Information technology is a vital component in the support of learning, teaching, research, and business in higher education. Northwestern University students, faculty, and staff have driven the adoption of technology that supports all of these areas on our campuses just as they have in their personal lives.

The University’s expanded use of technology and the growth of its global footprint increases the demand for advanced technology capabilities and services. As the University’s information technology organization, Northwestern University Information Technology (NUIT) is committed to listen and lead in the delivery of technology services and information resources in this dynamic environment.

The University continues to be challenged to contain costs, achieve operating efficiencies, and leverage available University resources. NUIT continues to explore and deploy new scalable service delivery models, utilize University governance structures that support and facilitate thoughtful investment decisions for new and existing enterprise systems, and review and prioritize enterprise system enhancements with the counsel of their advisory groups.

NUIT continues to focus on a number of critical objectives:

- remaining knowledgeable about new and innovative technologies that can be deployed to facilitate change and continuous improvement in the learning, teaching, research, and administration of Northwestern;
- providing technology that addresses the University’s expanding global footprint and builds all Northwestern community relationships across time and distance;
- determining policies that should be in place regarding the use of technology by the University community;
- promoting technology best practices and the adoption of new technologies that address the expanding technology demands of the existing University community and the incoming workforce, by continuing a robust and inclusive strategic planning process and fostering a continuous training/learning environment;
- continuing to become more energy-efficient by making sustainable technology service choices;
- expanding and enhancing information security practice through education and the use of automated assessment activities, testing, and delivery of forensic services;
- developing funding models for information technology that address the need for timely decisions on technology and consider savings and subsequent budget adjustments that may be necessary across the University; and
- assessing whether services should be provided internally or externally to best meet University goals based on value and quality, while ensuring data security.

The University’s Information Technology Strategic Plan for Fiscal Years 2012 through 2014 follows:
Learning and Teaching
- Enhancing the Course Management System
- Lecture and Seminar Media Services
- Learning and Teaching Spaces
- Scholarly Communication and ePublishing

Research
- Compute-Intensive Capabilities
- Data-Intensive Systems
- Visualization

Globalization and Community Building
- Global Campuses
- Alumni Engagement
- Global Research

Infrastructure
- Administrative and Academic Storage Strategy
- Mobile Infrastructure
- Advanced Research Network
- Performance and System Reliability

Enterprise Solutions
- Business Intelligence
- Identity Management
- Alumni Information Management System (AIMS)
- Faculty and Staff Information System (FASIS)
- Collaboration Services
- Learning Management System (LMS)
- Document Management and Imaging
- Videoconferencing
- Digital Media Services
- Role Administration
Customer Service
- Unified Service Center
- Continuous Service Improvement
- Customer Communication

Transformational Technologies
- Mobile Applications
- Social Collaboration
- Cloud Computing
- Virtual Desktops
- e-Platforms (including e-Books and Tablets)

Information Security, Regulatory and Compliance
- Security Improvement Program
- Regulatory /Compliance
- Disaster Recovery/Business Continuity Planning

Partnerships
- McGaw Medical Center Collaboration
- External Collaboration

Financial Stewardship
- Lifecycle Funding for University-wide Systems and the Technology Infrastructure
Learning and Teaching

Northwestern University is recognized for exploring and implementing innovative and collaborative educational approaches and technologies. New tools for enhancing the learning experience and providing time and place flexibility for learning are important for our current and future students and faculty.

Enhancing the Course Management System

Bring additional capabilities and modes to the learning experience of students at Northwestern by enhancing the digital learning tools available to students and instructors. Acquire Blackboard Community for Northwestern’s Course Management System, allowing NU schools and special educational programs to individualize the look, feel, and scope of the system to their particular curriculum needs and scheduling patterns. Integrate desktop conferencing technology into the Course Management System, allowing for virtual office hours, easier access to guest speakers at distant locations around the world, and ad hoc videoconferencing services. Introduce mobile device and tablet support to core services of the Course Management System. Enhance the integration of Google Apps with the Course Management System, providing additional options for social media, communications, and publishing tools to the Course Management System, and simplifying the options for use of Google Apps by instructors. Partner with the Northwestern University Library to increase integration of the Course Management System with useful academic content collections and information discovery and delivery systems. In concert with NU schools and with strategic planning groups organized by the Office of the Provost, investigate and design online learning services for University programs.

Lecture and Seminar Media Services

Support the work group commissioned by the Office of the Provost’s Classroom Committee to study an expansion of the Northwestern lecture capture effort. Chronicle best practices in this area by our peer universities and help the Northwestern work group complete its report to the Office of the Provost in 2011. Recommend expansion plans that include: increased economies in the production workflow of publishing Northwestern lectures, special seminars, and campus events; flexible management of video assets in support of students, alumni, and staff interests; and standardization of intellectual property agreements associated with the use of video assets. Provide support for delivery of lectures and seminars to mobile devices favored by the Northwestern community.

Learning and Teaching Spaces

Improve student learning experiences at Northwestern with more flexible classroom designs that accommodate a variety of learning and teaching styles. In concert with schools, libraries, the Division of Student Affairs, and Facilities Management, provide similar services for conference room designs, residence hall study spaces, informal drop-in collaboration “zones,” the Library InfoCommons, other library spaces, and specialized training labs. Continue to provide and improve contract services to schools and research centers on both campuses for classroom design, project management of technology upgrades of classrooms and labs, and ongoing classroom support services.
Scholarly Communication and ePublishing
In coordination with the scholarly communications work of the Northwestern University Library, acquire and deploy electronic publishing platforms to support expected requirements for the sharing of research results by faculty. In cooperation with the ten Bamboo Partner universities and the Andrew W. Mellon Foundation, help build new shared services for digital humanities research environments and scholarly tools. Expand self-publishing efforts for students and faculty, using successful communications technologies such as blogs and other social media applications.

Research

The success of research efforts, graduate student training, faculty recruiting, and external funding increasingly depends on the availability of excellent research computing systems coupled with a technical support staff working directly with Northwestern researchers to provide the University with competitive advantage. In support of this, and in close cooperation with the offices of the Vice President of Research and the Provost, NUIT has made significant progress in providing cost-effective systems and support services for high performance computing, large-scale data analysis capabilities, and visualization. This focus must continue as technology and our researchers’ needs change.

Compute-Intensive Capabilities

Expand the Quest High Performance Computing (HPC) system to 10,000 compute cores, including the introduction of new, hybrid Graphics Processing Unit (GPU) technologies. Add new reporting capabilities to Quest that will allow deans and research center directors to better track the progress of allocations on Quest and enable computational investigators and the HPC support staff to better guide the execution of parallel-processing jobs on the Quest cluster. Expand the number of expert NUIT staff consultants and programmers who work directly with Northwestern researchers and graduate students. The emphasis will be on HPC support staff that can help researchers prepare code for use on the NCSA Blue Waters cluster and use the TeraGrid distributed system, as well as the effective use of the Quest compute cluster. Investigate and prototype the deployment of cloud computing services for research activities that exceed the peak capacity of local HPC systems.

Data-Intensive Systems

Provide technology support for Northwestern researchers who conduct the most extreme, data-intensive investigations and large-scale investigations of complex systems. Extend the Quest HPC system with compute nodes designed for data-intensive calculations. Track new HPC technologies that address data-centric investigations of previously unprecedented scale. Provide storage services and data publishing options that support new federal agency requirements for research data management.
Visualization
Expand Northwestern visualization capabilities and partner with faculty to engineer ultra-high resolution display systems that can support fundamentally new ways of understanding and presenting research investigations. Investigate a core facility approach for additional imaging and visualization services for researchers.

Globalization and Community Building
The University continues to establish communication and collaboration communities among faculty and students on our campuses and with alumni and colleagues globally. NUIT is committed to providing services and capabilities for the further globalization and community building of Northwestern University that enrich the student experience, enhance learning, and broaden perspectives through international engagement activities.

Global Campuses
Enhance services to enable faculty to take advantage of international opportunities for teaching, research, and professional engagements and expand student interaction without borders. Continue technology enhancements and deployments of enterprise systems that meet the needs of the University’s remote campuses, such as Qatar. Continue providing a 24x7 infrastructure to support global operations.

Alumni Engagement
Support outreach to alumni around the world and make global access available to the appropriate University resources and alumni organizations.

Global Research
Provide support for the increasing globalization of research, especially by large international communities of investigators using shared instrumentation, facilities, and data repositories. Continue the enhancement of StarLight, the Northwestern University national and international communications exchange, to support multiple global science and research projects.

Infrastructure
The information technology infrastructure provides the foundation for University-wide services and information. The initiatives summarized below support the advancement and development of this infrastructure in a cost-effective, collaborative way that meets and anticipates the future demands of the University community.

Administrative and Academic Storage Strategy
Develop a strategy in collaboration with schools and various units for central storage services to address the future information storage, protection, repository, and preservation needs of the University’s administrative and academic functions. This strategy will be defined by a variety of
needs including specific needs such as lecture capture, digital object archiving, and mandated retention of administrative records and research results.

**Mobile Infrastructure**
Continue to build out and refresh facilities to improve coverage for wireless voice (cellular carriers) and wireless computer (WiFi) networks in University buildings and across our campuses. By deploying faster connection speeds and improving the reliability of mobile services, student expectations for mobile access to course work, lecture capture, and other learning experiences can be met, and mobile services in administrative offices, community spaces, and for campus visitors will also be met. Anticipate rapid technology change with a focus on reducing capital and operating costs by partnering with service providers.

**Advanced Research Network**
Design and implement a high-performance, low-latency, segmented network to serve the rapidly growing demands of data-intensive research. A separate network designed for research alone would address the most intensive research programs by providing rapid access to services within the University and from external resources and communities. This research need cannot be adequately addressed by the general campus infrastructure. An advanced research network would provide the required network capacity without affecting the University’s other activities that rely on the broader University network.

**Performance and System Reliability**
Continue to deploy for the Northwestern community and the public, robust, reliable, and redundant hardware and software architectures that provide 24x7 availability across maintenance, data backup, and upgrade events. Instrument and manage the infrastructure to maximize performance, minimize energy use, and provide planning and operational data to the community. Institute a program of operational and regulatory compliance, including a compliance assessment of vulnerabilities and risk mitigation associated with access to the data center and its services.
Enterprise Solutions

Enterprise systems impact virtually all members of the Northwestern community, whether in Evanston, Chicago, or on our remote campuses. Vital to the operations of the University, they support business processes, provide tools for analysis and decision-making, enable collaboration with colleagues, enhance the learning experience, promote data security, and address compliance and regulatory requirements. In collaboration with colleagues across the University to promote their efficient and effective use, we will continue enhancing these systems to improve functionality, usability, accessibility, and uniformity of design. By increasing the integration of enterprise systems, we allow easy self-service access to information anytime, anywhere across a variety of devices and platforms.

Business Intelligence

Continue to develop effective, intuitive, accurate, and easy-to-use business intelligence solutions that allow quicker adoption, self-service, and pervasive use of business intelligence for reporting, analysis, monitoring, and informed decision making at all levels of the institution. Enable all enterprise systems to standardize reporting on the enterprise Business Intelligence platform. Continue to design and develop the data architecture to support cross-functional analyses and integrated reporting while maintaining security requirements. Expand training and empower users to create ad hoc reports and analyses. Communicate effectively about available business intelligence solutions, share success stories and best practices to improve awareness and adoption of tools and processes across the University. Continue to investigate innovative business intelligence technology offerings and industry best practices that enhance the value of business intelligence solutions at Northwestern.

Identity Management

Advance identity management capabilities, including authentication, directory services and single sign-on to increase security, ease of authenticated access, and productivity. Improve the ability to collaborate in a secure manner internally and with external partners such as hospitals on our campus and other institutions. Modify existing systems and leverage systems being deployed to move Northwestern’s identity management towards a standard business practice approach and in compliance with auditing standards.

Alumni Information Management System (AIMS)

Replace the legacy Alumni/Development system with the Alumni Information Management System (AIMS). This Web-based solution will be tailored to the information needs of volunteers, deans, faculty, alumni, senior administrators, and staff of the Office of Alumni Relations and Development in their unique roles. Improve the quality and usability of degree data in AIMS with new business rules and system procedures that interface with the Student Enterprise System (SES). Implement a secure self-service interface to provide “on-demand” access and reporting by geographically dispersed administrative staff, fundraisers, and alumni. In addition to improving the effectiveness of fundraisers and engaging alumni/donors, this system will provide enhanced data quality and timely access to data for analysis and decision making.
Faculty and Staff Information System (FASIS)
Enhance the current Human Resources Information System by expanding faculty-related data to provide a single point of access for faculty information. Standardize data definitions regarding faculty types and appointments to facilitate system development, business processes, and reporting. Add the following new online components: faculty appointments, salary history, tenure tracking, named professorships, and awarded appointments, among others. Tailor the eRecruit module for faculty to simplify the creation of job openings and the application process. Bring together information seamlessly from the student, InfoEd, and financial systems with human resource data using the new enterprise NUPortal.

Collaboration Services
Deploy a standards-based enterprise Collaboration Services solution that integrates e-mail, calendaring, instant messaging, document sharing, Web-conferencing, and mobile access. The collaboration services environment will provide the foundation for new collaborative practices, regulatory compliance, and enhanced productivity across the University community.

Learning Management System (LMS)
Training and education services for faculty and staff will assist them in developing necessary skills and provide an opportunity to stay current and excel in the workplace. The availability of these continuous training and education opportunities to our faculty and staff will further distinguish Northwestern in this area. Partner with the Office of Human Resources, which will lead a University-wide collaborative effort to implement an enterprise Learning Management System (LMS) to provide workplace training and education across the University. The LMS will include: automated, online professional development planning; a secure and reliable platform for developing and delivering online learning about high-risk, University-wide processes including workplace safety, regulatory compliance, and financial administration; one-source recordkeeping for registration, completion, evaluation, and tracking of all on-site and online learning; and connection to future applications such as online professional development plans.

Document Management and Imaging
Investigate and implement a document management system, in partnership with business units, to capture, manage, store, preserve, and easily deliver content and documents based on organizational processes. The system will reduce the need for storage and distribution of paper documents. Business process issues and compliance requirements will be incorporated in the system in accordance with the practices of the University. This includes digital asset management, document imaging, workflow, and records management.

Videoconferencing
Extend interoperable desktop and room-based videoconferencing solutions across the University’s communities in order to support easier collaboration, enable cost-savings in travel expenses, support distance learning efforts, and improve global access to the University’s programs. Extend desktop technology to Northwestern’s Course Management System to enhance learning and teaching. Investigate opportunities for integration of emerging smartphone video
communications into the Northwestern suite of desktop and room-based videoconference services.

**Digital Media Services**

Provide digital media services and infrastructure that are especially important for the University’s teaching, research, and outreach. These services include a wide range of capabilities related to live media, visualization, imaging, conferencing, simulation, 3D modeling, and advanced display walls. Expand and enhance media management systems for the University’s digital media content, allowing for efficient access to and use of digital assets to support multiple activities across all campus sites. In concert with the Northwestern University Library and the development of an administrative and academic storage strategy, integrate archiving and preservation functions for digital media content with digital repository systems. Offer engineering services for high performance displays to researchers, including ultra high-resolution and 3D. Investigate a core facilities approach to expansion of these services.

**Role Administration**

Support the University’s efforts to deploy role-based security in the new enterprise portal by obtaining person attributes from the Human Resources Information System. Defining a person’s organizational role (or roles) and the business functions with which they are associated allows the creation of roles based on job functions and areas of responsibility. These roles can then be mapped to data security policies covering authorization and access to specific enterprise systems. Using these roles in the design of the new enterprise portal gives end users the targeted access they need only to those systems or portlets appearing on their desktops that are appropriate to their roles.

**Customer Service**

The University has invested and continues to invest significant dollars to provide and support information technology resources and services to the University community. Rapid changes in information technology and the increasing demands of users of technology require a responsive customer service function that helps customers effectively use the technology tools and services that have been placed at their disposal.

**Unified Service Center**

Integrate the various University technology service points to facilitate a stable, robust, efficient, and customer-focused support environment, including convenient Web-based assistance and performance metrics for all information technology services and systems. This provides a single point of contact for technology-related support that can be leveraged to optimize the support experience, improving response time and communication.

**Continuous Service Improvement**

Facilitate and continue to support NUIT organizational processes that align with industry service design and delivery best practices known as ITIL. The Information Technology Infrastructure
Library (ITIL) is a set of concepts and practices for managing information technology services, development, and operations for continuous service improvement. Elements include a focused and regimented process of service design, transition, operation, and continual process improvement. This enables the University to adjust technology resources in the face of changing needs and customer requirements.

**Customer Communication**

Enhance and expand communication efforts to make information technology-related planning and project status readily available to University stakeholders and the University community. Engage University thought leaders to identify effective methods of targeting messages for maximum effectiveness. Facilitate collaborative communication so that the needs of all constituents are addressed.

**Transformational Technologies**

New and transformative technologies available in the commercial and consumer marketplaces are growing. Students, faculty, and staff bring to campus the expectation that University technologies are comparable to those of the Internet and peer institutions. As we look forward, Northwestern University must acknowledge this rapidly changing environment and leverage new technologies to improve the effectiveness and image of the University.

**Mobile Applications**

Ubiquitous use of mobile applications (often referred to as “apps”) on mobile devices has become a favored communications means and processing channel for many members of the Northwestern community, particularly our students. Develop a mobile architecture that provides access to University information and communities, thereby enhancing the student experience, strengthening the campus community, facilitating faculty communication, improving alumni engagement, and increasing employee efficiencies. Support development of mobile applications that allow users of smartphones (such as the iPhone, the Android, and the BlackBerry) and users of tablet devices (such as the iPad and Android) to access enterprise applications (e.g., the Course Management System, CAESAR, HRIS, Library systems, etc.).

**Social Collaboration**

Facilitate the strategic adoption of social collaboration services (e.g., blogs, Twitter, Facebook, and other community tools) to expand communication opportunities for students, faculty, staff, and alumni. Use social collaboration services to empower University programs that are building new communities and expanding networks of collaboration.

**Cloud Computing**

Cloud computing describes a method of computing, storage, and networking that is extended as services without restrictions on location. Software applications and data are allowed to reside and perform their functions wherever resources are available under described performance or delivery criteria. Cloud computing resources are offered as a service on an as-needed basis,
providing highly scalable, reliable on-demand services with agile management capabilities. Clouds can be either “private” (within the organization) or “public” (deployed by external providers). For Northwestern planners, cloud computing may offer alternatives to investment in certain computational and information storage facilities, or logical extensions to facilities. Public clouds may be used for short-term storage backup or batch processing of modest amounts of information. Applications may also benefit from specialized cloud services which optimize large data set organization, speed of analysis, and dynamic allocation of processing to match data volumes. Cloud computing may be an extension of the virtualization technologies that are presently deployed within the University.

As an initial step, design and implement a “private cloud” computing prototype for non-research applications in partnership with a University school to reduce physical servers at the edge of the network. Then plan for cloud computing to be incorporated into the University’s technology strategy for other areas at Northwestern, including providing economic comparisons of cloud services to internal service platforms hosted in the University data centers. Because of potential security and compliance issues, any contemplated use of “public cloud” computing or cloud storage services must be discussed and reviewed in advance with appropriate University offices before proceeding with a “public” cloud solution.

**Virtual Desktops**

Establish an institutional model and a centrally provisioned virtual desktop environment to improve data security, reduce energy consumption, maximize the efficiency of desktop support efforts, and reduce overall costs. A broadly deployed virtual desktop infrastructure provides centrally hosted applications and a lower-cost alternative to the current standard desktop environment.

**e-Platforms (including eBooks and Tablets)**

eBooks and tablets are driving the creation of new content formats, publishing practices, reading traditions, access patterns for video channels, and information management practices in our society. They offer gesture- and stylus-based interfaces that extend our sense of how we can interact with computing devices and digital content. They point towards new models for note-taking, e-studying, organization of classroom materials, and access to digital libraries. At the present time, the software for these devices is incomplete; file management on these platforms is quirky and the interaction tools to work with digital content are incomplete. Libraries of digital content are promising but sparse. Several new, low-cost, networked eBooks and tablet devices now are appearing on campus. It is not yet clear how soon and in what exact ways these formative devices will become scholarly and educational tools of choice at Northwestern. To provide a direction for planning and deployment of the functions available on these devices, we will engage faculty, students, and technology companies on the optimal integration of these devices into the University’s environment.
Information Security, Regulatory and Compliance

The University’s information assets are of significant value and deserve measures that ensure their confidentiality, integrity, and availability. Knowing that information is adequately protected by information security practices, which recognize and comply with regulatory and policy requirements, allows the University to concentrate on achieving its academic and business goals.

Security Improvement Program
Continue to strengthen the University’s information security environment:

- Enhance network assessment processes with invasive testing, automated assessment of local environments, forensic services, and associated reporting as agreed to by schools and departments.
- Develop additional policies and standards, continue training and education, and recommend improvements for increased University network and data protection.
- Drive the adoption of two-factor authentication to enhance the ability to identify the individual requesting access and better protect sensitive resources.
- Develop applications to aid in identifying and reacting to critical conditions (e.g., cyberattacks, malicious traffic, policy violations, etc.) that have or may pose serious security threats. Based on open-source code and using security event notices from security industry consortia, these applications will improve our auditing and reporting capabilities in support of regulatory and policy compliance.
- Deploy Network Access Control technology to ensure computers are operating securely in compliance with Northwestern University policies before network connectivity and interoperability is allowed.
- Develop policies and process improvements to ensure that sensitive research data is processed and stored under appropriate access controls in compliance with program and regulatory requirements (e.g., NSF research grants, FISMA, etc.). This includes policies on information storage and accompanying measures to better control physical and logical access to University data centers and the network infrastructure.

Regulatory/Compliance
Develop, communicate, and support Northwestern’s information management, protection, electronic archiving, and reporting obligations for compliance with regulatory requirements. This includes contributing to the development of policy statements and business processes needed to achieve compliance.

Disaster Recovery/Business Continuity Planning
Enhance the University’s ability to manage and maintain all aspects of disaster recovery and business continuity planning. In collaboration with the Offices of Financial Operations and Emergency Management, deploy a software-based system that establishes a common language, standardizes plan development and implementation, and assists in University-wide coordination.
of disaster and business continuity planning. Provide guidance and assistance on planning to business units through education and awareness training and continued support of the Disaster Recovery Coordinators network.

**Partnerships**

**McGaw Medical Center Collaboration**
Facilitate discussions on policies, tools, and processes that will allow access to appropriate information among all of the partner systems.

**External Collaboration**
Provide services and expertise to support engagements and expand Northwestern University contributions to a wide range of communities, including other universities, national laboratories, major research centers, leading cultural institutions, local governments, state and federal agencies, community and professional groups, and international organizations.

**Financial Stewardship**

**Lifecycle Funding for University-wide Systems and the Technology Infrastructure**
University-wide systems supporting the teaching, research, and business operations of the University and the underlying technology infrastructure must be maintained and adequately funded to support the University’s mission and operations. Collaborate with University thought leaders to develop a financial model that anticipates the cost of enterprise system upgrades, new functionality demands, and technology infrastructure enhancements, and that provides appropriate multi-year budget planning throughout the technology lifecycle.