Yale IT Strategic Plan

2011-2015
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Developing Draft – IT Strategic Plan

March 24, 2010

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Summary of the Plan

In October 2009, Provost Peter Salovey and VP for Finance and Business Operations Shauna King charged Philip Long, Yale’s Chief Information Officer, to “take a formal strategic view of the impact of information technology on Yale and the opportunities investment in IT may afford Yale as it drives its mission activities.” The IT strategic planning charge (see Appendix A for the complete text) is to consider the totality of IT use at Yale, build on existing IT plans, and support continued innovation in Yale’s mission activities, while also providing the most effective and efficient core technologies for the ongoing operation of the University. The overall goal is to maximize the collective leverage of Yale’s total investment in IT. This five-year plan is the result of that charge.

The strategic objectives in this plan consider how best to use information technology to achieve President Levin’s strategic goals for Yale (December 1, 2009, Office of Public Affairs):

• Sustain the excellence of Yale College
• Maintain leadership in the arts, humanities and social sciences
• Ensure the continued pre-eminence of Yale Law School
• Strengthen science and engineering
• Broaden and deepen the clinical excellence of the School of Medicine
• Raise the School of Management to the top tier among business schools
• Extend Yale’s leadership in internationalization throughout the University and the world
• Establish global leadership in environmental research, education, and practice
• Support economic development and school reform in New Haven
• Develop the West Campus to advance science, medicine and the arts
• Create a culture of excellence in management and business operations

This multiyear plan presents a vision for an IT-enabled Yale in 2015, from the perspectives of faculty, students, alumni and administrators interacting with Yale throughout the world.

The plan was created in the context of three inherent challenges to managing IT services:

• the continuous and rapid pace of IT change
• the immense diversity of IT solutions
• the substantial, sometimes hidden costs of information technologies

Yale’s IT planning is guided by four principles to address the inherent challenges in a consistent way and thereby gain maximum benefit from Yale’s substantial ongoing IT investments across all Yale’s applications, academic and administrative:
• provide standard core IT infrastructure in abundance
• facilitate innovation
• plan, manage and fund IT strategically
• manage IT costs on a life-cycle basis

The resulting plan contains 10 primary **Strategic Objectives** in support of Yale’s missions:

1. Support Yale’s preeminence as one of the world’s finest educational institutions by becoming a leader in higher education in the use of technology to support and improve learning outcomes.
2. Support Yale’s research enterprise though the exploration of highly promising technologies and by providing a state-of-the-art IT infrastructure and associated expertise to support the research lifecycle from proposal to research through publication.
3. Meet students’ expectations of a technology-enabled university and support student success and the quality of the student experience at Yale by developing student-centric IT services supporting academics, administrative tasks, and student life.
4. Maintain Yale’s academic leadership by developing a comprehensive set of resources and easily accessible technologies for the creation and use of rich media in the classroom, student work, faculty research and scholarly work.
5. Support excellence in academic administration by providing state of the art tools to help Yale effectively and efficiently manage teaching, learning and research activities.
6. Deploy technology to support clinical excellence in the School of Medicine.
7. Foster lifelong connections to Yale in support of alumni with high quality and innovative technology services. Provide alumni with a *seamless Yale experience* in every phase of their lives and every interaction with the University.
8. Improve efficiency and services by dramatically streamlining Yale’s core administrative processes and compliance functions, reducing the complexity and effort associated with research and academic administration and departmental management.
9. Fully exploit information technology to improve access to Yale and its resources for the people and organizations of Greater New Haven.
10. Provide the technology foundation to support Yale’s internationalization efforts.

Each Strategic Objective is supported by one or more focused IT Opportunities to achieve the Objective, accompanied by Examples to illustrate specific, actionable projects.

In order to support innovation and provide the foundational technologies and operational excellence required to achieve and maintain Yale’s IT investments, the plan outlines eight additional IT Objectives focused on foundational infrastructure, emerging technologies and IT planning and management.

1. Meet essential academic and institutional mission activities with a highly available, reliable, cost-effective and secure set of core IT infrastructure services, provided in abundance across the University. Provide a firm funding foundation for these services.
2. Protect the privacy, security, confidentiality and integrity of Yale’s assets and institutional information in compliance with an evolving regulatory environment.
3. Help Yale establish global leadership in environmental practice by providing sustainable information technology throughout the University.
4. Create robust access control to systems and promote authorized collaboration by providing local and cross-institutional identity management.
5. Improve the Yale community’s effective use of technology by providing a rich, accessible set of outreach, education and self-help resources.

6. Anticipate the promise of technology at Yale by maintaining an ongoing awareness of emerging trends and investing in active explorations.

7. Maximize Yale’s investments in IT by developing transparent, consistent and effective processes to plan and manage institutional IT campus wide.

8. Use industry best practices to manage and deliver IT services with excellence.
Introduction

In 1958 the Yale Astronomy department installed an IBM 650 computer for academic research. While perhaps not the first, this event seems a reasonable marker for when computing – the precursor to modern information technology – began significant use in research at Yale. By the late 1960s the initial patterns of information technology use were in place: to extend research exploration and to support the efficient administration of Yale. In the 50 years since, information technology has cycled through generations of exponential growth in capability, speed and function and has been used at Yale correspondingly. Information technology has become a key enabler and critical success factor to Yale’s mission in myriad ways, including a platform for innovation and research, through digitally based dissemination of knowledge, and an underlying infrastructure on which the University functions.

The pace of IT development continues unabated. Most recently emerging is the potential of “cloud computing,” core IT services such as email, word processing or computation from “the network cloud” – a service provider somewhere on the Internet. Of course, Yale faculty and students and Yale as an institution are already using cloud services, but what impact might this and similar emerging technologies have on Yale? What impact should Yale aspire for it?

Coincident with the explosion of information technologies and their application to Yale’s activities has been an increase in Yale’s investment in IT. A key goal of planning is to manage Yale’s IT investments strategically, to get the best overall benefit for Yale from its investment; even small improvements every year in the focus of IT investment will result in substantial cumulative benefit to Yale over a multi-year period.

As information technology has grown increasingly critical to the day-in-day-out, nay hour-by-hour, operation of the University, it has emphasized the need for increased attention to the required infrastructure and applications. But the key strategic issues identified in this report derive largely from IT as an enabler of innovation. This IT strategic plan intends to take a comprehensive look at Yale’s current and envisioned IT needs for the next five years to map an IT management and investment plan that will provide the right balance of operational infrastructure with IT support for innovation.

This plan begins with a review of the many ways in which information technology is strategically critical to Yale’s mission, followed by a set of vignettes to envision an IT-enabled Yale in five years. The plan then reviews a set of challenges inherent in managing information technology, presents principles to guide management of those challenges and then identifies opportunities for the key IT areas.
The Strategic Importance of IT

“Yale’s mission is to create, disseminate and preserve knowledge.”

Summary by Linda Lorimer to Digital Dissemination Task Force, 2009

Information technology is strategic because “it creates possibilities and options that did not exist
before.” IT is creating new possibilities across Yale, most significantly by fostering innovation,
collaboration and access, by providing new applications in research, by managing and disseminating
data, and by powerfully improving individual, workgroup and organizational productivity.

**INNOVATION, COLLABORATION AND ACCESS**

Innovation is core to Yale’s creation of knowledge and IT is a strategic enabler of innovation. New IT
methods are constantly adopted to help extend Yale’s research activities, for example, the use of
dynamic data-driven application simulations in contaminant tracking and the short-range forecast
of wildfire behavior. Computational Science has joined experimental and theoretical approaches to
extend scientific research techniques.

IT is also enabling improvements in pedagogy. ITS assists faculty in applying such new technologies
as Twitter and Second Life to their teaching. These interventions developed from emerging
technology and a strong partnership between dedicated faculty and central IT facilities and
professionals.

Research and teaching are collaborative activities, now routinely fostered by information technology
among faculty and students within and across campuses and research laboratories and broadly
across society. Social software and teleconferencing tools support team collaboration, benefiting
from and contributing to community assessments, and finding both new collaborators and new
collaborative opportunities. For example, scientists from Caltech, Drexel, MIT, and Princeton have
formed a professional scientific organization based entirely in virtual worlds, providing a setting for seminars and lectures and
opportunities unique to the digital environment, such as facilitating complex data visualization.

Knowledge created at Yale and elsewhere is increasingly published in
digital form; this is true across the research and industry spaces and
the volume and access to that electronic information is truly
staggering. Yale now has campus network access to 66,764 databases
and journals and 840,000 books providing full text with rapid search,
full media, including multiple media in many cases, and, increasingly,
direct access to the digital data supporting research papers. The Yale community requires access to
all this digital knowledge when and where they need it via any Internet connected device. In July
2009, affiliates accessed Yale’s networked resources from more than 85 countries outside the United
States, accounting for more than 15% of all the external connections.

“In July 2009, affiliates accessed Yale’s networked resources from more than 85 countries outside the United States.”
**COLLECTION, MANAGEMENT AND DISSEMINATION OF RESEARCH DATA**

Information technology makes it possible to create, analyze and share extraordinary amounts of data. Most modern lab equipment is now managed by computers that collect and process data digitally and are usually attached to Yale’s network.

Modeling, simulation, statistical analysis and other IT-based tools are integral to Yale’s research, teaching, learning and clinical practice. Digital technologies are propelling a new generation of research tools. A telescope recorder designed by Yale researchers collects sky survey data from Mount Palomar as part of the Palomar-QUEST survey\(^\text{viii}\). The massive quantities of resulting data are transmitted in real time to Yale and other collaborating institutions. This survey provides, in effect, a digital ‘video’ of the sky across time, where previous surveys were only capable of producing the equivalent of snapshots.

Dissemination of knowledge is core to Yale’s mission and information technology is now the primary vehicle. Not only are Yale’s research, teaching and clinical practice materials now published in digital form, but Yale is increasingly publishing in multiple media, with 1,200 official Yale iTunesU Podcasts\(^\text{ix}\), 350 videos on YouTube’s Yale University channel\(^\text{x}\), and 25 full online courses from 17 departments in Open Yale Courses\(^\text{xii}\). The Visual Resources Collection at Yale combines digital information management and dissemination to provide students and faculty a unified online tool for collecting, curating and sharing digital objects.\(^\text{xii}\)

Yale now continuously contributes and references multimedia resources around the globe – a world wide web indeed!

**PRODUCTIVITY**

Information technology has advanced both personal and institutional productivity in numerous ways\(^\text{xiii}\). Bibliographic software and personal tools such as word processing have streamlined scholarly writing. Literature searches that once occupied days to obtain a handful of titles now take hours to deliver more comprehensive results using fewer resources. The administration of research, teaching and clinical practice have been automated, saving time and reducing errors.\(^\text{xiv}\).

While providing advanced techniques for teaching and learning, Yale’s online course management system (Classes\(^*\)V2) also facilitates efficient management of courses for faculty, for example, streamlining the distribution and collection of materials (syllabi, assignments, homework and more). Similarly, modern IT-based administrative systems automate tasks and complex business processes to improve Yale’s administrative efficiency and accuracy.

Information technologies have now become as important to scientific research\(^\text{xv}\) as lab space and instruments, as important for teaching and learning as the classroom, as important to clinical practice as diagnostic tests. IT systems are fundamental to the efficient administration of a large, modern organization. IT is both an enabler and a driver of research productivity, innovation, scholarship, collaboration, learning, teaching and just about all the activities of a modern research university. Information Technology infrastructure and tools are a necessary ingredient for Yale to continue as a leading university.

> “Information technologies have now become as important to scientific research as lab space and instruments, as important for teaching and learning as the classroom, as important to clinical practice as diagnostic tests.”

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Vision for an IT Enabled Yale in 2015

“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”

Roy Amara

The history of the World Wide Web is instructive on the pace and impact of technology. First developed in 1990, many at the time imagined the immense impact this development could have, but it had limited use until the introduction of the Mosaic Web browser in 1992. The Web then began to develop rapidly and an entire economic bubble grew and subsequently burst over the next decade. Yet the enduring impact of the World Wide Web over the last twenty years has surely exceeded even the visionary imaginings of 1990 or 1992. In many cases, the technical and user experience visions of the Internet bubble have been realized even if some of the content ideas were way off base. Major new technologies such as the widely discussed “cloud computing” are likely to follow similar patterns. Initial claims may be overblown but in the long run, this will likely have profound effects on the industry and IT at Yale.

It is with that background in mind that this IT plan attempts to imagine some of the major impacts of information technologies on Yale over the next five years. Without doubt, some of these visions will turn out to be out-of-reach, but in other cases reality will exceed this vision and so it is essential that Yale aspire high over a long time frame (long at least in information technology time) as the ultimate effects of information technologies almost certainly will be greater than most of us can now imagine even over the next decade.

A View of IT-Enabled Yale in 2015

Eli Hall, built in 1923, was substantially refurbished in 2013, resulting in the state-of-art teaching center it is today. Eli’s classrooms were designed and outfitted by a close collaboration among Yale architects, network engineers and academic computing professionals, with full engagement by teaching faculty and students.

Professor Hare arrives in one of Eli Hall’s standard classrooms and approaches the podium. Using the touch-sensitive monitor, she highlights Learning*V3, launching her lecture materials, and then begins an audio and video recording of today’s class.

Sarah Fishbein, Yale ’16, finds her usual seat. Before class begins, she checks the MyYale portal on her smartphone. It organizes her life at Yale, with feeds about Yale events, community messages, her activities, links to the courses she’s taking and her portfolio. She sighs, another message from her dean regarding her distribution requirements, then perks up to see that the Vice President will be giving a great lecture on campus next week!

The class at an end, Professor Hare presses the Stop button on the podium monitor. In two hours, a synchronized version of the audio, video and presentation materials from her lecture will be available to the Yale campus and Internet community.

In Italy, Matt Anders is spending the fall semester of his junior year studying Italian Renaissance Architecture at the University of Milan. He checks the Yale course feeds application on his mobile phone.
computer and sees that Professor Hare’s lecture is available. Matt wasn’t eligible to take her course until this year, and, as luck would have it, he’s away this semester and Professor Hare, who teaches this course every fall, will be on sabbatical next year. Professor Hare agreed to let him take the course remotely, and Matt is eager for today’s lecture. Matt listens to the lecture in Italian. He’s doing his best to immerse himself in the language, and so it’s great to be able to translate Professor Hare’s audio just by adjusting the application’s language setting.

In Lead, South Dakota, Mary Allen, Yale class of 1991, hears her smartphone chime. She picks up the phone to see a Twitter notification from Professor Hare. Mary was excited when Yale began publishing selected lectures to alumni, particularly when she saw her undergraduate mentor was one of the faculty adopting this technology. I love her lectures, thinks Mary, this will be a great start to my evening.

Dr. Rachel Heberling advances to the adjacent exam room to see the next patient at the modern facilities of the Yale Medical Group. Dr. Heberling unlocks the screensaver on the computer and quickly reviews the patient’s electronic medical record. This patient has an unusual condition, transverse myelitis, complicated by a urinary tract infection. Since her last visit, she has seen a urologist and had blood work sent.

Dr. Heberling reviews the physician’s consult and the lab results. A simple search brings up previous diagnoses on the patient. It also returns summaries of the latest medical research on her condition, reminding the doctor to inquire about a rare but significant complication.

Following a focused physical exam, the Dr. Heberling types a few keystrokes to order follow-up tests and a prescription, sent electronically to the patient’s designated pharmacy. The patient departs, pleased with the efficient, paperless visit.

As Dr. Heberling leaves the exam room, she thinks about how valuable this patient’s data will be to research, given her rare and comorbid condition. This, and other patient data, once de-identified, is added to Yale’s clinical data repository. The largest and most reliable clinical data repository, it is one of Yale’s strategic assets and lures to Yale many prominent medical researchers.

In Changsha, Hunan, China, Professor Xiao arrives at a Xiangya School of Medicine classroom, ready to deliver today’s lecture to 30 Xiangya students and another 20 Yale students. The Xiangya School of Medicine is collaborating with Yale to co-teach a course this year. Both the Yale and the Chinese students will hear the English language lecture in real-time, the Yale students attending in Yale’s new international classroom. Students report that after the first few minutes, you almost forget your professor and half your classmates are thousands of miles away.

Steven Nevsky, Professor of Chemistry, has been at Yale for 3 days. Lured from Princeton and courted by Stanford, Yale’s offer was strong, but in the end, it was the Chemistry faculty’s enthusiasm for Yale’s 5-year transformation of its cyberinfrastructure that tipped the balance. He was looking forward to all the bandwidth and storage he needed, along with computational power and the visualization and simulation tools to go with it. The transition to Yale was surprisingly smooth. In the weeks before he came, the IT people were in touch with him and his lab, helping them select their primary computers and mobile devices and setting up their access to Yale’s electronic resources, all without a hitch.
The laparoscopic cholecystectomy was successful and Vanessa Robinson is profoundly relieved and not a little bit proud. It’s her first cholecystectomy. Nervous at first, by the time she separated the gall bladder from the liver in preparation for removing it, she was too absorbed in the procedure to feel any lingering anxiety. Her School of Medicine classmates were right: Yale’s Clinical Simulation Center is amazingly realistic and a great way to practice surgical and other medical techniques.

Professor Roger Wolfers disconnects from the video conference with his Princeton and UCLA colleagues. Using the latest behavioral economics computational tools and techniques, they are mashing up - combining and analyzing - a wide range of data sources including personal, governmental and market financial data, interpersonal interactions recorded in public spaces or published in social networking sites, internet searches, real estate transactions, tax records, and medical data. Before settling down to work, Professor Wolfers glances at myYale, his personal portal, and sees that his NSF grant’s spending is on track, his postdoc’s visa has been extended, and it’s time to re-balance his retirement account.

Maria Santos is sending Professor Sari Kimura a press release she’s just drafted about the eminent chemist. Maria constructed her draft by searching the images, videos, and text-based resources in Professor Kimura’s Digital Profile, stored in Yale’s digital repository. Press releases never came together so easily or so well before the Repository.

Long before Professor Skinner arrived in New Haven, she heard rave reviews from faculty at Yale. “Compared to other research universities, working at Yale is just easier,” they told her.

She was impressed from the moment she applied for a position. Using Yale’s Faculty Application website, it took only a few minutes to attach her CV and the links to her published research, and the department chair reached out to her immediately.

A month prior to her start at Yale, she received a link and login to the faculty portal, with a checklist for things that could be handled prior to her arrival. The site included links for every item on that checklist - and more. It helped her sign up for benefits, provided access to her new email account, and listed the schedule for the courses she would be teaching next semester.

A” transition” section showed the assignment of her office and lab and the progress of the lab set-up. She was pleased to see that the lab was scheduled to be ready the next week and the equipment she had requested was on order. She saw that a transition coordinator was assigned, to coordinate the move into her lab and office, and noted a 24-hour hotline for urgent problems after hours.

Checking out the site a little further, she located the Faculty Research Database, which already included her credentials, areas of specialization, and publications. She reviewed helpful reference materials like an interactive map of Yale and The Insiders Guide for New Faculty. She then used the site to order a Yale sweatshirt and was pleased to see that it even applied the employee discount.

“They were right,” she said out loud, “Yale does make things easier.”
Professor Nina Stark will have reason to be pleased that she has been diligent about maintaining her Digital Profile. Joshua Hahn is studying it, and likes what he sees and hears, especially the video of the talk she gave at the International Conference on Indian History last year and the cool work she’s been doing combining geographical data and historical records from the Indian subcontinent at the end of the 20th century. Josh is looking for the right graduate program, and he will become one of Professor Stark’s most productive and satisfying students.

Tom Marcarelli of ITS, has just finished reviewing his department’s FY14 accomplishments. For the third year in a row, he’s been able to reduce the cost of data storage by 15% and email accounts by 12%, while hitting his availability targets of 99.99% and sustainability target of 8% power savings. Outsourcing storage and email to cloud.com was a good decision. He doesn’t miss overseeing a local data center one bit. And things are looking good on the support end of things: With the second generation of Managed Workstation fully deployed, he’s able to support faculty, staff and students, on and off campus, with another annual client savings of 15%. Security incidents are under control, too, down by 80% from five years ago with this more reliable infrastructure.

Zach Fairleigh, incoming freshman, is just leaving Yale’s Educational Technology Center, where the student consultants gave him tips about organizing his new ePortfolio. Zach’s quite excited about it. He’ll be able to collect and organize the best and most interesting work he does, whether it’s individual assignments, multimedia, or group projects. He can even store work from summer internships and other non-Yale activities. Best of all, the ePortfolio is his for life, so he won’t have to worry about moving everything to another location after graduation.

Professor Allison Staid is entering the Educational Technology Center as Zach is leaving. This is her fourth visit and she’s begun to feel comfortable. She is dead set against recording her lectures the way some of her colleagues are doing, but while she was at the International Conference on New Directions in the Humanities last spring, she was intrigued by a demonstration of a Shakespearean virtual world created by a close friend from graduate school. She wondered whether she might do something similar to broaden her course on Pindar. The Technology Center staff were so helpful, not pushing anything on her, and making the technology accessible. This might even turn out to be fun.

That night, Emily Chandras curls up in an upholstered chair in the Silliman reading room. She’s got several hours’ worth of reading, and it weighs only 10 ounces. This year, 80% of Yale’s textbooks will be delivered electronically, up from 62% last year. Emily’s parents are delighted, because even factoring in the cost when Emily lost her e-reader last year, they estimate they’re saving a couple of hundred dollars a year on books. And losing an e-reader turns out to be no big deal: It’s $50 to replace, and can’t be accessed by anyone except Emily. Emily turns to her statistics text, which includes built-in homework assignments for the fundamentals. Emily’s statistics professor loves this particular e-textbook, which will automatically grade Emily’s assignment.
Spotlight Scenario: The Studio Classroom

On his way to class, Professor Crawford muses about how his teaching has changed since he started using a studio classroom. He now spends less time preparing lectures and the accompanying presentations, and instead thinks about the problems he wants his students to work on during class, the dynamic student feedback he will solicit, the details he wants them to research, and the interactions he wants to foster.

Each time he enters IC-100, he is struck by the remarkable transformation of this room. In its previous form, it was a very traditional classroom, with rows of fixed seats and a “stage for the sage”. There is no “front” or “back”, the stage and rows of seats are gone, replaced by round tables distributed throughout the space and a teaching station in the center of the room.

He writes a short note about today’s topics on the touch-sensitive monitor on the instructor’s desk, and it is replicated across the digital displays that surround the room. The room design ensures that every student is within an optimal viewing distance to a display, no matter which way they are facing, a fact that reminds him that all are equal in this space, instructor and student alike. As the students enter the room and sit down at one of the tables with their assigned groups for the week, Professor Crawford starts his “mini lecture” on plate tectonics, illustrating the key concepts with an interactive simulation that he controls from the room computer and annotates with a digital pen. He assesses the students’ understanding of the ideas several times during his presentation using wireless “clickers”, moving ahead only if most of the class answers the (admittedly tricky) questions correctly. Unlike his traditional lectures of the past, students have no hesitation in interrupting him with questions and encouraging elaboration of particular points. He then assigns a set of problems that are distributed across the groups in the class, one 9-person group per table.

The space comes alive with energy as the groups start working on their problems. Several groups use tablet computers to set up the simulations that will help them solve their assigned problem. Others stand up and congregate around one of the nearby digital ink smartboards to collaboratively work out a solution, while other groups simply use the writeable wall surfaces (with associated video capture) to draw and refine the schematic sequence. The professor and several teaching assistants move throughout the space, observing, answering questions, providing suggestions. The Professor notes that one of the groups has discovered an interesting twist to the problem that the entire class would benefit from seeing, so he interrupts the discussion and electronically displays their work to the entire class.
The class wraps up by having selected groups briefly present their solutions. Professor Crawford is constantly surprised that, with no encouragement from him, students ask engaging and focused questions of the other student presenters, encouraging even more discussion with the rest of the class.

As is the case after most classes in this space, Professor Crawford leaves the room with another new teaching idea. He decides to follow up today’s material during the next class with an assignment to student teams to develop pro or con arguments about the contentious theory that they explored today. During the next class, they will post them on the digital whiteboards in the class and revise their arguments based on peer feedback.

Additional vignettes are under development in the following areas:

- Faculty lifecycle
- Roles management
- New or better vignettes welcomed...
**DISCUSSION**

The technologies and infrastructure required to achieve these future scenarios include the following:

Teaching, learning and collaboration tools:
- Writeable surfaces that capture and store everything written on them
- Real-time blogging in the classroom
- Institutional collaboration applications
- Classroom chat rooms
- Ubiquitous access to simple and intuitive videoconferencing
- Video/data-enhanced real-time capture
- Asynchronous discussion and annotation tools
- Tools enabling ad hoc guest instructors teaching from a distance to easily use classroom technologies
- E-Textbooks and readers
- Virtual worlds and other advanced pedagogical applications
- Social networking technologies
- E-Portfolios

Identity management

Cloud computing:
- High-performance computing
- High-capacity data storage and back-up
- Email

Personalized portal with real-time integration of academic and administrative applications

Voice language translation

Automated account provisioning

Cyberinfrastructure and computational science applications and tools, including:
- Simulation applications
- Parallelization tools
- Visualization tools
- Job scheduling tools
- Data mining applications
- Advanced network infrastructure
- High-performance networks on campus, and connections to those off-campus, to support massive data transfers, real-time visualization and use of remote instrumentation
- Dynamically available bandwidth provisioned to and within a room

Application and operating system virtualization

Digital asset management infrastructure and applications

Mobile computing:
- Management infrastructure
- Academic and administrative applications

New facilities:
- Clinical Simulation Center
- Educational Technology Center
- Technology-enabled learning spaces
- Advanced distance-conferencing facilities

Some of these technologies are already reasonably mature and in process or capable of implementation at Yale now. Others are developing and will depend on industry progress for full elaboration. As always, Yale’s outcomes will be influenced by the ability to organize technology to deliver on its promise. This plan will provide a technical roadmap for applying promising existing and developing technologies to academics at Yale.

The conundrum of how to encourage technology innovation while also providing the University with its core IT operations is a fundamental IT management challenge. The next section of this plan will explore this challenge and propose a set of general principles to meet it.
Principles to Guide IT Planning

The potential sketched by the vision is compelling - and, achievable if Yale can fully leverage its IT resources and investments in a coordinated effort. To realize maximum effect IT must be closely and carefully managed. If not managed, the diverse needs of a complex university will allocate IT resources indiscriminately across disparate technologies, diluting critical mass and missing the opportunity for full leverage. While there are many challenges to be met, the key distinctive IT management challenges are:

- the continuous rapid, pace of IT change
- the immense diversity of IT solutions
- the substantial, sometimes hidden costs of information technologies

Four principles will help guide Yale’s IT planning in order to address the inherent challenges in a consistent way and thereby gain maximum benefit from Yale’s substantial ongoing IT investments. These four themes recur across all IT areas and they will guide implementation of the action plans.

**Provide Standard Core IT Infrastructure in Abundance**

Yale needs to develop and adopt a *Standard Core IT Infrastructure* to provide a common, robust and effective foundation for all of Yale’s IT systems and provide that core infrastructure campus-wide, in abundance.

In the face of almost unlimited diversity of information technologies, Yale will not be able to provide unlimited access to every technology. It cannot even implement every good or useful IT technology: to do so would diffuse attention and resources creating mediocre results. Yale’s best outcome will be obtained through a focus on an appropriate set of core IT capabilities to cover the strategic essentials for a leading university.

It is critical that those identified standard core infrastructure technologies meet the reasonable expectations of the Yale community based on the state of commercial technology and on common campus-wide needs. For example, the Yale community will expect that Yale’s administrative systems will interlink, flowing information already recorded in student or HR systems into supporting systems rather than requiring re-entry; the community will expect self-service; the community will expect up-to-date learning management systems. These sorts of community-wide expectations should be met with *Standard Core IT Infrastructure*.

To optimize Yale’s overall IT leverage this core infrastructure approach will require some individuals or groups to adopt a Yale standard approach that is not their first preference. A corollary, given the immense diversity and scale of possible IT capabilities, is that Yale will be best served by adopting one or, at most, two standard approaches to solve a common problem even when many approaches may be possible, each offering some unique but not compelling advantage.

Core IT infrastructure is by definition broadly needed and expected; to promote its use and facilitate acceptance of standards, this core infrastructure must be provided “in abundance” without cost or

“If not managed, the diverse needs of a complex university will allocate IT resources indiscriminately across disparate technologies, diluting critical mass and missing the opportunity for full leverage.”
provisioning barriers. Faculty, students and staff must be able to rely on the ready availability of standard core technologies, absolutely including support (help) sufficient for successful campus-wide use. These core technologies must be delivered with highest appropriate reliability, availability, capacity and quality at maximum efficiency and with strong incentives to support campus-wide adoption. Absolutely dependable core IT infrastructure provides an essential foundation for success across Yale’s mission-focused activities.

**FACILITATE INNOVATION**

A modern university runs on information technologies and the *Standard Core IT Infrastructure* principle supports these foundational services. Equally or perhaps more important to Yale’s mission activities is that Yale take maximum advantage of new technology developments to advance its mission.

At a research university, the grant funded research process is a proven model for driving innovation by adoption of new approaches such as new information technologies. Researchers constantly track developments and begin quickly to explore promising options. Yale must take steps to facilitate the easy exploration of new technologies and rapid adoption of those that will provide material benefit.

Facilitating innovation is essential but without coordination, the great diversity of the Yale Community coupled with the immense proliferation of technical developments will drive the University in myriad different and often conflicting directions. Instead of focusing on achieving our strategic vision we will dilute Yale’s resources and actually slow the adoption of new technology. IT-based innovation of research, teaching and other mission activities should not be controlled centrally, but appropriate central resources should be allocated to facilitating and leveraging such innovation by identifying related efforts, helping innovators share their ideas, providing seed support for promising technologies, and, ultimately, helping move a new technology to production when appropriate.

Of course, the pace of adoption of new technologies will vary based on the scale of change, the potential benefit, costs and more. Issues to be considered when facilitating IT-based innovation include:

- Consider what is a meaningful advance: when does a new development present fundamental opportunity compared to a helpful but not compelling refinement?
- Some clients may not be interested in the change necessary to profit from IT innovation – or basic standardization. They will, however, generally appreciate the improved reliability, availability and cost that can result from standardization, process management, an institutional sourcing strategy and centralization of commodity infrastructure.
- Maintain a light touch on coordinating innovation activities. Units across the campus are constantly seeking mission-unique benefits from IT-based opportunities. Yale will benefit overall from broad communication of distributed innovation activities, in some cases from coordination of them or even careful institutional investments. But generally, most such distributed IT based innovation will first be explored

“...improved reliability, availability and cost [results] from standardization, process management, an institutional sourcing strategy and centralization of commodity infrastructure.”
and even adopted by individual units rather than by the central IT group providing core infrastructure.

• While much IT-based innovation, if not most, will begin from distributed campus activities, it is equally critical that groups responsible for Yale’s core IT infrastructure also track, explore and adopt IT innovations to evolve core infrastructure.

**PLAN, MANAGE AND FUND IT STRATEGICALLY**

By definition, *Core IT Infrastructure* must provide a firm foundation on which to build and, as such, will largely include mature technologies that evolve relatively slowly in technology time frames. By contrast, *Facilitating Innovation* requires the ability to explore emerging technologies and to adopt new technologies before they have fully matured. These two critical technology goals are inherently in tension. An exclusive focus on *Core IT Infrastructure* will fail at supporting critical innovation, while an exclusive focus on *Facilitating Innovation* will result in a reactive, confused and ineffective IT environment.

To provide both a solid IT infrastructure foundation and appropriate support for innovation, IT planning, management and investment must recognize this inherent tension and consciously seek to promote stable but evolving core technologies AND rapid adoption of those IT-based innovations that will materially advance Yale’s mission, skillfully knitted together in such a way as to maximize the value of Yale’s institution-wide IT investment.

This principle has implications for IT organizational structure, roles, management and investment that will differ from area to area and across time according to Yale’s changing strategic goals for IT.

“An exclusive focus on *Core IT Infrastructure* will fail at supporting critical innovation, while an exclusive focus on *Facilitating Innovation* will result in a reactive, confused and ineffective IT environment.”

**MANAGE IT COSTS ON A LIFE-CYCLE BASIS**

The rapid pace of technology change and obsolescence poses substantial challenge in managing IT investments successfully because future costs may not be obvious; an example is the future replacement costs of a system including design, selection, associated training and other transition costs. The need for ongoing funding is predictable. Just as every building at Yale includes ongoing “capital replacement charges,” all IT systems must consider initial, ongoing upgrade and replacement costs as part of their complete plan. Despite accounting distinctions between capital and operating costs, IT costs are best managed as life-cycle costs, including both capital and operating components. Such life-cycle planning must be comprehensive across all aspects of IT systems and services, including the technology costs, people impacts, ongoing support and, eventual retirement, upgrade or replacement of that technology.

These four principles will help Yale manage the inherent IT management challenges in a consistent way across the academic, administrative and infrastructure IT to gain maximum benefit from Yale’s substantial ongoing IT investments.
The IT Plan: Objectives, Opportunities and Example Projects

Mission-driven IT

This plan organizes information technology objectives in sections according to the following institutional mission activities:

Section I. IT for Academic Success
Section II. IT for Clinical Success
Section III. IT for the Yale Community
Section IV. IT for University administration
Section V. IT for the Community beyond Yale

Each section establishes one or more Objectives for Yale to reach our envisioned future state. Each Objective is supported in turn by one or more Opportunities that describe more specific actions in order to accomplish the objective. Each Opportunity is accompanied by one or more Example Projects to concretely illustrate the kinds of activities in which Yale could engage to achieve that Opportunity.

As a plan, this document identifies a broad set of areas for action. Each year, Yale will decide which of these areas deserve attention and will drive from these strategic priorities into project plans as described in Appendix B: The Annual IT Planning Process.

Information technologies underlie so many activities at Yale that no single organizational approach will neatly divide IT issues for clear coverage across a plan so if you seek a particular strategic goal and don’t find it in what seems the obvious section, please consider that it may simply be captured in another section.

IT Foundation and Management

Many of Yale’s activities share common IT services, such as the underlying network infrastructure or communications tools such as email and Internet access. After addressing specific mission-related needs within the major institutional activities in Sections I through V, the Plan then considers foundational and shared IT activities across Yale with a set of IT Objectives, IT Opportunities and Example Projects:

Section VI. Foundational and Shared IT

While the IT plan does not lay out the operating model for IT at Yale in detail, Section VI does address several goals for IT management. In particular, elements of Yale’s information technology services are organized and delivered in a distributed fashion and so this plan must seek comment from and coordinate those distributed activities. Thus, Section VI includes a set of IT Objectives and Opportunities to more effectively plan, manage and fund IT strategically to provide Yale an
interdependent model that leverages Yale’s IT resources, while retaining a distributed footprint required to deliver mission-unique services and service levels and to sustain the pace of innovation:

Separately, as part of the annual planning and budgeting process, Yale will need to assess progress against the vision and objectives in light of changing competitive pressures, institutional priorities and resources to develop a multi-year project road map and identify the specific projects with corresponding outcomes, costs and time lines which will be undertaken in the next budget year. Appendices B and C contain descriptions of the new IT planning and prioritization processes.

The Scope of this Plan

Adoption of information technologies must be undertaken thoughtfully. Yale must consider individual costs and benefits but also institutional costs and benefits including “hidden costs,” potential disruptions and more which could result from the broad adoption of new technologies. This plan expects that Yale will identify those issues during its planning process and will consciously choose which technologies to adopt, with awareness of the full impact.

Not every aspect of information technology at Yale can or should be covered by an institutional strategy. Faculty must be given as much leeway as possible to use technology to innovate in their research and teaching. Core institutional IT services such as the network, however, need to be planned and managed centrally to provide a secure and efficient use of institutional resources. Likewise, University systems and services should be part of the plan. Generally, this IT plan aims to address comprehensively Yale’s IT systems, services, organization, planning and management, acknowledging that most IT work happens in partnership with others.
P ART NERS
This plan is built upon an expectation of a productive partnership between central IT and Yale’s departments, faculty, students and staff. That partnership assumes central IT is responsible for the necessary institutional technologies, whether they are Web tools, networks, or applications. Content areas, such as library materials, course content, fund-raising, press releases, clinical or research data or financial information, are the purview of Yale IT’s partner organizations and individuals.

Essentially all of these IT goals and most of the specific projects require close work with critical partners — such as the Schools, academic departments, the Library, the Office of Digital Assets and Infrastructure or administrative units - to be successful. Every action undertaken in this plan must involve the appropriate partners. Particularly critical partners are identified with each Section, though this list cannot be comprehensive.
I. IT for Academic Success

Key partners in developing IT to support academic success include: faculty, instructors, individually and through departments and committees; schools; academic centers; the Provost’s Office; the Library; the McDougal Center; Student Financial and Administrative Affairs; Facilities; the Office of International Affairs and many others. In several cases, this IT Strategic Plan must be understood as a foundation for and complementary to the plans of these partners, including, particularly, the Library, the Office of Digital Assets and Infrastructure and the Office of Digital Dissemination.

TEACHING AND LEARNING

Objective 1.

Support Yale’s preeminence as one of the world’s finest educational institutions by becoming a leader in higher education in the use of technology to support and enhance the education process.

<table>
<thead>
<tr>
<th>Opportunity-1</th>
<th>Learning spaces: Explore and develop a range of innovative approaches to teaching and learning in all academic use facilities across Yale, including state-of-the-art instructional technology in conventional classrooms, IT-equipped learning spaces, and spaces specially designed to accommodate varying instructional approaches. Provide adequate resources, including support and life cycle upgrades. Explicitly include consideration of such innovations in the design and renovation of all new and remodeled facilities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>Improve current classroom standards and then update the installed equipment in all of Yale’s classrooms campus-wide including school and departmentally controlled classrooms.</td>
</tr>
<tr>
<td>Example</td>
<td>Identify, update and equip all of Yale’s learning spaces with appropriate technologies to support learning, which include but are not limited to residential colleges, libraries and academic buildings.</td>
</tr>
</tbody>
</table>

Opportunity-2  Teaching support and innovation: Provide faculty with the resources, support, and appropriate incentives to develop innovative digital instructional materials, educational resources, simulations, and educational games for use by students working alone or in teams, and for campus-based, and distance-learning delivery. Develop systematic processes to identify ideas, design experimental applications, disseminate results and implement new technology solutions to support and demonstrate improved student outcomes.

| Example | Implement appropriate compact, portable devices that connect students and instructors in ways that enable lean or rich communication, collaboration, and interaction using voice, audio, text, and video. |

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example Consolide key resources within an Educational Technologies Center, including pedagogical support, Library support, and technology support to create an identifiable, accessible source for this activity and provide opportunities for experimentation in a “safe” and well supported environment. Provide adequate follow-on support so instructors can successfully migrate and sustain this work in their ongoing teaching activities.

Example Extend current practice with technologies such as clickers or iPhones to provide real time and persistent student feedback to instructors.

Opportunity-3 **Personal learning environments:** Provide IT resources that offer students an online environment to integrate and personalize their Yale academic experience and selectively share it with instructors, advisors and others, while at Yale and beyond graduation.

Example Support a collection of online tools that students can use to personalize their learning experiences. Develop simple technologies that allow easy integration and augmentation of learning resources from Classes*v2, Library, and the web, with the student's own writing, interdisciplinary reflection, and research.

Example Provide students with an online portfolio environment where they can showcase samples of their academic work and skills for institutional assessment, potential employers or graduate schools. The system should have suitable protections for individual privacy and also enable institutional metrics for obtaining evidence of productive effect.

**Related Opportunities:**

- Administrative support for instruction (10)
- Space and event management (22)
- Distance learning (27)
- Abundant core IT (IT1)
- Abundant communication & collaboration tools (IT2)
- Abundant data storage and access (IT3)

**RESEARCH**

**Objective 2.**
Support Yale’s research enterprise though the exploration of highly promising technologies and by providing a state-of-the-art IT infrastructure and associated expertise to support the research lifecycle from proposal to research through publication.

Opportunity-4 **Exceptional research infrastructure:** Carefully assess new equipment, systems, facilities and skills that are necessary to advance promising opportunities as research becomes more IT-intensive. Provide sustained investments in IT-intensive areas strategic to Yale’s aspirations such as strengthening science and engineering. Target strategic acquisitions and hiring to supply or augment expertise.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
facilities and services for advanced, IT-enabled research and development. Continue, expand and initiate participation in national cyberinfrastructure initiatives and in efforts to win federal and private funding of cyberinfrastructure programs to enhance Yale’s IT research capabilities.

Example  Develop sustained growth and support for high performance computing (HPC).

Example  Based on existing resources, establish a world-class biocomputing center for the biomedical sciences that is ubiquitously accessible.

Related Opportunities:

- Multimedia digitization (7)
- Faculty information repository (8)
- Administrative support for the academic enterprise (9)
- Life cycle research administration (14)
- Business intelligence (17)
- Abundant core IT (IT1)
- Abundant communication & collaboration tools (IT2)
- Abundant data storage and access (IT3)
- Federate identity management (IT13)

STUDENT-CENTRIC SERVICES

Objective 3.  Meet students’ expectations of a technology-enabled university and support student success and the quality of the student experience at Yale by developing student-centric IT services supporting academics, administrative tasks, and student life.

Opportunity-5  Next-generation student portal: Provide a comprehensive student portal view that integrates relevant content (“what Yale already knows or should know”) for student life in one place, providing current information in proper context. Present this information in a way that makes sense from the students’ perspective and enables them to find the right information quickly as they choose classes, apply for financial aid, access course materials, apply for special programs, work with an advisor, pay bills, and handle other administrative tasks.

Example  Combine key content for student life into one relevant place and develop portlets as necessary to support key function such as class scheduling scenarios by inventorying and prioritizing the key University information that students need.

Example  Develop and deploy an institutional student system that fully meets the needs of all schools, departments, and programs to eliminate the use of shadow systems.

Example  Develop and deploy a student-centric calendaring system to help students effectively manage their time and track their participation in campus activities.

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Opportunity-6  **Electronic textbooks:** Assess emerging eTextbook technology and the associated infrastructure to determine if this might reduce costs, provide higher quality materials than current textbooks and reprints, or increase options for students with different learning styles.

Example  In the context of experience at other institutions, deploy e-book/e-reader systems on campus in pilot areas, assessing cost savings and effectiveness to inform decisions on broader deployment.

**Related Opportunity:**
- International students and scholars (26)

**ACADEMIC ADMINISTRATION**

**Objective 4.**
Maintain Yale’s academic leadership by developing a comprehensive set of resources and easily accessible technologies for the creation and use of rich media in the classroom, student work, faculty research and scholarly work.

Opportunity-7  **Multimedia digitization:** Provision a multimedia utility service to digitize (if needed) and preserve film, audio, and the many special events that enrich scholarly life at Yale. The service should enable abundant near- and long-term storage, ease of use across a variety of audio and video endeavors, and permissions and rights management, and should provide search and retrieval for whole and partial clips based on terms or associations.

**Objective 5.**
Support excellence in academic administration by providing state of the art tools to help Yale effectively and efficiently manage teaching, learning and research activities.

Opportunity-8  **Faculty Information Repository:** Consolidate, correct, and gather essential information on all faculty and researchers at Yale into a master data model accessible to all who need it. Fully connect this faculty information repository with the HR, Research Administration, and related systems to enable integrated support of faculty and researchers. Look for opportunities to consolidate over-lapping systems and to use shared staffing models. Ensure the tight integration of new and existing systems to meet the needs of all Yale’s schools.

Example  Develop the core data repository by combining essential existing information sources, including the Office of Institutional Research, the YSM faculty profile system, and other local repositories maintained by schools and departments. Gather missing information so that it is the authoritative and complete source for information on faculty and researchers. Provide appropriate faculty, school, departmental, and central access to the data to enable consistency and currency.

**NOTE:** Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example: Leverage document management capabilities to facilitate the aggregation, cataloging and accessibility of faculty credentials, references and publications.

Opportunity-9 **Administrative support for the academic enterprise:** Provide institutional systems that support effective management of the academic enterprise, including faculty appointments and career development.

Example: Develop a Faculty Administration system. Use the Faculty Information Repository to: administer faculty activity reporting, the tenure process, the appointment and promotion processes, committee nominations, committee proceedings, and efficient preparation of grant proposals; provide the Office of Public Affairs with quick and accurate quotes and examples of leading thinking and ground-breaking research in response to breaking news stories; feed school and departmental websites with easy queries on Yale’s special programs and faculty research areas of specialization; optimize the yale.edu search tools to prioritize and “push” the content most valued by the University; and pre-populate requests with data that “Yale should know.”

Opportunity-10 **Administrative support for instruction:** Revise existing systems for scheduling, course management, and other IT-supported teaching-related activities to enable “flexible learning units” including variable schedules, meeting times, credit, and prerequisite structures to support increasingly diverse needs outside of the traditional semester schedule to meet needs across all of Yale’s schools.

Example: Enhance systems for scheduling, course management, and related functions to support “flexible learning units”. Allow variability in schedules, meeting times, credits, and prerequisites to support increasingly diverse needs that are not structured like typical semesters.

Example: Provide an institutional course evaluation system.

**Related Opportunities:**

- Life cycle research administration (14)
- Business intelligence (17)
- Document management (19)
- International students and scholars (26)

**II. IT for Clinical Success**

Developing IT to support clinical success is driven primarily by clinical leadership, services and practitioners at the Yale School of Medicine but includes partnership with the Yale New Haven Hospital, Yale University Health Services, Yale School of Nursing and others.

**NOTE:** Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Objective 6.
Deploy technology to support clinical excellence in the School of Medicine.

**Opportunity-11**  **Clinical systems:** Provide a highly secure, usable best-practices digital infrastructure for clinical care and research.

- Example  Deploy an Electronic Health Record throughout the Medical Campus.
- Example  Deploy a Clinical Trials Management System throughout the Medical Campus.
- Example  Deploy Patient Protocol Management throughout the Medical Campus.
- Example  Deploy a Clinical Data Repository throughout the Medical Campus.

**Related Opportunities:**
- Abundant core IT (IT1)
- Abundant communication & collaboration tools (IT2)
- IT compliance (IT6)
- Disaster recovery and business continuity (IT7)
- Improved access control (IT8)

III. IT for the Yale Community

Key partners in developing IT to provide support for the Yale community includes the Office of Development, the Association for Yale Alumni, the Office of Public Affairs, the Office of the Secretary and many others.

**Alumni Outreach & Support**

Objective 7.
Foster lifelong connections to Yale in support of alumni with high quality and innovative technology services. Provide alumni with a **seamless Yale experience** in every phase of their lives and every interaction with the University.

**Opportunity-12**  **Foster and manage Alumni contacts and communications:**
Update, expand and extend the channel of communication among and between alumni and the University with innovative and effective technologies. Track contacts with alumni and givers to provide continuity across interactions with Yale entities. Provide a comprehensive picture to those who interact with alumni (selected volunteers, development officers, and representatives from schools and colleges) to leverage information which “Yale already knows or should know”.

- Example  Deliver a Yale-wide Customer Relationship Management application with alumni configured as a key customer type. Deploy this application across all parts of Yale that deal with external entities to track contacts with alumni, donors, dignitaries, the press, compliance/ government/ legal entities, and

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
other significant external organizations and individuals with appropriate privacy and access controls. Use this tool to facilitate proactive discussion about the need and the process to coordinate external communication effectively.

Example  Deliver to each alumnus a universal ID, accessible for a lifetime. Use this ID and the portal tools to provide personalized experiences to alumni who access password-protected portions of the Yale websites, donation sites, reunion information, and the alumni volunteer tools.

Example  Build on University systems to provide superior IT tools for alumni communications and collaborations.

Example  Target the best prospective donors through rich data mining on past and potential givers by improving the existing Development metrics dashboard with additional data sources and more insightful analytics.

Opportunity-13  **Alumni volunteerism:** Support volunteerism among alumni through the effective application of technologies.

Example  Deliver applications to improve administration and support for alumni volunteers.

Example  Develop a volunteer tracking and reporting system and secure web-based delivery of information to volunteers.

**Related Opportunity:**
- Personal learning environments (3)

## IV. IT for University Administration

Key partners in developing IT to support for University Administration includes the distributed business offices, the Business Office Leadership Team, the several central administrative functional units, the Security Office and many others.

### Objective 8.

Improve efficiency and services by dramatically streamlining Yale’s core administrative processes and compliance functions, reducing the complexity and effort associated with research and academic administration and departmental management.

Opportunity-14  **Life cycle research administration:** Continually improve systems to manage grants and related compliance activities throughout the research lifecycle, from proposal to publication. Deliver an enhanced user interface, intelligent business rules, and integration with related processes and systems, including integrating compliance unit activities with core grants management, and improving the capture and availability of regulated research data, such as data related to the care of animals used for research.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
Example Develop a “wizard” user interface on top of the core InfoEd application to facilitate the grant development process.

Example Implement an InfoEd model for IACUC.

Example Replace the eSirius tool with an improved system.

Opportunity-15 **Campus security systems:** Provide critical IT systems to support campus and community safety and security programs.

Example Link alarm stations to deliver integrated access control and situation management.

Example Assure comprehensive cell phone and emergency radio coverage throughout all appropriate campus spaces.

Opportunity-16 **Shared administrative services:** Leverage the methods and tools established for the IT Help Desk and HR Employee Service Center to further consolidate administrative activities into professionally managed shared services operations.

Example Implement improved service center capability and self-service tools to streamline purchase-to-pay processes, improving efficiency and quality by shifting work from business offices to highly trained shared services personnel.

Opportunity-17 **Business intelligence:** Use existing business intelligence tools and solutions to provide Yale leaders with analytics for strategic decision making, with a focus on improved financial reporting for faculty and unit leaders.

Example Build a faculty financial information tool, replacing the Account Holder Report, to provide timely, flexible data on grants and restricted funds, including an online self-service capability, delivering improved service and reduced work in the business offices.

Opportunity-18 **Budgeting and planning system:** Implement a highly functional budget and planning system to facilitate the budget development, submission, tracking and reforecasting processes. The system would dovetail with business intelligence efforts as a source and potential user interface for budget, forecast and actual.

Example Replace the OFA tool with Hyperion Planning.

Opportunity-19 **Document management:** Go paperless with an aggressive document management roll-out across the University to reduce waste and dramatically improve efficiency.

Example Deploy document management for the next wave of departments (e.g. OGC).

Example Digitize all the documentation needed for faculty appointments, promotions, and tenure. Implement an approval hierarchy and workflow to route these documents electronically to approvers, reviewers, and administrators. Hold committee meetings with only electronic copies. Throughout this initiative, identify and escalate opportunities for process standardization across Yale.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
Example Implement additional core document management capabilities across Yale to “go paperless.” Use workflow to route documents electronically to approvers, reviewers, and administrators. Replace some documents entirely with web forms that pre-populate core data and ask for “new” information. Ensure that processes are standardized as much as possible and that they all reference both the core data repository and the document repository, to eliminating redundant data entry. Make these documents accessible, to all who would have had appropriate access to the paper copies, so that no one needs to maintain a local copy and all have easy access to the authoritative document.

Opportunity–20 **Role and access management:** Standardize master data, roles, hierarchies and access permissions across administrative applications, including the master HR systems. Make it easier for administrators to obtain the right access to the systems and data they need.

Example Implement the Oracle roles management as a hub for 7 core hierarchies critical to managing transaction activity across business functions.

Example Standardize HR job definitions and hierarchies, implementing the change in the Oracle HR system and other source/downstream systems.

Opportunity–21 **Master Data Model:** Provide easier access to reliable data on students, faculty, staff, alumni, and financials. Improve service and reduce the confusion from competing or inaccurate data sources across the university. Consolidate and rationalize duplicate data and identify the “one right place” to obtain each piece of information, implementing governance so that the data stays accurate. Then make access easy with reporting tools that pull together the data in a simpler way.

Example Inventory the supplementary systems - even spreadsheets - that contain employee data. Identify whether this could be provided in the HR system. Facilitate easier reporting so that this data can be accessed directly in the HR system. Review the data in the HR system to ensure accuracy and correct the data that is not. Leverage automated comparisons of different data sources to facilitate analysis. Ensure the process is streamlined to facilitate local updates of the data so that it will remain accurate in the future.

Opportunity–22 **Space and event management:** Provide University-wide tools/processes to manage events and to track long-term assignments of Yale-owned and rented space and provide the “complete view” of space use at Yale across all its missions. Manage the daily and hourly scheduling of rooms in a more comprehensive and integrated way. Include all the space, reserved on a daily or hourly basis, for teaching, presentations, summer programs, meetings and special events.

Example Standardize on a single institutional room scheduling system and convert from the multiple systems and manual processes in use across the University. Integrate the system with existing course registration and course management systems. Ensure that all reservable spaces are available in the system (though some use may require additional approval).

**NOTE:** Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example Develop a University-wide system to track space, usage, and cost allocation. Clarify and standardize space cost allocation to assess charges appropriately and maximize appropriate recovery.

Example Deploy a University-wide event management system to improve administration of reunions and other events.

Related Opportunities:

- Next-generation student portal (5)
- Faculty Information Repository(8)
- Administrative support for the academic enterprise (9)
- Administrative support for instruction (10)
- Abundant communication & collaboration tools (IT2)
- Abundant data storage and access (IT3)
- IT compliance (IT6)
- Disaster recovery and business continuity (IT7)
- Local identity management (IT12)

V. IT for the Community beyond Yale

Key partners in developing IT to provide support for the community beyond Yale includes the Office of New Haven and State Affairs, the Office of Public Affairs, the Office of the Secretary and many others.

LOCAL OUTREACH

Objective 9.

Fully exploit information technology to improve access to Yale and its resources for the people and organizations of Greater New Haven.

<table>
<thead>
<tr>
<th>Opportunity-23</th>
<th><strong>New Haven economic development</strong>: Support Yale’s efforts to use technology transfer to contribute to the economic development of Greater New Haven.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity-24</td>
<td><strong>New Haven school reform</strong>: Support Yale’s efforts to improve neighborhoods and schools in Greater New Haven.</td>
</tr>
<tr>
<td></td>
<td>Example Provide a database to track student attendance and outcomes associated with attending Yale’s science oriented outreach programs with the New Haven school systems.</td>
</tr>
</tbody>
</table>

NATIONAL AND INTERNATIONAL OUTREACH

Objective 10.

Provide the technology foundation to support Yale’s internationalization efforts.

<table>
<thead>
<tr>
<th>Opportunity-25</th>
<th><strong>International access</strong>: Enhance and facilitate the international community’s experience of and interaction with Yale.</th>
</tr>
</thead>
</table>

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example Partner with international universities by providing them with ability to publish content to the Yale-renowned YaleGlobal Web site (or similar online magazine/news sources).

Example Provide better automatic language translation of online content for all of Yale’s websites.

Example Update and expand the Faculty Research Database to enhance its visibility and accessibility to scholars around the world.

Example Expand and improve the “Yale & the World” Web site.

Opportunity-26 **International students and scholars:** Streamline and improve administrative activities supporting international students and scholars.

Example Improve Yale’s ability to track international contacts and our interaction with them (who, when, what, where).

Example Provide better administrative support systems for international visitors/students/scholars. Find ways to reduce the administrative burdens associated with both faculty research abroad and international faculty visitors to Yale.

Example Improve the on-line housing information system for access from remote locations and multiple languages.

Opportunity-27 **Distance learning:** Increase support for distributed education environments that enable Yale faculty to effectively and efficiently conduct classes using distance technologies while easily integrating instructional resources and support for a variety of pedagogical approaches.

Example Modify existing systems such as Open Yale and Classes*V2 to allow for true integration which would enable immersive distance learning and blended (local and distance) environments.

Example Adapt Yale’s Course Management Systems to easily import, use, and export open educational resources from a variety of digital sources, including formal materials from other sources and informal student and instructor generated materials.

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**End of Mission Objectives**

**VI. Foundational and Shared IT**

In addition to mission-specific IT, Yale requires a set of common IT services, such as the underlying network infrastructure or communications tools such as email and internet access. This section of the Plan considers the foundational and shared IT requirements for Yale. Furthermore, Yale IT must be planned and managed according to industry best practices. The Objectives and Opportunities to build and sustain the IT organization and planning Yale needs are also included in this section.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
Key partners in developing Foundational and Shared IT include faculty, individually and through departments and committees; the schools, particularly via their local IT leads; academic centers; the Provost’s Office; the Library; the Office of Digital Assets and Infrastructure; and many others.

**FOUNDATIONAL IT INFRASTRUCTURE**

**IT Objective 1.** Meet essential academic and institutional mission activities with a highly available, reliable, cost-effective and secure set of core IT infrastructure services, provided in abundance across the University. Provide a firm funding foundation for these services.

**IT Opportunity-1**  **Abundant core IT:** Identify those IT services which are core to the academic and institutional missions and centrally provision them with high reliability and in abundance. Candidate services include: voice and data network, communications, calendaring, collaboration, storage, server and data hosting, backup, device management, asset management, core software and support. Eliminate cost, chargeback and provisioning barriers for these core services as much as possible: Yale faculty and students should be able to expect to use such services routinely and with ease.

- **Example**  Provision highly reliable, standard networking to the entire Yale campus with easy access to "plug-in" or connect wirelessly at standard core service network speeds (in 2009: 1Gb for wired; 802.11g for wireless). Network planning should assure the implementation of state of the art network technology in advance of need.

- **Example**  Provide connections to the commercial Internet and Internet 2 research networks with excellent reliability and capacity to meet Yale's operational and research needs.

- **Example**  Continue the upgrade of existing network infrastructure in specific buildings and develop transparent criteria for priority and schedule of deployment. Pay particular attention to the emerging parity between wireless and wired networks in terms of performance and reliability to determine how much resource should be devoted to wired rehabilitation.

- **Example**  Build on the current “FTE network services” allocation or similar model to fully fund core IT services by allocation rather than charge-back.

**IT Opportunity-2**  **Abundant communication and collaboration tools:** Provide faculty, staff and students secure, reliable, and cost effective communications and collaboration services to meet intra- and inter-institutional academic and business needs anywhere, at any time, on a standardized and wide variety of devices.

- **Example**  Adopt an emerging cloud-sourced collaboration tool suite as a standard / default collaboration tool set across Yale to achieve “network effect” benefits. Assure such a tool suite is compatible with peer institutions and meets relevant regulatory requirements.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
Example  Develop and maintain facilities capable of hosting high-quality, multi-media
distance conferencing.

Example  Standardize and provide campus-wide, scalable Web site hosting and common
web services.

Example  Replace the current messaging system with one that reliably and efficiently
meets Yale’s requirements.

**IT Opportunity-3  Abundant data storage and access:** Provide the Yale community and
authorized collaborators beyond Yale convenient, timely, and secure access to shared data
and information. Provide abundant standard data storage and management capabilities
for research data, teaching and learning resources, and scholarly life.

Example  Develop a data service for both teaching and learning materials and research.
The service should afford instructors abundant near- and long-term storage,
ease of use across a variety of courses, rigorous control of access to their
materials or open sharing, and simple import/export/reuse in Course
Management System/Learning Environments. It should provide researchers
with abundant near- and long-term storage, ease of use, and preservation
capabilities.

**IT Opportunity-4  Continuous infrastructure renewal:** Provide continuous
improvement to essential IT infrastructure.

Example  Develop and execute an institutional master plan for data center facilities that
will meet the needs of both general purpose and high performance computing
across all schools at Yale. Require use of shared data center facilities unless
specific, well-defined needs mandate a local solution. Consider commercial
data center services and Yale-owned facilities.

Example  Mandate the use of virtualized servers and storage except in cases where
virtualization will not meet the need.

Example  Continue the phasing out of Yale’s existing land-line telephone system in favor
of Internet Protocol-based systems accessible from workstations and
wired/wireless phones or, where possible, complete elimination of such
services.

Example  Continue the convergence of voice, video and traditional data services onto a
single, highly reliable backbone network capable of delivering a guaranteed
quality of service.

Example  Redesign the campus fiber-optic cabling plant to reduce single points of failure
and provide additional redundancy and disaster recovery options.

Example  Implement tools and processes to streamline the ordering and provisioning of
IT Infrastructure Services. Develop a standard service catalog.

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**NOTE:** Illustrations of potential projects are provided and formatted in blue text. They are meant to
provide concrete examples, but are not endorsements or recommendations.

March 24, 2010
IT Objective 2.
Protect the privacy, security, confidentiality and integrity of Yale’s assets and institutional information in compliance with an evolving regulatory environment.

IT Opportunity-5  **Risk assessment:** Conduct a risk assessment of Yale’s IT environments and develop and execute a program to lower risks.

Example  Fully deploy a secure managed workstation environment.

Example  Stop the use of sensitive data (e.g. SSNs) from all routine business use where possible.

Example  Deploy automation tools to secure the enterprise IT infrastructure and systems, e.g. intrusion detection, data loss prevention, workstation management software, url scanning, etc.

IT Opportunity-6  **IT compliance:** Ensure Yale is compliant with all relevant governmental regulations. Deploy solutions designed to address regulatory requirements during systems lifecycles.

Example  Implement and maintain an inventory to assist in identifying and tracking data systems with sensitive data and ensure ongoing auditing and monitoring of these systems.

IT Opportunity-7  **Disaster recovery and business continuity:** All core and major IT services should have a documented and regularly tested best practice disaster recovery and business continuity plan appropriate to the impact that failures would have on the Yale community.

Example  Update and expand Yale’s disaster recovery and business continuity plans to ensure they apply to all mission critical services and systems. Conduct a periodic real or table-top rehearsal of Yale’s disaster recovery and business continuity plans.

IT Opportunity-8  **Improved Access Control:** Provide additional security protection to high risk data repositories and systems.

Example  Develop and implement two-factor authentication for critical systems.

Example  Isolate difficult-to-secure IT systems (e.g., older devices such as MRI machines) using network security configurations and specialty firewalls.

IT Opportunity-9  **Security outreach:** Ensure the Yale community has the guidance it needs to safeguard its data.

Example  Adopt security policies and procedures.

Example  Provide best practice recommendations and guidelines for secure computing.

**NOTE:** Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
IT Objective 3.
Help Yale establish global leadership in environmental practice by providing sustainable information technology throughout the University.

IT Opportunity-10 **Energy efficiency:** Ensure Yale’s central and distributed IT infrastructure is configured and maintained to maximize energy efficiency.

Example
Maximize the use of virtualized server environments campus-wide.

Example
Incorporate an energy efficiency assessment into all IT procurement decisions.

Example
Take full advantage of power management capabilities in workstation management software (e.g., BigFix).

IT Opportunity-11 **Green computing outreach:** Educate and promote end-user “green” computing practices.

Example
Automate and maximize power management for faculty, staff and student computers.

IT Objective 4.
Create robust access control to systems and promote authorized collaboration by providing local and cross-institutional identity management.

IT Opportunity-12 **Local identity management:** Provide fine-grained identity management and role-based authorization to specific Yale systems and data.

Example
Provide the ability to restrict access to licensed library materials (e.g., online journals, Lexis/Nexis) to eligible classes of the Yale community based on their NetID login.

IT Opportunity-13 **Federated identity management:** Provide cross-institutional identity management and authentication.

Example
Implement Shibboleth infrastructure to support electronic access to library and other shared systems between and among key participating institutions such as the Ivies, Big 10, UC and other relevant campuses.

IT Objective 5.
Improve the Yale community’s effective use of technology by providing a rich, accessible set of outreach, education and self-help resources.

IT Opportunity-14 **End-user self-help:** Adopt self-help as Yale’s primary IT support and learning strategy, providing highly available state-of-the-art tools and resources for learning, expert assistance, and account and service management.

Example
Develop a knowledge management service that is Yale’s consolidated, primary resource for self-help for IT and other groups such as Finance, Human Resources, etc.

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example Replace classroom-based IT training with a range of Web-enabled multimedia IT training resources.

**EXPLORING EMERGING IT OPPORTUNITIES**

**IT Objective 6.**
Anticipate the promise of technology at Yale by maintaining an ongoing awareness of emerging trends and investing in active explorations.

**IT Opportunity-15 Monitor emerging technologies.** Track promising new technologies. Pilot emerging technologies to meet mission IT infrastructure needs. Adopt mature new technologies to improve or expand IT services to Yale.

Example Publish an annual assessment of the potential impact of new technologies on Yale’s missions and infrastructure; update existing roadmaps as required.

**IT Opportunity-16 Contribute to industry development such as open source.** Track, and maintain a presence in the development of critical industry and higher-ed initiatives such as open source efforts on CAS, uPortal, Sakai and Shibboleth.

Example Sakai is the technology underlying Yale’s course management system, Classes*V2; Yale has both contributed to and obtained software from the larger Sakai community to actively improve this system.

**IT PLANNING & MANAGEMENT**

**IT Objective 7.**
Maximize Yale’s investments in IT by developing transparent, consistent and effective processes to plan and manage institutional IT campus wide.

**IT Opportunity-17 Prioritize IT needs:** Develop prioritization methodologies for investments in IT initiatives and service improvements.

Example Conduct an annual IT project prioritization to enable Officers to select IT initiatives for funding.

**IT Opportunity-18 Oversight of IT:** Formalize and expand faculty, student, staff and leadership input in IT planning and services by obtaining community and school advice, ideas and feedback on needs, IT plans and the delivery of campus-wide IT services.

Example Convene IT-savvy academic leaders in an IT Advisory Committee to provide advice on strategic plans and annual management review of campus-wide IT services; Develop and actively maintain an outreach program to inform the Yale community on IT and to receive feedback.

Example Form an advisory committee including students and administrators from all Yale schools to improve student technology support. Leverage this committee to generate ideas, validate proposals, and participate in testing.

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
Example Increase the frequency of student survey from bi-annual to annual and use it as formal input to the IT planning process.

IT Opportunity-19 **IT funding:** Establish and coordinate University-wide IT budgeting and planning. Develop and apply a consistent IT funding and cost-allocation framework consistently across the University.

Example Establish a set of accounting controls to accurately, meaningfully and easily track IT expenditures and revenues University-wide; report campus-wide IT spend by function and unit for annual benchmarking and review; share school and unit IT budgets and plans within the annual budget cycle.

Example Create a unified administrative IT and business planning management structure campus-wide.

Example Establish standard IT recovery models such as allocation for widely-used services; cost sharing for shared services and charge-back for expensive and highly individualized services; apply those models consistently across the University for campus-wide and common IT services.

IT Opportunity-20 **University-wide coordination:** Coordinate services and activities of all IT groups at Yale.

Example Identify all IT groups and staff at Yale. Develop a representative outreach organization, conduct periodic campus-wide information sessions and workshops and obtain broad feedback on campus-wide IT plans and management.

Example Implement an approval process for all new IT systems, services and infrastructure to ensure that regulatory, security and economic efficiency considerations are taken fully into account.

IT Opportunity-21 **Reference architecture and infrastructure consolidation:** Define technology standards for Yale’s core applications, operating systems and hardware; limit institutional funding and support to those standards except to provide for mission-unique needs. Consolidate critical-mass IT infrastructure including major systems, servers, hosting, back-up and related common services.

Example Define a consistent set of core Web tools and technologies, adhere to them for all new Web-based development and examine the impact of applying them to Yale’s existing Web sites.

Example Consolidate all email services and technologies into a single University-wide email service; evaluate outsourced email and adopt if appropriate.

Example Identify opportunities to integrate applications to streamline processes, reduce redundant data entry, and ensure data integrity. Clean up data in core systems.

IT Opportunity-22 **Vendor partnerships:** Develop strategic software and hardware vendor partnerships to best meet Yale’s needs and leverage Yale’s investments.

NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.
Example  Establish partnership relationships with two desktop computing vendors to obtain best possible pricing, service and vendor support for Yale’s standard desktop needs.

**IT Objective 8.**

Use industry best practices to manage and deliver IT services with excellence.

**IT Opportunity-23 IT service management:** Adopt best IT management practices (e.g., ITIL) to deliver high quality, reliable and efficient IT services.

Example  All services undergo a formal "Service Introduction" process to establish the needed run books for operator control, appropriate availability monitoring with established target service level, identification of responsible parties for problem notification, etc.

Example  Set and reach a goal of 99.5% uptime for Yale's major networks (data, voice). Review performance to goal and the service standard annually.

**IT Opportunity-24 Application development and project management:** Establish a common methodology and process tools to support the delivery of projects and development of applications.

Example  Codify and adopt scalable methodologies appropriate to Yale to provide consistent project initiation and delivery and application development.

**IT Opportunity-25 Lifecycle planning and management:** Adopt a lifecycle management approach for all IT services and systems to ensure they are appropriately sourced, renewed and retired. All life-cycle plans should evaluate costs and benefits of all sourcing options. Outsourcing should be considered for commodity services. In those cases where Yale elects to provide a service in-house, prefer commercial or widely-accepted open source solutions.

Example  Conduct an annual review of all IT services and applications to assess their continued relevance, assure their appropriate maintenance level, review their funding and evaluate sourcing options. Consider accepting service limitations to achieve industry standard service levels with correspondingly lower costs to Yale.

Example  Identify a set of "pre-approved" outsource opportunities for common needs such as light weight server hosting.

Example  Build application replacement and upgrade costs into ongoing budget and staffing.

Example  Eliminate redundant systems, retiring older harder-to-support technology with options consistent with the enterprise reference architecture.

Example  Migrate the YSM Human Resources BMS system into Oracle.

**IT Opportunity-26 Continuous improvement:** Use metrics to define IT services and performance. Establish target service levels for reliability, performance and capacity for

*NOTE: Illustrations of potential projects are provided and formatted in blue text. They are meant to provide concrete examples, but are not endorsements or recommendations.*
core and other major IT services. Enhance metrics-based management using an industry standard framework such as Balanced Scorecard. Review performance against these metrics monthly.

Example: Develop a Balanced Scorecard 'report card' for Yale's core services with service quality targets, review it monthly and develop actions plans as needed to achieve service quality targets.

Example: Develop and publish an annual report detailing the costs, usage and satisfaction with IT services across the enterprise and the demand for new services and technologies.

End of Foundational and Shared IT Objectives
Conclusion

With 25 mission-related and 26 foundational IT opportunities, this Plan is vast and diverse. So too, is Yale University. At this very moment, 3,600 Yale faculty are educating over 8,000 students in subjects ranging from African American Studies to Applied Mathematics to Chinese to Physics to Renaissance Studies to Women’s Gender and Sexuality Studies and developing 3,500 professionals who will care for our souls and our health, lead our industries and our countries, create and shape our culture and sustain and improve our environment. Those same faculty are also conducting research in the arts, humanities, professions and social, physical and biomedical sciences with over $460M in extramural funds; writing books, plays, articles and monographs; editing journals, leading professional societies and serving on federal panels and presidential commissions; designing buildings, painting, sculpting, acting, composing and performing; and otherwise creating and disseminating knowledge of the highest caliber. Yale's faculty and students work and live side-by-side with Yale's administration, which exists to provide the services they require. Underlying the academic diversity at Yale is a plethora of services to build, renovate and maintain Yale’s buildings and grounds; curate and provide access to Yale’s astonishing collections in the arts and natural history; collect, organize, preserve, and provide access to Library resources; recruit, select and support the best students, fellows and faculty; house students and visitors; ensure Yale faculty and staff have a competitive and effective set of benefits; hire the most qualified staff; feed people with a diverse set of appetites and dietary restrictions; pay bills and people; procure goods and services; ensure Yale is in compliance with an increasingly complex array of laws and statutes; ensure the safety and the health of the Yale community; manage Yale’s funds and investments; support grants and grant applications; connect Yale’s many alumni and donors with the University; plan and manage academic events; and train athletes and support general fitness.

With 25 mission-related and 26 foundational IT opportunities, this Plan is vast and diverse. So too, are Yale’s ambitions, which encompass 11 visionary goals that span sustaining the excellence of Yale’s foundation, Yale College, and global leadership in academia and environmental research, education, and practice.

With such diverse missions, operations, activities and aspirations, Yale IT needs to be comprehensive and expansive. It also needs to be successful. The successful execution of this Plan will require a more coordinated and focused planning and service delivery, such as that outlined in the IT Objectives and the IT Planning Process in Appendix B.

In particular, two elements will most assure successful implementation of this IT Plan. The first is executing against a strategic portfolio of projects and foundational technologies, rather than an unrelated collection of projects. The portfolio approach will enable Yale to leverage foundational technologies to meet a diversity of needs, and will co-jion related outcomes in a way that delivers a deeper and faster impact. The second element for success is a recognition that even small yearly changes will accumulate to major change over time, providing those changes are coordinated to advance a common strategy.

This IT Strategic Plan and the accompanying annual planning process intend to provide the framework to deliver the IT support essential to Yale’s continued success.
Appendices

Appendix A: IT Strategic Planning Charge

To: Philip Long, CIO  
Date: October 1, 2009  
From: Peter Salovey, Provost and Shauna King, VP for Finance and Business Operations

By any measure, Yale’s Information Technology resources and services have a significant daily impact on Yale’s students, faculty, and staff. From the automation of basic business and communications processes, to the daily conduct of student life and work, from online course management and teaching support through continuing expansion of high performance computing for research; from continuous growth in basic network capabilities to campus-wide, high-security wireless networking infrastructure, IT is increasingly involved in delivering the basic services and supporting the innovation of Yale. In the past two decades Yale has made substantial strides in the use of our IT resources to meet mission needs and to run the business of Yale. Critical steps such as volume purchasing of hardware and software illustrate our coincident attention to reduce expense while providing essential tools to faculty, staff, and students.

Each year brings with it advances in IT and new expectations for the IT capabilities essential to a leading university. Considering these issues and the difficult financial conditions we face, it is time to take a formal strategic view of the impact of information technology on Yale and the opportunities investment in IT may afford Yale as it drives its mission activities. Such a plan must consider the necessities of meeting current IT needs and also the potential opportunities for Yale that are likely to develop over the next five years.

Questions to be addressed include, for example: What IT changes are occurring now that will or could affect how faculty teach or how students learn? What IT methods are emerging that Yale will adopt as critical to its future research endeavors? What new IT-based teaching or research methods may develop in the next few years? The IT strategic plan should develop a vision for IT at Yale and actions to achieve that vision based on the merits and potential of technology. At the same time, the plan should be attentive to efficiencies. It should anticipate industry developments and institutional approaches which will provide the most effective IT capabilities to meet Yale’s mission.

This plan must consider the totality of IT use at Yale, building on the several existing IT plans such as the business systems planning accomplished within the YaleNext project. Focused planning is still needed on academic activities and all these pieces must then be knitted into a unified plan across the full breadth of IT needs defined by our academic, clinical practice and administrative needs and opportunities including essential IT infrastructure.

New information technology is often an enabler to new University mission capabilities, such as advanced research, teaching or clinical treatments. As such, individuals and units have a high interest in rapid exploration and adoption of emerging technologies. At the same time, a set of technologies are core to the successful and efficient operation of Yale. Our IT Strategic Plan must support continued innovation in Yale’s mission activities while also providing the most effective and efficient core technologies for the ongoing operation of the University.

In considering the breadth of institutional needs, and recognizing the current financial challenges that Yale faces, the IT Strategic Plan should seek to fully leverage Yale’s institutional investment in IT. Where cost, regulatory or other institutional benefits are available, IT at Yale must be planned from a University-level view. Over the years units across Yale have appropriately developed independent systems to meet critical needs which could not be met by central units because of timing, capacity, cost or other issues and that will
continue to be true for various mission unique and specialty systems. In the future, to ensure that Yale maximizes the collective leverage of Yale’s total investment in IT in a way that is efficient, effective and financially responsible, core Yale IT services should be provided across all schools and departments by Information Technology Services (ITS). Where Yale requires completely new IT systems, services or infrastructure, discussions should first be held with the University Chief Information Officer to ensure that regulatory, security and economic efficiency considerations are taken fully into account. To meet this goal, it will also be essential both that Yale’s central IT services achieve a high level of reliability, capability, capacity and interoperability, and that Yale’s IT services are responsive to the needs of the individual schools and departments in a way that is consistent with meeting mission unique needs.

The vision and details of an IT Strategic Plan will establish a path of action to meet these goals. It should be a multi-year plan that will broadly engage the Yale community and our key partners to help sustain Yale’s world class reputation in scholarship, research, teaching and clinical practice. The plan should attempt to forecast and account for the impact of the new waves of technology innovation in education and research based on the best predictions and analysis that can be developed. If we can develop a solid strategic plan then its rigorous implementation will ensure that the University spends its money wisely to provide faculty, clinicians, students and staff the IT services and tools they need over the coming years. The plan will also ensure transparency to the community about where Yale’s priorities lie and how our decision-making is framed.

You will be responsible for the development of the new IT Strategic Plan. Please develop a structure and draft and then work with your IT colleagues and advisors from across the community to refine that draft into a plan for discussion with the Officers. We would like to receive the discussion draft of this plan on December 14th. During the second semester, we ask that you engage broad community review, including deans and directors, faculty, students and other interested parties, to deliver a completed plan to the Officers on May 1, 2010.

Adopted October 1, 2009
Appendix B: The IT Planning Process

The annual IT Planning Process is a three-step companion process to the IT Strategic Plan that develops the specific projects Yale will undertake each year to advance its IT strategic goals and address emergent needs. The following diagram illustrates the steps in this process:

**Step 1. Create Leading Scenario** (December-January) identifies the range of projects for annual consideration from four sources: 1) Strategic goals, including foundational technologies, drawn from the IT Strategic Plan, 2) relevant and mature emerging technologies, 3) newly identified needs that routinely develop and 4) the multiyear ongoing project roadmap. Newly identified needs include new compliance needs; life-cycle needs to retire, renew or upgrade specific applications; critical enhancements to maintain existing systems and IT projects from distributed areas throughout the University. Project proposals are collected from newly identified goals and needs. Ongoing Roadmap Projects may also be re-scoped during this step to reflect Yale’s changing needs or relevant connections with the newly identified projects.

Potential themes are identified across the new proposals and ongoing projects to cluster and consolidate them. Projects are assessed and prioritized by benefit, difficulty and cost to identify the highest priorities for the coming year.

A draft Leading Scenario is identified that may reflect varying strategies, including (a) concentrate within a specific mission, such as teaching and learning, (b) optimize investment in a foundational technology across otherwise unrelated goals and needs, or (c) balance work across the greatest possible variety of constituent needs. The Scenario creation step is considered complete when the Officers confirm the **Leading Scenario**.

**Step 2. Optimize Portfolio** (March-May) uses the Leading Scenario to develop a portfolio for execution in the coming fiscal year. Sponsors’ funding levels are confirmed, as are the capacity of both the technical and functional (i.e., mission or business area) staff. The impact of foundational technologies required to execute the portfolio of projects is also considered. Projects in the scenario are adjusted based on the newly identified needs.

Developing Draft – IT Strategic Plan
confirmed funding and staffing levels and technical requirements. The projects are then sequenced into an optimized portfolio based on commonalities among projects, dependencies that would affect sequencing, and resource, scheduling and other constraints. The Portfolio Optimization step is considered complete when the Provost and the Vice President for Finance and Business Operations confirm the **Optimized Portfolio** with its cost estimate, schedule and deliverables.

**Step 3. Initiate Portfolio** (July) launches projects and segues to management of the new **Ongoing Roadmap**. A charter is developed for each initially sequenced project in the portfolio. Project teams launch the “Plan and Analyse” phase of chartered projects and ongoing management of the roadmap commences. The annual IT Planning Process is now complete and attention moves to project execution. The Portfolio will remain subject to changes due to factors that include adjustments to project delivery, additional critical incoming project proposals and changes in resource, funding or other constraints.
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