

Carnegie Mellon University
Computing Services

2011 Strategic Plan

Contents

Introduction	5
Carnegie Mellon and Its Context	5
Since 2006	6
An Ever-Changing Landscape	7
The 2011 Strategic Plan	7
Vision, Mission and Values and Guiding Principles.....	9
Carnegie Mellon Pillar 1: Research and Artistic Creation	11
Supporting Strategies.....	11
Proposed Initiatives for Pillar 1:.....	12
Carnegie Mellon Pillar 2: Education & Student Life.....	13
Supporting Strategies.....	13
Proposed Initiatives for Pillar 2:.....	13
Carnegie Mellon Pillar 3: Regional Impact	15
Supporting Strategies.....	15
Proposed Initiatives for Pillar 3:.....	15
Carnegie Mellon Pillar 4: Globalization and International Initiatives	16
Supporting Strategies.....	16
Proposed Initiatives for Pillar 4:.....	17
Carnegie Mellon Pillar 5: Carnegie Mellon Community Success	18
Supporting Strategies.....	18
Proposed Initiatives for Pillar 5:.....	18
Carnegie Mellon Pillar 6: Finance & Infrastructure	19
Supporting Strategies.....	19
Proposed Initiatives for Pillar 6:.....	20
Strategic Initiatives Supporting Division Efforts.....	21
Architecture: Supporting Strategies	22
Planning and Project Management: Supporting Strategies.....	23
Robust Human Resources and Organization Development: Supporting Strategies.....	25
Challenges Facing Computing Services	27

Introduction

Carnegie Mellon and Its Context

On June 24, 2011, United States President Barack Obama visited Carnegie Mellon University (CMU) for the third time since he'd become President in January 2009. He captured the essence of the university in his comments:

"Carnegie Mellon is a great example of what it means to move forward. At its founding, no one would have imagined that a trade school for the sons and daughters of steelworkers would one day become ... one of the region's largest employers and a global research university."

"And yet, innovations led by your professors and your students have created more than 300 companies and 9,000 jobs over the past 15 years..."

"But more important than the ideas that you've incubated are what those ideas have become: They've become products made right here in America and, in many cases, sold all over the world. And that's in our blood. That's who we are. We are inventors, and we are makers, and we are doers. (Yours is) the kind of adventurous, pioneering spirit that we need right now."

By some standard measures, Carnegie Mellon might not be expected to compete in the league of our peer institutions. Yet we do compete—and very well. Our high rankings on numerous competitive lists belie the fact that CMU, as a national research university, came into existence in the twentieth century—at least 100 years later than most of its peers. CMU continues to rank at the top of any list representing innovation and discovery even though the university's level of endowment is substantially smaller than many of its peers.

The notion of “disproportional contribution” is central to this success across the university, a success that is promoted through aggressively decentralized university governance in a culture of pervasive and opportunistic interdisciplinary collaboration – an approach based on seeking opportunity much more than avoiding consequence. The role of any central administrative division like Computing Services therefore is to support the university's mission without getting in the way of this creativity and discovery. We embrace this CMU spirit of collaboration and intelligent risk-taking without losing sight of the fact that our primary focus is to support innovation by *faculty and students*. This support requires close collaboration with other central units and units within the

schools themselves. By working effectively within this ecosystem, Computing Services seeks to continue supporting CMU's level of excellence.

Since 2006

In the introduction to Carnegie Mellon's 2008 Strategic Plan, Provost Mark Kamlet wrote:

"In such a decentralized and open university, and in an era of great scientific discovery and cultural dynamism, the function of a strategic plan cannot be to offer restrictive prescriptions or strict timelines for progress. Its purpose is rather to identify areas of focus, to prime us to be alert to ways to build on our strengths, and to prepare ourselves to respond swiftly and skillfully to emerging opportunities."

This was the spirit in which we developed and used the Computing Services Strategic Plan of 2006 and in which we have developed and anticipate using the plan of 2011.

The context in which Computing Services does its work changed dramatically in 2006 when the university began a series of significant investments in the division's work to make Carnegie Mellon's information technology (IT) infrastructure more reliable, flexible, and secure. Achieving these goals has required major redesign and implementation of the underlying systems and networking environment, planning and beginning replacement of enterprise applications (Student Information System and Human Capital Management/Payroll), and upgrading the Oracle Financials System.

Our three broad areas of attention in 2006 persist today, albeit in new forms:

Working as a new division in a new setting (including, but not limited to the globalization of the university): Since 2006, Computing Services has had the opportunity to strengthen its information technology (IT) support of the university in Pittsburgh, Qatar, and other sites. We are now able to advise new international programs in their planning of IT services and continue to prepare for the addition of new international programs.

Creating a secure computing environment: Computing Services' fledgling Information Security Office (ISO) quickly developed policies, processes, and tools that serve the university well. As a result, the ISO has gained a high degree of credibility and many successes in operation in its first years. Beyond evolving the ISO itself, Computing Services

made strides in applying security principles across all of its operating departments, manifest in the success of the Secure and Integrated Infrastructure (SII) Program. Looking ahead, we will continue to frame security as a pervasive function in the division's work.

Evolving management strategies and organization development:

Computing Services' commitment to architecture, planning, project management, performance management and professional development has brought the organization to a new level of maturity. We are ready to deliver the workforce of 2011-2016 and continue to prepare as we consider the skill-sets needed to support the university in the "age of the cloud," that is, in an era in which IT services can be obtained from multiple sources both on and beyond campus.

An Ever-Changing Landscape

There are always new questions to be addressed in a profession in which the technology changes rapidly and the related services, policies, and social norms are always trying to catch up:

- What services should a central IT service organization provide in a time when many undergraduates arrive on campus with multiple mobile devices that they use constantly throughout the day? In an environment where "above campus" ("cloud") services are increasingly an option, how can the university balance support, security and compliance requirements with end-users' expectations of ubiquitous, persistent, and open access?
- Are there unique competencies of a central IT service organization that will allow it to add value to the core university missions of research, education, and regional development?
- How can a central IT service organization contribute to the university's "going green"?

All such questions must be addressed in the context of a "new normal" economic environment where effectiveness, efficiency in cost and delivery, and agility are all essential measures for every service or initiative. This strategic plan will lay the groundwork to address these and other issues over the next five years.

The 2011 Strategic Plan

In 2006, we compared the work in front of us to the legend of the 'Ship of Theseus' and, indeed, the work on infrastructure, processes, services, and organization done over the last five years has transformed things to the

degree that we can ask the same question that Plutarch did about the original ship: when so much change has occurred *in situ*, is it really the same entity at the end-point that it was at the beginning?

The ship wherein Theseus and the youth of Athens returned [from Crete] had thirty oars, and was preserved by the Athenians down even to the time of Demetrius Phalereus, for they took away the old planks as they decayed, putting in new and stronger timber in their place, insomuch that this ship became a standing example among the philosophers, for the logical question of things that grow; one side holding that the ship remained the same, and the other contending that it was not the same.¹

Our task for this strategic plan is to characterize our own continuing journey, how we are changing and how we are staying the same. Instead of pointing at boards to be replaced or sails to be changed, we look to the seas we expect to navigate, the opportunities and challenges in the adventures ahead, and the stresses on ship and crew as we continue to pursue our central role supporting Carnegie Mellon.

We have therefore chosen to describe our strategies according to and as they align with the six pillars of the Carnegie Mellon Strategic plan of 2008. This has the positive effect of showing direct relevance of our efforts to priorities of the Institution and measures of value can often flow directly to that work. On the other hand, this style of plan brings its own challenges. Specifically, the priorities of our role do not spread evenly across the pillars and since the extent of our engagement in the pillars varies, the length of the sections devoted to each pillar varies as well.

There are several strategic issues specific to operating our technical organization that we consider vitally important to achieving the proposed strategic initiatives. To address these, we include a section entitled *Strategic Goals Supporting Division Efforts* (page 21).

Strategic plans are also grounded in the context of where you are and are motivated by the inspiration of where you need to be. We therefore include the last section, *Challenges Facing Computing Services* (page 27), to characterize some of the most significant structural, cultural, and environmental challenges that we expect to face over the next five years.

The next five years promise to be a time of opportunity, challenge, change, discovery, and innovation. We look forward to the adventure.

¹ Plutarch. "Theseus". The Internet Classics Archive. <http://classics.mit.edu/Plutarch/theseus.html>. Retrieved 2011-07-07.

“Carnegie Mellon will meet the changing needs of society by building on its traditions of innovation, problem solving, and interdisciplinarity.”

“To create and disseminate knowledge and art through research and creative inquiry, teaching, and learning, and to transfer our intellectual and artistic product to enhance society in meaningful and sustainable ways.

To serve our students by teaching them problem solving, leadership and teamwork skills, and the value of a commitment to quality, ethical behavior, and respect for others.

To achieve these ends by pursuing the advantages of a diverse and relatively small university community, open to the exchange of ideas, where discovery, creativity, and personal and professional development can flourish.”

Vision

Computing Services will meet the changing needs of Carnegie Mellon by combining the best of industry-standard information technology (IT) services, innovative solutions and best practices.

Mission

Computing Services enables and advances an information technology (IT) environment that supports the research and education missions and the associated administrative functions of Carnegie Mellon.

Values

Outstanding Services, as exemplified by our stewardship in providing access to an information technology (IT) environment that anticipates and meets the needs of the university community while being cost effective, highly available, scalable to an enterprise level, accessible, user-friendly and secure.

A Welcoming Workplace, as exemplified by our quest to hire, retain, and develop the best, diverse staff for Computing Services, create an environment where they have and can create challenging and rewarding work, and provide tools and strategies for career-long learning and adaptability.

Collaboration, as exemplified by our respect for and partnerships with educators, researchers, administrators, and IT service providers across and beyond the university in supporting the complex IT and business ecosystem of a global enterprise.

Initiative and Innovation, as exemplified by our focus on problem solving, openness to new ideas, and commitment to providing high quality, cost-effective services to the university.

Environmental and Social Responsibility, as exemplified by our pursuit of green practices in IT operations and our support for volunteerism on and beyond campus.

Guiding Principles

We provide services that we believe will have the greatest impact on Carnegie Mellon's mission. In some cases, these services target the entire University—in other cases a smaller, more select group. Because the University's mission is broadly designed to "enhance society in meaningful and sustainable ways," some of our work benefits those outside of the Carnegie Mellon community.

We plan our work collaboratively with our colleagues throughout the University. To decide which services to offer, we seek to gauge the benefit to education, research, and administration by getting input from our colleagues who engage in those efforts. We recognize that we are constrained, as all IT organizations are, by the amount of time that we have and the number of things that we can do well.

We understand the services that we are best positioned to offer. We analyze the cost and benefit—both short and long term—of delivering a service ourselves *versus* taking advantage of the increasing number of alternative providers who may offer similar services. We decommission services as they have less of an impact over time, the resource requirements change, or others can better meet our constituents' needs.

We keep the commitments we make to our customers. This requires that we focus on planning, project and portfolio management, and effective management of services and operations so that we can deliver results on-time and within our budget. We recognize the need to be agile enough to respond to new opportunities and changing priorities while at the same time maintaining an efficient and effective organization. When balancing these needs requires revising our priorities, we are honest and forthright with both our customers and our staff about why the priorities have changed.

We are a learning organization. When our work leads us to innovate, we share those innovations with others in keeping with the mission of the University. When we make a mistake, we acknowledge that and use it as a learning experience so that our culture continues to support intelligent risk-taking.

“Through foundational research, artistic creation, and creative inquiry, Carnegie Mellon will make significant contributions to society and enhance human welfare by identifying and solving real-world problems.”

Carnegie Mellon Pillar 1: Research and Artistic Creation

Computing Services will contribute directly to the University’s mission in research and artistic creation by providing infrastructure options and assistance that researchers can leverage directly in their routine computing, storage, security, and research administration activities. We can also leverage specific opportunities to bring our environments and expertise to direct collaborations with researchers as they may find value, especially in the areas of security compliance. We will lend our expertise, lessons learned, and associations to advance our professional fields and expand the impact of Carnegie Mellon’s outreach.

Supporting Strategies

1. Deliver tools to facilitate and enhance artistic creation and research.

Computing Services will create and enhance relationships with campus providers to discover and deliver generic and specialized services that enhance artistic creation and research.

2. Facilitate the research business process. Computing Services will support the business processes of applying for and managing sponsored projects.

3. Achieve economies of scale for secure research requirements.

Computing Services will provide services to facilitate the construction, acquisition and/or management of compliant computing environments for secure research needs. Computing Services will leverage research results to improve operational practice and collaborate directly where there is value to researchers in interacting with our operations or operational data.

4. Provide Support for developing Carnegie Mellon spin-offs.

Computing Services will offer general IT consulting services as well as cost-effective cloud-enabled assistance for developing Carnegie Mellon spin-offs where there is benefit to the institution.

Proposed Initiatives for Pillar 1:

- 1.** Provide assistance and coordination for acquiring, connecting, and managing computing environments for research activities. These may be engaged through collaboration with researcher resources, departmental resources, direct provisioning from Computing Services or third-party cloud solutions.
- 2.** Provide assistance to the Office of Sponsored Programs by providing application support services for the workflow of acquiring and managing sponsored projects.
- 3.** Stand ready to assist with increasing security and compliance demands on sponsored research. We already help with compliance and Institutional Review Board (IRB) process requirements, including security reviews for export control and practices associated with datasets subject to special security requirements, for example, central repositories of the National Institute of Health. We will also help with new requirements for data management plans and security assessment for research environments, including access to independent third party assessors as necessary.
- 4.** Continue to use the Open Learning Initiative (OLI)—a research effort at Carnegie Mellon—to deliver Computing at Carnegie Mellon (C@CM) and will look for other opportunities to effectively use and benefit from ongoing research and the technology.
- 5.** Computing Services may participate as a research or development partner, early adopter, and/or customer. In the latter case, we may assist business development as a reference or case study. Key efforts across these areas include: the CyDAT (Cyber Center for Diagnostics, Analytics, and Telemetry) and EDDY (End-to-End Diagnostic Discovery) project, and several security efforts, including Wombat Security Technologies' PhishGuru and PhishPatrol products.

“Students will contribute to, and thrive in, the ever-changing global community as socially responsible leaders and architects of change.”

Carnegie Mellon Pillar 2: Education & Student Life

Computing Services will collaborate with departments and global partners to provide an effective, accessible and engaging information technology environment that complements and enhances educational activities and the positive social experience for undergraduate students during their time at Carnegie Mellon. We will collaborate with campus leadership, departments and global partners to provide Carnegie Mellon students with consistent and flexible access to IT services.

Supporting Strategies

- 1. Provide Carnegie Mellon students with reliable and flexible access to IT services to enhance education and the global Carnegie Mellon Community.** Computing Services will partner to discover and deliver physical and virtual environments for educational interaction and student collaboration in a global environment.
- 2. Deliver educational curricula for the efficient use of technology-based tools and sources of information.** Computing Services will continue to provide documentation and training to support educational and extra-curricular activities at Carnegie Mellon.

Proposed Initiatives for Pillar 2:

1. Develop technology-enhanced collaborative spaces in partnership with the offices of the Vice Provost for Education, University Libraries and other academic services. These spaces could be physical or virtual to accommodate the diversity of student needs. This includes spaces for team-based global collaboration and communication (e.g. spaces equipped with videoconferencing). In some cases we will develop collaborative funding models for these spaces.
2. Provide reliable and flexible storage and access services for academic information (for text, complex data formats, and rich media).
3. Provide media technology support to student organizations, including upgrading the University Center’s media technologies to support student activities.
4. Enhance outdoor access to wireless networks and explore improving access for personal, mobile devices to IT services. Elicit ongoing feedback from students and metrics for trending and service enhancement.

5. Provide educational programs to help prepare students for effective and efficient use of technology-based tools and sources of information, including safe and responsible decisions for emerging commodity services and tools in support of academic work. Continue to evolve the C@CM (Computing at Carnegie Mellon) course to teach students essential skills in the areas of computer security, effective and responsible computing, information literacy, and the tools, technologies and services specific to the university.

“Carnegie Mellon will contribute significantly to economic growth and improved quality of life in Western Pennsylvania in areas that leverage and complement our core research and educational activities.”

Carnegie Mellon Pillar 3: Regional Impact

Computing Services participates in a number of local and regional initiatives. Our goal is to seek opportunities to contribute to regional development in areas consistent with our core expertise: developing high-quality information technology infrastructure and services. These opportunities may be regional technology initiatives in which Computing Services engages directly, or University initiatives in which we contribute in a leadership or supporting role.

Supporting Strategies

1. Lend our expertise to technology initiatives with regional impact.

Computing Services will lend its experience and resources—both directly and in support of broader Carnegie Mellon programs and research initiatives—to local and regional technology initiatives that have the potential to support economic growth and quality of life in Western Pennsylvania.

2. Support the university in its local outreach activities. Computing Services will actively participate in Carnegie Mellon’s institutional initiatives that will have a positive impact on our local communities.

Proposed Initiatives for Pillar 3:

1. Computing Services has been and will continue to be a lead participant in the development of KINBER, the Keystone Initiative for Network-Based Education and Research, and their PennREN network, which aims to improve middle-mile connectivity between major anchor institutions and establish a platform for the delivery of research and education to un-served and underserved areas in our region and across the state.
2. Computing Services regularly reserves use of our computing clusters during off-peak times for a variety of lifelong learning and pre-college programs that have a direct impact on local citizens.
3. Computing Services will continue to participate in collaboration efforts such as the CMU Community Connections Committee, which works to leverage Carnegie Mellon’s research and learning opportunities to contribute to our local community. We assist by providing supporting services, consulting, advisement, and engagement with University colleagues to enhance and further their contributions and services to the community.

“We will strengthen our leadership position and will build new models for global knowledge creation, education, and citizenship.”

Carnegie Mellon Pillar 4: Globalization and International Initiatives

Carnegie Mellon has a physical presence in a dozen countries and international programs and partnerships in many others. These global programs are driven by talented faculty and creative departments rather than emanating from a centralized planning process. In concert with this model, Computing Services’ will foster and facilitate collaboration among academic and administrative units engaged in international programs by providing a computing and communications context that enables global programs to succeed while being flexible to support local adaptations.

Supporting Strategies

- 1. Encourage the exchange of ideas on information technology services, solutions and best practices among the various international programs.** Each Carnegie Mellon initiative develops its own information technology service and support plan; sometimes with input from Computing Services, sometimes not. Computing Services will work with disparate programs to capture and share best practices while identifying opportunities to solve common problems.
- 2. Consider international use during the planning process for all new and revised services.** Computing Services will incorporate requirements from key stakeholders in non-US locations as part of the planning process for new infrastructure systems and user services. Testing and acceptance plans will also take into account international constituents.
- 3. Continue to explore, deploy and encourage services and technologies that facilitate communication and collaboration amongst Carnegie Mellon faculty, staff, and students and their distant partners in research and education.** Communication—always an important component in a learning organization—is even more critical when the individuals are widely dispersed. Computing Services will continue to provide and promote services that make it easier for Carnegie Mellon faculty, staff, and students to communicate and collaborate.
- 4. Pioneer programs to develop staff as leaders for a global University.** Computing Services will create meaningful leadership experiences that enable our staff to learn about the challenges and rewards of participating in global initiatives.

Proposed Initiatives for Pillar 4:

1. Organize an international IT forum for information sharing among participants in existing and potential global campuses providing an opportunity to collaborate among international colleagues and document shareable practice or lessons learned from building international programs. These would likely address facilities and programs, plus cultural and legal/regulatory commonalities, differences, and opportunities.
2. Augment the current trajectory of improving processes and services in Computing Services to incorporate international campus considerations, for example, in the exploration of a global Help Desk strategy. Support service management efforts within the division and participate in monitoring and metrics activities to quantify service expectations for global campuses. Expand efforts to collaborate across the Pittsburgh campus and globally to leverage this work.
3. Continue the International Work Assignment program which enables staff to work at another campus for up to two months, and include global awareness and international management as part of the professional development program for managers.
4. Provide Computing Services' best practices and lessons learned to other departments who are trying to manage globally-dispersed teams. As part of our interaction with these departments, learn from their best practices and incorporate them into our work processes.

“To create a viable, supportive, rewarding, and collaborative environment that enables our faculty, students, alumni, and staff to advance the university’s vision and mission.”

Carnegie Mellon Pillar 5: Carnegie Mellon Community Success

With the rise of social computing, the concept of community and collaboration is defined more by the participating groups and individuals than a hierarchical organization². As an enabler of education and research, Computing Services’ role may be as much to remove obstacles to collaboration as it is to provide those services directly. Computing Services, with our institutional partners, also has the responsibility to determine when more hierarchical organizational decisions are appropriate for IT-related services.

Supporting Strategies

- 1. Enhance our service environments to account for the relevant technologies of social networking.** Federated access will enable the CMU global community to collaborate with greater ease and effectiveness, extending a fabric of trust through research computing, social networking, mobility and enterprise services. Federated identity services are an emerging infrastructure that is changing the way we develop, deploy and expand services beyond the traditional boundaries of the academy.
- 2. Increase our competencies to assist the university in IT service decision making.** Given the reality of an ever-changing environment — today, cloud computing and social networking: tomorrow, who knows? — we will strengthen our strategic internal partnerships to discern when university risk necessitates traditional top-down IT decision-making or when the newer grass roots environments are appropriate.

Proposed Initiatives for Pillar 5:

1. Extend our Identity Services efforts to enable enterprise applications to provide access for social networking accounts in accordance with policies concerning individuals’ access rights.
2. Build staff skills and expertise in techniques and process of business analysis and contract management for and vendor agreements related to cloud services.

² Howard, Chris. “2010 Executive Planning Guide: The Difficult Path to Recovery” Burton Group, 2010

“We will invest in cost-effective information technology systems, including those that support technology enhanced learning and facilitate integration of research and practice.”

Carnegie Mellon Pillar 6: Finance & Infrastructure

In an era of flat or highly selective budget growth, we will strive to manage our IT resources with cost-effectiveness, predictability and transparency as we continue to ensure a reliable, flexible, and secure IT environment. Having invested significant one-time funding in a series of infrastructure upgrades, we have created a platform that will provide sustainable, cost-effective models for infrastructure services that include regular updates and technology refresh.

Supporting Strategies

- 1. Evolve our applications and infrastructure development environments to leverage common industry practice even as we expand our dependent services into the cloud.** Adopting practices and technologies for software and hardware abstraction that will enable incremental improvements to our IT infrastructure and enterprise applications and help us avoid the large, disruptive, and expensive upgrade projects of the past.
- 2. Integrate focused improvement activities (Security and Disaster Recovery (DR)) into the routine project and service management activities of the Division.** We have established improved practice for operational security through our Secure Integrated Infrastructure (SII) initiative. We must generalize these targeted efforts and make them part of our standard operating procedure for new and renewed services.
- 3. Leverage our central IT position to reduce costs and add value.** Computing Services will leverage its unique perspective to look for areas of synergy across the work of our partners. We will reduce overall IT costs for the university by recognizing and fostering opportunities to take advantage of economies of scale.
- 4. Focus on long-term predictability for budget and functional capabilities.** Computing Services will expand and develop the current models of infrastructure and application support to provide predictable replacement and enhancement cycles for core applications and infrastructure. We will engage financial planning to facilitate new infrastructure and will adapt our tactical planning processes to allow for strategic shifts created by these new approaches.

Proposed Initiatives for Pillar 6:

1. Continue to invest in hardware abstraction and standardized virtual software systems – including application, desktop, server and storage virtualization, to accommodate local and outsourced cloud platforms as the capability matures.
2. Use Service Oriented Architecture (SOA) as appropriate to modularize applications and infrastructure services, allowing for incremental changes to systems and services while enabling more opportunities for sharing common methods among different systems.
3. Incorporate techniques developed through specific focused efforts (e.g., Disaster Recovery and security considerations) into our standard project and service management practices. Support campus departments as they embark on business continuity initiatives.
4. Pursue opportunities for off-site data center space that might expand opportunities for broader leverage of machine room spaces on campus for research, education, and administrative functions.
5. Develop strategies for decision-making and implementation to capitalize on new sourcing opportunities. As Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) offerings increase, the university will develop decision-making processes that account for numerous technology, service, and compliance issues. New “public cloud” and “private cloud” offerings will require an informed understanding of the consequences of our choices for the institution, end-users and information technology staff
6. Introduce a service management perspective to the task of documenting our day-to-day support activities. This will lead us toward more standard practices of justification and priority for ongoing operational work to complement the documentation we require for ongoing project work. Consideration of reasonable and valuable service metrics will be a critical aspect of this strategy.
7. Our move to virtualization has allowed Computing Services to contribute to the University's green initiatives. Our growth calculations in 2006 (date needs to be checked) indicated that our machine room utilization would have us saturating our space, cooling and power by 2015. Our aggressive investment in virtualization has radically slowed these growth curves. In essence we are doing more with significantly less.

Strategic Initiatives Supporting Division Efforts

Beyond the strategies motivated directly by the pillars of the enterprise, there are three integrative areas in which Computing Services will continue to invest:

- Architectural design and consultation to provide cross-division, cross-enterprise, and cross-industry perspective in support of the infrastructure and applications efforts of the division;
- Planning and project management to optimize resource allocation;
- Robust human resources and organization development to fulfill the university's requirements while supporting individual staff.

We discuss these activities here to draw attention to the vital role that each play in binding the other activities together and enabling the most efficient operation. The specific techniques, processes and tools engaged in each of these efforts will necessarily change to match the ever-changing world of technology and coupled with the increasing maturity of our own organization.

Architecture: Supporting Strategies

- 1. Integrate architectural leadership more deeply in the technical activities of the division.** We will continue to expand the routine integration of focused architectural leadership to complement the management chain of responsibility in directing the strategic agenda for the division. In addition to high-level strategy and large project review, we will engage technologists in individual service strategies within departments to consider opportunities to improve sharing and net value across the division.
- 2. Explore applicability of the Open Group Architecture Framework (TOGAF®) as an intellectual model to drive architecture artifacts for the division.** We will lead the exploration of The Open Group Architecture Framework (TOGAF®) to help establish a strategic technical base that complements our increasing maturity in planning and portfolio management as established through the PPMO (Planning and Project Management Office).
- 3. Provide leadership in service innovation, especially where it falls outside of our historical areas of focus and expertise.** We will provide leadership in areas of service innovation, for example:
 - Service options based on cloud computing: Issues to consider include: criteria for evaluation, strategies for integrating with inter-dependent application and infrastructure services that emanate on and beyond campus, potential impacts on baseline expectations for reliability, flexibility, security and compliance.
 - Service considerations for supporting IT needs in research: Since this is a significant focal area across higher education, we will stay engaged at least to help broker relationships among potential collaborators and assess potential gaps if they emerge.
- 4. Continue to engage peer and industry practices and strategies to the management and engineering activities of the division.** We will continue to expand the exposure, interpretation, and effectiveness of our Gartner subscription and other industry relationships as a reliable reference for information on IT Industry practice and strategy.

Planning and Project Management: Supporting Strategies

We have developed a basic Project and Portfolio Management Methodology and groomed a small pool of highly skilled project managers within the Planning and Project Management Office (PPMO). Our goals are to provide basic, high-value project and service management standardization for the division, and proactively improve it as opportunities arise.

- 1. Refine project management practices.** Based on feedback from previous projects, we will be adding requirements gathering, risk management components, and technical and project reviews to our project management methodology (PMM). Since most of the division projects are led by technical leads within departments, we will increase staff development training for our PMM.
- 2. Improve information and process to support Project Portfolio management.** It is vital to focus on those projects that are most valuable for the institution within the context of the university's strategic direction and culture, our business partners' requirements, technological changes, and our division's staff and financial resources. We will monitor and adjust our project selection efforts (tactical planning) to ensure that new projects are well-conceived and that strategic priorities are honored or updated through the process.
- 3. Aggregate our maturing efforts in operations support into an initial Service Management practice.** Through the maturing SII activity, we now have a foothold for bridging from project completion to service operations and ongoing support. We will take this opportunity to expand on existing SII practice of defining service ownership, technical interfaces, and support escalation arrangements (via Operational Level Agreements – OLA's) to engage additional service management parameters, including focused service definition, service sponsor, service resource plans, and service value assessment.
- 4. Develop common and practical governance strategies for the range of projects in the Division.** At the portfolio level for enterprise initiatives, the Executive Steering Committee on Computing (ESCC³) will continue to play a key role in advising Computing Services on

³ The ESCC membership includes the Provost; Vice Presidents for Campus Affairs, Advancement, and Research; the General Counsel; the Chief Financial Officer; Deans of two Colleges; and a representative from the Academic Leadership Group. It is an advisory committee to the Vice Provost Office (Vice Provost for Computing and Chief Information Officer, and the Associate Vice Provost).

sequencing for efforts that engage resources across the institution. At the project level, the PPMO assists each project team in structuring their governance, reporting and decision processes to address the roles of project stakeholders through the life of the project.

5. Support continued development and integration of the *Common Practice* areas identified by the bottom-up assessment during our strategic planning efforts of 2009. Through discussions with staff across the division, Computing Services discovered thirteen common practices to create a more efficient organization. These four emerged as priorities for immediate and focused attention, the others will be addressed through departmental or project initiatives.

- Desktop management – We will manage the division’s own desktops to adhere to the Information Security Office’s recommendations to the university.
- Nonfunctional requirements – Improve the process of gathering requirements to include all stakeholders, including the potential impacts on infrastructure, security, disaster recovery and operational processes.
- Metrics and monitoring – Across the divisional, gather and use data to measure our productivity and the effectiveness of our use of institutional resources. We will continue to assist departments on metrics to provide data for project and service assessment.
- Divisional document repository – We will make all division guidelines, policies and operational practices accessible *in one place*. Our goal is to improve the organization for our business documentation and to make it navigable and searchable.

Robust Human Resources and Organization Development: Supporting Strategies

We have made progress in developing an environment that supports the continued professional growth and success of our staff. The following strategic initiatives will build on that work to prepare Computing Services' staff for the future.

- 1. Build on our strong foundation of professional development practice to create opportunities for staff and leaders.** We will continue to ensure that performance management processes and documentation are current, effective, and implemented each year. At the same time, we will continue to actively engage in EDUCAUSE professional development activities and maintain our relationship with the MOR Consulting Information Technology Leadership Program (IT•LP) to develop Senior Leaders within and beyond Computing Services. Our Management Team forum (including the division's leaders from both the managerial and technical tracks) will continue to be a venue in which up-and-coming leaders learn about the division and the university and have an opportunity to contribute and grow. These activities will develop and change as circumstances require.
- 2. Enhance the two-career track to ensure relevance in an environment that includes "cloud computing".** We have been fortunate to have the opportunity to develop a codified two-career track framework for the entire university that provides full opportunity, recognition, and reward for technologists who are individual contributors rather than future managers. The development of this framework has had a positive effect on staff morale; our goal is to grow its use as a strategy for staff retention. It will also be a critical element for monitoring all position descriptions as the 'cloud environment' may potentially change the nature of the work itself. This work will be necessary to ensure that the university's requirements are fulfilled while individual staff members are given the opportunity to contribute effectively.
- 3. Continue to grow the International Work Assignment Program.** This program provides staff with many learning opportunities that are part of an international assignment while allowing staff to participate in important projects and exchange best practices with colleagues in other countries. We will explore the possibility of providing this as a CMU program beyond Qatar and Pittsburgh.
- 4. Develop a robust Succession Culture for Computing Services.** In an environment of ever-changing technology and leadership needs, we seek to foster a *succession culture* that focuses on identifying,

developing and growing talent within the organization as well as creating an atmosphere that encourages communication, teamwork, and growth. Our managers are encouraged to help people *understand the whole* and to be *on the look-out* for talent both inside and outside our own groups. Staff members are encouraged to ask about new opportunities and consider taking on different roles even if they are not strictly “promotions.” This notion is designed to be less linear than a traditional succession plan in which individual advancement is achieved only by succeeding specific leaders. Elements of a robust succession culture build on all of the strategic initiatives listed here as well as current efforts to offer significant communication and information sharing, and collaboration at the management level. The organization will also continue its systematic efforts to eliminate single points of failure based on individual skill sets.

Challenges Facing Computing Services

There are a number of challenges that we must acknowledge and address if we are to achieve the goals we have set. The following are significant challenges that we have identified along with strategies to mitigate risk.

- 1. Roles, responsibilities, process, and procedures are often discovered and defined on-the-fly.** The de-centralized nature of Carnegie Mellon challenges the collaborative governance that is required for many enterprise IT efforts. Large-impact projects can experience significant delay while we construct mechanisms to solicit requirements and feedback from stakeholders and groups. New international programs do not always include Computing Services in early planning stages. We will leverage and enhance partnerships gained through past success, rely on our improving predictability and reliability in making and keeping service promises, and continue to respect our collaborative partners as we face the challenges ahead.
- 2. Demand could exceed our ability to deliver.** Success can create its own challenges. Computing Services must exercise care that the development of services to support research, education, and administration remains sustainable. We need to focus on core competencies and employ methods that scale best over time and load. Creative and well-defined partnerships and processes will be critical to maintaining capability and meeting expectations.
- 3. Funding and human resources are stretched thin by existing operational work, leaving little room for new projects and innovations.** Maintaining existing IT services takes most of Computing Services' time and attention. We have made substantial progress in managing limited resources related to projects we undertake, and we need to expand this discipline into governance for ongoing services also - to reduce support for services on the decline, and decommission services once they have fallen below some value. Defining a measure of comparative value will be a significant challenge.
- 4. Diversity of mobile technologies creates challenges in delivering ubiquitous access to IT services.** Students, faculty, and staff all bring a variety of devices to campus with the expectation that IT services will be supported. The lack of technology standards is a significant challenge to delivering ubiquitous access to Carnegie Mellon IT environment and services.

5. **Managing a global enterprise complicates everything.** As the university expands globally, we must account for the combination of time zones plus the diversity of local controls, regulations, and customs, and anticipate their impact on core enterprise systems, processes and workflows. Complexities of currency exchange for acquisition, payroll, and reimbursement are but the tip of the iceberg. Diverse customs for work-day, work-week, seasons and holidays can force very different requirements onto customary notions of collaboration or community.
6. **Technology marches on.** Many collaboration and social networking solutions are free or inexpensive and easy enough to implement that the community—at the individual, group or organization level—can simply acquire and implement them without our consultation or help. On the surface, this is a fine approach to innovation. It is also true that such solutions may overwhelm or marginalize existing service offerings. Also, when interest fades or solutions lose support, we need to be able to respond if the organization has become highly dependent on the independent approach.
7. **Assessment of true impact of IT services on Education & Student Life is a challenge.** The actual impact of IT support services on education and student life is hard to measure and changes over time, making it difficult to assess return on investment. Computing Services is challenged to balance value of enhanced support for enterprise systems against the value developing services aimed at students. Although there is precedent for evaluating return-on-investment (ROI) for business improvement, there is no defined standard for improvements in education.