in full on page two of the Introduction.)

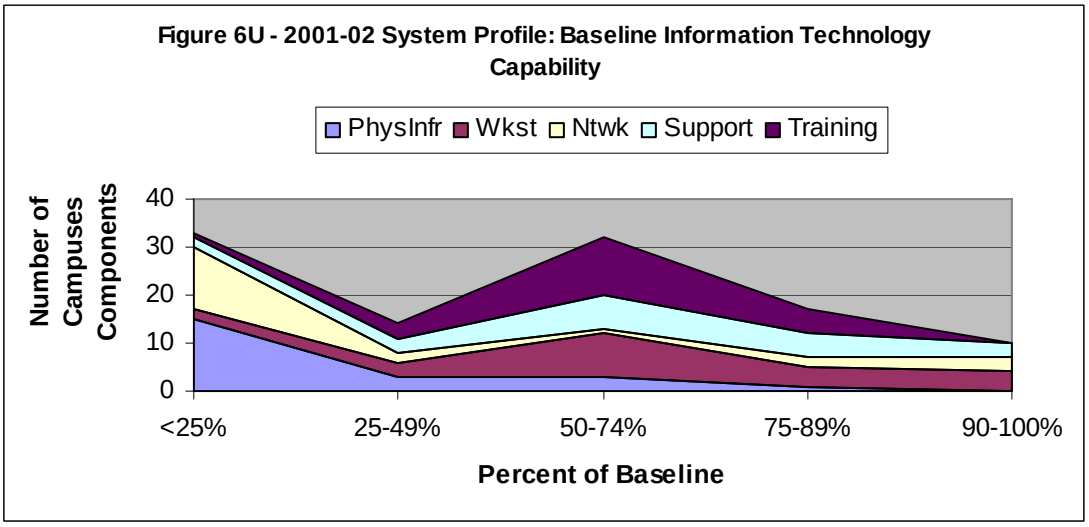


For purposes of conveying an overall sense of the progress the CSU is making toward baseline, *Measures of Success* has adopted a model based on the percentage of standards achieved on each campus in each of the five infrastructure components. For each component, "baseline capability" is defined as meeting standards at the level of 90 percent or higher. Progress toward baseline capability from 2001 to 2005 is displayed in the following four charts (Figures 6U, 6V, 6W and 6X).

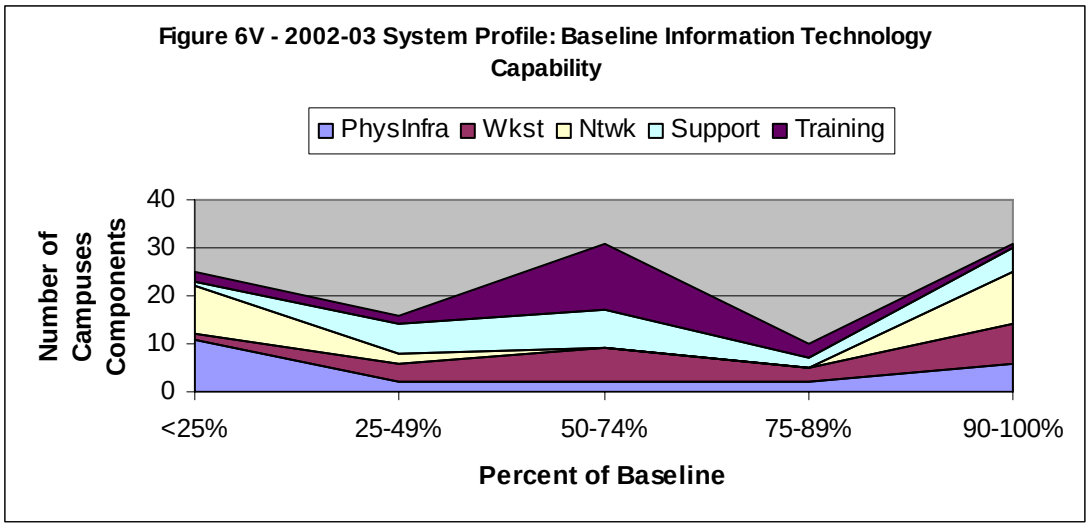
The figures below portray the overall progress that has been made toward providing all CSU campuses with the baseline IT infrastructure envisioned in the ITS. Information presented above in the three-dimensional bar graphs for each component is combined in the following four charts. The percentage range (x-axis) represents the level of capability as measured by the baseline metrics for the respective infrastructure components. The width of each band depicts the number of campuses at the respective level. Figure 6U, for example, shows that on 15 campuses the physical infrastructure was at 25 percent or less of baseline standards and no campus was at baseline. Only 2

campuses were at the 25 percent or lower level with respect to the standards for workstation access and quality, while 4 had achieved the target environment. Since the status of all 23 campuses is tracked for each of the five components, the total "number of campuses" (y-axis) is, therefore, 23 x 5 or 115.

Figure 6U profiles the status of the five infrastructure components of the end of FY 2001–02. Only 10 campuses reported having attained baseline capability in any of the components. The workstation environment on 4 campuses met the baseline expectations at the level of 90 percent or higher; 3 campuses provided high-speed network connections to 90 percent or more of the workstations, and 3 campuses met technical support standards at that level. No campus had a baseline telecommunications (physical) infrastructure, and no campus provided baseline training services. On 15 of the campuses, 25 percent or less of the network outlets were up to baseline standards and on 13 campuses only one out of 4 workstations (or less) was capable of connecting to the Internet at high speed (100 Mbps or faster). On many campuses, the quantity and quality of infrastructure resources and services ranged from 50 percent to 75 percent of baseline capability in the areas of workstations, support, and training.



A comparison of Figure 6V with Figure 6W suggests the progress that campuses made in 2002–03. Particularly notable are the improvements in the area of the physical infrastructure (from zero to 6 campuses at baseline) and network connectivity (from 3 to 11 at baseline). The aggregate number of total campus infrastructure components at the low end (25 percent or less of infrastructure capability) fell from 32 the previous year to 25, while the total at baseline grew from 10 to 31.



Continuing progress toward baseline is represented in Figure 6W by the displacement from the low end (less than 50 percent of baseline capability) to the higher end (75 percent or more of baseline capability). The aggregate number of total campus infrastructure components at the low end (25 percent or less of infrastructure capability) fell from 25 the previous year to 18, while the total at baseline increased to 32.

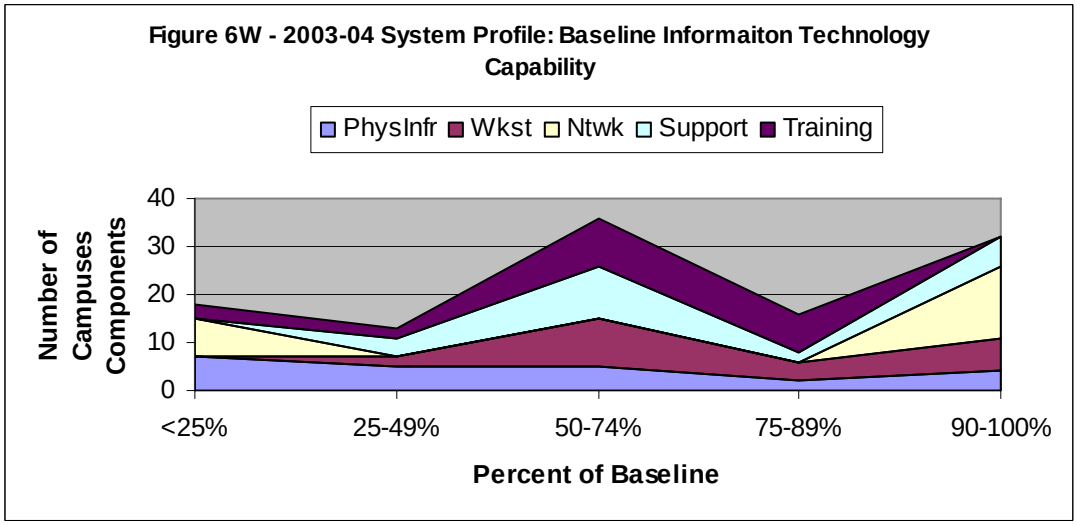
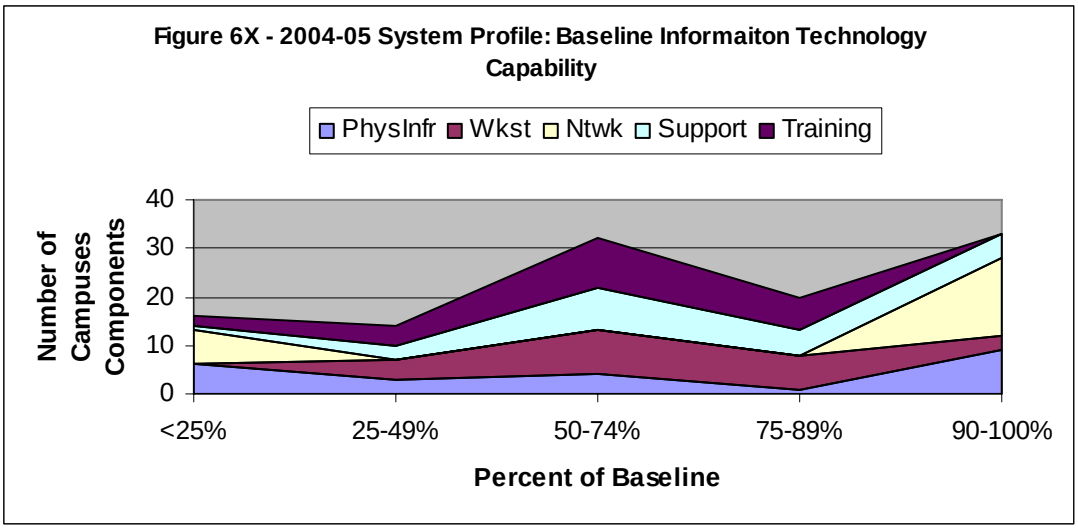


Figure 6X profiles the status of IT infrastructure progress toward baseline capability as of the end of FY 2004–2005. Note that the number of campuses at or near baseline (75–100 percent) has increased to 53 from 48 the previous year. The number of campuses below 75 percent of baseline fell from 67 to 62. The most dramatic improvements are attributable to progress made in network connectivity and the physical telecommunications infrastructure.



The system will have achieved a baseline technology infrastructure when all 23 campuses have reached 90–100 percent capability in all five TII components (23x5 = 115).

Fiscal Support for IT Infrastructure

In the 2004 Campus Computing Survey, CSU campuses reported sharp decreases in spending from the previous year for hardware, software, network equipment, and training and support. In addition, reductions greater than 5 percent were far more common on CSU campuses than among the 83 Carnegie Master's I institutions (the CSU comparison group) participating in that survey. For example, 61 percent of all CSU campuses reduced computer purchases by academic departments by greater than 5 percent; among comparison institutions, only 27 percent reported reductions of this magnitude. Similar patterns were observed for many other categories of expenditure.

The 2005 Campus Computing Survey witnessed a dramatic turnaround for both CSU campuses and comparison institutions nationally. Budget reductions of 5 percent or more affected fewer than 10 percent of both CSU and comparison institutions across 19 spending categories. For most categories, the vast majority of responses in 2005 was either "no change" from the previous year or budget increases of 1 to 3 percent.

However, the 2005 survey results mirrored those of last year from the standpoint of budget strategies. In both years, CSU campuses were more likely to "already be doing" the following (data are 2005): reducing purchases of computer technology (73 percent versus 39 percent nationally); charging fees to departments and service units (46 percent versus 32 percent); reducing services (50 percent versus 27 percent); cutting staff (55 percent versus 28 percent); delaying or deferring ERP deployment, replacement, or upgrades (41 percent versus 21 percent); and deferring or reducing the use of consultants on IT projects (82 percent versus 57 percent). In short, it appears that CSU campuses have institutionalized several cost reduction strategies even as overall IT budgets have improved. Notably, fully 60 of the 82 comparison institutions (73 percent) charge a computer or IT fee for all students, while only 2 CSU campuses have such a requirement.

Despite these differences, the CSU is virtually identical to national norms in expenditures for IT as a percentage of total campus spending (5.5 percent versus 5.6 percent), and expenditures for academic computing as a percentage of total campus IT spending (36.6 percent versus 36.4 percent).

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