

**Using Information Technology to
Achieve the Strategic Goals of
Rutgers, The State University of New Jersey**

Appendix 1: Report of the Teaching and Learning Subcommittee

Acknowledgements

I'd like to thank the committee members listed below for the time and energy they put into this report over the last year. The information collected and reports presented allowed us to identify the key issues and make recommendations that will improve the University's IT support of instruction. I'd especially like to thank the members for their candor, willingness to put politics aside, and dedication to improving IT support for instruction. This report is the result of many hours of hard work by many people – people that have and will make Rutgers a better place.

My sincere and heartfelt thanks go out to each and every committee member.

Don Smith

Committee Members

Joe Delaney	Richard Ludescher	Don Smith (chairman)
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I. Executive Summary

The Teaching and Learning subcommittee will make recommendations in three major areas: Learning Spaces; Online Tools; and Monitoring and Evaluating IT usage. In addition we will address some overarching issues related to including authority over and responsibility for IT support of instruction. Where possible we present milestones and estimated budgets. The budgets are the estimated total costs of delivering a support service and do not address funding that is already in place. Both the milestones and budgets should be revisited once the full IT plan has been compiled.

Over the past year numerous reports covering the IT infrastructure that supports instruction within the University were presented to the committee. We have learned that the current IT infrastructure is inadequate in several ways: the installed and supported resources are inadequate to meet the Universities mission of undergraduate and graduate education; funding for training, support, and operations is insufficient; the supporting physical infrastructure (*e.g.*, properly maintained classrooms) is substandard; and the integration with other campus functions (*i.e.*, scheduling) is lacking.

The committee believes that instruction at Rutgers is now, and will become more, dependent on IT support. IT can no longer be viewed as an optional capability used to enhance education, but rather must be viewed as a capability required to provide “for the instructional needs of New Jersey's citizens through its undergraduate, graduate,

and continuing education programs".¹ IT resources must be properly sized, reliably funded, and effectively managed with the responsibility over and authority for these resources clearly identified.

Over \$100 million has been spent in recent years to upgrade IT infrastructure (e.g., wiring, routers, switches, servers, etc.) but only a small fraction of that amount has been spent to provide environments that support teaching and learning. These environments have been under funded, understaffed, and have underperformed. With the infrastructure now in place it is time to leverage that infrastructure and provide effective software, systems, and support for teaching and learning. The committee recommends the following be adopted as part of the IT strategic plan.

- Overarching Recommendations
 - One-time capital funding of services, projects, or initiatives should not be appropriated unless there is a commitment to adequately fund ongoing training, operations, and support of these services.
 - Responsibility for services and authority over associated budgets should be clearly identified.
 - The "true cost" of providing services should be reported and reviewed annually.
 - All undergraduate students entering the University in 2010 or later should be required to complete at least one fully online course.
 - IT resources should only be deployed in spaces if the supporting physical infrastructure is properly maintained.
 - Scheduling of classes should be dependent on the IT resources required for instruction and availability of these services in lecture and recitation rooms.
- Learning Spaces
 - The Instruction and Academic Service Committee² responsibilities include the establishment and evolution of standards for Learning Space.
 - All new buildings should include learning spaces that meet standards. All lecture hall and recitation spaces in existing buildings should be upgraded to meet standards.
 - Faculty should be involved in the design of the classroom environment.

¹Rutgers University Mission Statement. <http://ruweb.rutgers.edu/aboutru/mission.shtml>

² The Governance subcommittee has recommended in their report the formation of an Instruction and Academic Service Committee (IASC). This report assumes that the IASC will oversee all aspects of instructional support and addresses specific IT aspects of that support.

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- A networked classroom environment should be developed that allows all materials to be delivered to the classroom over the network, and provides all necessary equipment in the classroom.
- Adequate resources should be available for the maintenance, upgrading, and security of classroom environments.
- Adequate staffing should be available for classroom support, maintenance, and repair.
- Classrooms should be equipped to allow a portion of the blackboard and the projector screen to be used simultaneously.
- Classrooms should be designed with multiple lighting controls and dimmers.
- Classrooms intended to accommodate videoconferencing should be designed to include two projectors or one projector with a split image.
- Classrooms be equipped with more flexible seating arrangements, such as moveable tables rather than fixed seats.
- Wireless deployment should be expanded, print stations should be located adjacent to wireless spaces, and a fee for print services should be established.
- The Instruction and Academic Service Committee responsibilities should include establishing the size and number of public computer labs and IMLs. The size and number of public computer labs and IMLs should be revisited in light of current and future usage patterns.
- Online Tools
 - The University should provide an adequate budget and sufficient staff to operate one or more well-supported CMS environments covering all campuses, departments, and units.
 - Equipment and personnel budgets should be expanded to support the development of the Rutgers Electronic Archive and expansion of databases, full text, and media materials.
 - The bandwidth and latency of Rutgers Internet connections, both internal and external, should be improved to keep pace with the demand for online digital information.
 - All new network hardware should be equipped with power-over-ethernet(POE) and support quality of service(QOS) management, existing installations should be upgraded to include POE and QOS as possible
 - Redundant hard-wired infrastructure should be minimized by routing all data, voice, and video over a single IP-based backbone.

- Funds should be allocated for University-wide purchase and support of software that supports instruction and research. IMLs should be organized to support instruction that uses this software.
- Monitoring and Evaluating IT usage
 - The Instruction and Academic Service Committee responsibilities include the establishment and evolution of standards for Usage Monitoring.
 - Usage and outcomes related to each IT service must be thoroughly monitored and annually reported. Online tools should be deployed only if their usage is thoroughly and completely monitored.
 - Course Surveys should be expanded to collect information about use of IT systems and services

II. Overarching Issues

The subcommittee identified several issues that are not specific to IT but either impact the ability to effectively deploy IT or are impacted by the effective deployment of IT. We recognize these issues and recommendations are not within the subcommittee's purview but felt we would be remiss if we did not mention them.

II.A. One-time Capital Funding

Recommendation: One-time capital funding of services, projects, or initiatives should not be appropriated unless there is a commitment to adequately fund ongoing training, operations, and support of these services.

The University has a history of relying on one-time allocations to provide operational support of essential services. This practice must be replaced by one that fully addresses the resources required to support ongoing training, operation, and management. An IT system that is not adequately supported is of little, some would argue of negative, value to the University.

Funding to support teaching and learning must be ongoing with training, operations, and maintenance included as part of annual budgets. One-time capital expenses that address specific needs are inadequate unless complemented by resources for ongoing operations. Funding decisions should be based primarily on the ability to provide resources for ongoing operations and secondarily on the one-time expenses required to initiate a program.

II.B. Responsibility and Authority Identified

Recommendation: Responsibility for services and authority over associated budgets should be clearly identified.

There have been numerous situations involving IT classroom resources where multiple organizations were responsible for various components in a classroom. Networks were

handled by one group, projectors by another, the screens projected on by a third group, and lighting by another. No single group had responsibility for the classroom. A faculty member wanting to dim the light, lower the screen, and project an image from a web site had no single point of contact where problems could be reported or help sought. The complexity of these reporting structures has been reduced in recent years but more needs to be done.

We recommend that responsibility for and authority over all infrastructure supporting teaching and learning, including IT, lie with academic officers of the University and that these be the VP for undergraduate education, VP of Research and Graduate and Professional Education, the Provost of Rutgers-Newark, and the Provost for Rutgers-Camden. This requires, and we recommend, that budgets for resources that support instruction, including those derived from student fees, should be controlled by these officers and that they should allocate portions of these budgets to organizations that provide essential services (e.g., Facilities, CAT, OIRT, etc.).

We further recommend that

- the Instruction and Academic Service Committee (IASC) oversee planning, deployment, and evaluation of all instructional resources, including IT;
- units providing essential services designate a specific individual who participates in planning of instructional environments and is responsible for the quality and timeliness of the service their unit provides; and
- faculty are involved in the decision making process and play key roles in planning for, operating, evaluating, and overseeing IT support for instruction.

In order to effectively carry out its responsibilities we recommend that the IASC be responsible for all instructional issues including planning for long-term needs, as well as evaluating and enhancing current facilities. We recommend its members include those with budgetary responsibility and authority, those with first hand knowledge of end user experiences and needs, and those with expertise sufficient to evaluate the cost to support the desired functionality. Only when all three of these groups participate fully in the process can the functional needs of, resources available to, and the budgetary limitations placed on the University be effectively addressed. Planning with a subset of these categories and throwing the result “over the transom” is not only an inefficient process but one that creates a crisis of confidence causing many to wonder whether their efforts will be appreciated and their recommendations taken seriously.

With respect to IT support for instructional environments, we recommend that responsibility on each campus be consolidated into a single group that is specifically charged with instructional IT support. Their responsibilities would include, but not be

limited to, IT support of all learning spaces, computer labs, online services such as course management systems, and faculty training and support (e.g. instructional design). Each campus's support group must be appropriately sized and organized to respond to the multi-faceted and geographically distributed needs of the user community. We recommend that IT support of instruction in New Brunswick be provided by the Office of Instructional and Research Technology (OIRT).

II.C. Cost of Services, Available Resources, Planning, and Decision Making

Recommendation: The "true cost" of providing services should be reported and reviewed annually.

Making effective decisions about what resources to allocate to what services can only be accomplished if the "true costs" and benefits of a service are known. Rutgers has a history of providing services at costs that are not consistent with typical industry charges³. This is true in several areas including IT and in all cases these "artificial costs" lead to decisions that do not effectively utilize available resources. All units within Rutgers need to redouble their efforts to determine and report the "true costs" of services.

In the case of IT, when considering whether to support a project in-house or contract it to an outside vendor, a critical piece of information is the relative costs of the two alternatives. If the cost of doing the task internally is not accurate or if surcharges are included, the decision cannot be effective.

II.D. Online Courses

Recommendation: All undergraduate students entering the University in 2010 or later should be required to complete at least one fully online course.

Milestones: September 2010: adopted as part of all college requirements.

We realize this recommendation is not formally within the purview of this subcommittee but it is relevant to a student's exposure to IT while at the University. It is clear that the use of IT for instruction and in the classroom is increasing and will continue to increase. Students expect online materials to be available and these materials are becoming an essential component of the University's educational mission.

Over the next 5-10 years most education will be done using a "blended" approach to IT. Lectures and recitations will continue to be an important part of a student's education but online material will augment these more traditional forms. Fully online courses are

³ Cost inconsistencies are due to many factors including imposed surcharges and internal accounting practices. Charges for some services are well above industrial rates while charges for others are below industrial rate. These inconsistencies render effective decision making all but impossible.

available today for many purposes (e.g., college courses, corporate training, etc.) and they will be relied on very heavily in the future. Moreover, the hybrid or blended model of staff development and training has become the preferred method of instruction for many large organizations. Rutgers graduates will live and work in a society that expects them to be comfortable with fully online materials and they should have some exposure to such environments while at the University. Learning how to learn using online tools is best accomplished at the University which can provide a low-risk, pedagogically sound learning environment.

Requiring each student to take a fully online course would help prepare them for the future and also encourage the University to expand its portfolio of online materials and offerings. Other Universities, such as Fairleigh Dickinson in New Jersey, have already developed a similar requirement as part of their curriculum. This proposal, of one online course, is modest, even conservative, in comparison to other institutions. There are acknowledged implementation issues, such as incentives to faculty members and departments who develop and maintain such courses, curricular issues such as which courses to develop and policy issues, such as when in a student's degree program the online course should be taken. This subcommittee believes it is beyond their charge to analyze, report on or solve these various implementation issues.

We support the current Senate-endorsed practice of providing all fully online courses using a single electronic environment because it allows faculty and students to use the knowledge and experience they have gained with an online environment in each successive online course⁴. We recognize that the recommendation that online courses be a requirement for traditional on-campus students introduces a population of students to which the University online course policy may not apply. Online courses for on-campus students should be considered like any other on-campus course although in this instance we believe efforts should be made to provide 24/7 helpdesk support when this course requirement is implemented. The University online course policy, intended to apply to revenue generating courses serving primarily off-campus courses, should be reviewed at an appropriate future time when the University can provide a course management system that "can appropriately handle 100 percent online courses"⁵.

II.E. Maintenance of Physical Infrastructure

Recommendation: IT resources should only be deployed in spaces if the supporting physical infrastructure is properly maintained.

The physical infrastructure in several enhanced classrooms has made it impossible to provide effective IT support. Leaking ceilings, broken projector screens, inoperable

⁴ Similar issues are also addressed in Section IV.A

⁵ The full Senate report and recommendation is in response to Charge S-0318. It is entitled "Use of Course Management Systems" and can be found at <http://senate.rutgers.edu/093005se.html>

blackboards, ineffective lighting, and inadequate networking, to name a few, have made it impossible to supply the services needed to support effective teaching and learning. Our strategic plan for IT assumes the supporting physical infrastructure is in place and maintained. Unfortunately, history and the current state of the physical infrastructure may render this assumption false. Resources need to be made available to maintain the physical infrastructure – these cannot be one-time capital expenses but must be budgets that support ongoing operations and maintenance. If the physical infrastructure is not maintained IT resources will fail and should not be deployed.

II.F. Scheduling of Rooms containing IT Equipment

Recommendation: Scheduling of classes should be dependent on the IT resources required for instruction and availability of these services in lecture and recitation rooms.

Courses are scheduled primarily based on enrollments and with minimal attention to the IT needs of the class. The subcommittee recognizes that this problem can be reduced or eliminated by providing a greater number of full-capability enhanced rooms and this document recommends these upgrades be made. We also feel that the scheduling of classes should address the specific IT support needed for lecture and recitation (e.g., laptop projection, audio capability, internet, wireless, etc.).

III. Learning Spaces

IT is transforming learning from an activity that had only been done in classrooms and libraries to one that can be done in any space in which IT services are deployed and effectively supported. Cell phones and laptops have untethered communication. Students routinely make calls and access information from the student center or coffee shop. The University can provide a significantly improved learning environment by leveraging IT and making resources available in carefully designed distributed learning spaces.

The importance of establishing and maintaining effective learning spaces cannot be overemphasized. The committee recognizes that equipping all rooms identically would be an unwise use of resources but it also knows, from first hand experience, that instruction will gravitate to the lowest common IT denominator and instructors will plan their lectures and recitations to only use resources they are guaranteed to have available over multiple semesters. We recommend that standards for IT support be multi-tiered ⁶; reviewed and analyzed annually based on user feedback, survey information, and usage statistics; and advertised to the University community.

⁶ Some rooms should have leading edge equipment, others should be middle of the road, and some should only meet minimum requirements.

III.A. Standards for Learning Spaces

Recommendation: The Instruction and Academic Service Committee's responsibilities include the establishment and evolution of standards for Learning Spaces.

Recommendation: All new buildings should include learning spaces that meet standards. All lecture hall and recitation spaces in existing buildings should be upgraded to meet standards.

Recommendation: Faculty should be involved in the design of the classroom environment.

Milestones:	April 2006:	Standing Committee established
	September 2006:	Initial standards established
	January 07:	Budgetary responsibility established
		New buildings built after this date include learning spaces that meet standards
	July 2007:	Initial plan for upgrading of existing facilities completed
	September 2007:	First phase of upgrade begins
	September 2012:	Initial round of upgrade is complete

The subcommittee recognizes that the establishment of complete standards for learning spaces extends beyond its purview but that there is a critical need for additional effective learning spaces that are supported by IT resources.

We recommend that the responsibilities of the Instruction and Academic Service Committee include the establishment and evolution of standards for learning spaces such as lecture halls, recitation rooms, IMLs, public IT labs, informal semi-public meeting areas, and public spaces. We suggest these spaces be integrated with the library's digital and physical resources, have wireless access, and convenient access to print stations.

Those who use the rooms are most likely to be aware of problems with current configurations and changing needs as technology evolves⁷. Any decisions made on classroom environment will impact a great majority of the instructors at Rutgers, and it is essential that faculty input and support be sought for any recommendations or standards created for smart classroom design. We recommend that faculty and instructors lead the effort to establish and evolve standards and that participation in the effort be for a period of three years with 1/3 of the committee being replaced each year.

⁷ The Newark Smart Classroom Development Subcommittee survey of campus faculty showed that over 50% of survey respondents used the computer, projector, network access, and document cameras in the smart classrooms and that roughly 70% of survey respondents indicated that the projector and the PC in the podium was either medium or high in level of importance to their instruction.

III.B. Suggested Initial Standards for Lecture Halls and Recitation Rooms

Recommendations in section III.B relate to the need for expanded and improved support for IT in the classrooms. They are provided as a suggested jumping off point for the standards committee mentioned in III.A and speak more to execution of the strategic plan than they do to a strategic vision.

III.B.1 Initial Standards for Lecture Halls and Recitation Rooms

Recommendation: A networked classroom environment should be developed that allows all materials to be delivered to the classroom over the network, and provides all necessary equipment in the classroom.

Recommendation: Adequate resources should be available for the maintenance, upgrading, and security of classroom environments.

Recommendation: Adequate staffing should be available for classroom support, maintenance, and repair.

Milestones:	September 2006:	Initial standards established
	July 2007:	Initial plan for upgrading of existing facilities completed
	September 2007:	First phase of upgrade begins
	September 2012:	Initial round of upgrade is complete

Budget:	Steady State:	\$6,000,000 per year (IT only)
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Currently using IT in the classroom is best described as an aerobic activity. A typical IT bag weighs ten pounds and carries a laptop, power cord, batteries for a wireless mic, and related equipment. Twenty years ago you carried a pad with notes and used the chalk and eraser in the room to deliver a lecture. The integration of IT into the classroom has not been fully realized and won't be until IT is as easy to use as the blackboard and chalk. Standards should be developed that eliminate the need to carry a ten pound IT bag and spend 5-10 minutes of setup and tear-down time for each lecture.

As we move forward, more and more material will be available on the Internet. We recommend that all materials needed for instruction should be made available online and access to this material should be through equipment installed in the classroom⁸. Further we recommend that lecterns and podiums should be designed to hold a built-in networked PC and a DVD/VHS player. They should run "standard" software, provide a laptop connection, and an easily accessible USB port. The room should have a

⁸ If audio or video materials are on physical media they should be copied to file systems and accessed online. Making material available online will require attention to both technical issues such as secure password controlled web sites and legal issues such as copyright infringement.

permanently mounted projector and screen, and wireless access should be available⁹. Plans for upgrading learning spaces should look three years ahead and be reviewed annually. As with design of learning spaces, faculty should play a significant role when it comes to deciding what to upgrade, what to install, and how to manage the budget for learning spaces.

The budget estimate provided is for IT only, is based on 400 rooms that require \$15,000 per year to operate, maintain, and support. It assumes equipment is replaced every five years and that the plan will be operated in steady state from its inception (i.e., it will take five years for every room to be upgraded). It includes staff that that will perform training and will respond to support calls both over the phone in person. The staff should be scheduled to address times of high demand such as early in the semester and during peak usage periods. Refurbishment of the physical infrastructure (i.e., chairs, boards, lighting, boards, etc.) is not included in these estimates.

Recommendation: Classrooms should be equipped to allow a portion of the blackboard and the projector screen to be used simultaneously.

Lectures can be presented effectively using the blackboard/whiteboard, a projector, or a combination of the two. Unfortunately the current configuration of most classrooms does not support using a combination of boards and projector since the screen is located in the center of the board and covers most of the board space. Classrooms should be equipped so that a portion of both the blackboard and the projector screen can be used simultaneously, enabling one image to remain on the board (or screen) while moving through other images, a particularly useful technique for comparative observations. This requires that the projection screen be offset to one side, or centered in front of a sufficiently large blackboard/whiteboard, so that some portion of the blackboard is easily accessible. The whiteboards installed in the room should cover as much of the front of the room as possible. In some large rooms, two offset projection screens with whiteboard space in the middle may be optimal. Some classrooms should be equipped with three vertically moveable boards (each approximately 3 feet by 10 feet) and an appropriately-positioned projector screen. Others may be equipped with plasma screens, whiteboards, and a projection screen for additional options in viewable areas¹⁰.

⁹ Instructors should be able to disable wireless access in the room when needed (e.g., during examinations) without affecting service in surrounding rooms. We recognize is technically difficult.

¹⁰ Several rooms on the Newark campus are equipped in this way and have provided effective support of instruction.

Recommendation: Classrooms should be designed with multiple lighting controls and dimmers.

In most traditional rooms, the lighting of the blackboard/whiteboard is controlled by a single switch so either the entire blackboard space or no blackboard space is lit. The lighting should be controlled by two separate switches, allowing for simultaneous use of the blackboard and projector with the blackboard well-lit but no light on the projection screen. In addition, lights in all rooms should be dimmable, with the front of the room dimmed most significantly -- new installations are being configured for this, but modifications need to be made in existing rooms. These design specifications should be part of the standards for learning spaces discussed in section III.A

Recommendation: Classrooms intended to accommodate videoconferencing should be designed to include two projectors or one projector with a split image.

Many classes are already using videoconferencing between campuses or between one campus and one or more offsite locations. In many classrooms, if a presenter is using a power point presentation, the camera is focused on the screen so that those at the remote location can view it. However, this means that participants at the remote location cannot see the person speaking, and any discussion that takes place between and among participants is in the absence of face to face contact. The preferred configuration would include one screen so that participants can see each other, and a second screen to show any computer display or other content.

Recommendation: Classrooms be equipped with more flexible seating arrangements, such as moveable tables rather than fixed seats.

The 21st century classroom needs to be a versatile educational environment that supports a wide range of learning activities and teaching styles, many of which do not involve lecturing. The current, ubiquitous use of immovable seats emphasizes the importance of lecturing and deemphasizes the value of group learning activities; increasing the use of moveable tables and chairs in "recitation" classrooms (with capacities of about 30-50 seats, allowing for small "breakout" groups as well) encourages group discussion and interaction. In addition, where armed seats are used, chairs with larger arms must be designed to accommodate today's students' equipment – which often includes various combinations of laptops, calculators, textbooks, and/or writing pads.

III.B.2 Initial Standards for Wireless Deployment and Print stations

Recommendation: Wireless deployment should be expanded, print stations should be located adjacent to wireless spaces, and a fee for print services should be established.

Milestones: January 2007: Standards for wireless, print stations, and print charges
 July 2007: Plan for deployment of wireless and Print Stations
 September 2007: Print charges established

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September 2008:	Initial phase of wireless deployment complete
September 2009:	Final phase of wireless deployment complete
	Initial phase of Print Station deployment complete
September 2010:	Final phase of Print Station deployment complete

Budget:

July 2007- June 2008:	\$ 2,500,000
July 2008- June 2009:	\$ 2,000,000
July 2008- June 2009:	\$ 1,500,000
Steady State:	\$ 1,000,000

These budgets assume that both wireless environments and print stations be deployed. The two services are synergistic and we strongly recommended neither be done if both cannot be done.

The cost of printing and related resources has risen significantly as more and more pages are being printed. The promise that deployment of IT will reduce printing has repeatedly been proven wrong and evidence suggests the number of pages printed will continue to increase. In addition, wireless laptops have become affordable (i.e., a laptop is comparable in cost to about three semesters of textbooks) and are being carried by more and more students. To address the emergence of wireless laptops, the University has deployed wireless environments in many public spaces.

The subcommittee believes a University-wide plan for wireless deployment must be undertaken and supported. This plan should not only address wireless issues but also print capabilities. Technological trends make it clear that resources will become geographically distributed and not localized. Just as cell phones have made wired phone lines obsolete in dormitories, wireless will make centrally located print station obsolete in favor of distributed print resources. Print stations should be deployed adjacent to wireless-capable public areas in a manner similar to how copying machines are deployed.

FAS and OIT have recently deployed services that could be the basis of a reliable, cost-effective scan/copy/print service. FAS has deployed a "copying machine" that can scan data to produce electronic images, print data from online repositories, or work as a typical copying machine. OIT has recently deployed "print stations" modeled after successful deployments at peer institutions. These stations, and their supporting software, provide a means for measuring print usage on a per user basis and can be extended to charge students for use of print services. Coupling FAS's scan/copy/print and OIT's print station could provide a cost effective distributed scan/copy/print resource that can charge for services.

The specific details of how and what to charge are beyond the scope of the committee but we suggest that each user be allocated some number of free operations (i.e., scan,

copy, or print) per semester and be charged per operation in excess of this number. The responsibility for developing a wireless and print station plan and overseeing its implementation should lie with the Instruction and Academic Service Committee.

The budget estimate is front loaded to allow for the initial design, development, and test of this environment.

III.B.3. Initial Standards for IMLS, Public Computer, and Departmental Labs

Recommendation: The Instruction and Academic Service Committee responsibilities should include establishing the size and number of public computer labs and IMLs. The size and number of public computer labs and IMLs should be revisited in light of current and future usage patterns.

Milestones:	January 2007:	Establish plan for IML upgrades
	September 2009:	IML upgrades completed
Budget:	July 2007- June 2008:	\$2,000,000
	July 2008- June 2009:	\$2,000,000
	Steady State:	\$ 500,000
		\$500 per workstation per year

IML upgrades will require renovations. These budgets are estimates and assume the necessary renovations are modest. Budgets should be revised once plans are finalized.

Computer prices have fallen precipitously over the last ten years. Students now routinely bring workstation or laptop running basic software (and usually looking for printers) with them to school and as a consequence usage patterns have changed. In New Brunswick usage of General Purpose Public Labs is lower now than it was ten years ago, while in Newark and Camden usage has not decreased. Over the same period the demand for hands-on instruction that require an Instructional Microcomputer (media or Multimedia) Lab (IMLs) has increased.

To date, most IMLs have been squeezed into available space. Going forward these rooms will play an increasing role in the delivery of instruction and they need to be sized and designed for their intended purpose¹¹. The current allocation of resources to public general purpose Labs and IMLs needs to be revised to reflect future usage patterns with special attention paid to the design and sizing of IMLs. Evaluation of usage and decisions about the size of number of labs should be campus specific.

Current IMLs provide an effective hardware base for general purpose and instructional use but often fall short when it comes to instructional software. Departments must either

¹¹ New offerings in SCILS need a lab size of 40, Sociology and others in Camden are in need of a lab size of 60, and RBS has a standard class size larger than the existing IMLs.

use the software available in the general purpose labs for instruction or purchase software from their own budgets to support their courses. Neither option provides the incentive or support necessary for effective teaching and learning.

In the past funds had been earmarked for course-specific software. However, over the last few years these funds have been used to support general purpose software forcing departments to find other resources to support course-specific instructional software. Funds should be allocated for the purchase and support of course specific software and IMLs should be organized to support instruction that uses this software. These funds should be part of the budget overseen by the Instruction and Academic Service Committee and made available to departments that can justify the software as an essential component of a course.

Departmental IT Labs are an extremely valuable resource that supports specific departmental instruction and often use course specific software and hardware. Given their dedicated nature they cannot easily be shared between departments; however, it might be possible for a small set of departments with similar needs to share such labs. The committee recognizes that this is a difficult planning and scheduling problem but suggests that departments be encouraged to identify opportunities to share resources and that assistance be provided to identify such opportunities.

The committee believes that funding of departmental labs should be tightly coupled to the availability of the lab to the University community. If the lab can be scheduled by any department it should be funded as a general purpose IML. If the lab can only be used by the department that manages it, it should be funded from that department's budget. Printing in all labs should be managed by the print environment described in section III.B.2 and electronic submission of assignments should be strongly encouraged.

All lab resources (e.g., hardware, software, etc.) should be thoroughly monitored and usage patterns analyzed. See section V for a more detailed discussion of monitoring issues.

IV. Online Tools

Discussion within the subcommittee about online tools was passionate and animated. There were, and are, strong opinions about how to proceed and what could be included in a viable strategic plan. The choice between deploying multiple distributed similar resources and deploying a single centrally supported resource was especially enlightening.

Over the past 5-10 years the University has spent a significant amount on hardware acquisition and upgrades (cabling, router, switches, servers, etc.) but has spent very little to supply environments that support IT in the classroom or meet the needs of instructors. Centrally supported systems have been acquired but the training, support,

and operation has been under funded, ineffective, and not timely. Departments, decanal units, and schools have designed, developed, trained users on, and operated “local” environment, not because they wanted to be their own IT organization, but because the University’s IT organization was underperforming.

Support must be performed in a timely way, be effective, and be sufficiently and continuously funded. Training must be available and ongoing. Support of ongoing operations is the key and the University’s report card does not have high marks for IT support of teaching and learning. The committee members have expressed a great deal of healthy skepticism about central services and whether University leadership will be willing to make the commitment to support such systems over the long haul. The historical evidence says it would take a leap of faith to believe in central services but if they were effectively provided they would receive strong support.

The true test of any system, and especially an IT system, is how well it is supported during its operation. A central system has a great deal of potential if it is supported in a timely and effective manner. The same is true for a distributed system. The choice is not centralized vs. distributed but rather well-supported vs. poorly supported. For any central system to be adopted the IT strategic plan must overcome the skepticism of committee members, faculty, and instructors.

IV.A. Course Management Systems

Recommendation: The University should provide an adequate budget and sufficient staff to operate one or more well-supported CMS environments covering all campuses, departments, and units.

Milestones:

May 2006:	CMS, or CMSs, selected for University-wide deployment. (e.g., Blackboard/WebCT, ecollege, and Sakai)
June 2006:	Training program established and first users trained
September 2006:	CMS in place
	Transitioning of existing online material begins
September 2008:	CMS fully deployed and operational
	All existing online material transitioned to new CMS.

Budget:

July 2006 – June 2007:	\$ 750,000
July 2007 – June 2008:	\$1,000,000
July 2008 – June 2009:	\$1,250,000
Steady State:	\$1,250,000

There is a strong consensus that CMSs have not received adequate central support. In response to this lack of support Newark and Continuous Education have deployed their own services. Newark has successfully deployed Blackboard and Continuous Education has successfully deployed Ecollege. Both have user bases that are satisfied with the services provided and only willing to consider changing if the new service is as good as or better than what they currently have.

A single central system, that is effectively supported and operated, could have several advantages. Faculty could seamlessly teach in any University Department without learning a new environment, materials could be easily shared among all faculty members and instructors, student taking courses anywhere in the University would have the same interface to their course material, and the University-wide user base would become a well-informed source of information. Given economies of scale, such a system could be less expensive to operate than several systems but the real win is not the dollars saved but rather the benefits of a single coherent, well supported environment. A single University-wide CMS could be a great success but only if support, training, operations, and management are adequately funded and effectively provided.

The decision of what system, or systems, should be adopted needs to address what functionality is currently being used, how this may change in the future, and the “true costs” of providing these services. The decision as to which system to adopt, plans for its deployment, and oversight of its operation should be the responsibility of the IASC.

All CMS resources should be thoroughly monitored and analyzed. See section V for a more detailed discussion of monitoring issues.

We recommend that the University provide an adequate budget and sufficient staff to deploy a well-supported CMS environment¹² covering all campuses, departments, and units with a budget that ramps up to steady state over a three year period. Further we recommend support and training be distributed by campus and under the academic leadership of each campus and that a 24x7 helpdesk be supported for faculty and students.

IV.B Online Digital Information Resources and Video Conferencing

Recommendation: Equipment and personnel budgets should be expanded to support the development of the Rutgers Electronic Archive and expansion of databases, full text, and media materials.

Recommendation: The bandwidth and latency of Rutgers Internet connections, both internal and external, should be improved to keep pace with the demand for online digital information.

¹² The committee has not reached a consensus as to whether to recommend one or more than one CMS but it does agree that the choice is not between one, or more than one environment, but rather between a well-supported or poorly supported environment.

Recommendation: All new network hardware should be equipped with power-over-ethernet(POE) and support quality of service(QOS) management, existing installations should be upgraded to include POE and QOS as possible

Recommendation: Redundant hard-wired infrastructure should be minimized by routing all data, voice, and video over a single IP-based backbone.

Milestones: July 2006 – June 2007: \$1,000,000
Steady State: \$ 750,000

Budget: July 2006 – June 2007: \$1,000,000
Steady State: \$ 750,000

The budget is only for the Rutgers Electronic Archive

The Rutgers University Libraries are developing a strategic plan that will make a significant commitment to enhancing the teaching and learning environment at Rutgers through the acquisition, creation, and delivery of digital resources. The Libraries will expand acquisition of commercially developed digital media and text resources, convert existing materials for online delivery to the classroom and integration into course management systems as well as preservation, and provide services for converting unique university resources to digital format and making them durably accessible. The constellation of Rutgers resources to be made available over the university network includes such unique resources as faculty lectures, artistic performances from the Mason Gross School of the Arts, media from the Institute of Jazz Studies, oral histories from Special Collections and University Archives, and dissertations and theses.

The costs for achieving this digital vision for the Libraries will be high. Financial resources will be needed for both acquisitions of commercial resources as well as local construction of the infrastructure and expertise needed to carry out resource creation, access, and delivery activities. The Libraries have already invested substantially in the first phases of creating this vision through grants and reallocation and will need substantial additional equipment and personnel for the next phase.

Commercial resources have been funded largely through a process of budget allocation and temporary funding. The university recognizes and the committee recommend that the process needs to change and that expanded acquisition of databases, full text, and media materials will require a commitment to ongoing annual funding. The Libraries will continue to develop and submit funding requests to the university administration for development of its commercially acquired digital collections. The technical infrastructure needed to make it available to Rutgers classrooms are as yet unknown and will need to be planned, funded, and implemented.

Local work needed to support creation, access, and delivery activities includes conversion of existing analog collections to digital form for reserve and classroom delivery, for seamless integration into course management systems, and for providing digital access to unique Rutgers resources. The primary way these resources will be made available for use across the university and beyond will be through the Rutgers electronic archive, scheduled to open in the fall 2006.

The Libraries commitment to these and other services in support of teaching and learning at Rutgers will require a robust university network capable of delivering substantial digital resources from outside and within the university to the classrooms, dormitories, libraries, and other physical and virtual spaces where students and faculty engage in the educational process. The Libraries will be developing plans, goals, and budgets for these and other complementary services during the course of the next five years as its own plans are realized.

Rutgers video conferencing and streaming capabilities need to be upgraded to keep pace with its peer institutions some of whom have been developing digital TV, Video on Demand, and related capabilities. A video conferencing server (i.e., a Multipoint Control Unit (MCU)) integrated with existing RUNet infrastructure could provide both high-quality video conferencing and services to departmental video conferencing units.

We recommend that Rutgers establish a high-end video capability and that bandwidth and latency of Rutgers Internet connections, both internal and external, be improved to support this environment and keep pace with the demand for online digital information. Further we recommend that new network installations provide effective support for streaming video and synchronous digital communication (e.g., video conferencing and voice-over-IP, VoIP) as well as enable services such as video on demand.

In addition we recommend that all new network hardware should be equipped with power-over-ethernet(POE) and support quality of service(QOS) management, that existing installations should be upgraded to include POE and QOS as possible, and that redundant hard-wired infrastructure should be replaced by an infrastructure that routes all data, voice, and video over a single IP-based backbone.

IV.C. University-wide Software Licensing

Recommendation: Funds should be allocated for University-wide purchase and support of software that supports instruction and research. IMLs should be organized to support instruction that uses this software.

Budget: Steady State: \$1,250,000 annually

Software needs to be available to users on their desktop or laptop and not only in computer labs. We recommend that a University-wide software collection be developed

and that that software be made available to users on any machine, including student owned machines, within the University.

If, as current trends indicate, the use of public labs is declining and the need for software is increasing the University can best respond by establish practices and policies to make software generally available to students and faculty on their office or personal machines. In addition, as vendor's licensing and pricing policies change, the University must evolve distribution and delivery mechanisms that efficiently and effectively manage these varied pricing and licensing options.

Possible options include using portals for low priced or site licensed software, using networked-based services made available by netid, and using license managers such as OIT key servers. Software titles that should be considered for the initial collection include ChemDraw, Stata, SPSS, Maple, matlab, and RefWorks; initial network services should include central and departmental servers (i.e., CS's Virtual operating systems lab), grid environments, online repositories, and experimental collaboratory resources (i.e., Physics telescope); and license managers should cover public access labs, Departmental labs, wireless access to resources, and Citrix servers.

Rutgers should combine its buying power to improve general availability of software that meets instructional and research goals and provide evolving alternatives to deal with licensing and pricing. Budget support for a University-wide software collection could be obtained from a combination of funds from central, decanal, and departmental budgets, as well as student fees.

This collection would need to have support available on all campuses to provide documentation, training, and help. The number and placement of staff needs be evaluated in light of the specific resources in the collection. Possible organizations in which these staff members could be located include CAT, IDT, OAT, learning centers, OIRT, libraries, or OIT help desks.

V. Usage Monitoring

Recommendation: The Instruction and Academic Service Committee responsibilities include the establishment and evolution of standards for Usage Monitoring.

Recommendation: Usage and outcomes related to each IT service must be thoroughly monitored and annually reported. Online tools should be deployed only if their usage is thoroughly and completely monitored.

Recommendation: Course Surveys should be expanded to collect information about use of IT systems and services

Effective usage monitoring of environments is as important as establishing their “true costs”. Without knowledge of the amount and type of usage it is impossible to assess performance and cost effectiveness of deployed services. Online tools should be deployed only if their usage will be carefully monitored and analyzed. Current monitoring has been found to be severely lacking. The data measured is a subset of what is needed and the data that is monitored is incomplete, ambiguous, and requires a significant amount of staff time to collect and analyze. Better information and analyses are needed to assess the effectiveness of the IT support for teaching and learning. Such analyses will need to differentiate between users but should not be able to identify a specific user. This may require that privacy policies be review and anonymizing/sanitizing options be considered. To encourage effective and efficient working and sharing relationships across similar resources, we recommend that standards for monitoring and reporting of resource usage be developed.

V.A. Monitoring Classrooms and Labs

Milestones:	September 2006:	Classroom and Lab standards developed
	September 2007:	Standards implemented in public labs and IMLs
	September 2008	Standards implemented in Departmental Labs

Classrooms and labs are currently monitored; however, the monitoring needs to be expanded to include information about what was used, when it was used, and the duration of the use.

In all labs (i.e., public, IMLs, and departmental) usage statistics for software packages as well as hardware should be systematically maintained. Currently techniques do a good job of recording hardware usage and provide some information about how often software is used, but better information is needed to assess the effectiveness of the IT support for teaching and learning.

V.B. Monitoring online materials

IT resources provide new ways to deliver information in support of teaching and learning. Some information, such as an on line syllabi, are little more than replacements for printing and copying while others such as discussion groups introduce new communication environments that need to be better understood and effectively managed. Gaining an understanding of how these resources are used by faculty and students and how this use impacts learning outcomes is essential to improving instruction. In the abstract, monitoring usage of IT resources is straight forward but in practice the amount and quality of information must be carefully analyzed so that effective reporting of usage can be done efficiently.

Online environments managed either independently or by a CMS are used to post syllabi, class notes, and homework as well as manage discussion groups, automatically administer and grade exercises, or assess the progress of an individual students or the

course as a whole. Quantizing how each of these various features is used requires careful and thorough monitoring. Currently available data allows us to count how many students use a CMS in a course, but not how many times in a semester it is used or what features of a CMS are used. For example, we can know that 80% of the courses in a department use a CMS but we can't differentiate between a course that only posts a syllabus and one that makes heavy use of discussion groups or between a student who visits the course site once a semester and one that visits hundreds of times.

The need for effective monitoring is critically important to the success of any IT environment but it rises to an essential service for fully online courses where the principle contact between a student and instructor is through the online environment. The information collected must be on a per session interaction and be sufficient to determine what information was accessed, when it was accessed, the frequency of access, the duration of the access, whether the interaction was "render, read, and print", an interaction with the IT environment, or an interaction with a classmate mediated by the IT environment. Without this usage information the value of an IT environment to the University's educational mission cannot be assessed.

The long term goal is to monitor learning outcomes and use the relationship between IT usage patterns and outcomes to focus support and training. Effective monitoring coupled with "true costs" provides the metrics necessary to evaluate the effectiveness of IT services. It is imperative that usage and outcome be thoroughly monitored and annually reported