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UC MERCED INFORMATION TECHNOLOGY

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Executive Summary

Introduction

At the request of UC Merced senior management, we have completed a high level review of the campus' information technology (IT) strategy and operations. IT typically is responsible for such things as networking, data center operations, application development and maintenance including web development, personal computers, and telecommunications. IT department expenditures for FY 2006-2007 are projected to be approximately $4.5 million. Business and Financial Services (BFS) has allocated approximately $630,000 to support and manage administrative computing for applications developed by BFS and recharges for the UCLA financial systems. Additional technology expenses are incurred by the School of Engineering, the Registrar's Office, Admissions, the Library, University Relations, Facilities, and others.

Objectives and Scope

The objective of this audit was to review and evaluate the use, management, and governance of IT at UC Merced. We assessed the overall environment, activities (including local processes and procedures), and other practices supporting information technology using the following categories and the underlying objectives described in COBIT Management Guidelines[1] to guide our efforts:

- Planning and Organization
- Acquisition and Implementation
- Delivery and Support
- Monitoring

The scope of this audit included the IT department and other technology related functions in campus departments. We interviewed over 40 individuals from the Chancellor's office, Executive Vice Chancellor and Provost's Office, Vice Chancellor of Administration's Office, IT, the School of Engineering, the School of Natural Sciences, the Office of Graduate Studies, Research, the Library, Facilities, University Relations, Institutional Planning, BFS, the Registrar's Office, Admissions, and IR&C at the Office of the President. Where possible, we reviewed documentation and performed limited testing to corroborate information obtained from the interviews. Based on the interviews and limited testing, we evaluated the maturity of the function to the COBIT guidelines.

Overall Conclusion

Based on the results of the interviews and the limited testing performed, IT at UC Merced has made good progress in a number of areas. As the chart in Appendix 1 shows, in many of the objectives UC Merced has advanced beyond the initial stages of maturity. In addition, there have been several projects that have been successfully completed that now support the operations of an open campus. These projects include the successful implementation of a network infrastructure and an identity management system which enables users access to many systems with a single sign-on. They have also implemented the Banner Student System and an integrated ID card (Cat Card).

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[1] Control Objectives for Information Technology (COBIT) 3rd Edition Management Guidelines, July 2000, Released by the COBIT Steering Committee and the IT Governance Institute.

However, within the overall context of this progress there are several critical areas that require immediate attention. One area involves the lack of communication between the IT department and its end users. Underlying the lack of communication is the lack of management structure and practices that could make good communication possible. The lack of communication and key practices can result in misunderstandings, frustration, and mistrust that detract from the overall progress of the IT department.

We also identified one area which is not currently a problem, but represents a potential missed opportunity. That area involves the lack of progress toward the development of an information architecture. If an information architecture were developed for both the business processes and the underlying information needs for those processes, UC Merced could develop integrated IT and data capabilities that could provide substantial long term benefits.

Management's Actions

UC Merced agrees with the audit findings that improved communications is an essential precursor for making substantial and sustained progress both in resolving currently recognized challenges and for not squandering the opportunities for creating an information architecture that would significantly enhance our long term business process capabilities. Between now and December 31, 2007, we are planning to undertake the following actions:

1. continue actions already in progress to extensively reach out to faculty, staff, and students to illuminate IT service delivery shortcomings from the user perspective, including through individual and group meetings;
2. complete a campus-wide survey on the effectiveness of IT services with the analysis of survey results completed by March 31, 2008;
3. convene follow-up meetings targeted at identifying specific changes to be implemented to improve service delivery processes;
4. aggressively implement those changes within the capability of the current IT organization to pursue on a short-term basis and create proposals for others;
5. present information about the scope and metrics of the current IT mission (consistent with information previously presented to the Chancellor, Executive Vice Chancellor and Provost, and Assistant Chancellor during a 4 hour session on August 6, 2007) to an expanded audience, beginning with the 60 Deans and Directors in late September;
6. establish at least one key committee to provide governance on information technology issues affecting general users; and
7. convene an IT Retreat in December 2007, under the aegis of the Chancellor, as a first major step in building consensus and providing direction as to the continuing implementation and service delivery models for information technology in a strategic campus-wide sense, as well as towards the associated planning and governance models.

Opportunities for Improvement and Action Plan

PLANNING AND ORGANIZATION

The planning and organization component concerns the identification of IT strategy and tactics that best contribute to the achievement of the organization's objectives. For the strategic vision to be realized, it must be planned, communicated, and managed for the different organizational perspectives. Finally, a proper IT organization as well as a technological infrastructure must be established.

Governance and Communication

The extent of responsibility and authority delegated to the IT department and the communication of that delegation to others in the organization are important for understanding the role of the IT department. The delegation of responsibility should be accompanied by appropriate mechanisms to assure management that other departments are being properly served by the IT department.

- End users do not have a clear understanding of the role of the IT department relative to technology decisions, particularly with respect to personal computer specifications and software development. IT standards should be the result of the joint decisions reflecting both the needs of the users and the support constraints of the IT department. Purchase of software and development of systems without this coordination could result in end users' needs not being met or an infrastructure that is expensive to support.

- The vision of IT within the future of UC Merced is not clear. The campus needs to consider whether they are going to be a "leading edge" user of technology and provide the corresponding funding and risk taking that accompanies this approach or whether they are going to follow a more conservative least cost approach. The recent changes in senior management may provide the campus with an opportunity to reassess the IT vision and clearly define the role and expectations of IT.

- There does not appear to be a framework or structure for establishing technology priorities that ensures input from end users, such as members of the faculty and administration, and accountability from IT management. An effective communication framework would seek input from users in all departments with significant technology activities, such as BFS and others. Using a standard framework for evaluating technical decisions could enable everyone to understand the basis for technical decisions and why their project was or was not selected for funding.

- Processes for defining, prioritizing, and staffing technology projects are not clear and documented. With the exception of the Banner Student Information Systems, most project development activities undertaken by IT do not have functional owners. As a result, administration and faculty who have not had input regarding technology strategy have been delivered technology solutions by IT that only partially meet or do not meet their business requirements.

With the changes in senior management, the addition of new faculty and students, and the shift in focus from opening campus buildings to running a campus, now may be a good time to clarify and communicate the role of the IT department to faculty, staff, and others.

Human Resource Management
Acquiring and maintaining a motivated and competent IT workforce and maximizing personnel contributions to IT processes is a challenge in any organization and is particularly challenging and important for UC Merced because of the lack of skilled technology personnel in the region.

- There is a dependence on single individuals for several critical network support functions, such as database management, operating system support, and network support. Since documentation of infrastructure operating procedures has not been developed, if any of the individuals in these critical positions were to leave UC Merced, the supported applications or network connectivity could be unusable for an extended period of time.

- Because of the small number of technology personnel, there is an inherent lack of separation of duties within IT as well as in other departments that have their own technology personnel. Under the new external audit standard issued by the American Institute of Certified Public Accountants, Statement on Auditing Standards 112, "Communicating Internal Control Related Matters Identified in an Audit," separation of duties among those performing key IT functions is considered a key control and will be expected to be in place. Appropriate separation of duties will need to be designed into key IT functions or, if that is not possible, compensating or mitigating controls will need to be established.

Information Architecture and Data Resource Management
Information architecture describes the structure of an organization's processes and related information systems. The primary reason for creating an information architecture is to ensure that business strategy and IT investments are aligned. Typically, information architecture includes a data model that is simple and clear to understand, data dictionaries, applications, data syntax, classification schemes, and security levels.

- Significant work has been done to develop a robust future-oriented technical infrastructure, including developing and installing the campus networks and single sign-on capabilities; however, little work has been done to develop a comprehensive information architecture to help ensure data is efficiently and effectively managed. Without an established architecture for managing information, new systems and databases created by users will generally make use of separate databases that only support the information and reporting needs of the individual user department. Because the information in the separate databases is not integrated with official organizational records, the resulting reports could contain inconsistent and inaccurate data for campus or department decision making. The existence and use of multiple databases managed by user departments also puts the campus at increased risk that laws, regulations, and University policies related to safeguarding confidential and sensitive information will not be complied with.

ACQUISITION AND IMPLEMENTATION
To realize the IT strategy, IT solutions need to be identified, developed, or acquired, as well as implemented and integrated into the business process. In addition, changes in and maintenance of existing systems should follow accepted practices for the entire life cycle of these systems.

- The implementations of the key infrastructure and information systems have been successful as a result of UC Merced having the benefit of experienced IT purchasing and implementation managers.

- There have been projects where end users have reported slippages in delivery dates, delivery of less than what was anticipated, and other changes that were not reported to them timely. While there is no substitute for quality project managers, there should also be processes and procedures established that enable issues arising during project development and implementation to be resolved properly and timely.

- Standards should be established for all parts of the systems development life cycle and should include both IT technical staff and end users in every step of the process. Particular areas of focus should include project scheduling, communications to end users, and communicating status to management. Business and Finance Bulletin IS-10 provides guidance for system development processes and would be an excellent starting point for developing local guidelines and procedures.

- An organization that develops or maintains systems should have a process for managing changes. At a minimum, the change management process should be documented and require end user sign-off of approval prior to any changes being made to the system. All changes to systems should be properly logged and monitored by management.

DELIVERY AND SUPPORT

This component addresses the actual delivery of required services, which range from traditional operations over security and continuity aspects to training. In order to deliver services, the necessary support processes must be set up. This component also includes the actual processing of data by applications systems, often classified under application controls.

Define and Manage Service Levels

The current types and levels of service provided by IT are not known or understood by the end user community.

- End-users are not clear about what services will or must be provided by IT and what services they can or must provide for themselves. For example, there are questions about who is responsible for application development, implementation of 3rd party systems, web site development, encryption of laptop computers, and desktop computer back up.

- There does not appear to be a process where end users can request changes to the level of service required or to question the need for or appropriateness of existing services. For example, users are unclear about and do not understand why there was a practice of deleting e-mail after 60 days.

- Cell phone, computer, and PDA offerings and support are limited, and, because of this, the IT department is perceived as a barrier to the use of technology. While standardization on a few technology products improves the ability of the IT department to deliver and support these products, the efficiencies must be balanced with end user needs. Currently, there does not

appear to be a mechanism for end users to discuss or influence changes to the IT department's service offerings.

- There is a lack of communication regarding goals, metrics, and standard management reporting. For example, for computers ordered for end users, the IT department could not report the average time to fulfillment, the days remaining for a particular order, or the number of outstanding orders.

- A substantial inventory of "spare" network equipment (estimated at $260,000) was on hand and not installed. Because computer equipment has a limited life before it becomes obsolete, it is important that investments be limited to equipment that is currently needed. In addition, spare inventory items with values of over $5,000 should be tagged and inventoried on a regular basis. Any decisions to order more than needed for immediate use should be carefully reviewed, approved, and documented.

- End users are not always receiving information and bills related to the delivery of telephone services. One department informed us that they have yet to receive a phone bill, and another reported that they used to get phone bills but no longer do. Unit managers need to receive and review telephone bills (with a record of calls made by employees) to detect improper employee use of University equipment and services. Additionally, information on costs related to the delivery of telephone service is needed to manage departmental budgets and expenses.

Establishing a common understanding of the level of service required by end user departments and able to be delivered by the IT department is important to customer satisfaction. While not required, service level agreements, which formalize the services to be provided and the quality and quantity of the services, could be used to attain this common understanding. These agreements could also include measurement criteria to enable both end user departments and the IT department to evaluate whether service levels are met. In addition, service level agreements generally undergo periodic review to determine if end user needs have changed and to allow end users an opportunity to question existing processes, practices, and service offerings.

Identifying and allocating costs

It is important that the IT process identify and allocate costs with the goal of ensuring a correct awareness of the costs attributable to the various IT services. This may require the use of a cost accounting system which ensures that costs are recorded, calculated, and allocated to the required level of detail and to the appropriate service offering.

- The IT department does not identify and allocate the costs of services. Also, the costs incurred for the various services are not reported. As a result, there is concern regarding both the amount and the use of the funds the IT department receives.

Managing User Problems

When providing support, the mechanism for handling problems should enable both the IT organization and the users to understand the status of their problem requests. The process of managing problems includes setting the proper expectations for resolution, timely communication of reasons why the resolution must be delayed, and mechanisms for the IT

department to track trends. The IT department has tracking software; however, the capabilities of the software and the accompanying procedures need to be improved.

- End users are unclear about the process for handling and responding to calls to the Help Desk. They are unsure how the calls are prioritized and feel they are not always kept informed of the status of their calls and when they can expect resolution. Several people informed us that their requests for assistance related to Help Desk, cell phone, or even building needs were only responded to and resolved after repeated phone calls and e-mails or after escalation to the CIO.

Ensuring Continuous Service

Most of the time, IT and user departments function under normal conditions. Some departments and the corresponding IT services need to be able to continue to operate even in the event of a disaster. Each department needs to consider the criticality of its operations and determine which of its functions can be suspended, can be maintained with partial service, or need to be fully operational immediately following a disaster and develop appropriate plans. These plans should be tested periodically to assure they will be effective when needed.

- Business Continuity Plans (BCP) for recovering and restoring critical functions after a disaster have not been developed and tested. While ultimate responsibility for developing BCPs rests with the department responsible for the function, because the IT department supports automated business processes, it is common for the IT department to play a significant role in assisting functional departments to develop, maintain, and test their plans. To support the campus recovery efforts and development of BCPs, IT should develop, standardize, and document backup schedules, media rotation practices, and restore test procedures.

Without BCP documentation and testing, UC Merced could face an extended period of time without the ability to function at an acceptable level. University policy and good business practices require the development, testing, and maintenance of BCPs for key functions and processes as protection against loss and extensive downtime.

MONITORING OF IT OPERATIONS

Measuring and monitoring key performance measures are important parts of managing an organization. Even without formal performance measures, reports showing status of current projects and service delivery statistics can help management identify problems and implement corrective actions before service is negatively affected.

- Performance measures are informal and not rigorously measured and reported. While there is an understanding of the importance of keeping the networks, application systems, and other key technology functioning, the formal documentation, recording, and reporting of these performance measures has not been established. Performance measures and results should be shared with users to increase their understanding of the level of service they are receiving.

- There does not appear to be an effective system for tracking the fulfillment of orders (for example, of phone orders and orders for PDAs). Without an effective system for tracking

order fulfillment, IT department management can be unaware of delays in the delivery of services to their customers. End users reported frustration regarding the length of time it takes to obtain cell phones, desk phones, and ISDN lines for enhanced call features. Some personnel reported waiting months for their order.

The IT department should establish quantitative and qualitative measures to report internally and externally the productivity of the IT department. Part of this reporting could include the use of the existing system for recording requests, which would need to be extended to other functions within IT to track performance measures and results for all IT department activities.

Action Plan: *For a description of the action plans developed to address all of the above opportunities, see the Management's Actions section of the Executive Summary.*

Overall Assessment of IT Objective Maturity

Objective	0	1	2	3	4	5
Planning and Organization of the IT Function						
Strategic IT Plan						
Information Architecture						
Technology Direction						
IT Organization and Relationships						
Communication of Management Aims and Direction						
Management of Human Resources						
Comply with External Requirements						
Assess Risks						
Manage Projects						
Manage Quality						
Acquisition and Implementation of New Systems						
Identification of Automated Solutions						
Acquire and Maintain Application Software						
Acquire and Maintain Technology Infrastructure						
Develop and Maintain Procedures						
Install and Accredit Systems						
Manage Changes						
Delivery and Support of Existing Systems						
Defined and Managed Service Levels						
Manage Third-party Services						
Manage Performance and Capacity						
Ensure Continuous Service						
Ensure Systems Security						
Identify and Allocate Costs						
Educate and Train Users						
Assist and Advise Customers						
Manage the Configuration						
Manage Problems and Incidents						
Manage Data						
Manage Facilities						
Manage Operations						
Monitoring of IT Operations						
Monitor the Process						
Assess Internal Control Adequacy						
Obtain Independent Assurance						
Provide for Independent Audit						

0 **Non-existent**. There is a complete lack of any recognizable process
1 **Initial / Ad Hoc** The organization recognizes the issue, but there is no standardized process
2 **Repeatable but Intuitive** Process are similar, though informal and intuitive.
3 **Defined Process** Procedures have been standardized, documented and implemented
4 **Managed and Measurable** The standard processes are monitored and measured.
5 **Optimized** Processes are at a level of external best practice, based on results of continuous improvement