PURDUE
UNIVERSITY

INFORMATION TECHNOLOGY STRATEGIC PLAN

September 2002

FINAL

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Information Technology Strategic Plan
Preamble

> …information technologies have probably had the most pervasive influence on what we are able to do in science and engineering over the last two decades. These technologies have become the new infrastructure of science.
>
> Rita Colwell, Director, National Science Foundation, "The National Science Foundation at Fifty", 1999

Information technology is a powerful tool that enables revolutionary breakthroughs in scientific research and student learning while dramatically lowering barriers to engagement by opening opportunities for technology and intellectual transfer without regards to time or place. Given the synergy on Purdue's campuses between research and education, Purdue is uniquely suited to create the "new infrastructure" necessary to support learning, discovery, engagement, and the business enterprise.

The Information Technology Strategic Planning Task Force was charged with developing a vision and implementation plan for creating a world-class digital information infrastructure and building services that support Purdue's strategic efforts. The task force felt strongly that another vital area for inclusion in the strategic plan was the underlying information technology systems supporting the business environment at Purdue. While these systems are often overlooked, it is the assessment of the task force that if designed and deployed properly they can act as a strategic advantage.

Two fundamental principles drove the development of the plan. First, collaboration is essential for this plan to succeed. The information technology community at Purdue, referred to as ITaP, is an alliance of peers from the West Lafayette and four regional campuses who work together under the coordination of the Office of the Vice President for Information Technology. This decentralized group will need to act in concert to answer the challenges and realize the opportunities presented in the plan. The best opportunity for success is by embracing an enterprise (or holistic system) approach to define what infrastructure and services can best be done centrally and which should devolve to local users. Through this approach, decentralized efforts (silos) resulting in duplication can be eliminated and additional energy focused on implementing the strategic plan.

Second, applications drive the need for technology and technology should never be thought of as an end in itself. The structure of the plan is broken into two conceptual sections: application drivers and enabling infrastructure. The application driver section defines the "story" of the importance of information technology to learning, discovery, engagement and the business environment. The examples used are not meant to be exhaustive, but rather illustrative of emerging trends demonstrating user needs. From the basis of this analysis, the second half of the document examines the underlying infrastructure necessary to achieve preeminence. The technical recommendations, and underlying metrics for measuring success, are tied to twelve categories of infrastructure and services.

On the basis of the application drivers analysis and the enabling infrastructure recommendations, the task force has identified five areas for strategic investment: encouraging instructional innovation, supporting multi-disciplinary research, creating the foundation for an engaged institution, building the business enterprise, and providing an enhanced and integrated infrastructure.

Note: Throughout the document the term Purdue is used to refer to the Purdue system including the regional campuses at Calumet, Fort Wayne, Indianapolis, and North Central.

Conceptual Overview

Mission

Provide and create an evolving information infrastructure and services to support user needs in learning, discovery, engagement, and the business environment.

Vision

Create a world-class digital infrastructure driven by user needs that leverages Purdue's information technology knowledge and infrastructure for economic development within Indiana.

Application Drivers

Learning

Supporting Instruction and Student Learning

i. Course Management
ii. Information Resource
iii. Site Licensed Software
iv. Classroom Technology
v. Computing Laboratories

Discovery

Enabling Research and Scientific Breakthroughs

i. Shared Scientific Resources
ii. Modeling and Simulation
iii. Web Interfaces for Science

Engagement

Leveraging Purdue's Information Infrastructure for Indiana

i. Web Environments Creating Purdue Anytime / Anywhere
ii. Community Networking to Build Indiana's Digital Highways
iii. Strengthening Constituent Relationships

The Business Environment

Supporting the Operations of Purdue University

i. Enterprise Applications Linking People, Processes and Data
ii. Business Tools Supporting Research and Advancement

Enabling Infrastructure

Cross-cutting Goals

a. Enhance communication with users
b. Develop Purdue's information technology workforce
c. Diversify funding for the IT infrastructure

Computing Environments

Create preeminent computing environment for all users.

Data

Establish a common data framework.

Enterprise Applications

Develop an integrated information architecture

High Performance Computing

Maintain an internationally ranked high-performance computing facility.

Instructional Development

Develop an instructional environment that encourages instructional innovation.

Networking

Create a pervasive information network.

Technical Support

Develop a technical support system focused on customer service.

Security

Protect network resources and individual privacy.

Video Services

Create integrated video services leveraging academic and technical expertise.

Visualization

Build state-of-the-art scientific and data visualization capability.

Web Environments

Design a dynamic and efficient Web environment.

Strategic Areas for Investment

Encouraging Instructional Innovation

Supporting Multi-Disciplinary Research

Creating the Foundation for an Engaged Institution

Building an IT Environment to Support the Business Enterprise

Providing an Enhanced and Integrated Infrastructure

Peers

Metrics

Information Technology at Purdue
Mission, Vision, and Principles

Mission:
Provide and create an evolving information infrastructure and services to support user needs in learning, discovery, engagement, and the business environment.

Vision:
Create a world-class digital infrastructure driven by user needs that leverages Purdue's information technology knowledge and infrastructure for economic development within Indiana.

Core Principles:

- *Collaboration is Essential to Success*
  Collaboration with users, among IT professionals at Purdue, and with partners (public and private sector) is essential to successfully meet ITaP's mission. These collaborations allow Purdue's system-wide technology investment to be fully leveraged.

- *Applications Drive the Need for Technology and Require Innovation*
  Technology is not an end in itself, but it enables users across disciplines to accomplish goals in learning, discovery, and engagement, and to effectively manage the business enterprise.

  Continual improvement of the information infrastructure depends on user-driven experimentation with new technologies and with new ways of using existing technologies, and is critical to continued evolution of the information infrastructure. Leadership requires exploration of alternatives and embracing technological change.

- *IT Staff are an Important Asset*
  Purdue's most important information technology resource is the people comprising the information technology community. These individuals are crucial to the success of ITaP and fuel the creativity that supports change.

- *Users Must have Ubiquitous Access to Resources*
  Access to information and computational resources from multiple devices and locations is critical for information technology to have its full impact.

  Adequate capacity (computational/networking) is critical to support this principle. Limited capability leads to the rationing of resources, hindering use.

- *An Enterprise Approach Assures Leverage*
  Purdue should embrace an enterprise (or holistic systems) approach to information technology that articulates what infrastructure and services can best be done centrally and which should devolve to local users.

- *Purdue's Information Infrastructure Should Be an Asset to Indiana*
  Purdue's statewide information infrastructure plays an important role in promoting engagement through knowledge and technology transfer, thus supporting educational and economic development throughout the State.

Application Drivers: Learning, Discovery, Engagement, and the Business Environment

Information technology is an important tool that enables revolutionary change in areas of strategic importance to Purdue. Because information technology is so pervasive, it is tempting to focus on infrastructure and forget that the true utility of technology depends on its applications.

The Information Technology Strategic Planning Task Force felt it was critical to examine the strategic applications that drive the need for information technology before discussing technical recommendations. The following application overview provides examples of how information technology is currently applied to create the foundations of a robust and dynamic information infrastructure at Purdue. The University couples IT infrastructure and services to applications, helping to assure strategic advantage as it strives for pre-eminence.

Application Driver: Learning
Supporting Instruction and Student Learning

Information technology offers faculty members opportunities to enrich their curriculum with tools and information resources and empowers students to pursue self-directed learning and collaborative research with peers.

Historically, Purdue has been a leader in incorporating technology into the curriculum, enriching course offerings and creating new distance-learning opportunities. In 2001, the West Lafayette campus offered 132 distance-learning courses to over 9,500 students. Purdue West Lafayette currently offers nine degrees using various distance-learning technologies.

Information technology is also deeply integrated into Purdue's campus learning environments through formal course management systems, new Web based resources, site-licensed software, integrated technology classrooms, and student computing laboratories.

- Course Management: Formal systems for course management are proliferating on campus. These systems, such as WebCT, Catalyst in the Krannert School of Management, and Computerized Homework in Physics (CHIP), provide templates for publishing course information, software tools for testing, and tools for on-line collaboration. WebCT offers a good example of the dramatic growth of these systems in the last year; with a 52% growth in the number of courses (from 791 to 1201) and a 60% increase in users. Purdue currently has the third largest installation of WebCT in the world.

- Information resources: Academic units are harnessing the power of the Web to create new information resources. One of the most successful of these efforts is the On Line Writing Laboratory (OWL) created by the English Department. OWL began as an on-line resource for local students who needed writing assistance. This goal led to the development of a robust Web site containing modules for self-directed learning, tips for improving writing syntax and style, and pointers to other writing resources on the Internet. Over 9 million users have used OWL.

- Site-Licensed Software: Purdue is increasingly embracing economies of scale, using institutional buying power to drive down per unit costs of commonly used software. One of the most successful of these efforts has been the negotiation of the Microsoft Master Agreement for the Purdue system. This contract allows students, faculty, and staff to purchase core software used for instruction and workplace productivity at substantially

discounted prices. In 2001, Purdue spent approximately $1.2 million on the agreement and received software valued at over $26 million.

- Classroom Technology: Spurred by faculty desire for greater access to technology in the classroom, the University began efforts at the West Lafayette campus to enhance computer support for faculty by developing the Technology in the Classroom (TIC) program. The TIC program deployed a computer, data connectivity, and LCD projection capability in selected classrooms. These sites are heavily used, with the current 103 TIC sites supporting 65,209 hours of instructional use in Fall 2001.

- Computing Laboratories: Purdue provides access to computing and information resources for students through computing laboratories. There are 300 computer laboratories on the West Lafayette campus, with 60 centrally managed. Of these laboratories, 15 are "open labs" for general student use, and 45 are primarily used for teaching. Last fall, students and instructors used these labs for more than 1 million computer hours.

Application Driver: Discovery
Enabling Research and Scientific Breakthroughs

Scientific research facilitating discovery is the cornerstone of a tier-one research institution. Science relies on the sharing of information to validate, advance, and distribute scientific knowledge. Information technology provides the scientific community with new opportunities for collaboration and distributed discovery through the use of computational/information resources and electronic publishing.

Information technology has in recent years become the "lingua franca" of science, helping draw together multi-disciplinary research teams and enable new discoveries. Purdue has strategically embraced this trend with the Discovery Park initiative, which defines new scientific application drivers that are, at their core, multi-disciplinary scientific efforts. Each application area (Entrepreneurship, Electronic Enterprise, Nanotechnology, and the Life Sciences) has unique and important information technology needs.

As information technology is embraced throughout Purdue, its transforming effects can be seen in the use of shared scientific resources, the development of new modeling/simulation processes, and the increasing use of Web interfaces for computational tools.

- Shared Scientific Resources: Increasingly specialized scientific instruments are becoming global tools for the research community through software developed to allow remote control. Professor Michael Rossman, Hanley Distinguished Professor of Biological Science, uses the Advanced Photon Source at Argonne National Laboratory in Chicago for scientific research into the nature of organic molecules, such as the molecular structure of the human immunodeficiency virus. These data are then transported via a broadband data connection to Purdue and processed on local computing resources. Professor Rossman's work is an example of leveraging a national resource to advance science while positioning Purdue at the forefront of information technology.

- Modeling and Simulation: Experiments that explore the edges of science and technology are often cost prohibitive; therefore, science is embracing model building and simulation to foster discovery. Increasing computational power allows simulations of greater complexity, and over a larger parameter space than previously feasible, achieving accuracy increasingly crucial to scientific inquiry.

A critical tool aiding research scientists in computational simulation is high-performance computer visualization and perceptualization. Based on recommendations from the multi-disciplinary task force citing the need for new high-end visualization and perceptualization capability, ITaP is developing Envision, a new 5300 square foot facility. Envision will support state of the art research and instruction in the areas of computer visualization and the emerging field of perceptualization. The facility will be a generally available resource for researchers and instructors.

- Web Interfaces for Science: Created by a multi-disciplinary team, the Purdue University Network Computing Hubs (PUNCH) is a Web-based interface that supports complex scientific applications. PUNCH allows scientists to easily access computational tools and computing resources for their research. A great deal of synergy has been created by the project, which now hosts tools developed for scientific research at other academic institutions, in the private sector, and at government labs. In 2001, PUNCH supported 850 scientific users.

  PUNCH has been customized by a variety of scientific disciplines. One of the most successful of these applications is the creation of the Nanohub, a PUNCH environment for experimental nanotechnology. Because of these efforts, Purdue is acknowledged as a leader in using information technology to support nanotechnologists. Mark Lundstrom from Electrical and Computer Engineering has joined with ITaP, the National Science Foundation, and academic partners from across the nation to develop a new national infrastructure, the Network for Computational Nanotechnology (NCN), which further supports this growing scientific discipline.

Application Driver: Engagement
Leveraging Purdue's Information Infrastructure for Indiana

A cornerstone of land-grant institutions has been serving the public by applying academic expertise to "real-world" problems. The challenges of making Purdue's expertise available to the citizens of the state were partially met in the early 20th century when the Hatch Act established the extension movement and dispatched agricultural experts to Indiana's 92 counties.

Information technology has fueled rapid social, economic, and scientific change in the last decade. Much like agricultural knowledge at the turn of the previous century, IT today ignites public interest across society and academic disciplines. The IT revolution has created new tools for distributing knowledge without regard to location.

Examples of how Purdue is leveraging technology to promote engagement include:

- Web Environments Creating Purdue Anywhere/Anytime*:* The power of the Web has created new opportunities for engagement by providing access anywhere at any time to the academic knowledge base of Purdue. New Purdue initiatives are using this technology to increase formal and informal educational opportunities. For example, the Department of Foods and Nutrition in the School of Consumer and Family Science has created a Web-based system, "X-Train," for food and nutrition information targeted at K-12 teachers and students.

- Community Networking to Build Indiana's Digital Highways: Due to the critical importance of infrastructure in supporting economic development, efforts are underway on the Fort Wayne campus to work with local educators, governmental leaders, and the private sector to define a coordinated plan for developing the local information infrastructure. These efforts

leverage Purdue's technical expertise to help design the data highways of the new information economy.

The West Lafayette campus is working with InteliNet, IHETS, and Indiana University to help assess statewide high-speed data needs and develop broadband solutions.

- *Strengthening Constituent Relationships:* Life-long relationships with alumni, friends, and corporate partners are crucial to the University's long-term success. More than 45% of Purdue's living alumni reside in Indiana, and the University's in-state system-wide information infrastructure presents new opportunities for strengthening and expanding alumni relationships. University Advancement and ITaP are designing environments to create electronic communities supporting dialogue with, and among, alumni and friends of the University.

  A critical area for engagement is building partnerships with the private sector. The private sector presents scientific researchers with the opportunity to apply academic knowledge to real-world problems. These efforts benefit all partners, supporting the economic progress of industry while also offering unique experiential learning opportunities for students and faculty.

Application Driver: The Business Environment Supporting the Operations of Purdue University

Strategic management of University operations requires linking people, processes, and data. This linkage is established through business applications that span academic and administrative units to support common practices and help provide a holistic business environment. Current examples of enterprise applications include finance, student services, advancement, purchasing, and human resources.

Purdue is a complex educational enterprise with a substantial business component, including a $1.2 billion budget and 16,224 faculty and staff members who provide educational opportunities for 67,548 students. The University generated 132,114 grade reports in 2001-2002 and maintains 347,466 electronic academic records.

Research and advancement also drive the business of Purdue and require modern, sophisticated business tools. In 2001, the West Lafayette campus had more than $196 million in sponsored research from the public and private sectors. Gifts have grown rapidly in recent years, with a record $173 million received in 2000-2001. These funds augment the substantial resources of the University's endowment, which currently has a market value of $1.3 billion.

Enabling Infrastructure: Directions for Technology and Services

The information technology trends illustrated in the applications section demonstrate the value of information technology to areas of strategic importance for Purdue. In addition to driving the current need for information infrastructure and services, these applications also define future directions for Purdue in expanding and developing information infrastructure and services.

Enabling Infrastructure: Cross-Cutting Goals

The Cross-Cutting Goals of the strategic plan focus on the need to enhance communication, create a well-trained IT workforce, and leverage Purdue's investment through collaboration with the private and public sector.

Goal: Enhance communication with users to engage them in improving ITaP's infrastructure and services in conjunction with creating new outreach initiatives.

Strategies:
Provide on-line access to ITaP projects, technology roadmaps, and institutional policies.

Conduct an annual comprehensive user survey to evaluate all ITaP enabling infrastructure and services.

Develop communications strategies for discussing emerging information technology issues with users, including forums, workshops, and presentations.

Create an ITaP annual report to showcase projects, articulate new initiatives, and measure performance against strategic plan goals.

Metrics:

- Number of users accessing information published by ITaP (Web site, subscribed mailing lists).
- Annual user survey as featured in ITaP Annual Report to ascertain quality of IT infrastructure and services.
- Attendance by user type (faculty, student, staff, community member) at ITaP forums, workshops, and presentations.

Goal: Develop and retain a diverse, well-trained, competitively compensated IT work force.

Strategies:
Use recruiting and retention strategies to develop a talented and diverse information technology workforce.

Establish collaborative relationships with minority serving institutions and appropriate student-organizations representing underserved communities to share information on information technology job opportunities and develop new programs to attract candidates.

Develop a progressive classification and compensation system that targets professional development and staff retention.

Leveraging academic expertise available on Purdue campuses, provide training opportunities to develop high-skill level staff.

Create a professional development program that promotes certification in critical core competencies.

Metrics:

- Diversity and qualifications of job applicants and new hires, with specific reporting on internships and student employment.
- Salary and compensation analysis in relation to regional job market.
- Number of professional development opportunities provided by ITaP, including invited speakers, Web based courses, and workshops.
- Number of relevant professional and technical certifications for ITaP employees.

Goal: Diversify funding for Purdue's information infrastructure.

Strategies:

Increase and diversify funding to promote the development of Purdue's information infrastructure through interdisciplinary collaborative partnerships that foster research with the public sector (federal/state).

Develop a formal program for working with private sector partners to support prototype development and creation of new information technology solutions (hardware/software).

Metrics:

- Number of collaborative research proposals involving ITaP.
- Fiscal support from collaborative partnerships with state/federal government, and the private sector.

Enabling Infrastructure: Computing Environments

Goal: Create a preeminent computing environment for students, faculty, and staff.

Strategies:
Support multiple computing platforms and leading operating systems for academic, research, and administrative use.

Develop a comprehensive funding plan for recurring costs in computing labs, classrooms, faculty offices, administrative units, core computing facilities, and research laboratories that:

- Leverages opportunities for "economies of scale" for hardware/software purchases.
- Pursues new external funds to support infrastructure development (partnerships with the private sector, donations, gifts).

Create a reliable computing environment that addresses disaster recovery and redundancy.

Provide robust data storage capability for learning, discovery, engagement and the business environment.

Metrics:

- Type, availability and quantity of centrally supported operating systems and computing devices.
- Average age of desktop computing hardware and software in labs, departments, and administrative units.
- Cost savings from large-scale purchases of hardware and software.
- Use of core computing environments, including:
    - Number of core computing labs, hours of computing use, and student users.
    - Number of technology in the classroom sites, hours of instructional use.
- Bytes stored in core data storage, analyzed by application area (instructional, administrative, research).

Enabling Infrastructure: Data

Goal: Establish a common data framework that supports easy access to information for transactions and analysis.

Strategies:
Develop a common data framework to:

- Standardize core institutional data elements.
- Define data retention policies.
- Identify authoritative data "ownership".
- Provide commonly used query tools with a Web interface for real-time secure access to data.
- Create a common data warehouse.

Empower the university community through efficient and effective management of information and data resources.

Work with appropriate administrative/academic units and regional campuses to achieve a smooth transition from the existing data system into the new comprehensive data framework.

Metrics:

- Number of users of the data warehouse and reports generated.
- Performance on annual audits for data quality and integrity.
- Number of redundant data items as a percentage of all stored data.

Enabling Infrastructure: Enterprise Applications

Goal: Develop an information architecture supporting the efficient and effective development/deployment of new enterprise applications and services.

Strategies:
Build and integrate applications into unified technology architecture to help improve university business processes.

Increase reliance on purchased applications in strategic areas to help drive data standardization, promote common business practices, and support efficient deployment.

Embrace and promote a culture of change that is willing to alter business practices at the University and department level to adapt to commercial (purchased) applications.

Improve project management through use of a common process that addresses customer needs, technical directions, security, fiscal oversight, and delivery on time.

Metrics:
- Number of applications integrated through broker or shared database as a percentage of the total number of application interfaces.
- Number of users by type using enterprise applications.
- Percentage of campus-wide applications enabled by unified technology architecture
- Percentage of strategic enterprise applications purchased versus those internally developed.
- Percentage of enterprise applications delivered within original schedule and budget.

Enabling Infrastructure: High Performance Computing

Goal: Maintain and enhance an internationally ranked high-performance computing facility that encourages multi-disciplinary research.

Strategies:
Provide growing computational capacity, including the use of distributed computing environments, to meet increasing needs for scientific research and instruction. The leading architecture for providing this functionally is called a *Grid*. The Grid architecture allows users ubiquitous access to computing, visualization, collaborative environments, data storage, and information resources, via reliable high-speed data networks.

Partner with strategic vendors to advance research and development of new high performance computing hardware/software.

Metrics:
- Placement of core computing resources on the Top 500 list (Supercomputing and Cluster).
- Number of hours of computing time provided, broken down by user type (student, faculty, staff) of ITaP high-performance computing resources.
- Science stories showcased in Purdue News and ITaP Annual Report.

Enabling Infrastructure: Instructional Development

Goal: Develop an instructional environment that integrates technological and curricular expertise to encourage innovation, support early technology adopters, and expand the use of technology in the classrooms.

Strategies:
Partner with educational experts to develop materials for faculty that examine the impact of new technologies on pedagogy.

Provide sustainable funding and technical support to encourage Purdue instructors to continue creating new software for learning and on-line services.

Support common software necessary for instruction, including in particular a common course-management system, to create and administer on-line curriculum and student information.

Use system-wide economies of scale to increase software and hardware available to all campuses for instruction.

Create new opportunities via forums and workshops to discuss emerging technologies and their applications for learning. Use these opportunities to discuss how emerging technologies can/should be deployed.

Metrics:
- Instructional materials developed for faculty and number of users.
- Total funding centrally provided for instructional development and inventory of materials developed.
- Number of courses, and number of students and staff supported, by course management software.

Enabling Infrastructure: Networking

Goal: Create an information network that provides users access to needed resources and leverages research expertise to establish Purdue as a leading "wired university".

Strategies:
Proactively provide robust, cost-effective connectivity to the commodity Internet, leading academic research networks, and administrative resources.

Deploy new technologies for classroom use, including wireless networks to support ubiquitous computing and communications.

Experiment with "converged" network architectures that allow a single network to be used for voice, video, and data.

Increase collaboration with the Indiana state government and with academic partners to identify statewide broadband data solutions that leverage existing investment and attract additional federal support.

Metrics:
- Network capacity (defined as available bandwidth) and uptime of network outside of scheduled maintenance.
- Percentage of each campus covered by wireless networks and number of users.
- Number of converged network devices deployed and number of users.

Enabling Infrastructure: Technical Support

Goal: Develop a customer service focused technical support system.

Strategies:
Design a technical support system that provides users with clear guidance on who to contact about specific information technology problems, leverages existing help-desks operated by departments/units/regional campuses, and uses asynchronous tools such as a Web "knowledgebase."

Leverage ITaP infrastructure and campus academic expertise to deliver training to users on demand.

Establish a centrally available hardware and software support office that leverages strategic vendor relationships to assist students, faculty, and staff with computing hardware and software problems.

Metrics:

- Users of core ITaP help desk services, measured by:
    - Total number of customers assisted.
    - Average time required resolving problem.
    - Number of hits to Web knowledgebase.
- Number of hardware related problems resolved, and estimated value of repair for faculty/staff.
- Number of "video on demand" training series offered and number of users.

Enabling Infrastructure: Security

Goal: Establish a secure computing environment that protects network resources and individual privacy.

Strategies:
Delegate responsibility and authority for computer security to the Chief Information Officer, who will work with a security policy committee to create necessary procedures and policies in compliance with university policies and federal/state law.

Develop institutional information privacy guidelines to assist in the development and deployment of electronic services.

Centrally acquire and make available to the University community needed hardware/software tools to maintain information security.

Enhance communication on security events (incidents/spam/hoaxes) with departmental technology coordinators, regional IT directors, and academic partners.

Create new educational opportunities via workshops, forums, and on-line training to increase security.

Metrics:
- Number of security incidents, severity, and response.
- Number of users of centrally acquired hardware and site licensed security software.

Enabling Infrastructure: Video Services

Goal: Create integrated video services that leverage academic and technical expertise to support the transition to digital media and serve the visual media needs of faculty, staff, and students.

Strategies:
Provide central videoconferencing services using prevailing technical standards to enhance collaboration among Purdue campuses and support distance learning needs.

Develop a Web based video-on-demand system with searchable archives for instruction and training.

Make available, and adequately staff with technical expertise, central video production facilities for faculty users, allowing them to focus their academic skills on the creation of content.

Leverage video expertise to provide targeted outreach to the local community, in particular K-12 constituents.

Create a workshop series to focus on how new digital media technologies can be incorporated into learning, employed to support collaborative research, and used to open new avenues for engagement.

Provide technical consulting to users who are developing, using, and maintaining multi-media/distance learning tools, tele-videoconferencing systems, and video/audio production facilities.

Metrics:

- Number of users of central video facilities (videoconferencing and video production) and satisfaction with services determined via annual survey.
- Number of users of Web based on-demand video services and availability to on and off-campus users.
- Number of courses integrating video for Web based instruction and student satisfaction with system.

Enabling Infrastructure: Visualization

Goal: Build a state-of-the-art scientific and data visualization capability that enables researchers to gain insight into complex data sets.

Strategies:
Create and support the operation of a showcase high-performance visualization facility for academic research, instruction, and outreach.

Develop programs to promote multi-disciplinary research (including non-traditional user communities) and instructional use.

Collaborate with research scientists and the private sector to apply data visualization techniques/technologies to solve scientific and "real-world" problems.

Use "finished products" developed to assist in communicating the value of the research conducted.

Metrics:
- High-performance visualization capability as defined by available hardware and software.
- Number of users of facility, analyzed by type and discipline.
- "Showcase" visualization stories.

Enabling Infrastructure: Web Environments

Goal: Design a dynamic world-class Web environment that supports efficient access to Purdue's information resources.

Strategies:
Create a modern Web architecture that supports Purdue's new institutional identity.

Develop a core Web development team to provide design and technical assistance and leverage existing decentralized staff to implement changes in Purdue's Web environment.

Develop seamless access to integrated information via the Purdue Web for students, faculty, and staff.

Provide Web support for research proposals requiring education, outreach, and training proposals.

Use universal design to assure that Web information (academic and administrative) is accessible to users regardless of disability or type of computing device used.

Metrics:
- Access of the Purdue Web site analyzed by domain, most frequently visited site, browser type, etc.
- Number of users supported by Web development team and number of projects supported.
- Development efforts aimed enhancing usability, including annual audit of usability of electronic resources.

Strategic Areas for Investment

On the basis of the application drivers and enabling infrastructure recommendations, the Task Force recommends five categories for strategic investment to support the world-class digital infrastructure envisioned: Encouraging Instructional Innovation, Supporting Multi-Disciplinary Research, Creating New Opportunities for Engagement, Providing Enhanced Infrastructure Capability, and Building the Business Enterprise.

Encouraging Instructional Innovation
Information technology is a critical tool that allows access to new information resources and offers the potential to fundamentally change the way students learn and the way faculty teach. Purdue must invest in its underlying infrastructure to support on-line learning and course development, provide access to computer tools and software that foster learning, and work to define new models for teaching with technology. Specific key investment areas from the recommendations include:

- Provide sustainable funding and technical support to encourage Purdue instructors to continue creating new software for learning and on-line services.
- Support common software necessary for instruction, including in particular a common course-management system to create and administer on-line curriculum and student information.
- Develop a comprehensive funding plan for recurring costs in computing labs, classrooms, faculty offices, administrative units, and research laboratories that:
    - Leverages opportunities for "economies of scale" for hardware/software purchases.
    - Pursues new external funds to support the information technology infrastructure (partnerships with the private sector, donations, gifts).
- Establish a centrally available hardware and software support office that leverages strategic vendor relationships to assist students, faculty and staff with computing hardware and software problems.

Supporting Multi-Disciplinary Research
From the Web to advanced computational models, information technology is an increasingly common and vital element in the discovery process. However, our vision is not one that forces every scientist to become an information technology specialist. Rather, our vision is of scientific leaders collaboratively developing needed tools (hardware/software) with IT professionals, allowing each discipline to leverage its respective expertise. Capitalizing on this specialized knowledge creates a powerful nexus for using information technology to tie together diverse scientific disciplines to support multi-disciplinary research. Specific key investment areas from the recommendations include:

- Create and support the operation of a showcase high-performance visualization facility for academic research, instruction, and outreach.
- Provide increasing computational capacity and capabilities, including the use of distributed computing environments, to meet the escalating needs of scientific research and instruction.
- Provide Web support for research proposals requiring education, outreach, and training.
- Develop a formal program for working with private sector partners to support prototype development and creation of new information technology solutions (hardware/software).

Creating the Foundation for an Engaged Institution

Purdue's information infrastructure is a powerful asset for creating the foundation of an engaged institution, applying academic knowledge to real world problems, and affecting local communities and the citizens of Indiana. New information technologies are creating Universities that are always open for learning, while interactions with local communities are helping leverage knowledge to deploy the digital infrastructure that drives the new economy. From working with Indiana businesses to help integrate new technologies into their workplace to assuring that the digital divide is spanned with underrepresented communities, Purdue has an important new role to play as Indiana's land-grant university. Specific key investment areas include:

- Increase and diversify funding to promote the development of Purdue's information infrastructure through interdisciplinary collaborative partnerships that foster research with the public sector (federal/state).
- Increase collaboration with Indiana state government and with academic partners to identify statewide broadband data solutions that leverage existing investments and attract additional federal support.
- Establish collaborative relationships with minority-serving institutions and appropriate student organizations representing underserved communities to share information on information technology job opportunities and develop new programs to attract candidates.

Building the Business Enterprise

Given the complex multi-campus business environment that supports the operation of the Purdue system, substantial need exists to use information technology to do things faster, cheaper, and better. A systemic approach to Purdue's business operations is essential to allow the substantial investment in enterprise applications to act as a strategic asset. Investment areas from the recommendations include:

- Develop a common data framework.
- Empower the university community through efficient and effective management of information and data resources.
- Build and integrate applications into unified technology architecture to help improve university business processes.
- Improve project management using a common unified process that addresses customer needs, technical directions, security, fiscal oversight, and delivery on time.

Providing an Enhanced and Integrated Infrastructure

Underlying efforts to support learning, discovery, and engagement is a need to substantially enhance and integrate our current technologies to create a world-class digital infrastructure. Purdue must develop sufficient capacity to support new efforts in learning, discovery, and engagement and allow computational infrastructure (networks, computing hardware, storage, visualization) to be viewed as an important commodity that can be shared to create synergy, rather than as a scarce resource that must be rationed. Specific key investment areas from the recommendations include:

- Deploy new technologies for classroom use, including wireless networks to support ubiquitous computing and communications.
- Develop a progressive classification and compensation system for the IT workforce.
- Create a reliable computing environment that addresses disaster recovery and redundancy.
- Centrally acquire and make available to the University community needed hardware/software tools to maintain information security.
- Provide robust data storage capability for learning, discovery, engagement and the business environment.

Peer Institutions

The Information Technology Strategic Planning Task Force selected the following institutions as peers for the purpose of benchmarking.

With the exception of Carnegie Mellon University and the Massachusetts Institute of Technology (MIT), these institutions mirror the West Lafayette strategic plan peers. Carnegie Mellon and MIT were selected due to their acknowledged national leadership in the use of information technology, while noting the substantial differences in campus profiles.

Peer Institutions for Benchmarks:

Carnegie Mellon University
Cornell University
Georgia Institute of Technology
Massachusetts Institute of Technology
Pennsylvania State University at University Park
Texas A&M University
University of Arizona
University of California, Berkeley
University of California, Davis
University of Illinois at Urbana-Champaign
University of Michigan
University of Texas at Austin
University of Wisconsin-Madison

Benchmarks:

The task force defined three common metrics for analysis across each of the institutional peers. In addition to these common metrics, the task force also identified select institutions per strategic application driver (learning, discovery, engagement, and enterprise applications) for measurement.

Common Benchmarks (all peer institutions)

- Total spending on information technology by area (instruction, research, enterprise applications) and percent of IT spending as overall University expenditures.
- Infrastructure capability (computing and networking.)
- Number of information technology staff and number of users supported by type (students, faculty, and staff).

Application Driver Specific Benchmarks (selected institutions):

Learning (University of Wisconsin, Pennsylvania State University)

- Number of courses and students and staff supported by core course management software.
- Number of distributed learning courses and students enrolled.

Discovery (Georgia Institute of Technology, University of Texas at Austin)

- Number, and value of, external grants supporting information technology research.
- Placement of core computing resources on the Top 500 list (Supercomputing and Cluster).

Engagement (University of Michigan)

- Number of private sector partners and value of fiscal support (including in-kind donations).

Enterprise Applications (University of Illinois and University of Michigan)

- Number of users by type of enterprise applications.

- Percentage of campus wide applications enabled by unified technology architecture.

Appendix A: IT Strategic Planning Task Force Membership

Name	Position	School/Department
Bob Bain	Director of Physical Facilities Computing	Physical Facilities Administration
Linda Bergmann	Associate Professor of English Associate Director of Purdue Writing Lab	School of Liberal Arts
Gregory A. Blaisdell	Associate Professor	Aeronautical and Astronautical Engineering
Jim Bottum	Vice President	Information Technology
D. Scott Brandt	Associate Professor of Library Science and Technology Training Librarian	Libraries
Carl Braunlich	Associate Professor	Hospitality and Tourism Management
Dan Burns	Director of Information Services	Information Services Purdue North Central
Doug Christiansen	Assistant Vice President of Enrollment Services and Director of Admissions and Records	Admissions
Bernie Engel	Professor of Agriculture and Biological Engineering	Agriculture and Biological Engineering
Jeff Gunsher	Associate Director of Industry Research and Technology Programs	Vice President for Research
Ryan Hatton	Student	School of Management
Mike Ivy	Computer Systems Administrator	Office of International Students and Scholars
G. Logan Jordan	Associate Dean for Administration	School of Management
Barbara Kapp	Associate Business Manager, Information Technology and Ticketing Systems	Intercollegiate Athletics
Greg Kapp	Director of Development Services	University Development
Evelyn Kazacos	Associate Professor of Veterinary Pathology	Veterinary Pathobiology
Lorraine Kisselburgh	Director of Information Technology	School of Liberal Arts
John (Tim) Korb	Assistant Head	Computer Science
Bob Kostrubanic	Director of Information Technology Services	Information Technology Services, IPFW
Christine Ladisch	Associate Provost and Professor of Consumer Science and Retail	Office of the Provost
Jim Lehman	Professor of Curriculum and	Curriculum and Instruction

	Instruction, Interim Director of CIE	
James Mohler	Associate Professor of Computer Graphics Technology	Computer Graphics Technology
Rab Mukerjea	Director of Strategic Planning and Assessment	Office of the President
Keith Murray	Director of Space Management and Academic Scheduling	Space Management and Academic Scheduling
Kathy Peters	Assistant Dean	Dean of Students
Ernie Poland	Manager of Computing	Housing and Food Services
Allison Porterfield	Graduate Student Representative	Graduate School
Phil Rawles	Associate Professor of Computer Technology	Computer Technology
Charlie Santerre	Associate Professor and Extension Specialist	Food and Nutrition
Doug Sharp	Assistant Vice President of Information Technology	Computing and Telecommunications Services, Calumet
Jerry Sheehan	Associate Vice President of Operations and Planning	Office of the Vice President of Information Technology
Ed Shibata	Associate Head and Professor of Physics	Department of Physics
Bill Simmons	Director of Engineering Computer Network	School of Engineering Administration
Phil Swain	Dean	Office of Instructional Excellence and Lifelong Learning
Mike Szczepanski	Director of Business Services Computing	Business Services Computing
Jenett Tillotson	Computer Systems Specialist	School of Pharmacy

Appendix B: Task Force Capability Matrix

The following chart provides an overview of the technical breadth and skills of members of the information technology strategic planning task force.

	Staffing		Users		# Workstations				# Servers				IT Effort (Add to 100%)				Capability										
Organization	IT Staff (FTE)	Student IT Staff (FTE)	Faculty/Staff Supported	Students Supported	Apple	Linux	Unix	Windows	Apple	Linux	Unix	Windows	Learning	Discovery	Engagement	Enterprise Applications	Computing	Databases	Electronic Information Resources	Enterprise Applications	Instructional Development	Networking	Technical Support	Security	Software Development	Visualization	Web Environments
Athletics [Kapp]	2		180	40			8	200			1	1	10	10	50	30	●	●				●	●				●
(Business Services) [Szczpanski]	36	12	340	1000				405				1				100	●	●		●		●	●	●	●		●
Computer Science [Korb]	11	7	80	1200	5	40	500	190		1	50	10	20	70	4	1	●	●				●	●	●	●	●	●
Consumer & Family Sciences, Hospitality & Tourism Mgmt [Braunlich]	4	1	350	50	4			396				8	60	40			●		●			●	●	●			●
Education [Lehman]	5	1	181	2400	92			446	1		6	16	60	30	5	5	●	●	●	●	●	●	●	●	●	●	●
(Engineering) Aeronautics & Astronautics [Blaisdell]	1	0.5	43	520	2	114	11	176		2	10	4	70	20	5	5	●				●		●		●	●	●
(Engineering) Engineering Computer Network [Simmons]*	51	15	700	5547	138	294	493	2505	5	100	50	20					●	●	●			●	●	●	●	●	●
Housing and Food Services [Poland]	9		400					320			4	1				100	●	●					●				●
International Programs [Ivy]	2	2	50	5000		2		54				3	10	10	10	70	●	●	●	●		●	●	●	●		●
ITAP [Sheehan]	350	75	16000	36000	300		100	1830			43	132	25	20	10	45	●	●	●	●	●	●	●	●	●	●	●
Liberal Arts [Kisselburgh & Bergmann]	20	15	1044	7126	200	10	15	1800	5	1	2	20	45	30	10	15	●	●	●	●	●	●	●		●		●
Libraries [Brandt]	12*	3	16000	36000				435		5	10	15	55	20	7	18	●	●	●	●		●	●	●	●	●	●
Management [Jordan]	11	6.3	218	3270	13	3		560	1		1	32	55	30	5	10	●	●		●	●	●	●			●	●
(Office of Instructional Excellence and Lifelong Learning) [Swain]	6		120	6	3			140				10	20		80		●	●		●	●	●	●		●		●
Physical Facilities [Bain]	30	15	925		15			735				35				100	●	●	●	●		●	●	●	●		
Regional IT Director - Calumet [Sharp]	31	27	680	9100	100	2	6	2300	2	1	16	55	40	15	5	40	●	●	●	●	●	●	●	●	●		●
Regional IT Director - IPFW [Kostrubanic]	34	32	1100	11000	109	10	40	2500	2	10	25	45	40	10	5	45	●	●	●	●	●	●	●	●	●		●
Regional IT Director - North Central [Burns]	21	4	360	3492	47	4	0	796	0	3	3	5	30	3	7	60	●	●	●	●		●	●	●	●		●
Science - Physics [Shibata]	4	2	104	250	80	22	15	81		2	15		25	25	10	40	●	●	●	●	●	●	●	●	●		●
Space Management [Murray]	5.5		8.5		1			14			3	7				100	●	●	●	●		●	●	●	●		●
Student Services [Christiansen]	58		3100	38000				670					10	25	5	60	●	●	●	●			●	●	●		●
University Advancement [Kapp]	8		150	20				200							100		●	●	●	●		●	●	●	●		●
Veterinary Medicine [Kazacos]*	28	3	530	300	2	2	6	802		3	7	13	35	35	20		●	●	●		●	●	●	●	●	●	●

Appendix C: Information Technology Staff at Purdue